RAILWAY MASTER MECHANIC

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Index to Volume XXVIII.

January to December, 1904

Issue.	Pages.	Issue.	Pages.	Issue.	Pages.	Issue.	Pages.
January	1 to 36	April	109 to 144	July	225 to 312	October	381 to 452
February	37 to 72	May	145 to 180	August	313 to 348	November	453 to 484
March	73 to 108	June	181 to 224	September	349 to 380	December	485 to 516

Illustrated Articles Indicated by Asterisk

Address of President Brazier Before M. C. B. Association. 285
Address of President Lewis Before M. M. Association... 305
Address of Mr. H. H. Vreeland Before M. C. B. Association ... 284
*Adjustable Reamers ... 166
*Air Brake Hose Testing Apparatus—N. & W. Ry ... 113
*American Locomotive Company—Improvements at Schenectady Works ... 19
American Railway Master Mechanic's Association—Committee on Subjects ... 60
American Railway Master Mechanic's Association—Report of Thirty-seventh Annual Convention ... 255
American Railway Master Mechanic's Association—Reports of Committees and Individual Papers ... 288
American Semi-plug Piston Valve ... 273
American Society of Mechanical Engineers ... 17-261
*Amew Spring Stop Cock ... 269
*Andrews, M. C.—Oldest Living Master Car Builder ... 264
Apprentices ... 211
Apprentices—the Training of—By John B. Phillips ... 351
*Arch Bar Drill ... 165
*Armstrong Bros.' Exhibit, World's Fair ... 478
*Armstrong Tool Holders ... 101
*A., T. & S. F. Ry.—Coal and Water Tests of Freight Locomotives ... 7
*Automatic Band Rip Saw ... 138
*Automatic Car Ventilator ... 65
*Automatic Double Car Tenoner ... 408
*Automatic Friction Board Lift Drop Hammer ... 68
*Automatic Air Discharge for Refuse Water ... 499
*Bancroft, William H., General Manager of the Union Pacific Railroad ... 74
*Barrett Geared Ratchet Lever Jack ... 67
*Belt Management ... 510
*Bettendorf Steel Truck ... 267
*Bodler, O. W., on Electric Wiring of Machine Tools ... 111
*Boiler Design—Report to M. M. Association ... 288
*Boring Tool Holder for Lathe Work ... 268
*B. & O. Ry.—Mallet Articulated Compound Locomotive .. 206
*Bowes Patent Hose Coupling ... 476
Brazier, Address of President before M. C. B. Association 285
Burke, John, on Economical Distribution of Scrap ... 10
*Bushing Pipe Plates ... 63
*C. & A. Ry.—Heavy Passenger Locomotive ... 338
*Cafe-Parlor Car—C. G. W. Ry ... 26
*Car Brass Boring Machine ... 475
*Car, 100,000 lbs. Capacity—C., M. & St. P. Ry ... 41
*Car, 80,000 lbs. Capacity, Steel Underframe Box—Illinois Central Railroad ... 487
*Car, Cafe-Parlor—C. G. W. Ry ... 26
*Car, Combination Stock and Grain ... 274
*Car, Convertible Sleeping and Parlor for Electric Railway 55
*Car, Dynamometer—International Correspondence Schools 333
*Cars for the Milwaukee Refrigerating Transit Company. 124
*Car Heating and Lighting ... 103
*Car, Vanderbilt 100,000 lbs. Capacity, Steel Flat ... 210

Care of Locomotive Boilers—Rules of Instruction....... 162
*Cast Iron Wheels 282
*C., B. & Q. Ry.—Balanced Compound Locomotive......... 328
*C. & E. I. Ry. Shops at Danville..................185, 315
*C. G. W. Ry.—Cafe-Parlor Car.......................... 26
*Chaser Grinder 269
*Cinder Pit—Terminal Railroad Association of St. Louis.. 164
*Clearance Reducing Valve Mechanism and Cylinder..... 366
*Cleveland Pressed Steel Car Lines...................... 173
*Cleveland Punching Machine 60
*C., M. & St. P. Ry. Shop Improvements at West Milwaukee 47, 75
*C., M. & St. P. Ry.—100,000 lbs. Capacity Car........... 41
*Coal and Water Tests of Freight Locomotives—A., T. & S. F. Ry.. 7
*Columbia Lock Nut 275
*Combination Stock and Grain Car....................... 274
Combustion, or the Source of Energy in the Locomotive. 501
Cost of Locomotive Repair Shops—Report to M. M. Association 292
*Comparative Trials of Locomotives Using Saturated and Superheated Steam 505
*C. & O. Ry.—Locomotive, Freight 21
*Crank Pins, a Gauge for Setting......................... 123
C., R. I. & P. Ry.—Opening of Line Between Kansas City and St. Louis 357
*Crown Brass—Device for Planing 163
*Cushions 507
*Cutting Keyways on Driving Axles—I. C. Hicks........ 460
*De Glehn Compound Locomotive—G. W. Ry. (England).. 44
*Device for Grinding Piston Rods......................... 19
*Device for Holding Drill Press Work.................... 217
*Device for Locating Gauge Cocks........................ 120
*Diaphragms 170
*Dickinson Adjustable Smoke-jack 266
Distribution of Scrap 123
D. & H. to Use Electric Power............................ 465
*Drafting Room—Kink for the............................. 464
*Driving Wheel Drop Table—Southern Railway.......... 160
*Drop Forgings 156
*Dynamometer Car of the International Correspondence Schools 333
Economical Distribution of Scrap 10
*Electric Locomotive for the N. Y. C. & H. R............. 340
Electric Plant for Railroad Shops......................... 159
*Electric Wiring of Machine Tools......................... 111
*Equalizing Truck for Freight Cars........................ 215
*Expanding Mandrel 275
Farlow Draft Rigging 275, 508
*Fitch, Charles H., on Railroad Shop Tools.....23, 51, 91, 125
*Floorer—A New Style 509
*Galvanized Iron and Steel Sheets........................ 269
*Garrett Interlocking Draft Arm.......................... 276
*Gas Engine—A New Design 477
*Gauge Cocks—Device for Locating 120
Grates for Bituminous Coal—Paper Before M. M. Association 303
*Gray, C. R.—General Manager, S. Louis & San Francisco Ry. 382
*Green Pneumatic Hammer 276
*Green River Bolt Cutter 220
*G. S. & F. Ry.—Standard Front End Arrangement...... 157
*Handy Journal Jack Block 33
*Hardening and Annealing Furnace....................... 170
*Hayes Electric Drill 276
*Hess Milling Machine 137
*Higgins, Samuel—General Manager of the New York, New Haven & Hartford Railway.......................... 110
*Holmes Metallic Packing 410, 102
*Hydraulic Driving Brass Press........................... 158
*Hydraulic Piston Puller 463
*Illinois Central—80,000 lbs. Capacity Steel Underframe Box Car 487
Improved Tool Steels—Report to M. M. Association...... 302
*Improvements at the Schenectady Works of the American Locomotive Company 19
Injectors 202, 336
*Inside Braces for Flat Bottom Gondola Cars............ 82
*Inspection Engine—D. & H............................... 467
Kleinans, Frank B., on Piping for Hydraulic Machinery. 81
Lewis—Address of President before M. M. Association.. 305
*Link Radius Grinding Machine of the West Milwaukee Shops—C., M. & St. P. Ry.............................. 464
*Locomotive, Balanced Compound—C., B. & Q. Ry........ 328
*Locomotive and Machine Co. of Montreal, Limited...... 507
Locomotive Boilers 198
*Locomotive Boiler Design 331, 154, 194
*Locomotive, Consolidation Freight—Canadian Pacific Ry. 461
*Locomotive, Deglehn Compound—G. W. Ry. (England).. 44
*Locomotive, Electric for the N. Y. C. & H. R. Ry....... 340
*Locomotive, Electric for the P. & R..................... 500
*Locomotive, Four-Cylinder Balanced Compond—N. Y. C. & H. R. Ry.. 199
*Locomotive, Freight—C. & O. Ry.......................... 21
*Locomotive, Freight—N. Y. C. & H. R. Ry................ 98
*Locomotive, Freight—Southern Railway 121
*Locomotive Frames—Report to M. M. Association....... 296
*Locomotive, Heavy Freight—L. S. & M. S. Ry........... 12
*Locomotive, Heavy Passenger—C. & A. Ry............... 338
*Locomotive—High Speed Three-Cylinder Compound German 358
*Locomotive, Mallet Articulated Compound—B. & O. Ry.. 206
*Locomotive Passenger, Union Pacific Railway........... 130
*Locomotive Proportions, Trend of.....................4, 39
*Locomotive, Ten-Wheel Passenger—C., B. & Q. Lines West 402
Locomotive Testing at the St. Louis Exposition—Bulletin No. 3 342
*Locomotive Testing Plant at the Louisiana Exposition.. 212
*L. S. & M. S. Ry.—Heavy Freight Locomotive........... 12
*Maher, N. D.—General Manager of the Norfolk & Western Railway 214
*Marked Advance in Locomotive Boiler Maintenance..... 467
Master Car Builders' Association—Abstract of Committee Reports and Individual Papers.......................... 279
*M. C. B. Association—Report of Tank Car Committee... 362
Master Car Builders' Association—Report of Thirty-eighth Annual Convention 250
M. M. & M. C. B. Associations: Should They Consolidate? 383, 459
M. M. & M. C. B. Associations—Results of Letter Ballot.. 463
Master Steam Boiler Makers' Association—Third Annual Convention 403
*McGuire-Cummings Grain Door........................... 276
*McCord Journal Box 64
*McKeen, Benjamin—General Manager of the Vandalia Line 38
*Metal Saw Cutting-off Machines......................... 31
*Mica Metallic Packing 271
Mica Metallic Paint 409
*Miller, H. I.—General Manager C., R. I. & P. Ry........ 350
*Modern Blacksmith Shop for Railroad Work—A. W. McCaslin 472
*Moodie, D. E., on Distribution of Scrap................. 123
National Railroad Master Blacksmiths' Association—Annual Convention 364
*N. Y. C. & H. R. Ry.—Electric Locomotive............... 340
*N. Y. C. & H. R. Ry.—Four-Cylinder Balanced Compound Locomotive 199

*N. Y. C. & H. R. Ry.—Simple Freight Locomotive........ 98
*Oil Cup and Swab 11
*Oldest Living Master Car Builder—M. C. Andrews...... 264
Ormsby, W. R., on the Handling of Scrap............ 58
*Paint Plants for Railroads.......................... 271
Pennsylvania Railroad Testing Laboratory at St. Louis Exposition—Bulletin No. 1 28
*Pintsch Side Lights for Suburban Coaches............ 219
Piping for Hydraulic Machinery....................... 81
*Plain Radial Drill 167
*Pneumatic Hammer for Boiler Shop.................... 90
*Porteous Injector 66
Power Required to Drive Machine Tools.............. 96
Preventive of Rust of Steel Cars..................... 279
Prices for Repairs to Steel Cars..................... 284
*Railroad Shop Tools.......................23, 51, 91, 125
Railroading as Viewed by a Railroader................ 3
*Railway Club, Western 57
*Railway Officials Who Received Their Training in the Motive Power Department 182
Randolph, L. F., on Modern Locomotive Boilers........ 198
Railway Mechanical Training as Viewed by a Technical Graduate 489
*Renewal of Car Department of Portsmouth Shops—Seaboard Air Line 86
*Repairs to 9½-in. Air Pumps......................... 162
*Reversible Ratchet Wrench 63
*Revolving Racks 218
Rexoid Roofing 410
*Riveting Machine with Special Universal Bail......... 219
*Robertson, Alexander—General Manager of the Terminal Railroad Association of St. Louis.................. 146
*Roofing 218
Rough Switching 390
*Ruth Flue Machine 136
Scrap Handling 58
Scrap—Economical Distribution of..................... 10
*S. A. L. Ry.—Renewal of Car Department at Portsmouth Shops 86
*Secor Gas Engine 32
*Sherwood Manufacturing Company 476
*Shops of the Chicago & Eastern Illinois Railway....185, 315
*Shops—Locomotive and Machine Co. of Montreal........ 507
*Shops of the Terminal Railroad of St. Louis........115, 147
*Shops—Rock Island System at East Moline........455, 490
*Sixteen-inch Crank Shaper 370
*Six-Spindle Gang Drill 136
*Smith, H. B., Machine Co.—Exhibit at the Universal Exposition, St. Louis................................ 409
Solid Draft Rigging 103
*Southern Railway—Driving Wheel Drop Table.......... 160
*Southern Railway—Freight Locomotive 121
*Square Engine Houses—Terminal Railroad Association of St. Louis 386
*Standard Accident and Medicine Cabinets.............. 510
*Standard Front End Arrangement, G. S. & F. Ry....... 157
*Staybolts—The Proper Location of Tell-tale Holes...... 59
*Staybolts, Radial for Oil-Burning Engines—By I. C. Hicks 396
*Steam Motor Car 466
Steam Turbine Installed in Paint Plant................ 102
*Steel and Passenger Car Construction.................. 279
*Steel Construction and Car Design.................... 322
*Sullivan, A. W.—General Manager of the Missouri Pacific 454
*Super-Heater—The Schenectady, for Locomotive Practice 398
Super-Heated Steam Trials in Germany................ 466
*Taps and Dies 66
Technical Graduate and the Machinery Department of Railways 133
Technical School Graduates—Individual Paper Before M. M. Association 291
Terminal Handling of Locomotives 459
*Terminal Railway Association of St. Louis—Cinder Pit.. 164
*Terminal Railroad Association of St. Louis—Square Engine Houses 386
*Terminal Railroad of St. Louis—New Shops at East St. Louis 115, 147
Test of High Speed Electric Locomotive—N. Y. C. & H. R. R. R. 504
Test of Compound for Brazing Cast Iron............... 466
Theodore Audel & Co.................................. 103
*Thirty-six Inch Engine Lathe 372
*Thor Power Hammer 475
*Tool Holders 31
*Tools, Special in Elkhart Shops—L. S. & M. S. Ry...... 352
Traveling Engineers' Association—Twelfth Annual Convention 391, 357
*Traverse Shaper with Pull Cut Head.................. 165
*Trend of Locomotive Proportions......................4, 39
*Union Pacific Railway—Passenger Locomotive.......... 130
*Universal Grinder 272
*Valve Gear—The Young Rotary for Locomotives........ 495
Valve Lubrication 156, 208
*Vapor System of Car Heating.......................... 278
*Variable Exhaust Device—C. G. W. Ry.................. 45
Variable Speed Motor—Individual Paper Before M. M. Association 306
*Ventilating System in Blacksmith Shop—Northern Pacific Railway 83
*Vertical Boring and Turning Mill...................... 172
*Vise Wrought Bars Parallel Swivel................... 476
Vreeland, H. H.—Address Before M. C. B. Association... 284
*Washburn Coupler 509
*Western Railway Club 57
Western Railway Club—February Meeting............... 97
*Wilcox, David—President of the Delaware & Hudson Railroad 2
*Young Rotary Valve Gear for Locomotives........... 495

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THE conventions are to be held at Saratoga again this year. The headquarters of both associations will be at the Grand Union Hotel. The Master Car Builders' Association will hold their convention June 22nd to 24th inclusive and the American Railway Master Mechanics' Association, June 27th to 29th, inclusive.

Applications for hotel accommodations should be made to Woolley & Gerrans, care Hotel Marie Antoinette, 67th street and Broadway, New York City, up to May 1st, 1904. After that date to Woolley & Gerrans, Grand Union Hotel, Saratoga Springs, N. Y. Applications for exhibition spaces should be addressed to Mr. J. Alexander Brown, Secretary, 24 Park Place, Room 17, New York City.

IN another column we reproduce the results of a coal and water test made on the third district of the Chicago Division of the Atchison, Topeka and Santa Fe Railway. The figures presented are of peculiar significance in that they not only offer a basis of determination upon which to be guided in the selection of a suitable machine for a given service; but further compare two locomotives of identical design except in that one is a simple engine and the other a four-cylinder compound. It is possible to arrive at definite conclusions regarding the relative performance of simple and compound locomotives only by comparing those whose designs are identical except in the feature of steam distribution. By comparing locomotives whose heating surfaces, grate areas, wheel diameters, etc., are the same, which are equally well drafted and in which the proper ratio of heating surfaces and grate area to cylinder volume exists. the difference in the results obtained should be due entirely to the relative erciency of the methods of steam distribution, when both locomotives are placed in the same service. We are pleased at the opportunity of reproducing the results of tests of two locomotives so arranged and merely direct attention to the figures presented.

OBSERVATION of the fact that in a lot of new switching locomotives the Frisco officials have specified friction gears at both ends, prompts the query as to why friction gears are not more generally applied to both ends of switching locomotives. This particularly so, inasmuch as the great majority of draft gears are damaged in switching yards, hence the provision of a cushion of large capacity on the engine would certainly seem to tend to reduce the severity of many of the shocks.

THOSE having to do with machine tools and consequently interested of late by the new tool steels and the generally increased attention given to machine tool output resulting from the introduction of the new steels, will do well to secure the paper of C. G. Barth upon "Slide Rules for the Machine Shop," which was presented at the December meeting of the A. S. M. E. The rules are based upon extensive tests which have been made to determine the relation between the depth of feed, cut and speed, diameter of work and its speed, the size and shape of tools, etc. The results of these tests have been brought down into simple rules, easily handled by the ordinary shop man, and should certainly be in the hands of all concerned with the subject.

THE superintendent of motive power of a prominent western line sends us a letter in which he approves of the remarks on engine failures expressed in an editorial in our December issue. But he objects that we should have gone further and set forth the reasons for desiring a hot fire down hill and in side tracks in order to keep flues from leaking. He says, further: "We can make a guess that the writer's reason for keeping the fire up while on side tracks and going down hill is to keep up circulation, so that when cold water is put into a boiler it don't all settle to the bottom and start the bottom flues in the shallow fire boxes to leaking. When we had the deep fire boxes of the American type engines we did not have so many leaky flues because there was room in the water leg for cold water to settle and it did not reach the flues until after it had been heated from around the fire box."

As to the greater tendency of the shallow box (particularly the wide grate type) to leak we will simply say that we believe this tendency has increased in exactly the amount in which the proportion of firebox to total heating surface (and grate area) has been reduced in these shallow boxes—in other words, in any given water district, the comparative tendency of different boilers to leak depends entirely upon the comparative ratio of fire box heating surface to grate area. Reverting to the main proposition, however, as to what the engine crews can do with the engines with which they are furnished, we will not take boiler design or circulation into the question, but will go at the matter from the standpoint of the man who is handling the engine, as follows. When we reach the engine we are to take out on this trip, and look into the firebox we will see the tube sheet in one of three phases. It will either be dry, seeping or spurting. If it is dry we are all right, if it is spurting we had better turn it back into the roundhouse. If it is seeping we know that if it is a comparatively new set of tubes the seeping will take up under a hot fire, but if the tubes are rather old the probabilities are that the seeps will too easily develop into spurts and we had better not take her without recording a protest.

Once having accepted the engine, however, it is, or should be, "up to us" to get over the road with her. We know that when the tubes start to seep it is a question as to whether they will take up again or else develop into the spurting which is generally a hopeless stage. Obviously then, the thing to do is to prevent the start of any phase of leaking. We know that this start never occurs while the engine is working hard, but develops after we tip over the hill or are lying in sidetracks. Why? Because when the engine is working hard we are burning coal at a rate which produces an intensity of temperature which causes the junction of the tubes with the tube sheet to expand (with bad water) to an extent which is beyond the limit from which they will return (when the rate of combustion drops) to the tightness of junction which existed before.* Now having in mind this knowledge that the tube junctions with the sheet have become distorted while working the engine hard, to an extent which renders them liable to start leaking when the firebox temperature drops, because of a cessation of firing when we tip over the hill, or go in a sidetrack, our only chance is obviously an endeavor to prevent any material drop in the degree of firebox expansion reached while the engine was working hard. This means that the firebox temperature should not be allowed to drop very much, which means that ideas of fuel economy and aversions to popping must be dropped, the blower used freely and a good hot fire kept up. That's the whole secret of getting over the road with a leaky engine—keep her hot in the firebox, all the time, at all points and places and under all conditions, from the time we start out until we cut off from the train at the end of the run. The start of a tube leak indicates that this was not done—that the fire was allowed to die down—otherwise the leak could not have occurred. In this line it may be remarked that this avoidance of temperature drop does not imply that a high combustion rate is necessary to be maintained, for the differences of temperature produced by burning coal at 40 lbs. per sq. ft. of grate per hour as compared with that of 180 lbs. per sq. ft. per hour is only a couple of hundred degrees. It is at rates below 40 lbs. per sq. ft. of grate per hour that the corresponding temperatures drop so rapidly as to be of practical effect.

MR. DAVID WILCOX.

PRESIDENT OF THE DELAWARE & HUDSON RAILROAD

Mr. Wilcox was born in Flatbush, N. Y., December 12, 1849, and has remained a native of New York State all his life. He was graduated from Yale University in 1872, later studied law at the Columbia Law School and was admitted to the bar in 1874. He was appointed general counsel of the D. & H in 1895, elected vice-president also in 1899 and president in May of the past year.

Before leaving this subject we would like to call the attention of our correspondent to another matter in connection with this subject, inasmuch as the tone of his letter gives us the impression that some of the ideas expressed are going to be promulgated. And this is, that retaining his knowledge as a superintendent of motive power, he views the engineer's job from the standpoint of an engineer before coming down very hard on some of the less efficient. The ordinary engineer is perforce dependent upon his officials for knowledge of the major portion of the finer points of

*For an extended consideration of this subject we refer to a paper entitled "Concerning Leaky Fireboxes," by T. S. Reilly, Proceedings Western Railway Club, October, 1903.

engine handling. If the superintendent of motive power, master mechanic or traveling engineer, by reason of his greater breadth of view and facilities for information and observation, arrives at the proper solution of any particular difficulty, it is his duty to promulgate the information before calling down a transgressor. An instance: Not long ago our attention was called to a roundhouse foreman who refused to have wet sand cleared out of sand boxes where the main air reservoir was found to contain much water (and with a regular crew he was in the right), yet neither the master mechanic nor traveling engineer of this division had a realization of the connection between the two phenomena, and even after their attention was called to the kink no bulletin was issued passing around the information.

In this line we recall a division whereon the master mechanic was consistent in going after the engine-failure-because-of-leaking matter by first placing himself upon record in a bulletin stating that: "Fuel economy, black smoke and popping around stations and down hill was to be disregarded when handling leaky engines. That they must be kept hot all over the division; that if an engine was delivered to an engine crew with a wet sheet the roundhouse foreman's attention must be called to it, in which case the roundhouse assumed the responsibility for failure; but where an engine was delivered to the crew with a dry sheet, or no protest against a wet sheet was made, the engine crew were to be held strictly responsible for any leakage that might develop on the road. Any engineer feeling a doubt as to his ability to make successful trips under these conditions will please request this office for instruction." This instruction involved the assignment of the traveling engineer to make a trip with the requesting crew and "showing" them. This course rendered the information available, without which being done there is as little reason for calling down a transgressor as would be exemplified by the general manager of our correspondent reducing him in rank because "since the last lot of locomotives purchased under your specifications are not giving as satisfactory service as expected, you evidently are not a competent man." Since it is well conceded that the design of boilers has an undoubted, though not clearly analyzed, effect upon its performance, it is evident that the engine crew is not alone in being short on information, and if the officials, because of their superior advantages, have knowledge of more proper ways of engine handling than is possessed by the ordinary engineer, it is certainly unjust to the latter to be called to account before having had these pointers brought to their attention. And the bulletin board should be backed up by a traveling engineer who is not only able, but actually does take the engine himself and demonstrate. This thing of traveling engineers spending their time in roundhouses and cabooses, gouging the fireman out of his seat, or else as a mere errand boy for the master mechanic and superintendent, is the main reason for the wide variation in the performances of the different engine crews on any particular division. We do not know the traveling engineer of our correspondent, but if his physical constitution and mental disposition are such as to have within the year just closed have actually taken a shovel in his hand and fired up a ten-mile hill, or is so conspicuously able and self-confident as to have gone over on the right side and brought in a train that some less able man was ready to give up, he differs considerably from the usual incumbent of this position. And if he further spends one-third of his time actually on the engines, he is a wonder. Yet only by such means is he of any use to the engineers, who are willing to agree where an actual demonstration is given, but very loath to pay much attention to a man who does not get out and "show" how it is done.

Railroading as Viewed by a Railroader

Communication from a Superintendent of Motive Power.
Editor, Railway Master Mechanic.

Have just been reading your editorial on page 536 of the December Master Mechanic, on the subject of "get thar." The article appeals to me as being an excellent one and has a smell of tallow only found between the roundhouse stove and the bulletin.

The fellow that wrote that article has been close to an engine sometime and knows what he is talking about when he says "a crew that knows its business don't have leaky flues." He ought to have given some reason for giving just as much attention to a fire down hill and on side tracks as when working on a hill.

While we don't know who wrote the article we can make a guess that his reason for keeping the fire up while on side tracks and going down hill is to keep up circulation, and when cold water is put into a boiler it don't all settle to the bottom and start the bottom flues in the shallow fire boxes to leaking.

When we had deep fire boxes on American type engines we did not have so many leaky flues because there was room in the water leg for cold water to settle and it did not reach the flues until after it had been heated around the firebox.

Have that fellow write some more, it sounds like a railroad and reminds me of an answer of a brakeman when asked what he passed at a certain station, he answered "two stocks, a way car bounce and a drag." That's railroad vernacular for you, and sounds a whole lot like reading the article referred to which treats of breakdowns in a business-like way. If most of these breakdowns were disregarded and the crew kept going the motive power department might have some less explanations to make without having to call a fellow in and tell him where he made the mistake.

I want to convey my appreciation of what I consider to be a good, practical article. I have written to each of our master mechanics and invited his attention to it.

December 12, 1903.

The Trend of Locomotive Proportions

(Continued from Page 540 of Volume 27.)

CONTINUING with the series of tables, the first of which appeared in the December, 1903, issue of the Railway Master Mechanic, showing the existing ratios of locomotive parts and the changes which these relationships have undergone, we present herewith a table of dimensions and proportions of freight engines, selected as representative of freight locomotive design from the year 1880 to the present time. The figures appearing in the table are arranged graphically to demonstrate more clearly and readily the changes undergone in the several dimensions and ratios during the development of locomotive design.

The diversity of opinion among designers, evident from the irregular location of the points by which the curves are plotted and the difference in the conditions under which locomotives are operated on different roads and upon the different divisions of the same road, renders it impossible to advocate a given set of ratios as representative of best practice. It is therefore possible to arrive at a definite understanding of the proportions considered best practice only by tabulating the dimensions of a number of representative engines and comparing the data so obtained.

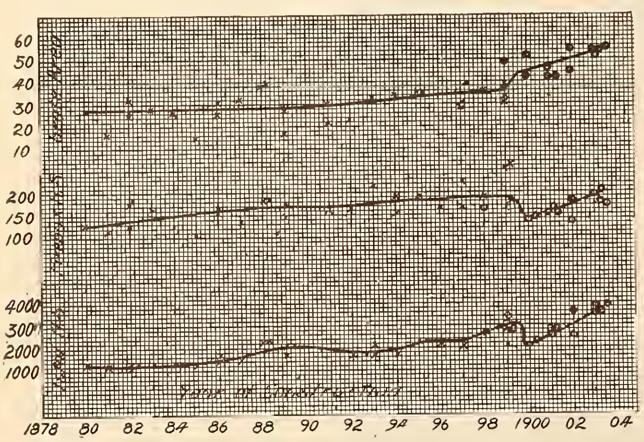


Fig. 1—Heating Surface and Grate Area.

By following the general direction of the points plotted an imaginary zone may be outlined within which the several dimensions and proportions vary. Instead of outlining such a zone we have plotted a curve in each case, indicating a general average of the several results determined and an imaginary zone would follow the general direction taken by the curve.

In order to discriminate between locomotives using the narrow fireboxes and those burning coal on the modified wide grates, the former are represented by crosses and the latter by circles. Where no discrimination is made the points are represented by solid dots, as in the case of the curve representing length of tube divided by diameter. In the case of compound locomotives, the volume of both cylinders is taken as twice the volume of the high pressure cylinder.

Referring now to the curves, the heating surface is seen to have increased continually and in the years of, about, '98 and '99, would tend to rise more abruptly, due to the general increase in length of tube. This is borne out by the form of the curve, representing ratio of tube length to diameter at the points indicating these years. The introduction of the modified wide firebox was attended by a reduction in the firebox heating surface as manifested by the abrupt change of form and the total heating surface and firebox heating surface are seen to rise together, the former, however, rising above those of the older type of boiler having the narrow grate, while the firebox heating surface accompanying a modified wide grate is, in many cases, as low as that of the narrow box in service ten years

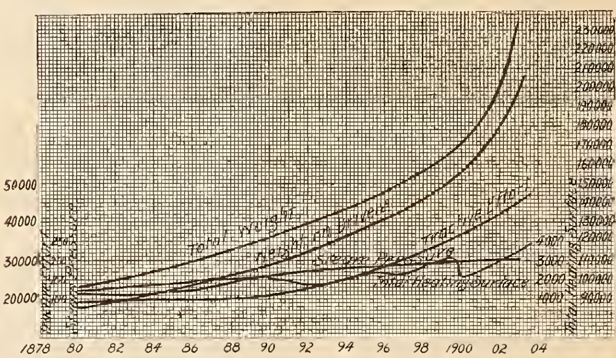


Fig. 2—General Features.

ago, and is much lower than the same surface of some recent designs which continue to use the narrow grate.

Steam pressure has increased steadily and consistently up to 1900, after which time 200 pounds appears to be the more general boiler pressure for simple engines, while in some instances it has reached 225 pounds on compound locomotives and in recent years is generally higher than 200 with this type. Comparing the curve of the freight locomotive with that of the passenger, simple pasenger locomotives are operating under higher boiler pressure than the simple freight engines.

Weight on drivers and total weight of locomotive have increased together and consistently. The small diameter of the freight locomotive driving wheels permits the mud ring of the modified wide firebox to extend beyond the frame so that the trailing wheel is usually unnecessary on locomotives in such service. The change in the direction of the curve is not so abrupt as in the case of the passenger curve where the influence of the introduction of the wide grate and trailing wheels is clearly marked.

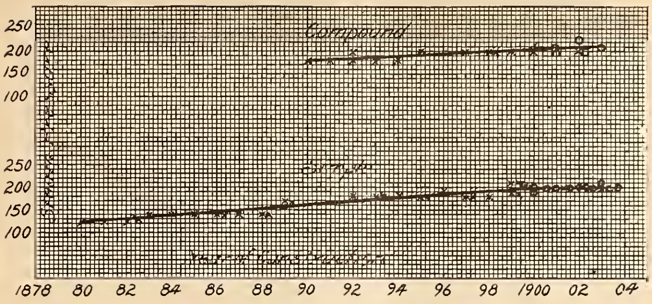


FIG. 3—STEAM PRESSURE.

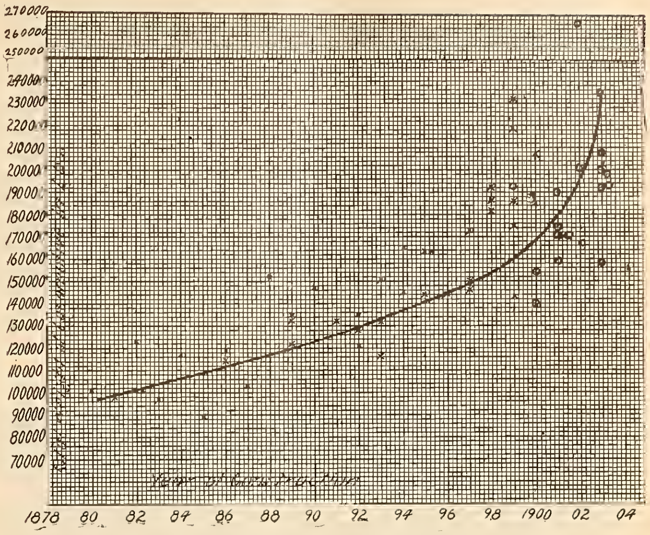


FIG. 6—TOTAL WEIGHT.

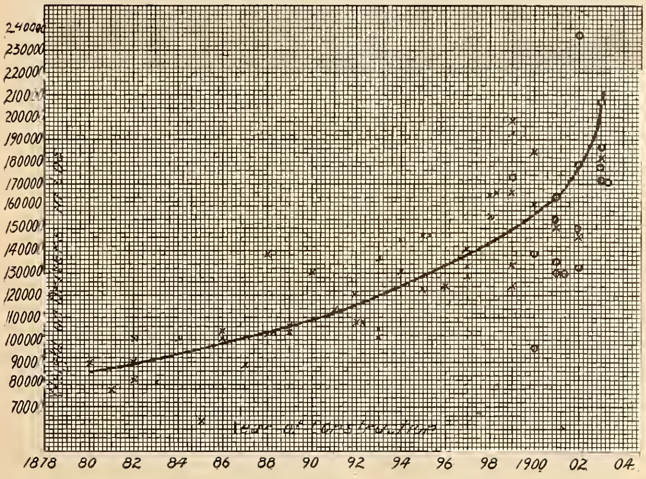


FIG. 4—WEIGHT ON DRIVERS.

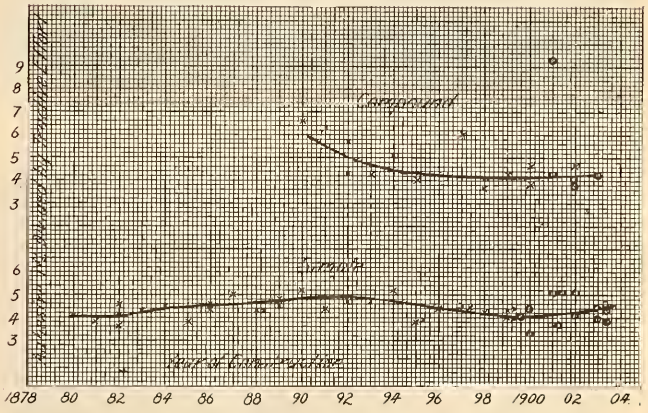


FIG. 7—RATIO OF WEIGHT ON DRIVERS TO TRACTIVE EFFORT.

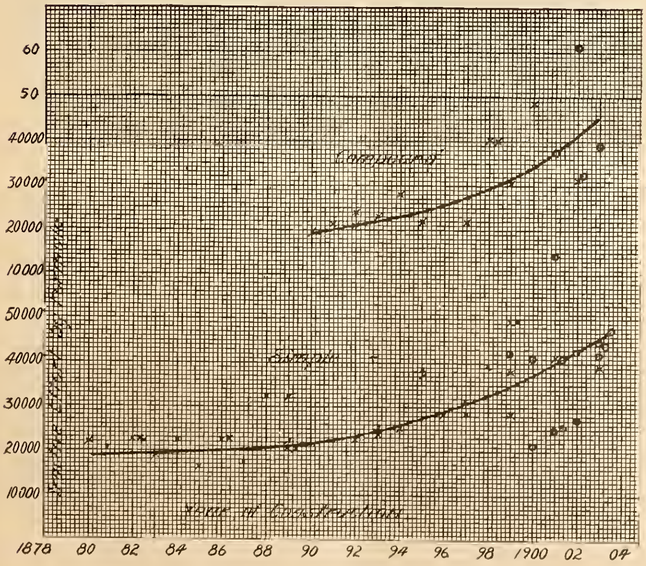


FIG. 5—TRACTIVE EFFORT BY FORMULA.

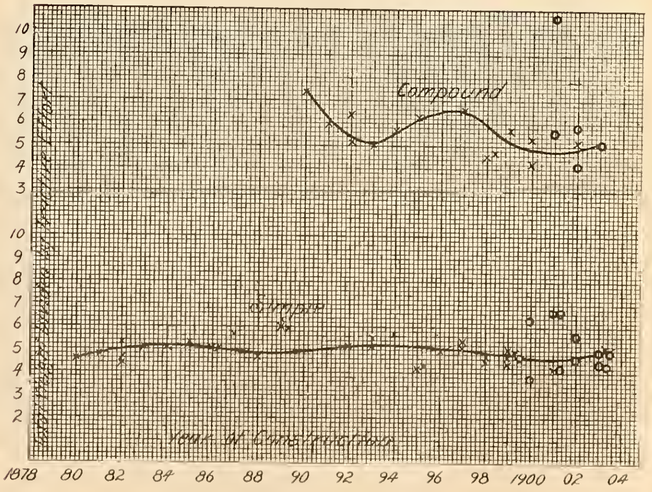


FIG. 8—RATIO OF TOTAL WEIGHT TO TRACTIVE EFFORT.

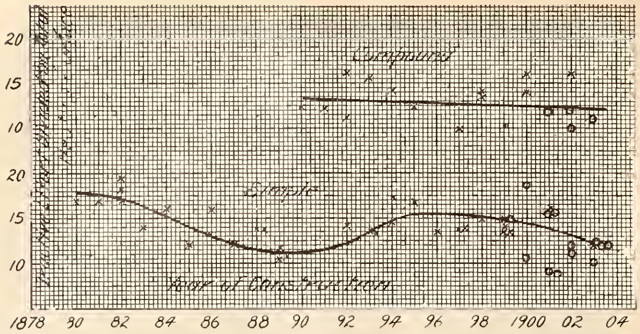


Fig. 9—Ratio of Tractive Effort to Total Heating Surface.

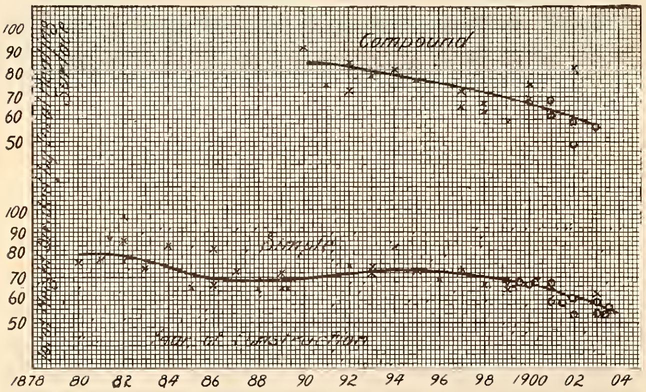


Fig. 10—Ratio of Total Weight to Total Heating Surface.

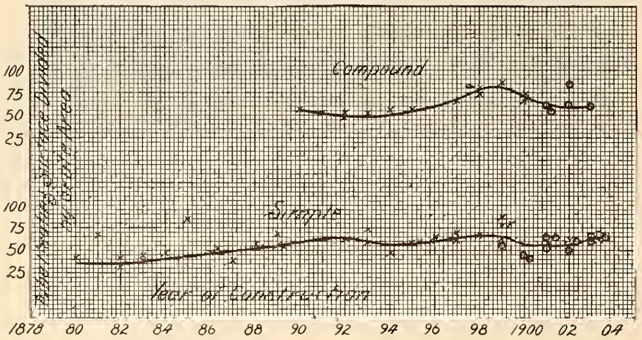


Fig. 11—Ratio of Tube Heating Surface to Grate Area.

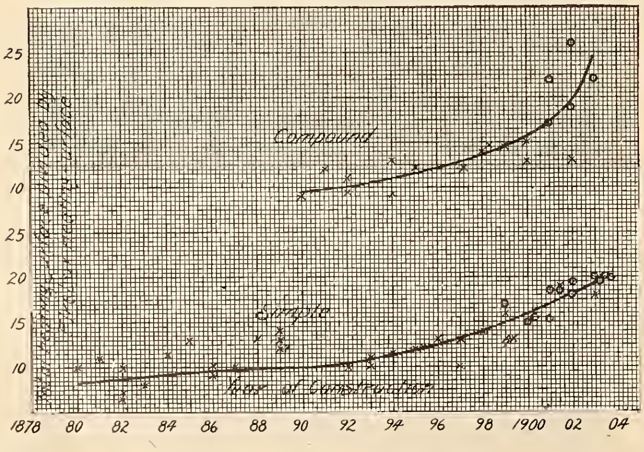


Fig. 12—Ratio of Total Heating Surface to Firebox Heating Surface.

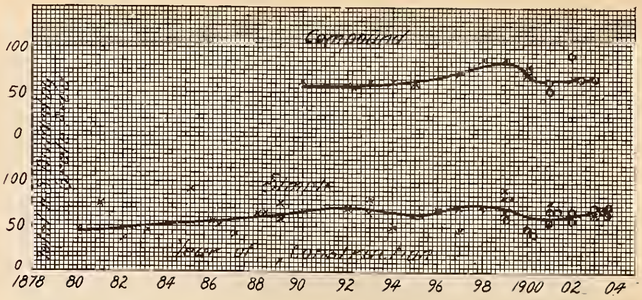


Fig. 13—Ratio of Total Heating Surface to Grate Area.

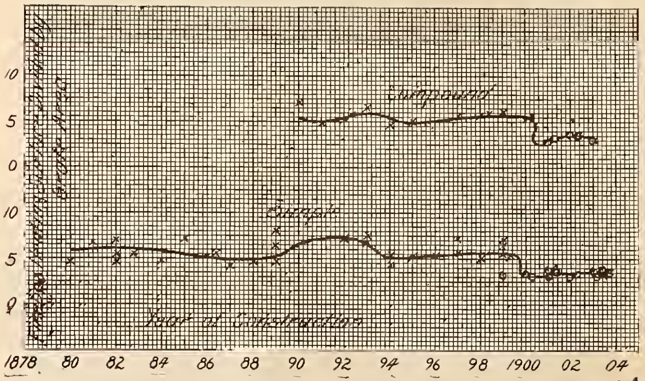


Fig. 14—Ratio of Firebox Heating Surface to Grate Area.

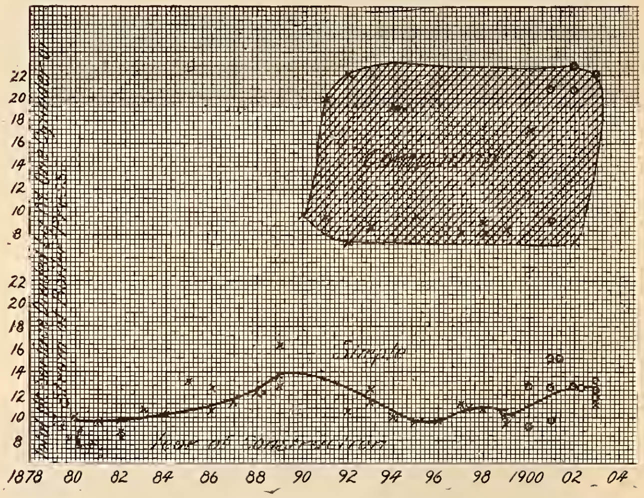


Fig. 15—Ratio of Total Heating Surface to Weight of One Cylinder Full of Steam at Boiler Pressure.

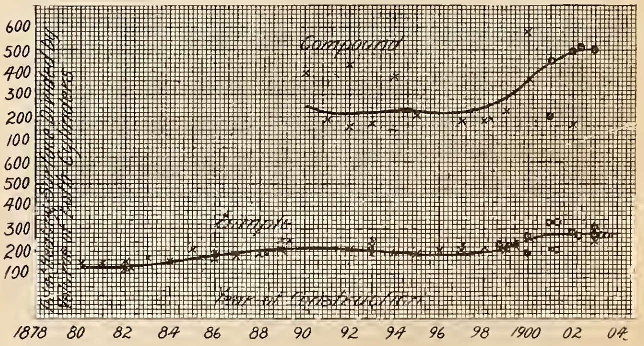


Fig. 16—Ratio of Total Heating Surface to Volume of Both Cylinders.

Most of the curves speak plainly for themselves, as the curve of tractive effort, Fig. 5.

Arriving at the curves of ratios, the first two which are the most impressive are those showing the ratio of tractive effort and total weight to total heating surface. By the drop of the curve during the last few years the total heating surface is seen to have been increased, indicating the greater attention given by designers to produce freer steamers and the attempt to place all available weight within the boiler. While we have seen that both the total heating surface and grate area have increased, the ratio of the former to the latter has increased very gradually and during the past fifteen years the average ratio has remained nearly constant. The longer tube is responsible for this, as as clearly shown by the curves in Fig. 12, where the ratio of total heating surface to firebox heating surface has increased very rapidly since 1894. A curve representing the ratio of tube heating surface to firebox heating surface would have practically the same form, as the difference between total and tube heating surface is equal to the firebox heating surface; except where water tubes are used. There is a difference of opinion extant regarding the advisability of the present relation between tube and firebox heating surface and the subject is worthy of more careful investigation than has been made since the adoption of wider grates and longer tubes.

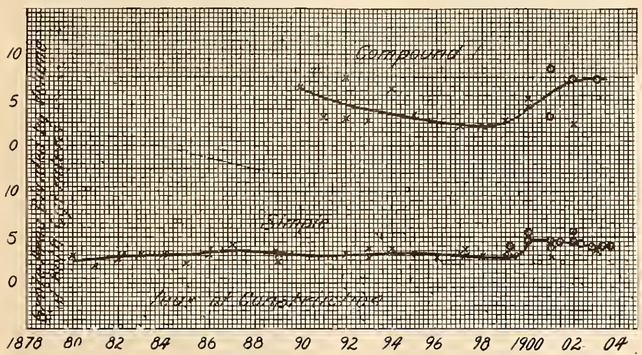


Fig. 17—Ratio of Grate Area to Volume of Both Cylinders.

The change in the direction of the curve indicating the relationship existing between firebox heating surface and grate area is so abrupt as to impel attention to the fact that with the modified wide grate there is a much smaller firebox heating surface per square foot of grate area than with the narrow grate. The result of this change in the ratio is that the effect of the hot gases impinging against the firebox sheets is much intensified.

A factor used by the Pennsylvania railroad in locomotive design is the ratio of total heating surface to weight of one cylinder full of steam at boiler pressure, this road requiring the ratio to be 1,000 or greater. This relationship is presented in Fig. 15. The great difference appearing among the figures representative of compound locomotives rendered it necessary to trace a zone as it is impossible to plot a consistent curve from the points given.

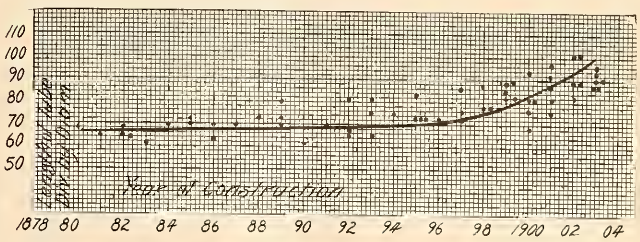


Fig. 18—Ratio of Tube Length to Diameter.

Coal and Water Tests of Freight Locomotives---A., T. & S. F. Ry.

THE Atchison, Topeka & Santa Fe Railway has completed a number of coal and water tests with five of their freight locomotives, over the third district of the Chicago Division, a distance of 113 miles, between Ft. Madison and Marceline. One of this number made but a single run. We include it, however, as the figures are of some significance.

The profile of the road, the elevation at each terminal and at points between, the maximum grade in each direction are clearly shown on the accompanying data sheet.

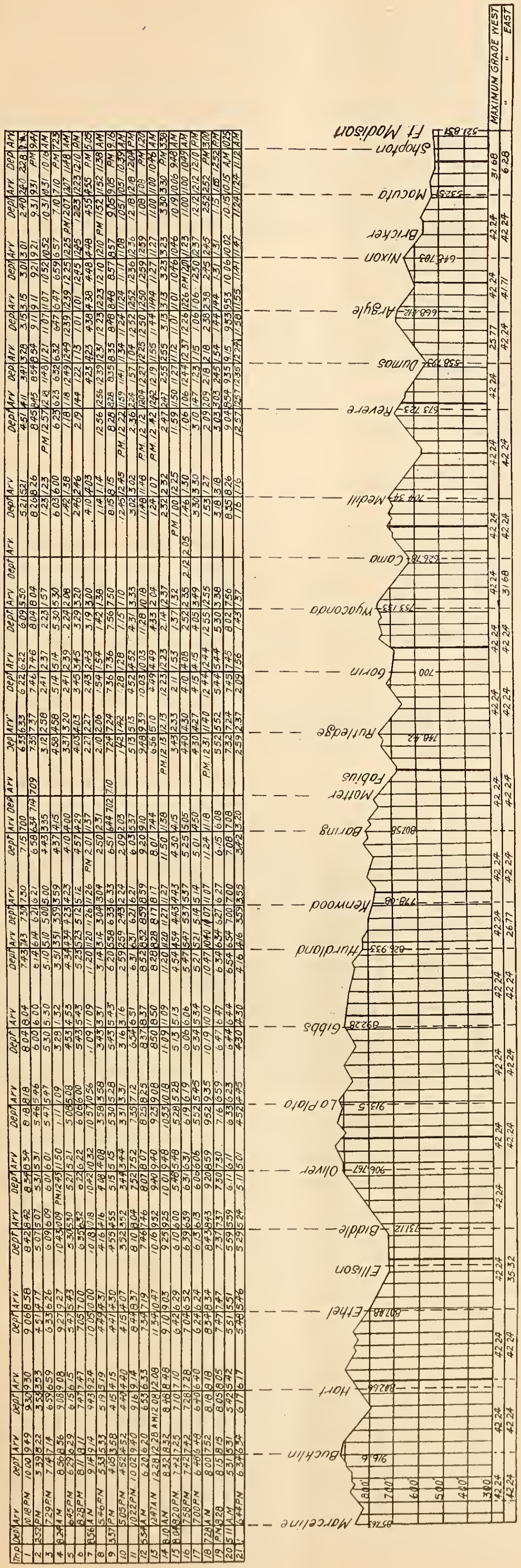
There were entered in these tests three compound and two simple locomotives: Engine 606, Vauclain compound, 2-6-0, cylinders 15½ ins. and 26 ins. with 28-in. stroke, 62-in. driving wheels, steam pressure 200 pounds. Engine 601, Baldwin simple, 2-6-0, 20-in. cylinders with 28-in. stroke, 62-in. driving wheels, steam pressure 200 pounds. Engine 1051, Vauclain compound, 2-6-2, cylinders 17 ins. and 28 ins., with 28-in. stroke, 69-in. driving wheels, steam pressure 220 pounds. Engine 565, 2-6-2, Schenectady tandem compound, cylinders 16 ins. and 28 ins., with 28-in. stroke, 63-in. driving wheels, steam pressure 210 pounds. Engine 175, Brooks simple, 4-6-0, cylinders 18 ins., with 24-in. stroke, 63-in. driving wheels, steam pressure 180 pounds. The fireboxes of all boilers are of the modified wide type for burning bituminous coal, with the exception of engine 175.

During the tests the coal and water used were carefully weighed. The same kind of coal was used on all locomotives during the several runs, the coal being Illinois mine run.

With regard to the corrected weight of coal used per thousand ton miles, a decided advantage is shown on the part of engine 1051, being a gain of 5.53 per cent as against engine 606; 25.6 as against engine 601, and 35 per cent as against engine 175.

Trip number	1	2	3	4	5	Aver.	6	7	8	9	10	Aver.	11	12	13	14	15	Aver.	16	17	18	19	20	21	Aver
Engine number	606	606	606	606	606		1051	1051	1051	1051	1051		601	601	601	601	601		565	175	175	175	175	175	
From	Shop.	Mar.	Shop.	Mar.	Shop.		Shop.	Mar.	Shop.	Mar.	Shop.		Shop.	Mar.	Shop.	Mar.	Shop.		Shop.	Shop.	Mar.	Shop.	Mar.	Shop.	
To	Mar.	Shop.	Mar.	Shop.	Mar.		Mar.	Shop.	Mar.	Shop.	Mar.		Mar.	Shop.	Mar.	Shop.	Mar.		Mar.	Mar.	Shop.	Mar.	Shop.	Mar.	
Leaving time	2-28p	2-52p	10-16a	8-24a	11-48a		12-10p	8-56a	11-38a	3-37p	10-39a		12-04p	5-54a	10-46a	8-10a	9-48a		10-49a	12-10p	7-28a	12-52p	5-11a	11-12a	
Arriving time	10-18p	9-41p	7-29p	7-23p	6-45p		8-28p	5-05p	5-46p	9-16p	5-05p		10-22p	1-20p	12-47a	3-38p	8-20p		5-54p	7-00p	3-00p	8-28p	10-25p	6-44p	
Running time, including delays (hr. and min.)	7-10	5-49	9-13	10-52	5-57	8-08	8-18	8-9	6-08	5-39	6-36	6-55	10-18	7-26	14-01	7-28	10-32	9-57	9-09	6-50	7-32	7-24	5-14	6-28	5-53
Running time, excluding delays (hr. and min.)	5-58	4-29	6-08	7-00	5-40	5-51	6-43	4-44	5-03	4-36	5-25	**5-18**	6-56	5-18	8-19	4-44	6-37	6-23	5-54	5-44	5-07	4-17	3-57	4-48	4-46
Avg. running time, including stops (M. P. H.)	14.4	19.4	12.25	10.4	16.25	12.25	13.69	13.8	18.4	20	17.14	16.6	10.9	15.2	8.06	15.14	10.73	12.00	12.33	16.54	15.0	14.48	21.6	17.5	17.02
Avg. running time, excluding stops (M. P. H.)	18.9	25.2	18.47	16.16	20	19.75	16.85	23.89	22.6	24.5	21	21.76	16.7	21.35	13.6	23.7	17.53	18.57	19.15	19.71	22.08	26.27	28.6	23.5	24.03
Delays, hours and minutes	1-52	1-20	3-05	3-52	1-17	2-17	1-35	3-25	1-5	1-3	1-11	1-54	3-42	2-8	5-42	2-44	3-55	3-38	3-15	1-6	2-25	3-07	1-17	1-4	2-35
Number loaded cars, excluding caboose	38	31	26	15	27		42	26	39	30	28		36	30	35	18	24		23	19	11	12	9	17	
Number empty cars, excluding caboose	0	0	0	37	0		0	10	8	7	0		0	5	1	27	0		0	0	11	0	10	0	
Actual tonnage, excluding engine and tender	1203.35	1112.65	1191.8	1038.15	1207.65	1150.72	1396.00	926	1355	1162.6	1382.3	1244.38	1215.4	1065.05	1204.8	1142.2	1204.2	1166.33	1357.3	748	571.05	764.4	559	756	579.69
Actual tonnage, including engine and tender	1335.35	1244.65	1323.8	1170.15	1339.65	1282.6	1557.4	1087.4	1516.4	1324	1543.7	1405.78	1341.9	1191.6	1331.35	1268.75	1330.75	1292.87	1519	845.85	668.9	862.25	656.85	853.85	777.54
Thousand-ton miles, excluding engine and tender	135.9	125.7	134.6	117.3	136.4	129.98	157.7	104.6	153.1	131.3	156.1	140.56	137.3	120.3	136.1	129.0	136.0	131.74	153.3	84.5	64.5	86.3	63.1	85.4	76.76
Thousand-ton miles, including engine and tender	150.8	140.6	149.5	132.2	151.3	144.88	175.9	122.8	171.3	149.6	174.4	158.8	151.6	134.6	150.4	143.3	150.3	146.04	171.6	95.5	75.5	97.4	74.2	96.4	87.8
Pounds of coal used, including delays	14979	12981	14975	18300	14480	15143	21850	12883	10400	13100	14200	15686	19825	14550	24215	16245	21990	19365	16970	13740	12890	12470	10730	14990	12964
Pounds of coal used, excluding delays	13893	12604	13175	17114	13745	14106.2	21080	11628	15740	12485	13180	14822	18535	13965	22625	15135	20730	18198	15815	13250	11910	11820	10470	14380	12366
Pounds of coal used per thousand-ton miles, including delays	110.22	103.27	111.25	155.99	106.15	116.5	138.55	123.16	107.11	99.77	90.96	111.59	144.39	120.94	177.91	125.92	161.69	146.17	110.69	162.6	199.84	144.49	170.04	175.52	168.75
Pounds of coal used per thousand-ton miles, excluding delays	102.22	100.27	97.88	145.89	100.76	108.52	133.67	111.16	102.8	95.08	84.43	105.42	134.99	116.08	166.23	117.31	152.42	138.13	103.16	156.80	184.65	136.96	165.92	168.38	161.04
Pounds of coal used per M. ton miles, excluding consumption for air pump, delays, etc., including weight of engine and tender	81.46	87.79	89.5	124.51	86.78	**94.00**	116.69	93.56	89.35	81.09	74.41	91.02	118.39	94.43	147.61	90.71	134.20	117.06	89.89	133.1	154.1	112.8	137.8	146.2	136.8
Pounds of coal used per M. ton miles, excluding consumption for air pump, delays, etc., excluding weight of engine and tender	97.58	98.38	98.67	140.34	96.12	106.21	129.23	101.44	99.84	92.35	82.45	101.06	130.72	105.64	160.9	101.54	148.04	129.36	100.53	148.7	180.0	127.3	161.8	165.1	156.58
Pounds of water used, including delays	93423	77228	95965	112586	82402	92320	164043	94188	126058	85610	104175	114814	126926	87480	143343	90323	126032	114820	113364	105524	90602	92812	82602	104971	95302.2
Pounds of water used, excluding delays	91936	76237	94100	109586	81243	90620	162285	90421	124665	84356	102980	112941	124468	85876	139362	88270	123507	112296	111971	104497	88571	91923	81871	103949	94162.2
Pounds of water used per pound of coal, including delays	6.23	5.94	6.40	6.15	5.69	6.08	7.52	7.31	7.68	6.53	7.33	7.32	6.40	6.01	5.92	5.56	5.73	5.925	6.68	7.68	7.02	7.44	7.69	7.00	7.366
Pounds of water used per pound of coal, excluding delays	6.61	6.04	7.14	6.40	5.91	6.42	7.69	7.77	7.92	6.75	7.81	7.588	6.71	6.14	6.15	5.84	5.95	6.158	7.02	7.88	7.43	7.77	7.81	7.22	7.622
Pounds of water evaporated from and at 212° per lb. of coal, excluding all delays and wastes	6.87	6.22	7.35	6.68	6.14	6.652	8.00	8.08	8.23	7.02	8.12	7.89	6.91	6.38	6.33	6.01	6.12	6.35	7.23	8.11	7.65	8.00	8.04	7.43	7.846
Temp. (Fahr.) of feed water; average	52°	57°	59°	50°	54°	54.5°	50°	51°	52°	52°	52°	51.4°	57.5°	52°	60°	59°	55°	56.7°	65°	74°	73°	72°	72°	72°	72.6°
Temp. (Fahr.) of atmosphere; average	70°	64°	42°	66°	66°	61.6°	60°	46°	72°	62°	**78°**	63.6°	80°	76°	78°	62°	58°	70.8°	78°	80°	82°	78°	74°	75°	77.2°
Equated coal per M. ton miles, excluding all delays and wastes; including weight of engine and tender	88.75	87.24	86.63	124.09	86.37	94.616	115.32	91.12	88.42	80.32	72.71	89.578	118.80	100.00	146.38	102.49	134.26	120.382	89.52	134.91	153.35	117.96	137.22	145.12	137.712
Equated coal per M. ton miles, excluding all delays and wastes; excluding weight of engine and tender	98.49	97.58	95.11	138.85	95.80	105.36	129.89	106.97	98.93	91.51	81.24	101.708	131.17	111.88	161.76	113.72	148.38	133.382	100.2	152.47	179.48	123.26	161.36	163.81	158.076
Pounds of coal used per locomotive mile, including delays	132.1	114.87	132.52	161.94	128.14	133.914	193.36	114.00	145.13	115.92	125.66	138.814	175.44	128.76	214.29	143.76	194.60	171.37	150.17	121.59	114.07	110.35	94.95	132.65	114.84
Pounds of coal used per locomotive mile, excluding delays	122.94	111.54	116.59	151.42	121.63	124.824	186.54	102.89	139.29	110.48	116.63	131.166	164.02	123.58	200.22	133.93	183.45	161.04	139.91	117.25	105.39	104.6	92.65	127.25	109.428

COAL AND WATER TEST OF FREIGHT LOCOMOTIVES—A. T. & S. F. RY.



Schedule During Test and Profile of Road. A. T. & S. F. Ry.

Notes

Trip No. 1—North quartering wind 8 to 10 miles per hour: engine slipped at Baring and Ethel.

Trip No. 2—North quartering wind 20 miles per hour: engine slipped on Oliver hill: engine popped 40 seconds.

Trip No. 3—North quartering wind 15 miles per hour to Oliver: engine slipped leaving Ethel, mud ring leaked, Revere to Baring: boiler washed Marceline.

Trip No. 4—Southeast quartering wind 15 miles per hour: engine slipped at Hart, Gorin, Wyaconda, Medill: mud ring leaking, Biddle to La Platte: bad rail Marceline to Revere.

Trip No. 5—South quartering wind 15 miles per hour: engine slipped at Revere and Ethel.

Trip No. 6—South quartering wind 30 miles per hour: engine slipped at Revere, Medill and Ethel: traction increaser not working: engine simpled 1½ miles on Dumas hill and 2 miles out of Ethel.

Trip No. 7—North quartering wind 15 miles per hour: traction increaser working: light tonnage from Marceline to Baring.

Trip No. 8—North quartering wind 8 to 10 miles per hour: train handled nicely.

Trip No. 9—North quartering wind 10 miles per hour: coal 50 per cent slack.

Trip No. 10—South quartering wind light and helping: train handled nicely.

Trip No. 11—South quartering wind 15 miles per hour: slow into Revere and Ethel.

Trip No. 12—Calm.

Trip No. 13—North quartering wind 30 miles per hour: pushed out of Ethel by train No. 57: slow into Revere and Rutledge.

Trip No. 14—Helping wind: bad storm at Wyaconda.

Trip No. 15—North quartering wind 30 miles per hour.

Trip No. 16—South quartering wind light: engine slipped at Shopton, Nixon, Dumas, Wyaconda Rutledge, Baring and Ethel: hole ⅝ inch in diameter in left valve which admitted boiler pressure steam into low pressure cylinder: track scale broken at Shopton and engine transferred to another division, hence but a single run made with this engine.

Trip No. 17—South quartering wind 6 miles per hour: 4¼ inch nozzle.

Trip No. 18—South quartering wind 10 miles per hour: stopped on grade east of Cana: 4¼ inch nozzle.

Trip No. 19—South quartering wind 6 miles per hour: 4½ inch nozzle: diaphragm plate 15½ inches high.

Trip No. 20—South quartering wind 8 miles per hour: engine fired 24 hours before starting.

Trip No. 21—South quartering helping wind 18 miles per hour.

West bound engines on trips 1 to 16 took water at Ethel on account of water being short. East and west bound engines on trips 17 to 21 did not stop.

Engine 565 shows to a little better advantage in the single run than the average of the runs made by engine 1051. At the same time each of three runs made by engine 1051 shows up better than the single run of engine 565.

Engine 606 shows an advantage in the use of coal per thousand ton miles of 20. 9 per cent as against engine 601, and an advantage of 31.2 per cent as against engine 175. The comparison between engines 606 and 601 is the most striking and as the test of a compound engine in the same service as a simple, it is the most practical, for the reason that these two locomotives are identical in design and dimensions with the exception of the systems of steam distribution.

While the figures representing the performance of engine 1051 appear the most satisfactory, these results must be considered merely as comparing a number of locomotives with regard to each one's respective fitness for the given class of work. As a test between simple and compound locomotives or between two different systems of compounding the figures cannot be considered as truly comparative in view of the difference existing among the several designs of boilers, ratios of heating and grate surfaces to cylinder volume, etc.

The comparison of the results of the tests as between 606 and 601 tell a different story however and speaks highly in favor of the compound.

The results of the tests and the important details of of the several locomotives, appear in the accompanying tables.

These tests were conducted under the personal supervision of Mr. A. L. Beardsley, Road Foreman of Engines, through whose courtesy we are enabled to reproduce the results.

	Engine Numbers.				
	606	1051	601	565	175
Type of locomotive..	2-6-0	2-6-2	2-6-0	2-6-0	4-6-0
Steam pressure......	200	220	200	210	180
Cylinders	15½&26x28	17&28x28	20x28	16&28x28	18x24
Diam. driving wheels.	62	69	62	63	63
Weight on drivers...	132000	141690	132000	134500	96500
Total weight.........	157100	210190	157100	211000	125100
Tractive effort:......	28900	31000	28900	34000	17800
Total heating surface	2626	3738	2626	3666	1492
Grate area	48.5	53.5	48.5	51.25	18
Weight on drivers divided by tractive effort	4.56	4.57	4.56	3.95	5.5
Tractive effort divided by total heating surface	11	8.29	11	9.27	11.9
Total heating surface divided by grate area	54.14	68	54.14	71.5	83
Total heating surface divided by volume of both cylinders...	430.5	508.5	258.5	564	210
Grate area divided by volume of both cylinders	7.9	7.6	4.76	7.87	2.53
Diameter of nozzle..	4⅞	5¼	4¾	....	4¼

Economical Distribution of Scrap

Communication

Editor Railway Master Mechanic:

I noticed your issue of December presenting the very able and useful paper written by Mr. Murphy, of the L. S. & M. S. in regard to the economical and advantageous disposition of scrap material. He leaves but little to be said in connection with this, as he has gone over the ground very fully. I might add, however, that the classification of scrap material, when reported for sale, should be entirely in accord with the ideas of the purchasing agent, who usually makes the sales. It is a fact, probably well known, that the several mills that purchase scrap have different classifications under which scrap is purchased, and that a great deal of money is lost to railroad companies from the fact that they sell to brokers, under a certain classification, the broker probably reclassifying the scrap and selling to the mills, the mills not wishing to buy from the railroad company, being afraid that the classification will not be up to the standard as used by the mills. A suggestion as to handling this feature of the disposition of scrap, that the difficulty above referred to can be best overcome, would be for the purchasing agent to outline a form of scrap report, showing the usual information as to quantity, class, etc., and on the back of this form have full printed instructions showing what would make up the different grades of scrap iron, and these instructions to be followed carefully by the storekeepers who do the loading and shipping.

Another feature is that storekeepers sometimes anticipate in their report a certain accumulation of scrap. It is sold by the purchasing agent upon this report, with the result oftimes that the accumulation does not accrue as rapidly as the storekeeper anticipated and there is a great delay in making shipment on the sales order. This is another factor that keeps the mills from buying from railroads direct, as they depend upon prompt deliveries; thus it will be seen from the above that if the mills could depend upon a correct grade and a prompt delivery they would purchase from the railroads direct, instead of through the brokers, and the profit the broker is now making would accrue to the railroad corporation.

There is just one important classification of scrap that Mr. Murphy has omitted. The class of scrap known as No. 1 shop wrought should be separated as to arch and tie bars, and any similar grade of iron from the regular No. 1 wrought, as the former always commands a higher price than the latter.

There is another problem which we are now wrestling with, and one which is quite important to railroad companies from an economical as well as expedient standpoint. The subject might be classified under the head of the best method of handling wooden bridge material as between the stores and bridge and building department. The custom in vogue on a great many roads is that the general foreman of bridges or master carpenter makes requisition for what is needed at the various bridges in his territory, to be shipped to the station nearest the bridge where material is to be used. The storekeeper loads the material up, bills it to the station, the agent notifies the general foreman of bridges or master carpenter, who moves the bridge gang to the station, calls on the transportation department to handle cars to the bridge for unloading, and the local trains which usually handle this work are delayed, probably making overtime while this work is being done. Thus, it can be seen from this method that the prompt handling of shipment is dependent, first, upon the transportation department to move cars promptly from storehouse; secondly, upon the agent to give prompt notice when the cars arrive; third, upon the ability of the general foreman of bridges or master carpenter to move his bridge gang to the station where the cars have been billed to, and fourth, upon the ability of the transportation department to handle the cars from the station to the bridge where material is to be unloaded. Where it is dependent on so many departments for the accomplishment of delivery, it would be easily seen from a practical standpoint that there is always more or less delay. There is also the expense attendant upon delay to equipment, from the movement of bridge gangs to and from the place where material is to be unloaded and the overtime paid train crews while the unloading is being done, and the uncertainty as to the delivery of the material and the lack of knowledge on the part of the bridge department officials as to whether the material is on the ground so that gangs may be moved there to perform the work outlined. As a method of overcoming this, I have recommended the adoption of the following plan.

The officer in charge of repairs to bridges to indicate in what territory he desires his work to be done, he to indicate sufficient work to make use of at least twelve carloads of material. This to be loaded by the store department and the material handled as a work train, which usually costs $25 per day, stores department to furnish men to put the material on the ground in accordance with requisition furnished, and as soon as delivery is accomplished notify the officer in charge of bridge work that the material is there. He can then advantageously dispose of his bridge repair gangs, knowing at what points material is on the ground for the accomplishment of work outlined. There is no delay to equipment other than that occurring while the cars are being hauled in the work train to the several points where the material is to be unloaded. The work of unloading is done by cheap labor and not by bridge carpenters, who always receive a greater compensation than laborers employed in the stores department.

I think by the adoption of the above plan that several thousand dollars in the aggregate can be saved the railroad companies annually in the handling of material and that the maintenance of way department will be always able to make a better showing in the accomplishment of bridge work, at a lesser expense, than where they attempt to handle the bridge timbers.

I would indeed be pleased to have the opinion of other general storekeepers on this subject.

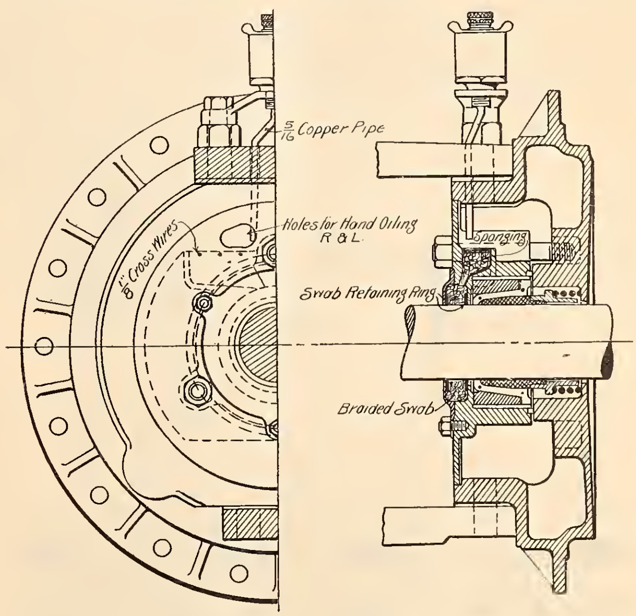
Yours truly,

John Burke,

General Storekeeper, Choctaw, Oklahoma & Gulf R. R.

The Oil Cup and Swab

AT the last meeting of the Traveling Engineers' Association, held in Chicago, October, 1903, the Association placed itself on record as favoring the use of an oil cup together with a swab for lubricating piston rods. During the discussion of the committee report regarding piston rod lubrication, Mr. G. W. Wildin, mechanical engineer of the Central Railroad of New Jersey, described a successful method of using a swab and oil cup which he has placed in service on the road. Through Mr. Wildin's courtesy we are now privileged to present an illustration of his method of



Application of the Oil Cup and Swab—C. R. R. of N. J.

making this application. The swab is placed in a cavity within the gland and oil is fed thereto by a 5-16-in. copper pipe, leading from the cup, which is located above the guide as shown by the accompanying line drawing. Provision is also made for hand oiling when necessary, by arranging holes through the casing. An advantage of this arrangement is that the pipe leading from the cup to the swab is kept within the cylinder head casing and is thus maintained in all weather at a temperature which permits a free flow of oil.

According to newspaper reports the western roads are continuing to experience much difficulty from bad water with the heavy locomotives operating at high steam pressures, and the only relief possible seems to be in the erection of water-treating plants.

Heavy Freight Locomotive--Lake Shore & Michigan Southern Railway

A NUMBER of heavy 2—8—0 freight locomotives built at the Brooks works of the American Locomotive Company have been placed in service on the Lake Shore & Michigan Southern Railway. Their design and construction represents careful observation and investigation on the part of Messrs. H. F. Ball and H. H. Vaughan, superintendent and assistant superintendent of motive power of the road, and Mr. John Player, consulting engineer of the American Locomotive Company. The design embodies a number of interesting features, among which we mention first the provision for free circulation in the boiler. The water space in the throat sheet leg is made very wide to permit water to flow back to the water legs; the water spacings at mud ring are 4½ ins. wide and the spacing between flues is wide, having a bridge of 15-16 in. Another noticeable feature in the boiler design is that of the large radius of crown sheet at corners. Boiler feed water is supplied through two No. 11 Nathan non-lifting injectors. The check valves are located at the bottom of the front sheet, being connected with a specially designed elbow on the inside of the boiler, so directed as to assist in the circulation of water and lead it towards the flue sheet.

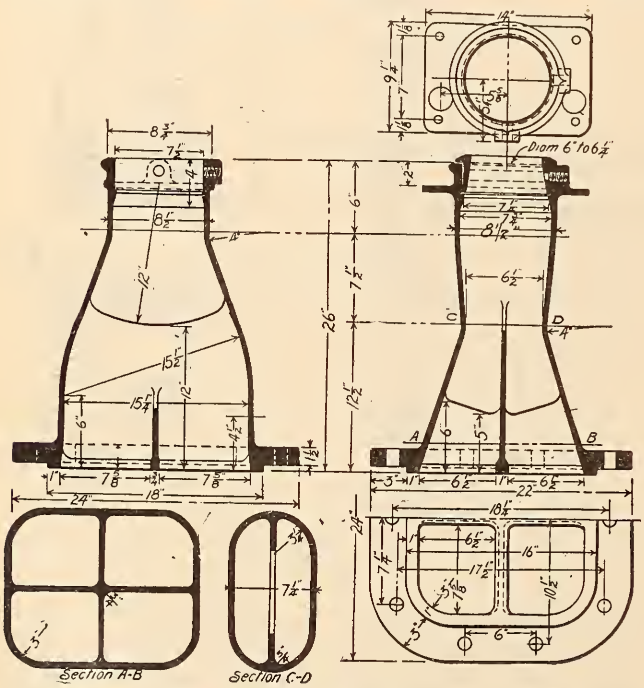


Fig. 1—Heavy Freight Locomotive—L. S. & M. S. Ry. Exhaust Nozzle.

The front end arrangement is peculiar. The stack is very short and but a portion is visible above the smokebox. Its height above the smokebox is 22 ins., while a portion extends within the box 24½ ins. The portion of the smokebox below the bottom of the stack is separated from the remainder by a horizontal diaphragm so that the effect of the stack is the same as that of one 46½ ins. high. The stack was designed according to the formula of Prof. W. F. M. Goss, resulting from his recent experiments.

The exhaust base and nozzle received careful attention in design. It is illustrated in Fig. 1, and as will be seen it has cross ribs through the center on account of its large size. The flanged base is 24 by 22 ins. and the diameter of the nozzle is 6¼ ins. The valve gear, also shown herewith, Fig. 3, is arranged for direct motion. It includes a transmission bar connected to a double pendant rocker arm. The valves are of the piston type, having inside admission and fitted with 12-in. piston rings.

The frames are of cast steel 6 ins. wide and are illustrated by Fig. 4. They have been made very strong and stiff and are provided with braces at both top and bottom to resist lateral stress. The cast steel cross braces in front of the cylinders combine the guide for truck, center pin and bumper bracket.

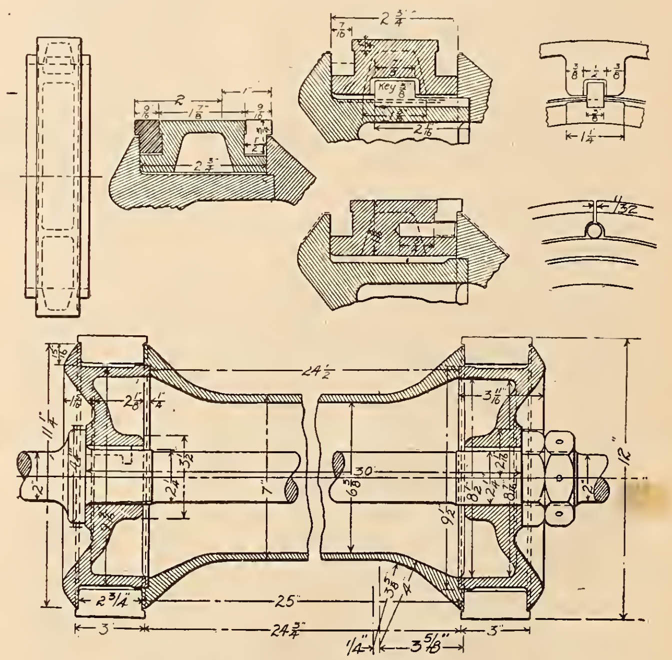


Fig. 2—Heavy Freight Locomotive—L. S. & M. S. Ry. —Piston Valve.

The design of the engine truck is shown by the accompanying line drawings, Fig. 5. The usual equalizers and side springs have been dispensed with and coil springs are used on top of the journal boxes. The frame is of cast steel.

The engines were designed for pusher service with coal and ore trains on the hills at Youngstown and Ashtabula, on the Franklin division. Except at the division terminals the grades are low and trains can be conveniently handled with smaller power. They are also to be used as pushers from Cleveland to West Park on

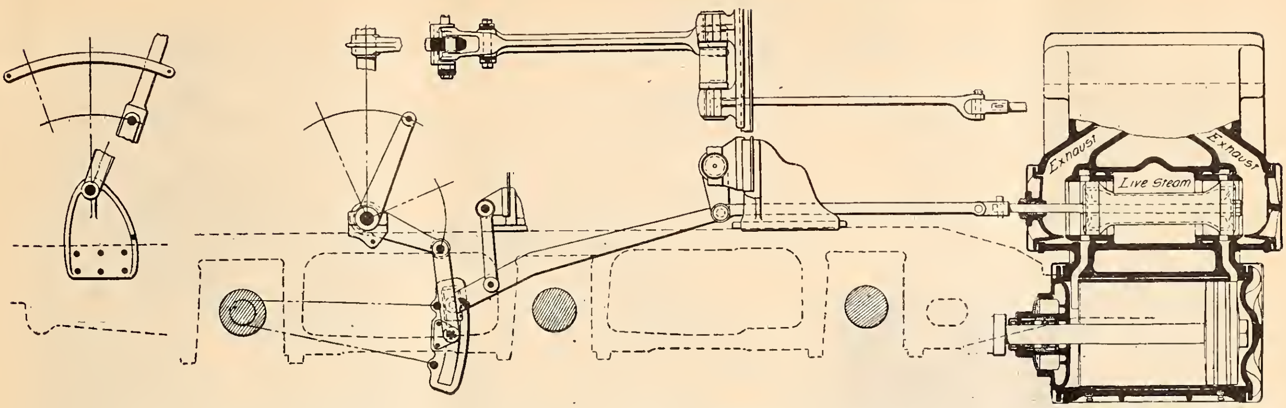


FIG. 3—HEAVY FREIGHT LOCOMOTIVE—L. S. & M. S. RY.—VALVE MOTION AND CYLINDER.

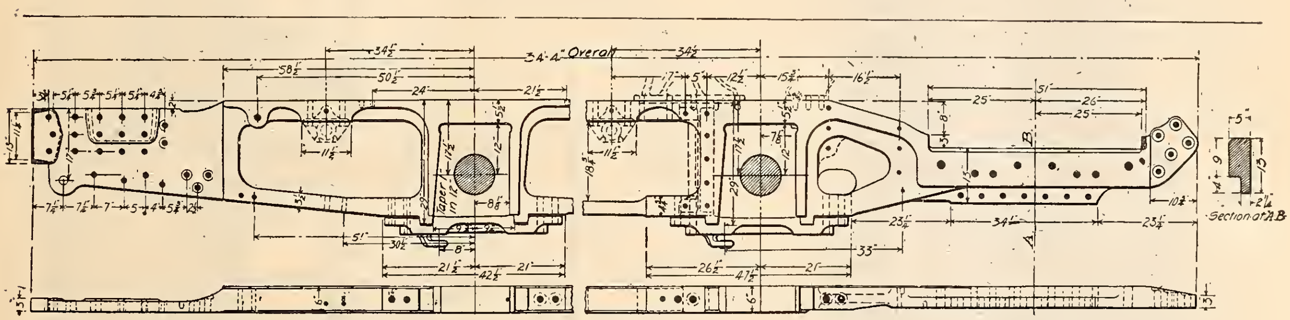


FIG. 4—HEAVY FREIGHT LOCOMOTIVE—L. S. & M. S. RY.—FRAME.

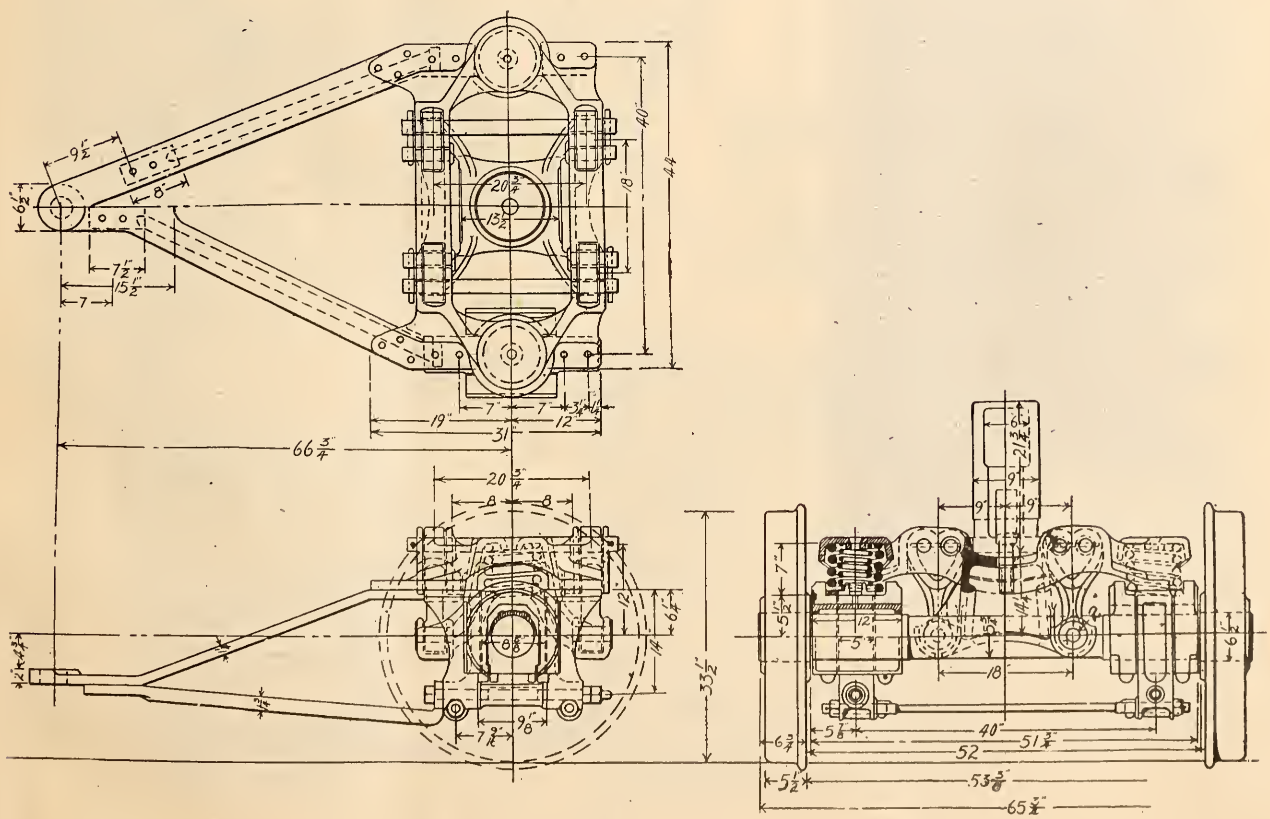


FIG. 5—HEAVY FREIGHT LOCOMOTIVE—L. S. & M. S. RY. ENGINE TRUCK.

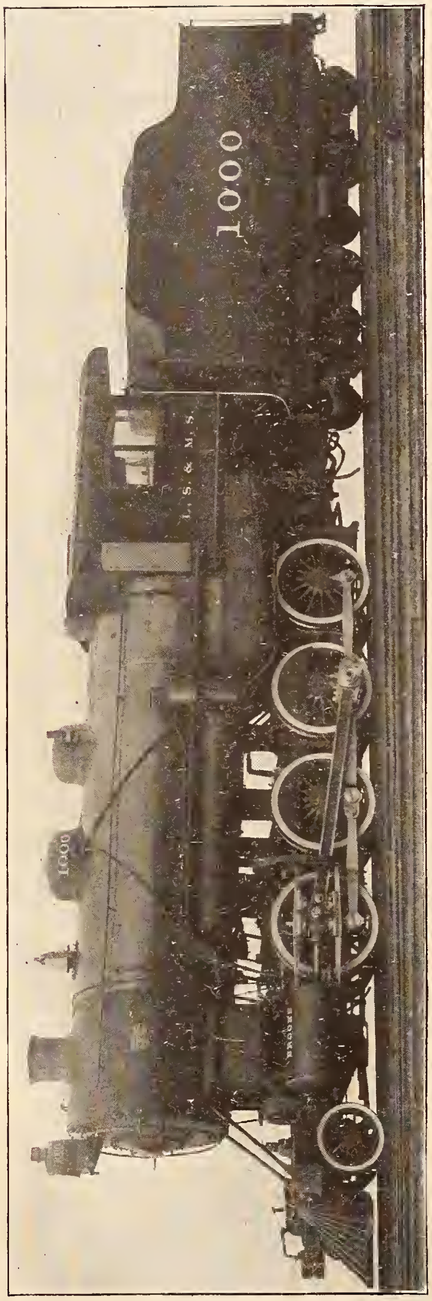


Fig. 6—Heavy Freight Locomotive—L. S. & M. S. Ry.

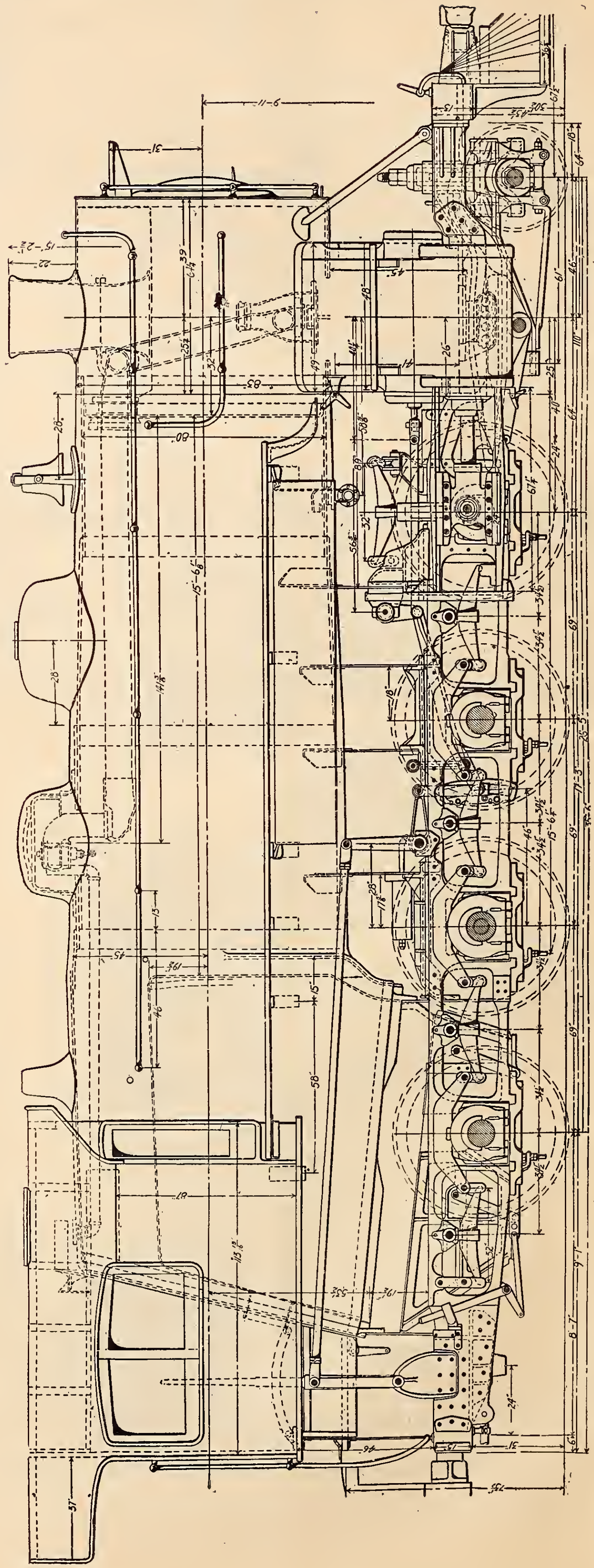


Fig. 7—Heavy Freight Locomotive—L. S. & M. S. Ry. Side Elevation.

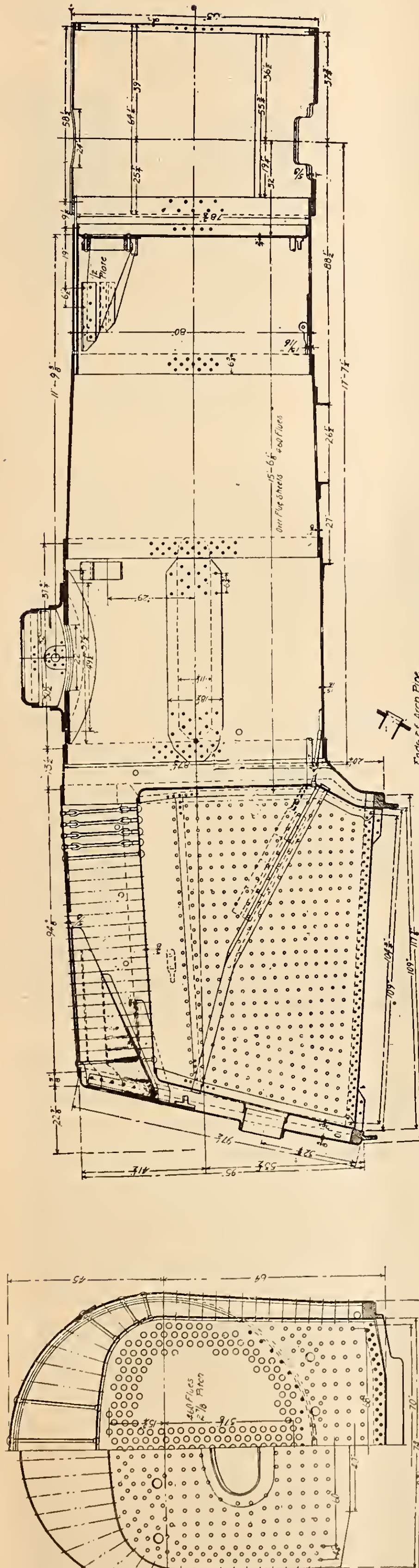


Fig. 8—Heavy Freight Locomotive—L. S. & M. S. Ry. Boiler.

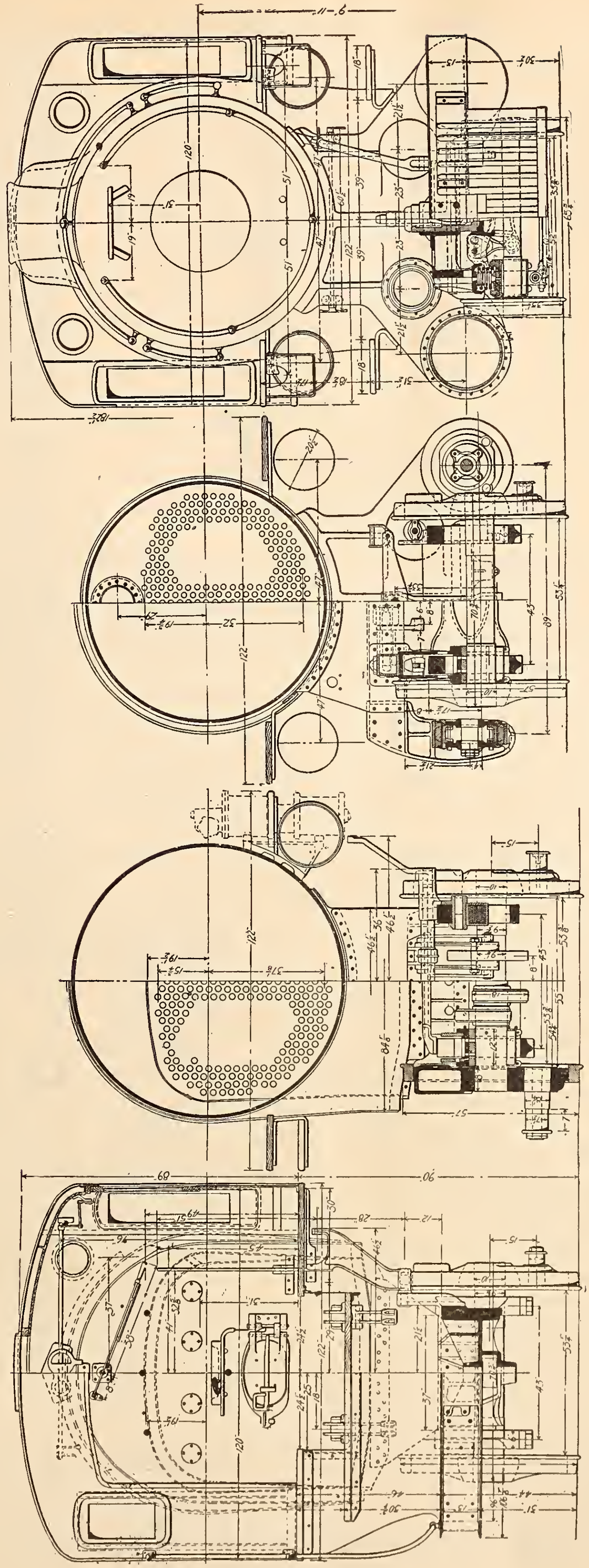


Fig. 9—Heavy Freight Locomotive—L. S. & M. S. Ry. Cross Sections and Elevations.

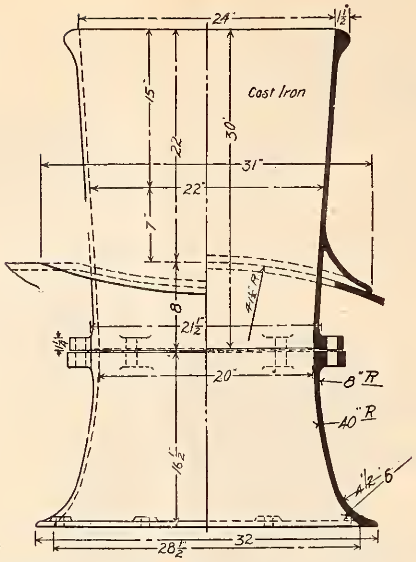


FIG. 10—HEAVY FREIGHT LOCOMOTIVE—L. S. & M. S. RY.—STACK.

the Toledo division, and for service in the new gravity hump yards at Collinwood and Elkhart. They will later be put in regular road service on the Franklin division, when steel cars of 80,000 and 100,000 lbs. capacity are sufficiently numerous in the traffic over this division to provide full tonnage.

The usual formula shows these engines to be capable of a starting power of 47,300 lbs. The several ratios of heating surface, etc., are included in the table of freight locomotive proportions appearing in the insert accompanying this issue.

The general dimensions are given in the following table:

General Dimensions.

Gauge	4 ft. 8½ ins.
Fuel	Bituminous coal
Weight in working order	235,400 lbs.
Weight on drivers	207,000 lbs.
Weight engine and tender in working order	386,400 lbs.
Wheel base, driving	17 ft. 3 ins.
Wheel base, rigid	17 ft. 3 ins.
Wheel base, total	26 ft. 5 ins.
Wheel base, total, engine and tender	57 ft. 10 ins.

Cylinders.

Diameter of cylinders	23 ins.
Stroke of piston	30 ins.
Horizontal thickness of piston	7 ins.
Diameter of piston rod	4¼ ins.
Kind of piston packing	Dunbar
Kind of piston rod packing	U. S.
Size of steam ports	29¼ ins. by 2 ins.
Size of exhaust ports	65 sq. ins.
Size of bridges	4 ins.

Valves.

Kind of valves	Piston
Greatest travel of valves	5 7-16 ins.
Outside lap of valves	1 in.
Inside lap of valves	0 ins.
Lead of valves in full gear	1-16 in.
Kind of valve stem packing	U. S.
Transmission bar	With

Wheels, Etc.

No. of driving wheels	8
Diameter of driving wheels outside of tire	57 ins.
Material of driving wheel, centers	Cast steel
Thickness of tire	3½ ins.
Tire held by	Shrinkage
Driving box material	Cast steel
Diam. and length of driving journals	9½ and 10 in. dia. x 12
Diam. and length of main crank pin journals	7½ in. dia. x 7
Diam. and length of side rod crank pin journals	8¼ in. dia. x 5½
Section of rods, main I side	Double fish belly
Engine truck, kind	Swing
Engine truck, journals	6 in. dia. x 12
Diam. of engine truck wheels	33½ ins.
Kind of engine truck wheels	Cast steel spoke centers

Boiler.

Style	Radial stayed extended wagon top
Outside diameter of first ring	80 ins.
Working pressure	200 lbs.
Material of barrel and outside of firebox	Worth
Thickness of plates in barrel and outside of firebox	13-16, ⅞, 15-16, ⅝, 9-16, ⅝ in.
Horizontal seams	Sextuple bolt with inside and outside welt strips
Circumferential seams	Double
Firebox, length	109 ins.
Firebox, width	74 ins.
Firebox, depth, front, 83½ ins.; back	69½ ins.
Firebox, material	Worth
Firebox plates, thickness	Sides, ⅜ in.; back, ⅜ in.; crown ⅜ in.; tube sheet, ⅝ in.
Firebox, water space	Front, 4½ ins.; sides, 4½ ins.; back, 4½ ins.
Firebox, crown staying	1 in.
Firebox, staybolts	1 in.
Tubes, material and gauge	Steel
Tubes, number	460
Tubes, diameter	2 ins.
Tubes, length over tube sheets	15 ft. 6⅛ ins.
Firebirck, supported on	Four 3-in. tables
Heating surface tubes	3,725 sq. ft.
Heating surface, water tubes	29 sq. ft.
Heating surface, firebox	203 sq. ft.
Heating surface, total	3,957 sq. ft.
Grate surface	55 sq. ft.
Grate, style	Rocking
Ash pan, style	Hopper
Exhaust pipes	Single
Exhaust nozzles	6¼ dia.
Smoke stack, inside diameter	20 and 24 ins.
Smoke stack, top above rail	15 ft. 2½ ins.
Boiler supplied by	Two 11-in. new Nathan injectors

Tender.

Style	Eight-wheeled
Weight, empty	56,580 lbs.
Wheels, number	8
Wheels, diameter	33 ins.
Journals, diameter and length	5½ ins. dia x 10 ins.
Wheel base	18 ft. 0 ins.
Tender frame	13-in. channel steel
Tender trucks	B. W. cast steel bolster
Water capacity	7,500 U. S. gallons
Coal capacity	16 tons
Brake	American outside equalized driver brakes .... Westinghouse tender and train brakes, 11-in. pump

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OF interest to builders and designers of American locomotives is a letter from Consul-General J. H. Worman, stating that the Bavarian government has decided to construct a large number of new locomotives from the designs of the American locomotives introduced by the railways of Bavaria nearly four years ago. During the next two years 40 locomotives are to be replaced by 70 new locomotives, and 5,000,000 marks ($1,190,000) are to be expended for this purpose. The two locomotive building establishments in Munich, the large establishment of Maffei, as well as that of Kraus, are to be favored in the distribution of these contracts.

A Washington press dispatch states that fifteen of the Interstate Commerce Commission's inspectors of railway safety appliances were presented to President Roosevelt on Dec. 17 by Edward A. Mosely, secretary. The inspectors were in Washington in connection with an application for an extension of time for the adoption of the safety appliances required by act of congress.

The American Society of Mechanical Engineers

THE American Society of Mechanical Engineers convened for its forty-eighth meeting at its house in New York City, Tuesday evening, December 1, 1903. After an informal gathering of an hour or two, the members were called to order. President James M. Dodge then delivered his presidential address, on the "Money Value of Technical Training," in which he made a very careful comparison of the eminence attained by the technically trained man, the trade school graduate, the shop trained man and the unskilled laborer, pointing out that the progress of the world calls for a better and more speedy means of producing trained men than could ever be developed by the methods of self-instruction.

The business meeting opened Wednesday morning at 10 o'clock in Mendelssohn Hall, the first thing on the program being the presentation of reports of the various committees. The tellers of election of members presented their report through the secretary, showing that 58 new full members had been elected and that the total increase of membership by reason of election was 119.

The secretary presented the report of the tellers of election of officers for the ensuing year, which resulted as follows: President, Ambrose Swasey, Cleveland, O.; vice-presidents, Prof. D. S. Jacobus, Hoboken, N. J.; M. L. Holman, Saint Louis, Mo.; W. J. Keep, Detroit, Mich.; managers, George I. Rockwood, Worcester, Mass.; J. W. Lieb, Jr., New York City; Asa M. Mattice, Pittsburg, Pa; treasurer, William H. Wiley New York City, re-elected.

The committee report on standard specifications for boiler plate, rivet steel, steel castings and steel forgings, presented by Prof. Spangler, met with a vigorous discussion and criticisms by several members. Upon motion the subject was finally referred to "Committee No. 1." It is understood that this committee will have authority to go over the entire matter and revise it.

It was moved that a committee be appointed to prepare a history of the society and its organization, embracing its records and description of relics, portraits and library. This motion was adopted and before adjournment the president appointed a committee to this end.

Having disposed of the preliminary business, the first paper of the program was presented by Mr. Frank Richards. In this paper, entitled "Is Anything the Matter with Piece Work?" the author attempted to show that the premium plan is essentially the same as piece work, except that it is not so fair to the workman because it does not pay him a uniform price per unit of work done regardless of output. This paper was followed by one presented by Mr. H. L. Gantt on "Modifying Systems of Management," in which he dealt with the difficulty of starting a premium or bonus system.

"What Are the New Machine Tools To Be?" is the title of a paper by Prof. John E. Sweet. It is first suggested that machine tools must be largely redesigned to meet the demands and the later possibilities in high speeds, increased feeds and heavy drives. The machines must be made not merely stronger, but must be changed in form in many cases. For instance, it is stated that a complete box is thirteen times more rigid against torsion and four times more rigid against bending than if the same materal is in the form of side plates with thin cross girts.

By invitation the Thursday morning session was held in the main lecture hall of Stevens Institute of Technology, at Hoboken, N. J. The meeting was opened by the reading in abstract by the secretary of Prof. W. B. Gregory's paper, the "Pitot Tube." Attention was called to this simple, efficient instrument for measuring the velocity of fluids. Reference was made to several former reports and papers and a description with diagrams was given of a simple form of Pitot tube, together with the results of tests made on the Mississippi River. . .

"A Method for Determining Rates and Prices for Electric Power," by Mr. Frank B. Perry, General Electric Company, was the next subject presented. This dealt with defects of the ordinary "step" system of rates for charging consumers of power by electric companies and the author formulated a method for paying by kilowatt-hour, which would produce uniform results.

"Tests of a Compound Engine, Using Superheated Steam," by Prof. D. S. Jacobus, Stevens Institute, followed. In a discussion Professor Jacobus said that the cylinder proportions were not the best for saturated steam, but that he considered that a saving of 15 per cent due to this amount of superheat can be safely counted upon. Some discussion was held upon the difficulty of regulating the degree of superheat, and it was stated that by running a by-pass round the superheater or by providing an additional outlet for the steam after passing the superheater, thus enabling a larger amount to be passed through in a given time, the degree of superheat can be regulated closely.

The paper by Mr. Edward F. Miller, "Pressure Temperature Curve of Sulphurous Anhydride," gave the results of an investigation of the properties of sulphurous anhydride similar to those on which the tables of the properties of saturated steam have been constructed. The results were presented in both tabular and diagrammatic form. Of this paper there was no discussion and the program was continued by taking up the "Construction and Efficiency of a Fleming Four-Valve Engine Directly Connected to 400-Kilowatt Generator," by Benjamin T. Allen. This paper contained a short description of this type of engine, in which the valves, which are somewhat similar to the Corliss type, are positively actuated by a system of bell cranks. Sample indicator cards were shown, and the result of five tests was given, the best of which at about 7-10 load gave a water-rate of 12.33 pounds, with an indicated horsepower of 348. According to the results, the efficiency of the engine did not vary widely from one-sixth load to a little over full load.

The next paper considered was entitled "Slide Rules for the Machine Shop as a Part of the Taylor System of Management," by Carl G. Barth, who described a method of constructing slide rules which will solve relations between cutting speeds, depth of cut and feed, considering the material and class of tool steel. The data used was obtained from many experiments made by Mr. Taylor in regard to resistance in cutting steel and iron. This rule is intended for use in shops in order to determine quickly the most efficient feed or speed, knowing the other factors of material, tool steel, etc.

Mr. F. A. Scheffler's paper, "Suggestions for Shop Construction" was the last paper presented at the morning session. He discussed a proposed arrangement for an electric manufacturing plant, consisting of seven buildings arranged radially, with administration building in the center and material and shipping tracks connecting the different buldings.

The members reassembled in the auditorium in the afternoon to listen to an address, accompanied by experiments, by Dr. Hans Goldschmidt on the use of "Thermot" in welding steel and iron.

The Friday morning's session was opened by Mr. C. A. Morgan's paper, "A Compact Gas Engine of the Beam Type." The engine is of the inverted beam type, two cylinders operating on the two-cycle principle being connected to the opposite ends of a working beam from which a third arm drives the crank-shaft through a connecting rod. The valves are a combination of poppet and piston valve and are operated in a decidedly novel manner directly from the working beam without eccentrics or cams. The valve gear is of the releasing type with dash-pots. The author called attention to the immense waste in the gases from blast furnaces and coke ovens for the utilization of which his engine is more especially intended.

The next paper was a plea for the institution of a "Standard Unit of Refrigeration," by Mr. J. C. Bertsch. He directed attention to the extensive employment of mechanical refrigeration, and especially to the rapid increase in its use in the last few years. The writer, an expert in this line, says that sooner or later it will be applied to our dwellings and public halls not only to replace the ice in the refrigerators, but to furnish also cooler and better air in the hot season of the year.

Prof. W. F. M. Goss presented a paper on "A Series Distillery Apparatus of High Efficiency," in which he gave a very complete description of a distilling apparatus consisting of a succession of chambers, in each of which the liquid to be vaporized is successively raised in temperature, and in all but the first of which some vaporization occurs, the process continuing until all is changed to vapor. Heat is supplied at only the last chamber, and all the vapor produced starts from that on a return circulation, passing the chambers successively, giving up a portion of heat to each, a portion of the vapor being condensed thereby, until at the end of the series the condensation is completed.

A Device for Grinding Piston Rods.

A paper on "Air Motors and Air Hammers," by Mr. Max H. Wickhorst, was read by the secretary. The paper described the apparatus and methods employed in testing air impelled tools used by the Chicago, Burlington & Quincy Railroad. The principal facts to be determined were the air consumption, horsepower and stalling load of motors, the number and force of hammer blows, etc. A written discussion was presented by Mr. Hobart in which he contended that the apparatus was useful for obtaining comparative results only.

The concluding paper of the meeting was by Mr. Sterling H. Bunnell, "An Improvement in Valve Motion of Duplex Air Compressors." The improvement described applies to the inlet valves of the air cylinders in connection with the Meyer cut-off for the steam cylinders of duplex air compressors. Diagrams and explanations of the valve staying were included, and a statement as to the advantages gained over the use of the ordinary pocket valve.

The attendance of the several sessions was good and the total attendance was larger than at any previous meeting, the register showing a total of members and guests of 837. About a hundred members availed themselves of the privilege of visiting the Trenton Works of the De Laval Steam Turbine Company on the excursion of Friday afternoon.

It is regretted that lack of space will not permit us to include any of the valuable papers read, which form interesting additions to existing technical literature.

A Useful Device for Grinding Piston Rods

A USEFUL device for quickly grinding the ends of piston rods and for securing a good fit between the piston rod and cross-head, has been placed in service in the Collinwood shops of the Lake Shore and Michigan Southern Railway. The accompanying engraving from a photograph illustrates the device very clearly. The cross-head is held securely by the vise shown on the floor. The end of the rod is placed therein and is held in a vertical position by the bracket shown bolted to the end of the bench. A clamp is attached to the rod above the bracket, which in turn is connected by a pin to the jaws at the end of the connecting rod shown. By a suitable arrangement of gears and crank the power derived from an air machine is made to give an oscillating motion to the rod, a means of grinding which is found much more satisfactory than the old hand method. In order that continuous grooves may not be cut in the surfaces of the rod and cross-head, the operator gives the rod an occasional vertical motion by a stick which he places between the bracket and clamp.

Improvements at the Schenectady Works of the American Locomotive Company

SINCE the acquisition of the Schenectady works by the American Locomotive Company a number of changes have been made in the use of the several buildings constituting the plant, and many improved facilities are being added. The original plant on the south side of the Erie Canal having become inadequate and no accommodation being available immediately adjacent, it was necessary to secure land on the opposite side of the canal. This was done some time ago and the erection of suitable buildings has been rapidly advanced.

The building now used as the cylinder shop was originally the blacksmith shop. It is arranged in two bays, the main bay being occupied by machines for the heavier work on cylinder castings, boring, planing, etc., and is served by three electric traveling cranes. Machines for lighter work, such as cylinder heads, steam chests, steam chest covers, piston valves, bushings, etc., are placed in a side bay where they are served by light traveling hoists. Machines in this shop are arranged in groups and electrically driven.

The old boiler shop has recently been converted into a frame shop, while the old foundry has been rearranged for a wheel shop. The old hammer shop has been torn down and in the position which it occupied is being erected a five story brick building supported by a steel frame in which the office drawing room and store rooms are to be located. Its position being the most conveniently available from the several buildings on both sides of the canal makes it the most appropriate location for the store house. A new building is being constructed for finishing locomotives, on the site on which the tender frame shop was previously located. This building is to be equipped with a light traveling crane and the necessary machine tools for finishing locomotives after they have reached such stages in construction that it is practical to transfer them from the erecting shop, thus making room to forward the construction of others.

Fig. 2—Centre Bay of New Boiler Shop—Schenectady Works of the American Locomotive Co.

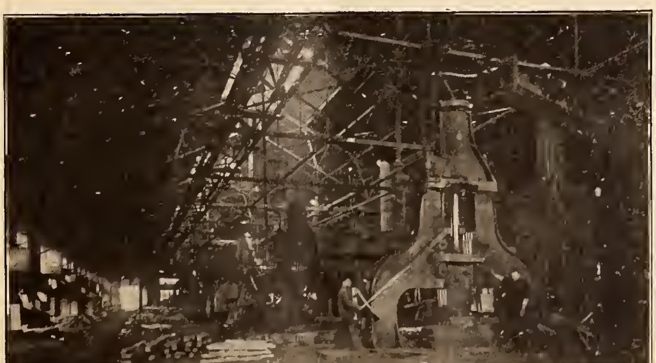


Fig. 1—Interior of New Hammer Shop—Schenectady Works of the American Locomotive Co.

Fig. 3—Showing Structural Work of New Foundry Schenectady Works of the American Locomotive Company.

Fig. 4—Interior of New Blacksmith Shop—Schenectady Works of the American Locomotive Company.

A new tank shop is being constructed in which tanks will be finished complete and painted before being removed from the shop. The building is 600 ft. by 175 ft. and is constructed of brick upon a framing of steel, a construction which has been consistently followed in the erection of the new buildings about the plant. The building is divided into three bays, each of which is served by a Niles electric traveling crane. The capacity of the crane serving the main center bay is 40 tons, while each side bay is served by a crane of 10 tons capacity.

The new hammer shop, interior view of which is presented herewith by Fig. 1, is 85 ft. by 650 ft. In it are located 10 steam hammers of Chambersburg and Bement-Niles manufacture and space provided for the addition of four more hammers. Each hammer is served by a steam generating furnace and two jib cranes.

A new shop has been erected for drop hammer and die work. Machines in service in the drop hammer shop

Fig. 5—Interior of New Blacksmith Shop—Schenectady Works of the American Locomotive Co.

and machine tools in a small machine shop adjacent thereto are driven by electric motors. In order that one or the other of the two groups may be operated at a time, the heavier machines in the drop hammer shop are connected to a large 60 horse power motor, and the machine tools are driven by a small motor of 35 horse power.

A view of the interior of the foundry is presented by Fig. 3. The building is 650 ft. by 175 and is divided into three bays. The main center bay is served by 35 ton Niles electric traveling cranes and local hoisting work is done by jib cranes. Transfer of material is further facilitated by lorry tracks.

The boiler shop is 650 ft. by 175 and divided into three bays, as shown by the accompanying illustration, Fig. 2. The main bay in which the heavy work is done is served by three traveling cranes of 35 tons capacity, one of which is of Shaw manufacture and the other two are Niles cranes. Punches, shears, etc., are located in one

Fig. 6—Interior of New Cylinder Shop—Schenectady Works of the American Locomotive Co.

of the side bays, where they are served by three traveling cranes of 10 tons capacity, manufactured by the Niles Co. Both this side bay and the main bay are equipped with jib cranes for local use. The fires, etc., are located in the third bay, a part of which is arranged for staybolt and flue work. The heavy machinery, riveters, accumulators, etc,. are located in one end of the building.

All material for the boiler shop is unloaded in the yard at the east end of the building. The work begins at this end of the shop, the sheets being carried first to the layout benches, from which point the cranes continue them to the punches, shears, rolls and drills, the shells finally reaching the riveters. In the mean time all flange work has been going on in the opposite bay and the parts are finally brought to the centre bay where they are assembled. Upon completion all boilers are thoroughly tested before leaving the boiler shop.

In converting the old boiler shop to the present frame shop, the riveters were removed and the ventilators re-

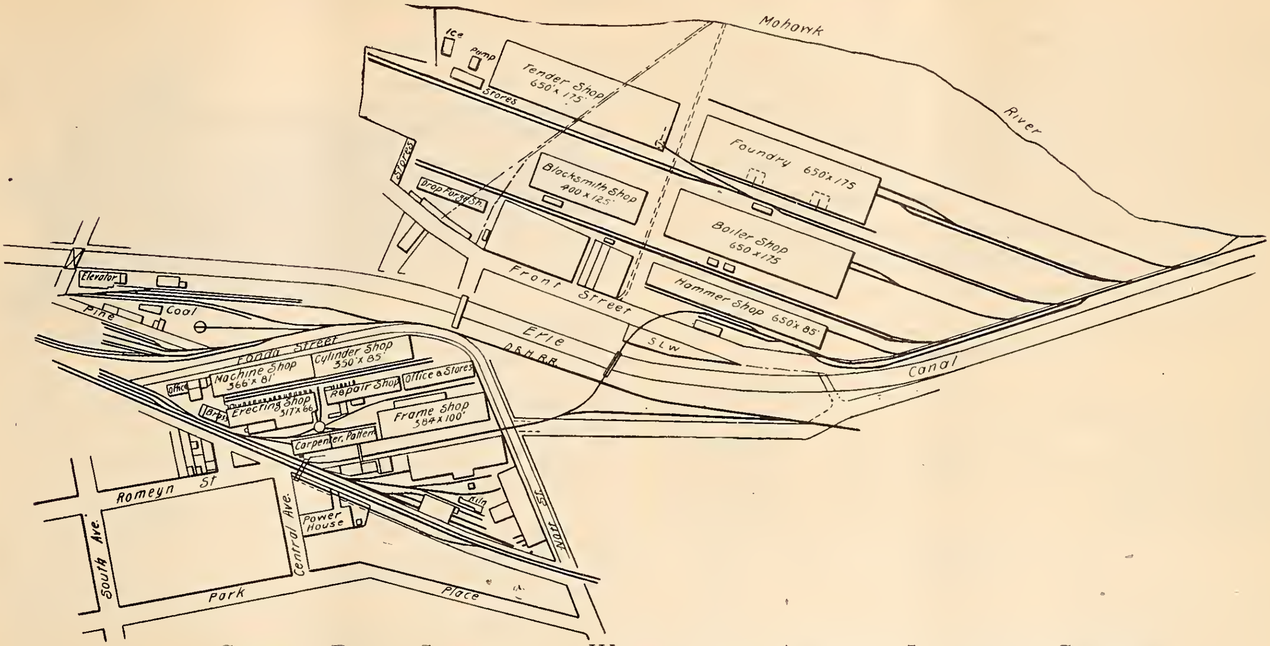


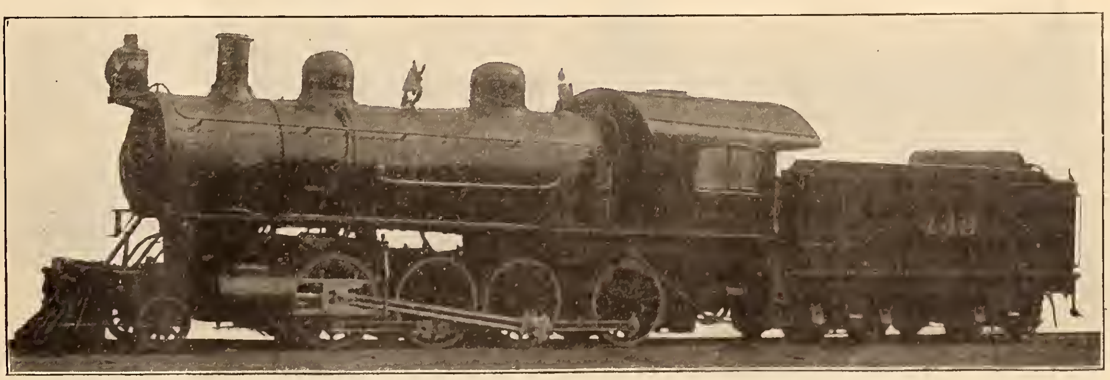
FIG. 7—GENERAL PLAN—SCHENECTADY WORKS OF THE AMERICAN LOCOMOTIVE COMPANY.

placed by sky lights. The machines for heavy work are located in the centre bay, where they are served by three electric traveling cranes of twenty tons capacity, which were installed by the Morgan Engineering Company when the shop was used for boiler work. Light machines are in the side bay and the whole machine tool equipment is driven by two 60 h. p. General Electric Motors, one located in each side bay. Adjacent to the north bay is a bolt room well equipped with bolt cutting machines.

All shop buildings of the entire plant, on both sides of the canal, are connected by standard gauge tracks. There are two traveling jib cranes in service, which operate upon standard gauge tracks, for transporting material, which have been found very serviceable in saving both time and labor. They were manufactured by the Industrial Works, Bay City, Michigan.

Freight Locomotive--Chesapeake & Ohio Railway

THROUGH the courtesy of Mr. J. F. Walsh, superintendent of Motive Power of the Chesapeake and Ohio Railway, we are enabled to present herewith a photograph and the principal dimensions of one of the standard consolidation locomotives recently built for that road by the Richmond Works of the American Locomotive Company. The engines are designed for service on all of the several divisions of the road. They are giving satisfactory service both from the standpoint of economy and popularity with the enginemen who have handled them. The firebox is of the modified wide type for burning bituminous coal and the valves are of the piston type. The cab is made of steel, presenting a neat appearance and a design simple of construction. For convenience and for economy of space the main reservoir is placed on the rear of the tender.



FREIGHT LOCOMOTIVE—CHESAPEAKE & OHIO RAILWAY.

By the usual formula the tractive effort is 41100; the ratio of weight on drivers to tractive effort is 4.05; the ratio of tractive effort to total heating surface is 13.6 and the ratio of total heating surface to grate area is 64.5. The ratio of total heating surface to firebox heating surface is 19.25; the ratio of firebox heating surface to grate area 3.35; the ratio of total heating surface to volume of both cylinders is 245.4 and the ratio of grate area to volume of both cylinders is 3.8.

The further interesting features are evident from the following table:

General Dimensions.

Gauge	4 ft. 9 ins.
Fuel	Bituminous coal.
Weight in working order	186,225 lbs.
Weight on drivers	166,875 lbs.
Weight engine and tender in working order	305,525 lbs.
Wheel base, driving	17 ft. 0 in.
Wheel base, rigid	17 ft. 0 in.
Wheel base, total	25 ft. 3 ins.
Wheel base, total, engine and tender	54 ft. 10½ ins.

Cylinders.

Diameter of cylinders	22 ins.
Stroke of piston	28 ins.
Horizontal thickness of piston	6 ins.
Diameter of piston rod	4 ins.
Kind of piston packing	Plain rings.
Kind of piston rod packing	Jerome Elliott.
Size of steam ports	1⅝ ins.
Size of exhaust ports	2½ ins.
Size of bridges	1⅞ ins.

Valves.

Kind of slide valves	Piston.
Greatest travel of slide valves	5½ ins.
Outside lap of slide valves	1 in.
Inside lap of slide valves	0 in.
Lead of valves in full gear	0 in.
Kind of valve stem packing	Jerome Elliott.
Transmission bar	With.

Wheels, Etc.

Number of driving wheels	8.
Diameter of driving wheels outside of tire	56 ins.
Material of driving wheels, centers	Cast steel.
Thickness of tire	3 ins.
Tire held by	Shrinkage.
Driving box material	Cast steel.
Diameter and length of driving journals	9x9½ in. dia. x 10.
Diam. and length of main crank pin journals	7 in. dia. x 6½.
Diameter and length of side rod crank pin journals	7¼ in. dia. x 5 3-16.
Section of rods, main	"I" side, "I."
Engine truck, kind	2-wheeled swing motion.
Engine truck, journals	5½ in. dia. x 9⅞.
Diameter of engine truck wheels	30 ins.
Kind of engine truck wheels	"Standard" steel tired, spoke.

Boiler.

Style	Extended wagon top, wide fire box.
Outside diameter of first ring	70 ins.
Working pressure	200 lbs.
Material of barrel and outside of fire box	Cen. I. & S. Co.'s steel.
Thickness of plates in barrel and outside of fire box	¾ in., 13-16 in., 11-16 in. and ⅞ in.
Horizontal seams	Butt jointed, sextuple riveted.
Circumferential seams	Double riveted.
Fire box, length	90 ins.
Fire box, width	75 ins.
Fire box, depth	front, 73 ins.; back, 61½ ins.
Fire box, material	Cen. I. & S. Co.'s steel.
Fire box plates, thickness	sides, ⅜ in.; back, ⅜ in.; crown, ⅜ in.; tube sheets, ½ in.
Fire box, water space	front, 4 ins.; sides, 3½ ins.; back, 3½ ins.
Fire box, crown staying	Radial, 1⅛ ins. dia.
Fire box, stay bolts	1 in. dia.
Tubes, material and gauge	National No. 11.
Tubes, number	370 x 11-16 rear, 23-32 front.
Tubes, diameter	2 ins. O. D.
Tubes, length over tube sheets	14 ft. 9 ins.
Fire brick, supported on	Water tubes.
Heating surface, tubes	2841.38 sq. ft.
Heating surface, water tubes	26.04 sq. ft.
Heating surface, fire box	157.08 sq. ft.
Heating surface, total	3024.55 sq. ft.
Grate surface	46.87 sq. ft.
Grate, style	Rocking, 2-section.
Ash pan, style	Sectional.
Exhaust pipes	Single.
Exhaust nozzles	5¼ ins., 5½ ins. and 5¾ ins. dia.
Smoke stack, inside diameter	16 ins. tapered to 17 ins.
Smoke stack, top above rail	14 ft. 11⅝ ins.
Boiler supplied by	2 No. 10 Hancock injectors.

Tender.

Style	Channel steel frame with water bottom tank.
Weight, empty	48,600 lbs.
Wheels, number	8.
Wheels, diameter	33 ins.
Journals, diameter and length	5½ ins. dia. x 10 ins.
Wheel base	18 ft. 1⅞ ins.
Tender frame	Channel steel.
Tender trucks	"Stirlingworth."
Water capacity	6000 U. S. gallons.
Coal capacity	10 tons.

Railroad Shop Tools

By Charles H. Fitch

IX

WE have already described the Ajax forging rolls, by use of which a variety of shapes can be quickly and cheaply drawn down to taper by the movement of revolving dies through part of a revolution. The movement of the work in these rolls is in a plane perpendicular to the axis of the rolls. Its length must, therefore, be limited to such a fraction of the circumference of the rolls as will admit the passage of the work through them with reasonable clearance between the work and the portion of the dies which form the end of it, in a taper piece, the small end of the taper being rolled last.

Rolling, however, in a broader sense, is not limited by this construction. It may be continuous, as in the

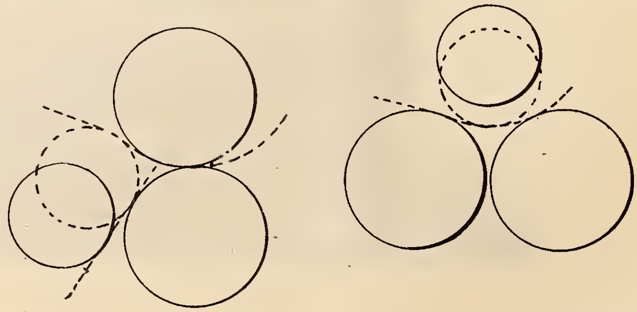


FIG. 1—VERTICAL AND HORIZONTAL ARRANGEMENT OF ROLLS.

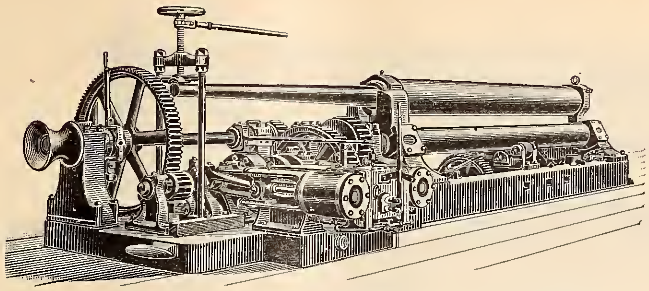


FIG. 2—ENGINE DRIVEN ROLLS MANUFACTURED BY WICKES BROS.

rolling of merchant bar and tubes, and peculiar and valuable results may be had from the use in combination of rolls set askew, and dies formed in the surfaces of conical or sphero-conical rolls. Such are some English types of flange-rolling machines, and the devices for producing Mannesmann tubes. No more interesting application of conical rolls can be found than that which originated in Chicago, the invention of Frank C. Caldwell, for the continuous rolling of the flights of helicoid conveyors. There remains a great deal more to be done in the processes of rolling material in the place of milling or cutting it. The latter removes the skin, or earliest cooled portion, hardest to resist wear, while rolling retains it.

Such methods of rolling will apply in railroad as in other work, but for the present, apart from roll-cutting and the forging of comparatively short taper pieces, the chief use of rolls is in the time-honored machinery for straightening and bending plates in boiler work.

Antecedent to rolling and other machine forging was, of course, hand work. In this formers were used, plates for fireboxes, saddles, etc., being forged over them with sledge and hammer, until these methods were superseded by use of heavy hydraulic flanging machinery. The formers were held by clamping in long vises by means of screw jacks. Pneumatic vises have also been used for quicker action on plate work, and there is no reason why hydraulic power should not be employed.

Plate-bending rolls are not only machines for rolling plate, but combine with this function that of a vise with rolling instead of fixed jaws. Rolling plates is a process of peining or swaging upon long lines or cylindrical elements. The outside of the plate is stretched, and the inside is compressed, to form a cylinder, which retains the diameter determined by this stretching and compressing. If plates are curved or warped they are restored to plane surfaces by straightening rolls in which several sets of rollers above and below are employed, but for forming boiler cylinders only three rollers are used, two being driven by power, while the third one, revolving idly, is adjustable for bending, so that by moving it the curve required may be given.

Where plates are very heavy the weight of the plates affects uniformity of curvature, and the large shipyards find that they can handle plates better with vertical rolls, but locomotive boilers do not have very thick plates, nor very great variety in dimensions, and railroad shops commonly use two geared horizontal rolls side by side, and a movable bending roll above, midway between them. This is called the pyramidal form. It does not bring the edges of the plate to a true curve. Another form of machine has two power-driven rolls, one above the other, while the bending roll is advanced in an oblique line. This makes a uniform curve, but unless epicycle and compensating gears are used, one power roll rubs over the plate after it is curved, calendaring it, which is objectionable.

The two types are shown in sketch Figure 1. The pyramidal type is more commonly used as being on the whole more simple and satisfactory. Such rolls made by Wickes Bros., Saginaw, Mich., are shown in Figure 2. In these the bending roll is seen to be larger in diameter than the power-driven rolls, and to

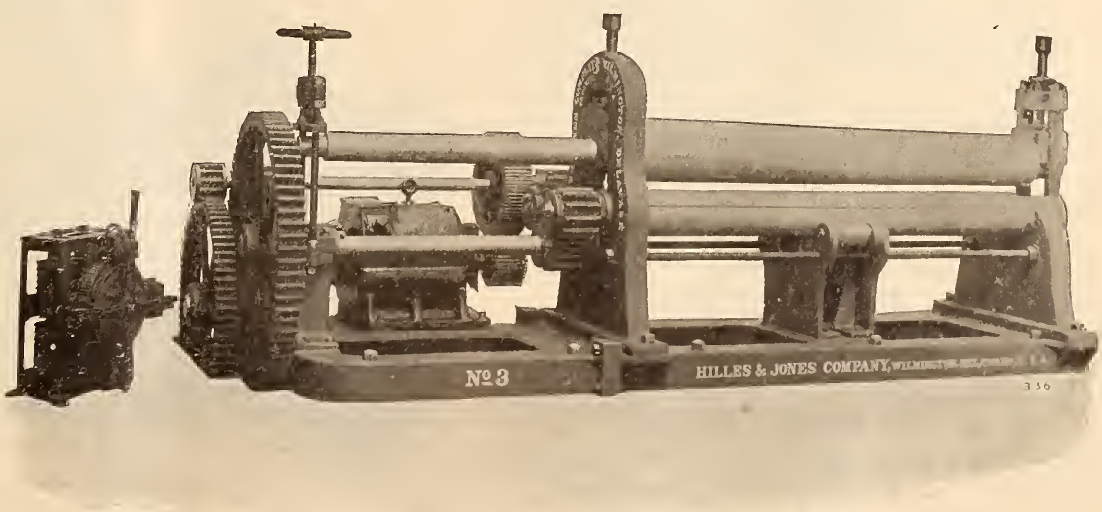


FIG. 3—ELECTRIC MOTOR DRIVEN ROLLS MANUFACTURED BY HILLES & JONES CO.—TOP ROLL OPERATED BY HAND.

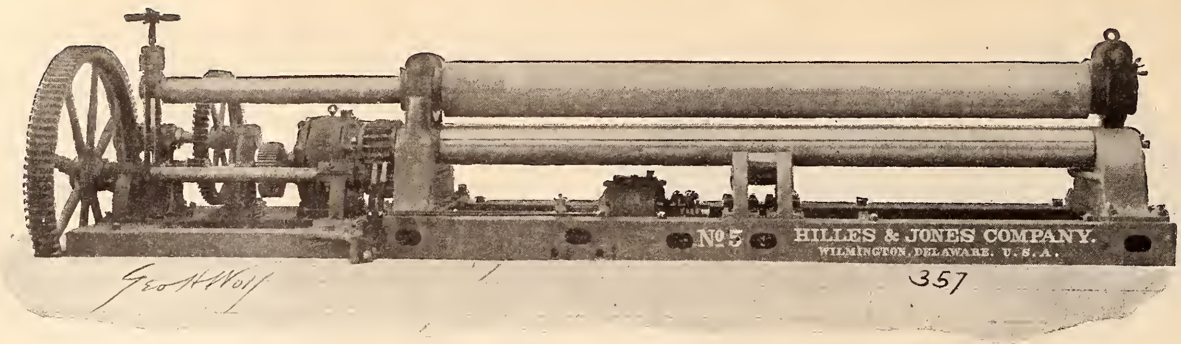


FIG. 4—ELECTRIC MOTOR DRIVEN ROLLS MANUFACTURED BY HILLES & JONES CO.—TOP ROLL OPERATED BY INDIVIDUAL MOTOR.

prevent the latter from yielding under their work short roller bearings are placed in the middle.

We have all heard the story of the man who built a machine and had to take down his shop to get it out as an illustration of the lack of forethought. Bending rolls are commonly built with this provision. Where cylinders are rolled in one sheet, as consists with the best practice for ordinary diameters, it is necessary to make special provision for their removal after rolling. The outer top roll housing is mounted in trunnions, so that it may be swung down to permit the rolled cylinder (boiler shell) to be drawn out sidewise. To make this easy by giving clearance and relief from the weight of the top roll, this roll is extended (it is usually of forged iron) in a long taper balance bar, to the end of which a hand screw may be applied, lifting the roll by leverage upon the inner housing.

Plates are bent with one pass, the heaviest plate being handled at ten or twelve feet per minute.

A number of railroad shops have tools which mark an epoch prior to the convenient application of electric motors for individual machine drive. In the boiler shop where machines are few and powerful, and the use of shafting was always undesirable, separate steam engines were installed, an expense which would now hardly be considered. The arrangement, then the best obtainable and still available in exceptional circumstances, is shown in Fig. 2, rolls by Wickes Bros., Saginaw, Mich., driven by duplex reversing engines. The C. & N. W. shop arrangement for driving rolls was even more elaborate, there being two pairs of vertical engines, one pair for each live roll. Such installations are expensive in first cost, and as the use of steam in such small engines is uneconomical, it is probably only a question of a short time before these engines give place to electrical drive.

The idle roll whose position determines the curvature, may be fed uniformly at each end by actuating the nuts of the vertical feed screws by power gearing. This is usual in ship work, where plates have to be rolled of thicknesses of 5 inches or more, and often "out of wind," so that the problem of rolling involves much more than usual with the light plates and straight work on locomotive boilers. Illustrations of up-to-date machines for locomotive work are shown in Figure 3, rolls driven by electric motor, top roll operated by hand, and in Figure 4 showing method of driving by electric motor, with a separate motor for raising and lowering the top roll.

Examples of roll equipment are the Du Bois shops, Hilles bending rolls, one set No. 0 light and one set No. 5, for plates up to twelve feet by ¾ inch, and straightening rolls, all belt driven, and the new Collinwood shops, two sets bending rolls, Hilles No. 2, the lighter, and Bement for plates 12 ft. 2 in. long by ⅞ in. thick. These are driven by ten and twenty horse-power variable speed motors, respectively, and a set of Niles No. 3 plate straightening rolls is used, requiring a 10 horse power motor. The latter shops are of much greater capacity than the former, and this emphasizes the fact that plate rolls are an element in machine plant in which capacity of work is so great that small shops are at a disadvantage, requiring as expensive machinery as large ones with less continuous use for it.

Machines embodying the rolling principle and used upon plate are those for shearing, splitting, beveling and forming the edges of plates. Joggling machines are

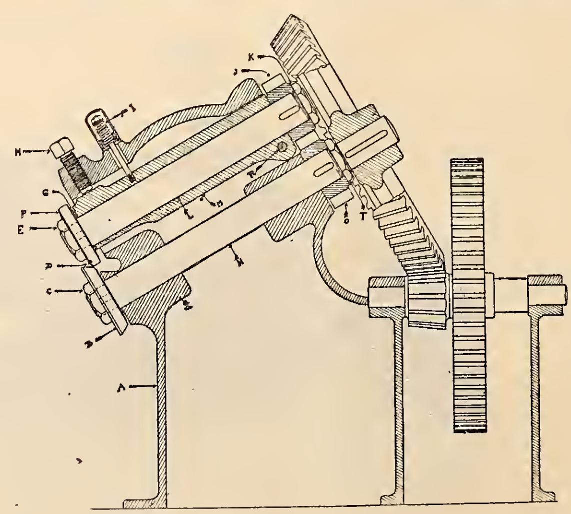


FIG. 5—SECTIONAL VIEW OF LENNOX ROTARY BEVEL SHEAR.

those used for forming a ribbed lap joint special to ship work. A machine seen in nearly every large railroad shop is the Lennox rotary bevel shear made by the Lennox Machine Co., of Marshalltown, Iowa, represented by Joseph T. Ryerson & Son of Chicago. Few machines are more admirable than this in its labor-saving qualities, neatness of design and adaptation to its purposes. It expands the ability of a man to do a class of work which for clean finish could not otherwise be attempted.

Rolling cutters have some obvious advantages over shear blades. They act at a contact point instead of along a cylindrical element so that they can be used on curved and irregular work, and at the same time the cutting edges are out of contact with the work most of the time, preventing heating even when work is done as fast as a man can handle it.

Figure 5 is a sectional view of the Lenox machine. The bevel is on the lower cutter. The work is usually held horizontal. The upper spindle has a small pivotal movement adjustable by spring and set screw for thickness of plate. The top cutter overlaps the lower one about one-sixteenth of an inch, and small variations in bevel may be made by letting out the lower cutter. The upper cutter is reversible, and the machine will not receive plates too thick for its capacity, usually limited to ¾ inch, a convenient safeguard. The cutters pinch and feed the work as they cut it. A guide roll is operated by hand wheel. Figure 6 shows one of these machines with direct motor drive, Figure 7, a furnace flange in process of being beveled, the boiler head being suspended on center by temporary angles. Mr. A. A. Akins, F. B. M., Chicago Great Western Shops at Oelwein, Ia., makes the following comparison of machine and hand work on locomotive sheets, the machine requiring one man at 23½ cts. an hour, with helper at 17½ cts. an hour.

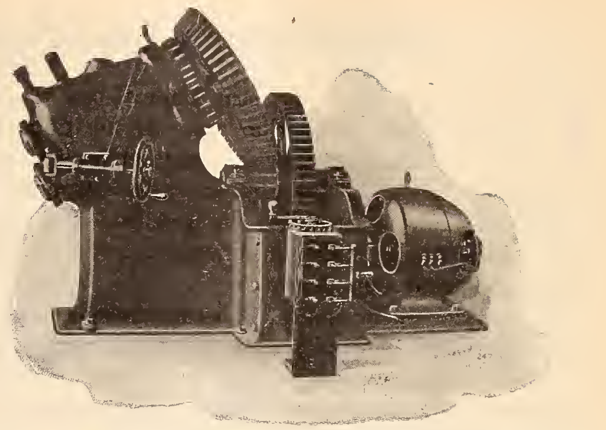


Fig. 6—Lennox Rotary Bevel Shear Operated by Individual Motor.

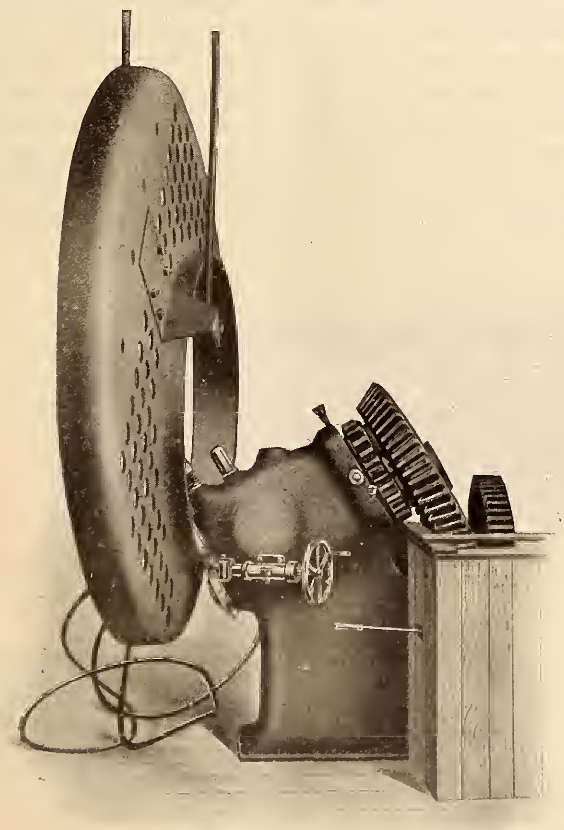


Fig. 7—Beveling the Furnace Flange of a Boiler Head.

	Machine.	Hand.
Dome head, 29 inch	8 min.	360 min.
Crown sheet, 108x56	12 min.	540 min.
Firebox side sheet, 108x70	14 min.	600 min.
Door sheet, 56x56	10 min.	420 min.
Flue sheet, 56x71	11 min.	570 min.

Translated into hours the dome head takes 6, etc., by hand. The machine is 40 or 50 times as fast. The time labor cost on the above sheets is about 40 cts. by machine, against $10 by hand, or 1 to 25. Labor of handling is about the same by machine as by hand.

On some work the planer can be superseded, and the rotary shear is a much more convenient tool than the plate planer.

Splitting shears for straight work will handle 400 or 500 feet of plate in an hour, about 5 times as much as by other methods. Compare this with the speed of rolling the heaviest plate (statement attributed to Mr. Cullen, Niles-Bement-Pond Co.), viz.: 10 or 12 feet per minute, or at rate of 600 to 720 feet per hour. In the splitting shears the cutters are milled on edge so that they will grip and feed the plate as it is being cut.

A Chicago mechanical engineer is putting in a central heating system, to cost $250,000, for the Little Rock (Ark.) Heating Co., a novel feature of this installation being in the fact that the heating plant will utilize waste steam from cross compound condensing engines under vacuum conditions. The steam will be secured from the Little Rock Traction & Light Co., who will place steam from engines aggregating 4,000 horse-power at the disposal of the heating plant.

Cafe-Parlor Cars--Chicago Great Western Railway

THE Chicago Great Western Railway has recently received seven cafe parlor cars for day trains and a number of buffet-smoking cars for night trains, on its new line to Omaha. These cars are similar in design to the club cars now in service on the line between Chicago and St. Paul, though they are in advance of the latter in arrangement and equipment.

Two types of the buffet-smoking cars have been placed in service, both of which have the smoking compartment. In some of them, however, the remaining portion is equipped with regular coach seats, while in others this portion is used as a baggage car. The latter are illustrated herewith in plan.

The cafe parlor cars were first placed in service on Sunday, December 13, between Chicago, Minneapolis and St. Paul and between Chicago, Des Moines and Omaha. The cars are thoroughly modern in every respect and because of their elegant ornamentation and equipment, as well as their many features arranged for the convenience of travelers, they have been denominated "house cars" by the passenger department.

The body of the car weighs 75,000 pounds, trucks 35,300 pounds; total 110,300 pounds. They are 79 feet long over all, 9 feet 8 inches wide over sheathing and are carried on the usual six-wheel truck. The forward platform is of the regulation wide-vestibule type and the rear platform is a 3-foot observation platform with brass railing and gates. The forward platform is fitted with the usual swinging door designed to cut the view of the kitchen compartment off from passengers passing from car to car. The exterior of the car is painted in olive green and decorated in gold, presenting a very attractive appearance. A noticeable feature adding to the pleasing appearance of the car are the many wide windows and the small high windows in the kitchen and toilet rooms, instead of the oval windows which have been so commonly used in parlor cars.

An exterior view of the car is shown by Fig. 2, while the distribution of the several compartments is shown by Fig. 3. The interior of the dining compartment, looking to the rear, is shown by Fig. 4. In the background appears the table and very artistic mirror above the same in the rear of the parlor section, the location of which can be noted in the floor plan. Fig. 5 is an interior of the parlor compartment looking forward and showing the very tasteful mission type of combined book case and writing desk. Fig. 6 is an interior view of the smoking and observation room looking forward in which the disposition of oval mirrors over the corner sofa and with the gas globes between, appears very clearly. The sofa is equipped with locker below for bedding. Fig. 7 is a view looking toward the rear of

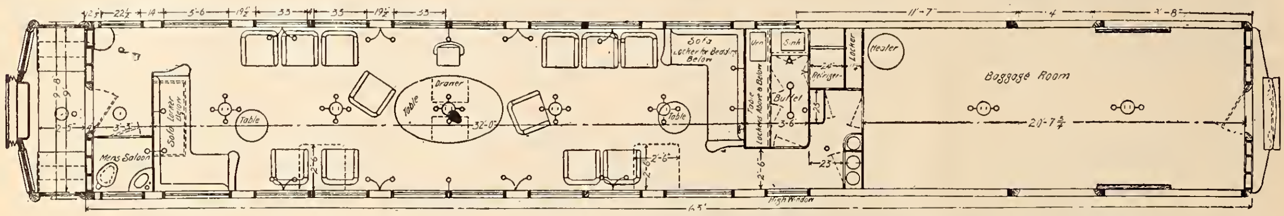


Fig. 1—Plan of Combination Baggage and Buffett Smoking Car—C. G. W. Ry.

Fig. 2—Exterior View of Observation-Cafe-Parlor Car—C. G. W. Ry.

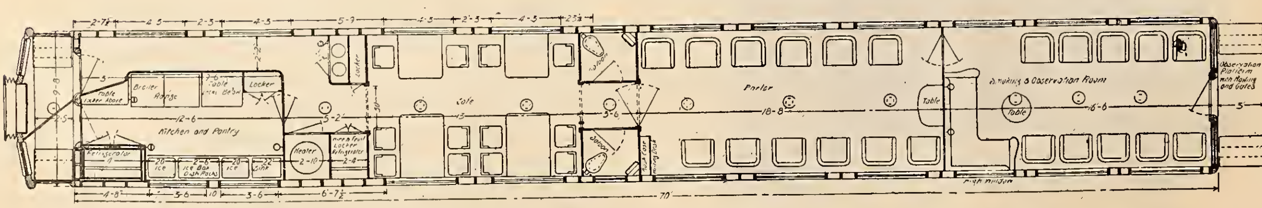


Fig. 3—Plan of Observation-Cafe-Parlor Car—C. G. W. Ry.

Fig. 4—Interior View of Cafe Compartment—C. G. W. Ry.

the smoking and observation compartment in which the low glass observation windows and door are shown.

The kitchen compartment is 12 ft. 6 ins. long and contains the most modern equipment throughout, including conveniently located lockers, tables, range, broiler, etc., and a full quota of copper utensils, together with Bohn white enamel refrigerator. Entry is had to the car by a door opening into a passageway 2 ft. 2 ins. wide at the left of the kitchen. A swinging door leads from the latter passageway into the kitchen for the purpose of serving instead of access being had through the butler's pantry as is usual in full-dining car construction. An acetylene gas generating outfit is located in the locker immediately back of the kitchen at the left of the car, as indicated, and on the opposite side a booth for the heater and a wine and a fruit locker are installed. This subdivision consumes 5 ft. 2 ins. of the length of the car.

Entry is had into the cafe portion through an arch 30 ins. wide and by reference to Figs. 3 and 4 it will be seen that this room contains four tables—two large and two small—with a total seating capacity of twelve persons. The style of this room is colonial, and the design in consequence is very properly a plain one with little carving to catch the dust, but unusually beautiful woods are used, and the entire equipment, including the brass chandeliers and hat hooks, were especially designed, so that the result is a room which presents a very ornamental ensemble. This compartment is 13 ft. long, and it will be noticed at once upon reference to the photo-engraving and line drawing that an unusual amount of space is provided, making a very roomy cafe. Immediately to the rear of the last named compartment the men's and women's toilet rooms are located on opposite sides of the car.

Just back of the cafe is the parlor portion of the car, which is 18 ft. 8 ins. long and is illustrated in the reproduced interior view, Fig. 5. This portion of the car has the full wide windows on both sides with leather upholstered wicker easy chairs, twelve in number, and various other details designed for the complete comfort of travelers. Like the dining room the style is colonial, the walls being of green burlap with a frieze decorated in relief in ivory, and with woodwork of light mahogany. The usual traditions of car design have been departed from in this section so that it presents the appearance of a room in a house rather than a subdivision of a car. The extent to which this is true may be had by reference to the photo-engraving. At the rear end of the room is a table for books and papers and over the latter is a large oval mirror set in an ivory colonial frame, as illustrated in Fig. 4, and the book case and writing desk is in the opposite corner, as previously mentioned.

To the rear of the parlor, entry to which is had through a swinging door at the extreme left, is the smoking and observation room, which is 16 ft. 6 ins. long. This room is, as its name implies, largely made up of windows, and is provided with the same form of easy chair as the parlor compartment, ten being furnished. The wide corner seat is luxuriously upholstered with a convenient small, round table. The observation room, as is the whole car, is hansomely carpeted and has an aisle strip in addition. The observation room is

Fig. 5—Parlor Compartment—C. G. W. Ry.

Fig. 6—Observation Compartment—Looking Forward—C. G. W. Ry.

Fig. 7—Observation Compartment—Looking to Rear—C. G. W. Ry.

finished in the empire style with considerable ornamentation, as will be noted in Figs. 6 and 7, brass being largely used in the decoration. The ceiling is domed, and of an entirely original, and exceedingly attractive design. The end windows and door are fitted with plate glass extending down, nearly to the floor, as is shown in the last view, and the wide observation platform is provided with an awning so that it may be used as a piazza in the summer. These cars are heated by steam, lighted by acetylene gas, and provided with hot and cold water.

The Pennsylvania Testing Laboratory at St. Louis

A BULLETIN has been distributed describing the plan and scope of the work to be accomplished by the locomotive testing laboratory which is to be installed at the Louisiana Purchase Exposition by the Pennsylvania Railroad as a part of its exhibit. The formal announcement of the Pennsylvania Railroad System to provide the facilities for testing locomotives at St. Louis was made before the conventions of the American Society of Mechanical Engineers and the American Railway Master Mechanics' Association, then in session at Saratoga, June 25th, 1903. An outline of the work contemplated was presented in our issue of August, 1903.

The plant will be ready for preliminary running by the first of March next, and in perfect running condition by the first of May, at which time formal work will commence. The purpose of the whole work is to be comprehensive and the endeavor will be to determine by the use of locomotives presenting different characteristics, the effect of the latter upon the economic performance, and the limits of the tractive power and boiler capacities. It is planned to test twelve different locomotives, and it is hoped that a portion of this number can be of foreign design and construction. The time to be allowed to each locomotive will vary from twenty to fourteen working days, the longer time being allowed those which are tested when both men and equipment will be new at the work. While it is not possible at this time to present a complete list of the locomotives which will be tested, we understand that this matter is now under careful consideration and will be announced by the authorities in a later bulletin.

Personals

Charles A. Hino, of Wilkes-Barre, has been appointed general foreman of the Lackawanna car shops in Elmira, to fill the vacancy caused by the death of Donald W. Jackson. Mr. Hino during the last 17 years has been connected with the Lake Shore and Lackawanna.

Mr. John R. McIntosh has been appointed boiler inspector of the Grand Trunk, at Montreal, Que.

Mr. A. Buchanan, Jr., has been appointed superintendent of motive power of the Central Vermont Railroad, with office at St. Albans, Vt.

Mr. T. M. Downing has resigned as master mechanic of the St. Louis, Memphis and Southeastern and St. Louis and Gulf, at Cape Girardeau, Mo., to accept a position with the Mobile, Jackson & Kansas City at Mobile, Ala.

Mr. Joseph Walsh, general foreman of the locomotive department of the Pittsburg, Cincinnati & St. Louis, at Dennison, O., has been appointed general foreman of the locomotive and car departments of the Toledo division of the Pennsylvania Company, with headquarters at Toledo, O.

Mr. W. W. Leeman, heretofore master mechanic of the Chicago, Rock Island & Mexico at Dalhart, Tex., has been appointed master mechanic of the Chicago, Rock Island & Pacific at Goodland, Kan.

Mr. James McDonough has been appointed master mechanic of the Chicago, Rock Island & Mexico, with office at Dalhart, Tex.

Mr. Alfred Owens has been appointed storekeeper for the Baltimore & Ohio at New Castle Junction, Pa.

It is stated that the offices of the motive power department of the Chicago Great Western are to be removed from St. Paul, Minn., to Oelwein, Ia.

Mr. E. T. Munger has been appointed master mechanic of the Metropolitan West Side Elevated Railroad of Chicago.

Mr. R. Preston, who was formerly master mechanic of the Lake Superior division of the Canadian Pacific, with headquarters at North Bay, Ont., has been transferred to the Ontario division, with headquarters at Toronto Junction, Ont.

Mr. T. J. Cutler, formerly master mechanic at Fargo, N. D., has been transferred to Missoula, Mont., as master mechanic of the Rocky Mountain division of the Northern Pacific.

Mr. Webb C. Ball has been appointed general time inspector of the Illinois Central, Chicago & Eastern Illinois and Yazoo & Mississippi railroads, with headquarters at Chicago, vice J. W. Forsinger. Effective December 5, 1903.

Mr. Elliot Summer, formerly assistant engineer of motive power of the Pennsylvania in Buffalo, has been transferred to Altoona.

Mr. P. T. Lonergan, of the Rutland, has been appointed master mechanic of the Boston & Albany in West Springfield.

Mr. Joseph Stehlin has been appointed mechanical engineer of the engineering department of the New York Central.

Mr. C. A. Snyder, foreman of the shops of the Gulf, Colorado & Santa Fe at Gainesville, Tex., has been transferred to a similar position at Galveston, Tex. Mr. C. C. Walker, road foreman of engines, has been placed in temporary charge of the Gainesville shops, to succeed Mr. Snyder.

Mr. Frank Cain has resigned as master mechanic of the Louisiana & Arkansas, and that office has been abolished. Mr. F. A. Symonds has been appointed foreman of shops, with headquarters at Stamps, Ark.

The directors of the Midland Railway of England have appointed Mr. Richard Mountford Deeley, locomotive works manager at Derby, chief locomotive superintendent, succeeding Mr. S. W. Johnson, who is retiring. Mr. Deeley is succeeded in his former position by Mr. Cecil Paget.

Mr. J. J. Williams has been appointed general foreman of shops of the Pennsylvania Lines at Dennison, O.

Mr. J. F. Osborne has been appointed acting master mechanic of the Saratoga and Champlain divisions of the Delaware & Hudson, with office at Green Island, N. Y.

Mr. W. B. Ott has been appointed assistant engineer of motive power of the Buffalo & Allegheny Valley division of the Pennsylvania Railroad at Buffalo, N. Y.

Mr. George A. Bruce, master mechanic of the Superior and Mesaba divisions of the Great Northern, has been appointed master mechanic of the Eastern district, with headquarters at Saint Paul, Minn.

Mr. L. E. Woglemuth, chief draughtsman of the Chicago, St. Paul, Minneapolis & Omaha, has been appointed mechanical engineer, with office at St. Paul, Minn.

Mr. B. R. Moore has been appointed assistant superintendent of motive power and machinery of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at Sioux City, Ia.

Mr. J. E. Anderson has been appointed master mechanic of the Mexican International, with office at Monclova, Mexico.

Mr. E. A. Gilbert has resigned as master car builder of the Southern Pacific at San Francisco, Cal.

Effective November 1, Mr. Charles B. Morrill has been appointed general western passenger agent, with office at Troy, N. Y., succeeding Mr. C. A. Nimmo, resigned to accept service with another company.

Notes of the Month

Hoisting rope of every description for elevators, mines, coal hoists, ore hoists, conveyors, etc., is described and illustrated in a neat pamphlet which is being distributed by the American Steel & Wire Company, Chicago.

The Armstrong Brothers Tool Company has sent us a copy of their latest catalogue illustrating their tool holding devices, and including a tool holder history.

Mr. Willis C. Squire, mechanical engineer, has been elected vice-president of the Locomotive Appliance Company, with offices at 1614, 1615 and 1616 Chemical building, St. Louis, Mo. Mr. Squire is well known as mechanical engineer for the Frisco System, and previous to that as engineer of tests for the Santa Fe System. His large experience in railroad and locomotive work especially fits him for the business in which he is now engaged.

Level, Straight and Comfortable.—The roads of the New York Central Lines, over which run hourly trains, occupy the Natural highway between the East and West. A water level for one thousand miles between Chicago and New York, along the shore of Lake Erie and Lake Michigan, through the Mohawk Valley and beside the Hudson River. A route, level and straight, and offering comforts and conveniences unsurpassed. Send a two-cent stamp to George H. Daniels, General Passenger Agent, Grand Central Station, New York, for a copy of the illustrated catalogue of New York Central's "Four-Track Series."

We are in receipt of a catalogue from the David Bell Engineering Works, Buffalo, N. Y., devoted exclusively to steam hammers, of which this company makes a specialty in ten sizes, from 250 lbs. to 1600 lbs. falling weight. These hammers, as shown and described in the catalogue, are furnished from comparatively new and improved patterns and embody the very best features, which have been found essential after many years of experience in this line. The company's sales during the past year have exceeded those of any previous year, and include 48 hammers, and in spite of the general dullness of trade they shipped seven hammers last month, which is more than in any other month of the year. These 48 hammers, actually finished and shipped, represent a total falling weight of 34,350 lbs., and a total shipping net weight of 558,400 lbs. They have been shipped to practicaly every part of this country, besides numerous export shipments. Their field is constantly increasing, which is thought to be due to some extent to these hammers having taken their place among the high grade machine tools, in place of being built in an indifferent fashion, with the idea that anything will do as long as it will hammer.

During the past few years, the motive power and rolling stock of railroads, and the heavy machinery in mills throughout the world, have undergone a complete revolution, and in order to keep pace with the modern requirements of heavy freight and high-speed passenger locomotives and modern mills machinery, the question of bearings became a serious one. The duty of a handsomely arranged and peculiarly attractive circular pamphlet issued by the Damascus Bronze Company, of Pittsburg, Pa., is to solve this question by directing attention to Damascus Nickel Bronze Bearing Metal.

The Georgia Car Company, of Atlanta, Ga., have the following orders for freight equipment: Four flat cars of 60,000 lbs. capacity, 40 ft. long, equipped with automatic couplers and Westinghouse air brakes, for the Greenbrier & Elk River R. R.; eight box cars of 50,000 lbs. capacity, equipped with automatic couplers and Westinghouse air brakes, for the Georgia Northern Ry.; and are building for the Coal River & Western R. R., five drop bottom gondola cars of 50,000 lbs. capacity, equipped with automatic couplers and Westinghouse air brakes; five flat cars of 50,000 lbs. capacity, 36 ft. long, equipped with automatic couplers and Westinghouse air brakes; two box cars of 50,000 lbs. capacity, 36 ft. long, equipped with automatic couplers and Westinghouse air brakes.

The growth of the associations and erection of new buildings during the year 1903 has been the largest in any single year of the history of the Railroad Department of the Young Men's Christian Association. This has included a building devoted strictly to the use of men in street railway work, as well as sixteen well equipped buildings for railroad men generally. The fact that this number of buildings has been secured is an indication of satisfactory, substantial and permanent growth, and of the favor of the railroad officials and companies. The growing interest of railroad men is indicated by an increase, during the year, of over twelve thousand in the membership.

It is also of interest to know that additional railroad systems have, during the present year, committed themselves to hearty co-operation with this movement. As in the past, the cost of construction of buildings and their maintenance has been shared both by railroad men and the corporations.

The Electric Club announces that it will issue an illustrated monthly magazine to be styled the Electric Club Journal. The first number will appear Feb. 1, 1904.

The immediate purpose is to put into permanent form the engineering papers and technical discussions that form a regular part of the work of the Electric Club. Many of the papers will be written by the engineering staff of a leading electric company, and much of the material will pertain to the latest apparatus and to the newest problems in engineering work. This matter will be published in a form suited to the needs of intelligent young men.

The Journal will also publish other material of special interest and value to members of the club.

The circulation of the Electric Club Journal is not restricted to the members of the club, but the privilege of subscribing is extended to others.

We have been favored with a clearly illustrated catalogue describing the principle of the surface condenser manufactured by the Cosmopolitan Power Company, of Chicago. Its principle is based upon the fundamental fact that the thermal conductivity of water in a solid body is very low—so low, indeed, that only about 12¾ B. T. U.'s per square foot per hour could be conducted from face to face of a thin sheet of water ½ inch thick for every degree of difference in the temperatures of the faces; but this same water, broken up into minute particles, and coming in contact with a hot metal, produces a vaporous gas which is a vigorous absorbent of heat.

The thermal conductivity of copper is five hundred times that of water in solid bodies. Therefore copper tubes are used in the construction of the condenser and the injection or spray water is broken up into minute particles. By means of a sprinkling device—the perforations in which are but 25-1000 of an inch in diameter—the water is driven against the tube-head and drawn into and through copper tubes by means of an exhaust-fan. The spray water coming in contact with the hot tubes (the tubes are surrounded by steam) produces vapor or vaporous gas, which is the medium by which the latent heat is absorbed, and the fan the vehicle for the removal of same.

The Sligo Iron & Steel Company have sent us a copy of their latest price list. The list is arranged very clearly and consistently from which the desired prices may be readily ascertained. The Sligo Iron & Steel Company are manufacturers of high grade iron, staybolt iron, iron and steel plates, sheets, angles, tees, light rails, etc.

Recent experiments by Massachusetts bacteriologists have determined that cresylic acid as a disinfectant is more effective and cheaper than formaldehyde. This is a matter the railroads interested in disinfecting car interiors would do well to look into.

October 6th last there were remaining 421 passenger cars on the Boston & Maine R. R. with the Miller hooks to be removed and replaced with couplers of the M. C. B. type. In two months this was practically all accomplished, as it had to be any way by January 1st, which was the limit of the new extension of time. This work has handicapped paint shop work to the extent that they were 105 cars behind December 1st over last year in varnishing their equipment.

Good Track, Good Trains, Good Time.—In each of these the New York Central is not surpassed, as thousands will attest. Travelers between the West and the East will find it to their advantage to use the New York Central which, in point of time, equipment, roadbed, dining car service, and scenic attractions is first among the railroads of the world. Send a two-cent stamp to George H. Daniels, General Agent, Grand Central Station, New York, for a copy of the illustrated catalogue of the New York Central's "Four-Track Series."

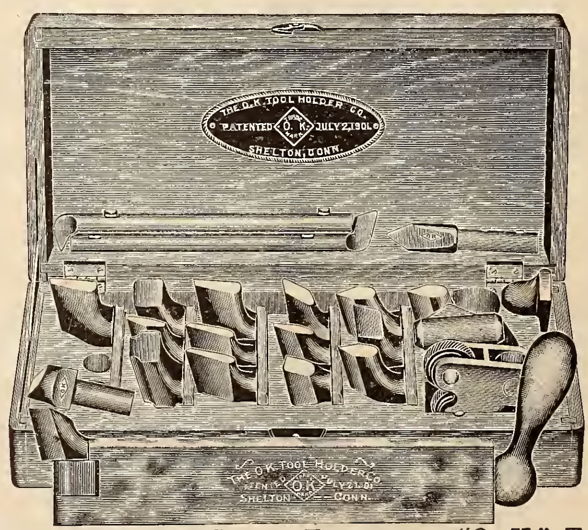


Fig. 1—Complete Set of Tools with "O. K." Tool Holder.

Tool Holders

With the increased use of high speed tool steel the value of tool holders becomes more apparent. By the application of a practical holder a small piece of steel is all that is required for making a tool instead of using up a large portion of the bar for the stock of the tool. The latter practice is very expensive, especially in view of the additional expense incurred in the purchase of the high speed tool steel.

To meet the demand for such appliances a holder has been placed on the market which is known as the O. K. Tool Holder. This device with the assorted tools supplied therewith possess many advantages.

Any of these tools can be removed from the holder and another substituted without disturbing the holder when once placed in position on the lathe, or shaper. This change can be made instanteously as a quarter turn of the handle serves to release the tool and allow another to be inserted. The holder is so constructed as to hold the tools as firmly as though they were a portion of the holder itself. With this holder is furnished shapes of tools, also many attachments for lathe use, and are not limited to one special shape, as is usually the case. The tools are hydraulic forged and drop forged to the correct shape of the old style hand forged tools. They are made at the present time out of Jessup Best Cast, Novo Air Hardening, Capital High Speed and D. S. W. Steels, and the company is prepared to make tools of any first-class steels that are called for.

The holder and tools are supplied in two sets, the complete set being shown in Fig. 1, which contains a holder and twenty-two tools and working set containing thirteen tools, shown by Fig. 2.

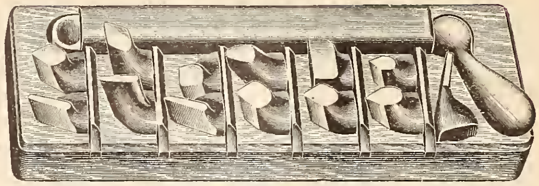


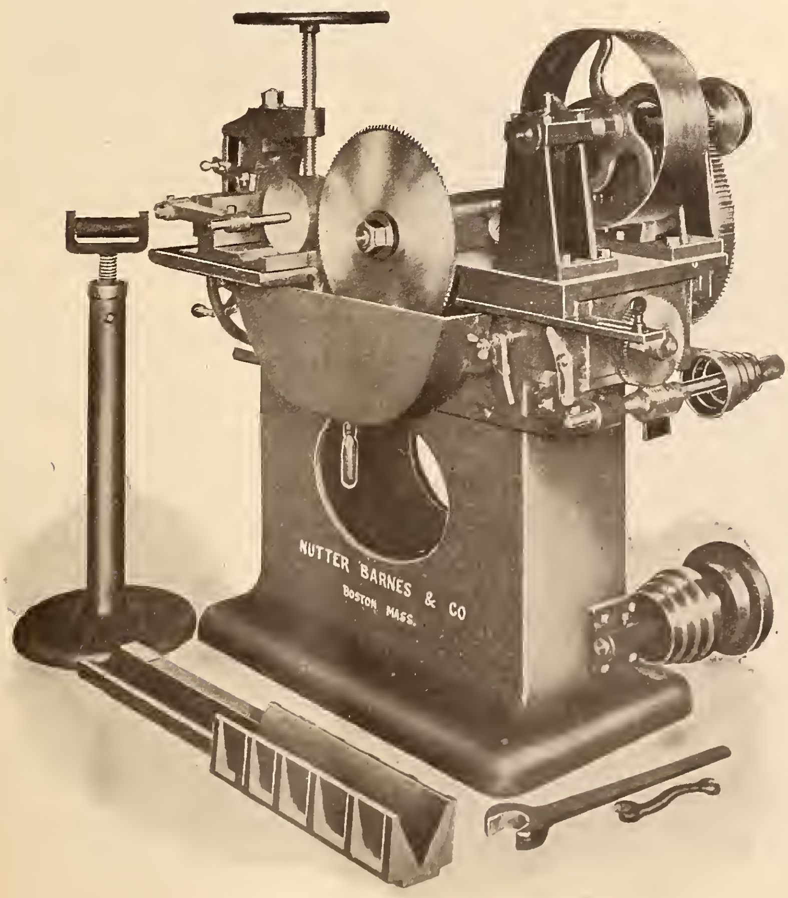
Fig. 2—Working Set of Tools with "O. K." Tool Holder.

This holder is marketed and manufactured by the "O. K." Tool Holder Company, manufacturers of lathe, shaper and planer tools, Shelton, Conn.

Metal Saw Cutting off Machine

This machine, of recent design, contains the principal requirements for a thorough-built machine tool for rapid and accurate steel cutting, and is essential to the machine shop where blanks are to be cut, or finished stock cut square and to exact length. It is well arranged for cutting dies, cranks, keys, studs, cutter blanks, small I-beams, channels, angles, and a large variety of work usually done on a milling machine.

With the special large V shoe, four pieces of 2-inch round may be held to be cut at once, and smaller sizes in various quantities, which admits of a very much larger product from a machine of this kind than can possibly be obtained from one where the stock revolves and which cuts but one piece at a time. Larger pieces may also be cut faster with a saw properly arranged than in any other way. One of these machines will cut more in a day than twenty hacksaws. The principal advantages over machines where the stock revolves are that it will take in any shape or size within its range, is more convenient to operate, requires less labor to handle stock, will give a greater output, and cost less.



Six-inch Metal Saw Cutting-off Machine.

The saw arbor is driven by a spur gear powerfully connected with other gears to the pulley-driving shaft. These are all mounted on a traveling slide which is moved forward by a feed screw, driven by a worm wheel and worm on the feed shaft, the speed of which is regulated from a four-step cone pulley. The feed is controlled at the front of the machine by a hand wheel and levers. The work shoe is surrounded by a channel to catch the oil and return it to the trough, which is under the saw, and supplies the lubricant for the saw. Rounds, flats, squares and hexagons may be held in the V shoe. For special work the V shoe may be removed and one substituted to suit the work; or the plain table may be used.

The number 3 machine operates a saw, 15 inches diameter, ⅛ inch thick; the depth of cut with 15-inch saw is 5½ inches; the speed of 15-inch saw is 11½ turns per minute; saw arbor bearing in box, 14½ inches; saw arbor diameter, 2¼ inches; saw arbor collar diameter, 3¾ inches; main driving gear, 14 inches diameter, 1¾-inch face; traveling slide, 15 inches wide, 20 inches long; traveling-slide movement, 6½ inches; traveling slide bearing on beds, 12½ inches by 20 inches; capacity of work shoe, 6 inch rounds, 7-inch squares; driving pulley, 12 inches diameter, 4-inch face; from floor to work table, 34 inches; positive automatic cone-feed, 8 changes from ¼ inch to 1 inch per minute; floor space, 2 feet 8 inches by 4 feet; height, 4 feet; weight complete, 1,600 pounds; V shoe for single bars; counter friction pulley, 14 inches by 4-inch face; speed of countershaft, 120 revolutions per minute.

The machine is manufactured by Nutter, Barnes & Co., Boston, Mass.

The Secor Engine

The United States Census Bulletin of October, 1902, shows an increase during ten years of over fifteen hundred per cent in the number of internal combustion engines used in manufacturing, while steam power shows an increase of only seventy per cent, and water power less than one per cent.

Th electric motor is subject to the loss of a secondary power generator, but the gas engine is a prime mover which dispenses with the boiler and fireman required by steam power, while it can be used where water power, or even water, is not available. The demand for the internal combustion engine is, of course, due to its labor saving and thermodynamic advantages over the steam engine. No competent authority claims that the gas engine as heretofore constructed is equal to the steam engine in its performance, or is in the same rank as a machine, nevertheless the present output of these engines is seriously restricting steam engine production, especially in the smaller sizes. The commercial prosperity of the leading makers evidences the earning power of gas engine manufacture.

It would add to the industrial value of any gas engine if it could operate with a single cylinder without involving inferior regulation, and fluctuation in rotation rate during its cycle. Steam engine reliability would add further to the value of the gas engine; that is to say, if the occasional delay, or uncertainty in starting, or operation, were entirely eliminated; so that readjustment would be uncalled for, when extreme variations occur, whether in atmospheric conditions, gas pressure, or power demand.

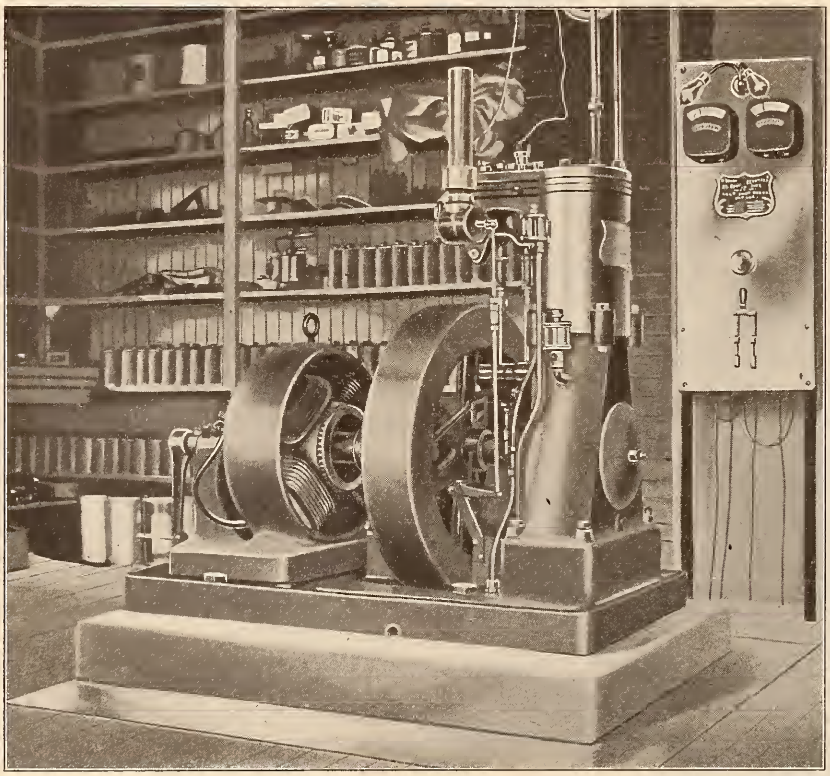
In view of the limited areas of gas supply and its cost, and the insufficient supply of gasoline, its dangerous properties, and advancing price, the usefulness of these engines would be still further increased if they were adapted to use the only universally obtainable and safe fuel, kerosene oil.

The Secor engine, an illustration of which is presented herewith, embodies a new conception. Emphasis is placed equally on the three great features which govern commercial value—range of availability, quality of service, and cost of power production. For universal use the Secor oil engine stands in a class by itself. It has been successfully installed by unskilled labor, with the aid of printed instructions, in the most remote districts. It starts as promptly and positively as an electric motor. Its operation after starting is automatic. It requires only to be supplied with lubricating and fuel oil; its design permits ready access for examination, or cleaning when required.

The special advantages of this type of machine may be briefly summarized as follows:

Reliability, regulation, scientific and simple method of using the most desirable of fuels, kerosene oil, which is independent of atmospheric conditions, and which burns all its fuel within the combustion chamber, and never clogs up with soot; the ability of an engine using safe fuel to start quickly and positively; an oil engine which has the accurately timed explosion due to electic ignition; mechanism, of which the interchangeable spare parts are available, and all wear easily compensated for, thereby insuring great durability; safety, it has no such elements of danger as an exposed lamp, or an oil tank on the engine from which the oil flows into a hot chamber by gravity, or is forced by other pressure. It complies with the underwriters' requirements in every particular.

Including within itself the best features of all existing types, the Secor engine is constantly gaining popularity and is being widely installed in railway yards, stations, machine shops, factories, printing offices and private establishments. One company who are large users of power have ordered and installed over fifty Secor engines. They are suitable for all the ordinary uses of an auxiliary power such as air compressing, pumping and hoisting. The important advances of the Secor system over all previous practice and performance have created what is practically a new generator or power, with an enlarged industrial opportunity, fully meeting the modern and constantly increasing demand for detached and independent power installations of modern capacity.



The Secor Gas Engine.

The users of power demand an engine which will furnish their needs at the lowest possible cost per horse power. They will consider the reliability of the engine at all times, and under the most difficult conditions. The Secor engine is so designed and so performs as to supply power at a low cost.

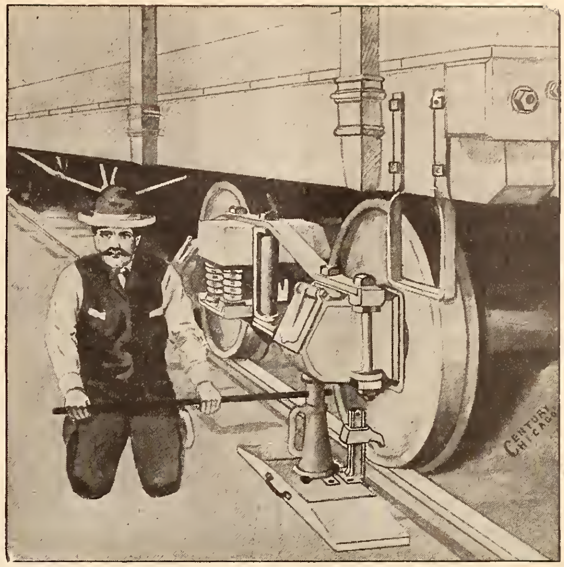
The Handy Journal Box Jack Block

While the removal of journal bearings and wedges and the insertion of fresh ones is in a way a very simple operation, it at times becomes a good deal of a bother because of the lifting of the wheel when the load is lifted by the jack under the journal box. The result of the lifting of the wheel being that the bearing and wedge does not become free so that they can be taken out. The usual proceedure under these circumstances being the gathering of from two to four men to assist the man with the jack; blocks, bars and levers being required to hold the wheel down so that the hot or worn bearings will become freed from all load and in condition to be lifted out, and no time be lost in inserting new bearings.

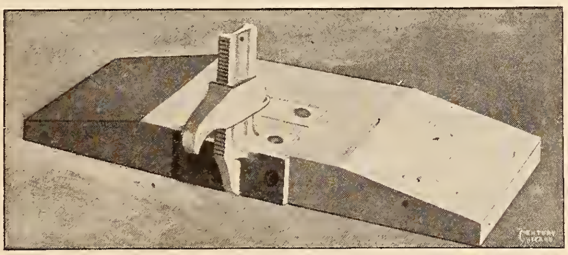
Many trains are delayed and blockades formed due to the time consumed in changing bearings on the road. There is also a great deal of unnecessary time and labor spent in repair yards in changing bearings.

The device here illustrated is designed to reduce the time and labor in changing bearings both on the road and in yards. It is claimed that one man with any good journal box jack and with this Handy Journal Jack Block can change bearings in from five to ten minutes.

The device consists of a base or block of oak 9 ins. by 2½ in. by 26 ins., which rests on the ties or ballast and on which the journal box jack rests. On the inner edge of the block is secured a malleable casting, this casting having top and bottom flanges for securing it to the block by bolts and rivets, on this casting there is a post having teeth on the edge next to the wheel, moving loosely on this post is the hook-like piece, also of malleable iron, having teeth for engaging with the teeth on the post; the hook is thus kept from slipping upwards when the strain is applied in resisting the tendency of the wheel to lift. The projecting hook or arm engages the rim of the wheel. Adjustment for varying heights is provided by the provision for locating the hook at different positions on the post. A handle is provided by which to carry the device.



THE HANDY JOURNAL BOX JACK BLOCK IN SERVICE.



THE HANDY JOURNAL BOX JACK BLOCK.

Further particulars can be secured from the manufacturers, the Handy Car Equipment Company, 890 Old Colony Building, Chicago, Ill.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

Locomotive Painting

The painting of locomotives seems to be receiving a fair share of attention, especially of late. Mr. A. P. Dane of the Boston & Maine read an interesting paper on "The True Economy in the Painting of a Locomotive" at the October meeting of the New England Railroad club, which would have met with more discussion than it did had the painting fraternity of the New England roads and vicinity been properly notified. The editor of these columns intended to be present, but got unavoidably detained while on a visit to New Hampshire.

Mr. Dane's paper, which was similar to one read at the Chicago convention, is too long to reproduce in its entirety in these columns, as it would nearly fill them, occupying, as it does, eight pages of the club's October proceedings. It can be obtained by any one for a trifle by writing to the secretary of the club, Mr. E. L. Janes, South Terminal Station, Boston, Mass.

Mr. Dane is also a member of a committee of five which is to report to the Master Mechanics' Association at their next convention in response to their request, through Secretary Taylor, as to the best method of painting a locomotive. When this report is published it ought to be plain sailing on this subject, so that a novice ought to know how to proceed.

Locomotive painting was once an art; today it is a business. The writer painted all the locomotive tanks on the original B. & M. road from July 1, 1876 until September, 1885, when, with one exception, no more were sent to the carshop at Lawrence, but shop facilities were made in Boston at the machine shop to do them with the locomotives, as in December, 1884, the Eastern Railroad had been leased and the rolling stock of all kinds had been doubled in amount. During this time the writer painted or varnished in all about 300 tanks, 60 of which had the paint removed to the iron, mostly by the flame, a few being done by the lime and soda plaster process. Those were the days when locomotives were rolling chromos. In contrast with present practice what a difference in the cost! Now a tank is painted entire for $15 or $20. We note the figures in our old record book before us of the cost of some of the work in those "good old days." We note about the last ornamentally painted tank, if not the last. It belonged to the "Lowell," No. 72, for the engines were all named then, and the cost of painting this tank was $72.20! and the president of the road, who lived in Lawrence, found no fault with it, but when it backed up to the station to take his train to Boston, he said to Engineer Fallensbee, who by the way, is still running, "You have a handsome engine."

Some freight engine tanks cost $54.40 to paint. However, there was no uniform figure of cost because instead of painting them uniformily we were told by the superintendent of motive power not to do them all alike and not to be afraid of putting on the "apple sass," a characteristic term of his for scroll work or other ornamentation. Of these 300 tanks 42 were new tanks and 65 were cleaned and simply touched up and varnished at a cost of from $15 to $20.

This is a point that we wish to particularly contrast with the present times. Those were days when engines were painted to stay painted and looked after by the engineer and fireman, and consequently were in such shape that a cleaning and varnishing were all they needed. How many tanks are touched up and varnished today? While the painting is done cheaply that is all that is done, so that the saving is not so much as at first appears. The very best materials were used also in those days. The mechanical officer bought his own materials, and did not buy them at auction either, as is largely the practice today, of purchasing departments. departments.

It is a question whether it would not be better to paint engines as thoroughly as formerly, if not decorated, and take care of them as well, and then shop them in season to clean and varnish them, possibly cutting in the tank and cab, and thus save so much painting of the iron or rusty tanks. They were painted smooth in those days and could be cleaned and kept clean.

The New P. B. & W. Shops, Wilmington, Del.

On a recent trip we visited Mr. Charles A. Cook, president of M. C. & L. P. A., to look over the new plant that is being made for the P., B. & W. at the outskirts of the city. Judging by the old ramshackle shops they are now occupying it was a well-directed effort to give them something new and fit to do their work in. But in this regard they are no worse off than many others who will have to wait longer still for new shops.

Mr. Cook was found, after some effort and delay, in the little office and shop in which the late lamented veteran, Jacob Sheller, made himself famous. As soon as greetings were over and he was at liberty, we began our tour. The new shops seemed destined to be called the "Shellpot" shops, as they are built along a creek by that rather uneuphonious designation. This great plant, designed for both locomotive and car work appears to be as large as the new shops of the New York, New Haven & Hartford at Readville, Mass., if not larger, and is built on "a fill" in a rather low, swampy plot of land, which must have cost an immense sum to put in shape for building thereon. There appears to be eight or ten feet of filling, which is of the best red earth and must tread down hard by use. These shops are large, light and airy and well constructed and well adapted to the purposes for which they are built. If we were to criticise them at all it would be as to the relative location of some of them to one another. Particularly bad is the location of the stock house to the paint shop. One might think it was intended to hold tons of dynamite so that if it blew up the paint shop would not be harmed, so remote is it from the seat of the painter's warfare. As it is there should be a retail department of paint stock for daily use in one end of the varnish room at the end of the paint shop nearest to this brick store house where paints and varnishes, etc., may be kept in wholesale packages. Unless this move is made we wonder at the result of the Foreman Painter giving an order to a painter in the paint shop to go over to the stock house and get some priming and go over to the wood working shop, another block away, to do a half hour's priming. Somewhere we have read about "a city of magnificent distances" and some of these new shop plants correspond to that description pretty well, and it requires almost superhuman effort to get out a corresponding amount of work from them compared to the old shops, there is so much time to be consumed in traveling these long distances from one shop to another.

At one end of this new paint shop there is a division wall crosswise of the shop which is again subdivided into two large rooms, one of which is the varnish room and office and the other the tin shop! It would seem that upholstery would better fit the location of this tin shop, as it does one other shop plant in mind. But, strangest of all, the stock house before referred to is located opposite the tin shop instead of the varnish room! However, shops of this character are usually designed and built by the building and bridge department of a road in which possibly the head of the mechanical department may have a hand and he may not, but as to the foreman painter he is about as apt to be consulted as to his conveniences as a Hottentot would be about putting a baptistry in a church in a Puritanic town. Still, almost anything is better than old ramshackle shops to do painting and varnishing in and if the writer can get his some sweet day he will not complain.

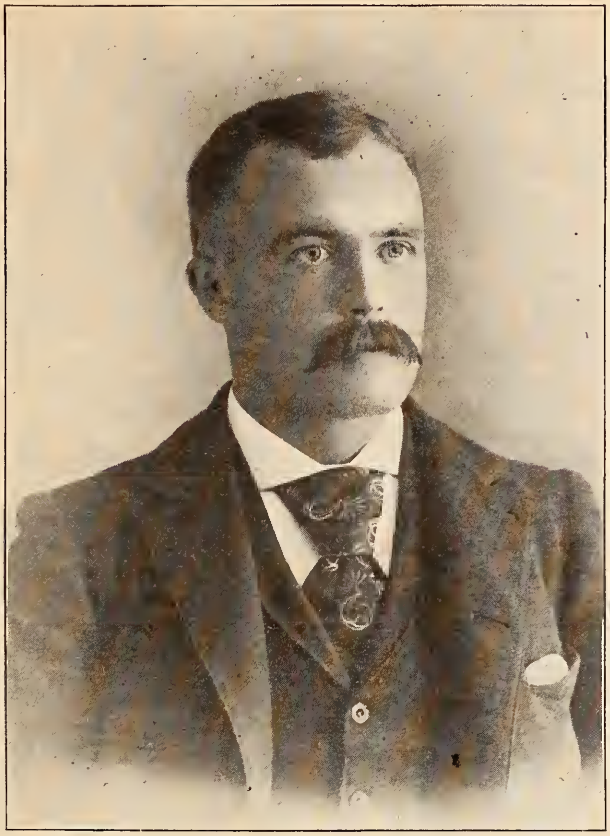
The elevation of the P., B. & W. tracks throughout the entire city of Wilmington is progressing so fast that they are up to the old shops and waiting for them to get out. In fact it looks like "a freeze out" and into the new shops the first of the year before they are nearly ready in their interior appointments and fittings for occupancy. However, where there is a will there is a way, and much can be accomplished that seems impossible when once the mind is made up and concerted action begun. We should think though that next summer in the dull season would be the time to make this transfer, if it can be deferred that length of time.

M. C. & L. P. A. Portrait Gallery

JOHN STOCKS.

The editor of these columns takes pleasure and some degree of pride in presenting to the fraternity the picture and sketch of one of his own shop "cubs" who, though not yet a member of the M. C. & L. P. A., is in a fair way to be one in the near future, for he succeeded our old friend and confrere, Edward Hartshorn, as foreman painter at the Maine Central R. R. shops in Waterville, Maine, June 1, 1903, where he still remains and was doing well at last accounts, and likely will attend our next convention. He is a member of the New England R. R. Club.

Mr. Stocks was born in Queensbury, Yorkshire county, England, in October, 1869, and came to this country with his brothers (two of whom are carpenters, with their father, in the Lawrence shops of B. & M.) in March, 1890, landing in Boston Wednesday, and going to work with the writer as a car washer the following Monday. Brilliant, apt, capable, he worked his way up through all the grades and classes of work in the shop, being faithful in all branches and trusty wherever placed, until he was regarded by the writer as almost indispensible, doing much of his clerical work, having been paint shop stock-keeper for several years. However, he



Mr. John Stocks.

recommended him, with one other applicant, for his present position, and he was promptly accepted by Mr. Philip M. Hammett, superintendent of motive power, and we believe he will have no occasion to regret his choice.

The accompanying picture is from a photograph taken a few years ago, but, with the exception that he now has less hair and more flesh, it still does him justice.

The Pullman Shops, Wilmington, Del.

While in Wilmington, Del., Nov. 30, the writer was pleased to visit the Pullman shops also, in connection with touring the shops of the P., B. & W., with Mr. Cook. Here we met and made the acquaintance of Mr. Vanney, the superintendent of the shops; also Mr. John H. Dunn, the Master Painter. Mr. Dunn resumed his duties in September and looks the picture of health and good spirits, though, as it were, he is out of the valley and shadow of death. Mr. Dunn was at our Boston convention a year ago last September, but in poor health; and was obliged to give up entirely in December following, and was out of the shop on account of his illness, some nine months. Big fellow that he is, we hope he will hold his own and have no recurrence of his illness. We found him and his assistants busy, it being the last day, in straightening out the month's accounts, for it is all piecework there. At this time it was a sort of imposition to visit his shop, but he nevertheless left his desk and showed us over the plant, which is a veritable hive of industry in all departments, especially did it appear so in some departments, such as the cabinet room, where the interior finish and fittings of these palaces on wheels are made. They are, however, making some cheaper cars for tourist business for the World's Fair use at St. Louis, which will allow of a night's rest and the comforts of a day's travel for less money than the company's regular sleepers, for they are shorn of the luxuries of draperies, etc., while they have all the essentials. They are to have four-wheel instead of six-wheel trucks, we understand.

Here we saw Pullman cars painted to conform to the color of various roads' passenger equipment—Tuscan red for the Pennsylvania, blue-black for the Lehigh Valley's "Black Diamond express," Cadium yellow for the "Big Four," Chesapeake & Ohio, etc. Concerning the latter color, Mr. Dunn says it is not susceptible of being treated like others when the cars are brought in to the shop for general repairs and varnishing. That is to say, he cannot cut in a car of this color or repaint it over the old paint without first skinning off the varnish by the use of ammonia. If he does, the newly applied paint will peel from the old. This was "a new one" to me, and seemed strange. We wonder of Messrs. Gohen and Byrne have the same trouble? This, of course, is on cars that are beyond the point of cleaning and varnishing without cutting in or repainting; and he says that such colored cars cannot be cleaned and touched up and varnished more than once, or twice at the most, before they must be repainted over the old paint to make a first-class job, and be treated in the way he does them. If this is so, it appears to be an expensive color to maintain. But when newly painted and striped in gold it makes a most elegant appearing car, with the letter belts and posts of a darker hue.

Mr. Dunn has an old condemned car in the yard which he uses as a shop for the use of varnish removers, to keep their disagreeable smell out of the shop. This is a good idea. He does much of this commendable work, having tanks large enough in which to immerse the bunks face down into the liquid remover, and in a few minutes the old varnish is softened up so that it may be readily washed off with brushes, etc. He keeps one man at this work, and all detachable articles needing this treatment are carried to this car.

We were shown the glass finishing department, of which Mr. John Kelley is the presiding genius. They make all the fancy glass used in the Pullman cars here, except the apolescent glass which is bought in the plain form and is here cut up and leaded into various intricate patterns. This form of glass, we understand, is getting to be passe. Cars are coming back to the Wilmington shop to have this glass removed and the etched, gilded and silvered glass placed in its stead. The trouble is the smoke from the engine gets in between the plain outer glass that covers the leaded design and the metal frame in which it is bedded, and blackens the window so that light is obstructed, in spite of all that they can do in thoroughness of work, and cannot be readily cleaned. Once they had at the Wilmington shop slivered lights to burn, so great was the fad for the opalescent glass. Now it is the reverse.

They bevel and polish mirror plates here, as well as silver them; also all forms of acid etching, etc. It is an interesting corner in this great establishment. No car shop of magnitude is up to date without a glass finishing department. This has followed the brass dipping and lacquering department, which was not many years ago adopted by a sort of natural evolution; and now the enterprising car shop foreman has all the requisites for the prosecution of his work, so that he does not have to wait for outsiders but knows in just what stage of progress it is in all the time, and he can figure to a nicety when he can promise the management a car that is wanted. If to the brass dipping plant plating is added, with buff wheels, of course, to polish the work, it is all the better.

Mr. Dunn informs us that he expects to meet with us at Atlantic City next September.

The Recovery of Lost Gold

Gold leaf has entered into the lettering and decoration of passenger equipment painting to such a degree, and is still used for that purpose, though perhaps to a less extent, that we have often thought in years gone by of saving the paint chips when burning off to see if the gold could not be recovered. But somehow we never put our thoughts into practice.

However, while being shown over the old P., B. & W. shops in Wilmington, Del., by our associate, Cook, recently, we passed by a large wooden box in the paint shop nearly full of burnt-off paint chips, with two mortar pestles shaped like Indian clubs of heavy wood to pound them down with.

"What's that?" we inquired.

"O, that is what we save in burning off cars; there is $45 or $50 worth of gold in that box. It is the practice on the Pennsylvania system to save the burnt chips where there is gold," replied Brother Cook.

Now here we saw in operation what we had years ago thought of doing. Of course, it makes some difference whether or not there is much gold leaf used upon a car in attempting any thing of this kind. On the best cars of the P. R. R. system there is a running scroll band of gold below the belt rails and another near the bottom of car that goes clear round the body of car; also there are scrolls above and below the side numbers, as well as all the lettering. It might pay to save the letter belts and number panels with any road's method of painting, whether it would the entire body or not. At any rate, if the body contains gold bands, the entire lot of paint chips could be swept up from the floor and powdered down in a box, and what gold there is would be saved.

How is the gold saved from that mess of paint and dirt, do you ask? Well, the whole is dumped into a retort and burned up into ashes; then the ashes are dumped into a trough of water, and that which settles to the bottom, containing the gold, is treated with acids in a way peculiar to the gold beater, and thus the gold is separated and saved. This is worth trying by all.

Notes and Comments

The organization of the new paint shop of the Lake Shore & Michigan Southern Ry. at Collinwood, Ohio, is as follows: Robert Shore, foreman; Geo. Durnbaugh, assistant foreman; J. G. Keil, assistant foreman. The Cleveland and Buffalo shops have been abolished. Mr. Wm. T. Burton is general foreman car department at Collinwood shops and Mr. Geo. N. Dow, master car builder.

The New York, New Haven and Hartford R. R. has started up work to some extent at least at its new plant at Readville, Mass. Already the coach work has been taken from the Roxbury and Norwood shops. Our associates, "Sam" Brown, of the Roxbury, and George Gehman, of the Norwood, are to remain at their respective shops in charge of the locomotive painting only, we understand. Mr. McGregor, who succeeded Mr. Shuttleworth as foreman painter at the New Haven shops, is to have charge of the new big passenger paint shop at the Readville plant, we are informed, and the coach work at New Haven also will ultimately all be done at Readville.

The following, clipped from the Frankfort (Ind.) Evening News of Dec. 14, 1903, concerning a well-known member of the M. C. & L. P. A., will be read with interest by his many friends among our readers:

"Frank Fisk, Sr., foreman of the Clover Leaf paint shop, who has been laid up since the 30th of last April with a badly scalded leg, will again assume charge of his department tomorrow morning. Mr. Fisk has chafed under enforced idleness for seven months and fifteen days and now that he is able to go back to his employment he naturally feels like a boy who has just been let out of school for a vacation. Frank had a very close call to lose a leg, and it was only by the most patient care he is today able to go about on two pins, a fact which his friends appreciate nearly as much as he does himself."

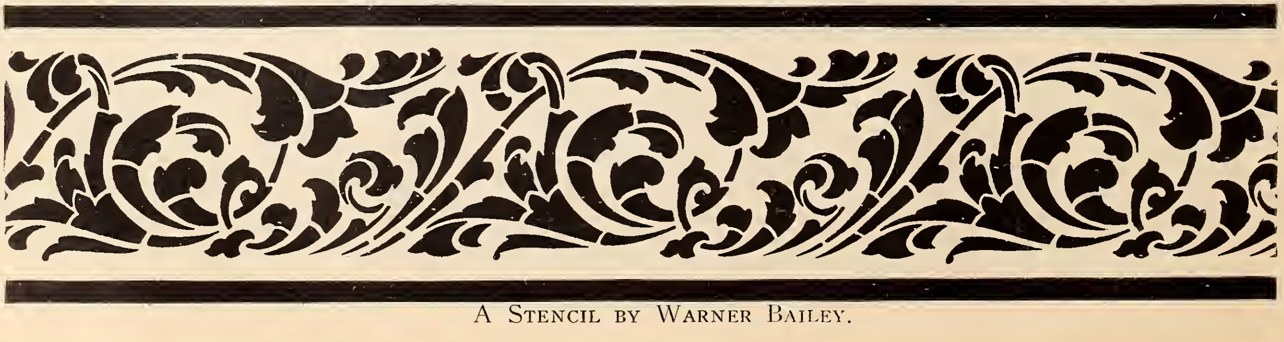
He adds, however, that he is "still walking with a cane."

Sometime ago we received the following appreciative words from Mr. John H. Kahler, chairman of the Advisory Committee, M. C. & L. P. A.:—"In the November issue of Master Mechanic your explanatory remarks regarding the Advisory Board was a timely hit, and explains to associate members the necessity of centrally located members on this committeee. Also a central place of meeting to do the business in the least time and for the least expense. It is true, the expense of this committee is supposed to be borne by the association, but it is a rare case of a bill being presented, or at least to my recollection. I have been meeting with the committee for the last fifteen years, either as a member or as a visitor, and have never caused the association one cent of expenses." We learn that he also pays his regular dues. He is a model member in this regard, and his example is thus held up for others to follow.

We clip the following timely words from an exchange about varnish removers:

"If removers are made on the creosote or carbolic acid basis, they are obnoxious in odor, and those acids cannot be neutralized—that is, the effects of the acid cannot be killed, especially when absorbed in spongy wood, cracks, joints, deep mouldings or carvings. They also have very dangerous effects on the hands of the workmen.

"If made on the fusel oil or amyl sprits basis, they are most dangerous to health, and are highly inflammable and explosive. Ethers, guncotton, collodion, the well-known banana liquid, also the poison in whisky, contain as their basis fusel oil. Everyone knows the danger of all of them, and it is a very unscrupulous undertaking of some firms to sell, under a spurious name, an article containing a deadly poison, which should be handled only by experienced persons. Furthermore, removers should not be used if they contain greasy or fatty ingredients. Because, despite the utmost care, those ingredients cannot be cleaned out of corners, carvings and cracks; they will settle in pores and they will not allow the bleaching of discolored wood; neither will they allow the proper hardening of paint and varnish used afterwards."



A Stencil by Warner Bailey.

Established 1878.

RAILWAY MASTER MECHANIC

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FOLLOWING a line of thought to which attention was directed in our editorial columns of a recent issue relating to existing facilities in the older roundhouses, the length of stall necessary to accommodate the new and larger engines is a matter of some significance. In a number of cases, where additions to the roundhouse have not kept pace with the growth of locomotives running on the division served thereby, or where larger engine-houses have not been provided, it is impossible to close the door behind a large engine having a correspondingly large tank. While this fact does not appear on first sight to affect the number of hours during which the engine is detained in the roundhouse, and therefore the interval between arrival at and departure from terminal, yet it is a fact that a greater length of time is consumed in warming the outside of the locomotive and melting the snow and ice accumulated during the run and while standing over the cinder pit.

The result of this condition is that machinists can not work on repairs to equal advantage while the engine is cold; they cannot keep their hands warm, and a lack of interest in their work ensues. This leads to complaints against the larger and heavier engines, which are even louder than those which might be raised against the heavier parts to be handled by inadequate roundhouse facilities.

The suggestion has been offered that the same objection might be raised as an argument against the compound by those uninitiated in the repair of this type of machine, as most compounds have been constructed according to designs of heavy locomotives, and are therefore probably among the number to hold the doors open. There are so many looking for the smallest excuse to condemn these engines that it is well to put them, so far as possible, beyond the reach of unfair criticism.

AT the January meeting of the Western Railway Club Mr. Waggoner presented a paper suggesting the organization of a "bureau of economies" on railways. The author seems rather inclined to think the present departmental officials do not have a sufficient appreciation of the possibilities in this regard in their departments—chiefly through lack of time to devote to the subject. While the author makes several good points, we are under the impression that no set of men have the necessity of economy more persistently held before them than do railway officials. That more advantage is not taken of often apparent possibilities of more economical operation is, we are quite sure, solely because the recommendations of the departmental heads are turned down by those higher up. On practically any line it would be a very simple matter to point out an infinite number of instances and directions in which economies might be effected. But on looking closely into any one of these propositions it will almost invariably be found that the subject was closely scanned by the departmental head long, long ago, and that measures tending to better operation in this regard are dependent entirely upon some proposition which has been turned down by those higher up.

For example, we were recently in a shop where the boiler tubes were caulked by hand. It needs no bureau of information to point out to this master mechanic that the work could be more cheaply done pneumatically, or that water softening plants would obviate the necessity for the work at all. Yet we would hesitate in undertaking to say how many months and years the master mechanic and his superintendent of motive power have been endeavoring to secure the appropriation necessary to institute these remedies.

The author makes a good point, however, when he states that "a large number of items are made at railroad shops that can be purchased cheaper outside, if their actual costs were known, but many master mechanics will say that flat cost and 10 per cent is close enough to real cost for the statement that the shops can make a thing cheaper than it can be bought—forgetting that heat, light, power, handling materials, general labor, shop repairs, supervision, etc., are all legitimate parts of the cost per unit. Master mechanics, shop foremen and shop clerks need education along the line of more careful economical accounting." One difficulty in this regard, however, is that the motive power department is often called upon to manufacture despite its disinclination for such work. The department must perforce often manufacture articles it would prefer to have purchased outside, principally to avoid delay on material of which it would require an undue investment if carried in stock parts sufficient to avoid such manufacture. It is true, though, that there is much need of more education of officials on costs. At present there is practically no means at hand whereby railway men gain an idea of what the articles they are handling cost. Ask any brakeman what his lantern cost, or any machinist the price of a file or any other article, or any engineer the price per ton of the coal he is burning? Not one out of ten could give anywhere near the amount. This should not be. A knowledge of the price of things will assist any man to a more intelligent idea of that relative importance of things which is so necessary in a railroad man. In this line we remember one road where, on going to work as a machinist, we were surprised to note that every article handed out of the storeroom had a price tag on it. In the casting platform all castings had their weight and price painted on them. Heavy lumber and other material was all price-painted the same way, so every one handling or using material of any nature gained an idea of the price of things. We remember an immediate personal inclination to give greater esteem to files and other tools as more worthy of care while in that shop, not to mention a surprise at learning injectors cost $110. It has been the only line on which we have encountered a similar system, but as an educational matter we have always thought the trouble well worth while.

MR. BENJAMIN MCKEEN.

GENERAL MANAGER OF THE VANDALIA LINE (TERRE HAUTE AND INDIANAPOLIS).

Mr. McKeen was born in Terre Haute, Ind., in 1864, and graduated from Rose Polytechnic Institute at Terre Haute in 1885. He entered the service of the Terre Haute and Logansport in the engineering department, and has advanced from his first position as chainman in the engineering department through a number of positions to become general manager of the road. His entire railroad service having been with the Vandalia, with the exception of a year and a half with the Pittsburg, Cincinnati, Chicago and St. Louis.

OUR attention has been directed to the stand taken by a railroad company in opposing the minor railroad associations, whose members are principally among the foremen. We have been informed that this company has given its men to understand that membership in such organizations will not be countenanced and the attendance at their conventions will be sufficient grounds for dismissal. The objections raised are that the foremen take advantage of such occasions to amuse and enjoy themselves when they are supposed to be acquiring information for the interest of the companies which they represent, and this may possibly be true to a very limited extent, and also that these associations have a tendency to assume the nature of labor organizations.

Both of these objections are inconsistent and we believe that they will prove so to anyone who will take the occasion to view the proceedings of the several associations, wherein it may be seen that the conventions take up many points which relate to the efficient and economical methods of accomplishing results.

To claim that the men do not appreciate the object for which they convene and that they waste the time which they should spend in session is unfair. Granted that they do set aside a portion of their time for recreation, and for sight-seeing, or to visit an old friend while either on their way to or from the convention point, wherein does the objection lie? Many such men are practically confined to the shop for months at a time and a large number of them are located in small towns. A short rest and change of environment is, therefore, an advantage rather than a detriment. The opportunity of mixing with other men, exchanging ideas with regard to methods and a possible visit to a shop located at or near the point in which the convention is held tend to broaden a man and expand his vision. The more men present and the greater the number of roads represented the larger the field in which the individual may profit from the experience of others.

The feature suggested with regard to labor organization may be met by the argument that the associations consider to no small extent the introduction of the most improved machinery and methods for saving labor as well as the probable saving resulting from the piece work system. In consideration of the unquestioned view taken of such matters by labor organizations, it cannot consistently be further held that associations which endeavor to promote economy for the good of the railroad companies are aiding unionism.

The arbitration committee of the American Railway Association has decided that roads on which rolling stock of foreign roads was located at time of the Kansas City floods must pay for cars damaged in the floods.

The Trend of Locomotive Proportions

(Continued from page 7.)

PROPORTIONS of switching locomotives show no marked evidence of particular change at any given time which would indicate radical differences in the design of such engines. Locomotives of this type have been gradually increased in weight, steam pressure and power to meet the greater demands. The tables of switch engine parts and graphical expositions of the same here presented are therefore interesting as comparative data only and do not attract the same attention as those relating to passenger and freight engines wherein the effect of the introduction of the modified wide grate for burning soft coal was clearly marked by the abrupt change in the form of several of the curves representing the ratios.

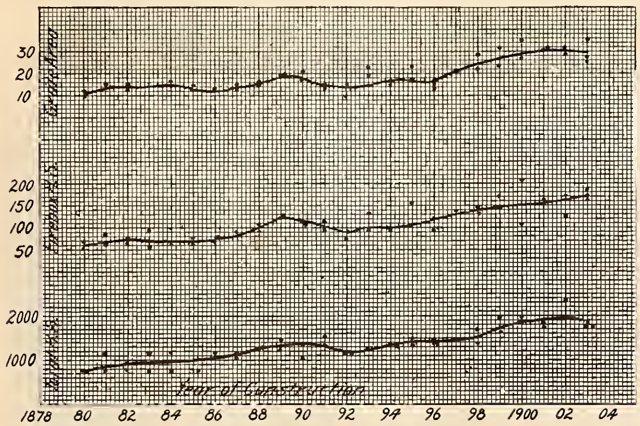


Fig. 1—Heating Surface and Grate Area.

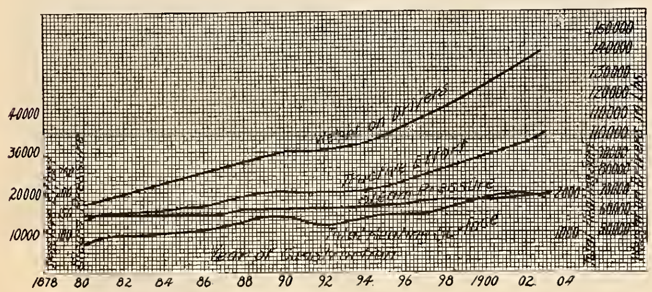


Fig. 2—General Features.

Steam pressure is seen to have attained 200 lbs. per square inch in but a few cases, 180 lbs. being the maximum working pressure of most locomotives in yard and switching service. The curves representing weight on drivers and tractive effort indicate a consistent increase in these features. The curve of ratio of total heating surface to firebox heating surface is noticed to incline toward the axis of abscissae, indicating that in the gradual increase of total heating surface the tendency has not followed that of passenger and freight engines wherein the tube heating surface has been so rapidly enlarged that the firebox surface now constitutes a smaller percentage of the total surface than heretofore. In contrast to this the firebox heating surface of the switch engines constitutes a larger portion of the total in locomotives of more recent design. Nor has tube length been increased in this type of engine as in the case of road engines, the ratio of tube length to tube diameter varying in most instances between sixty and ninety.

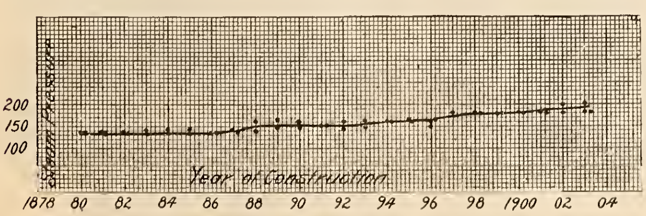


Fig. 3—Steam Pressure.

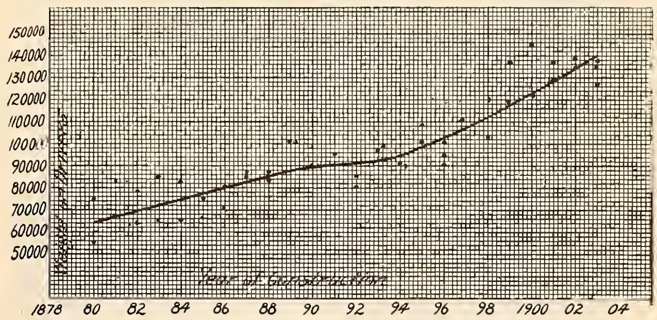
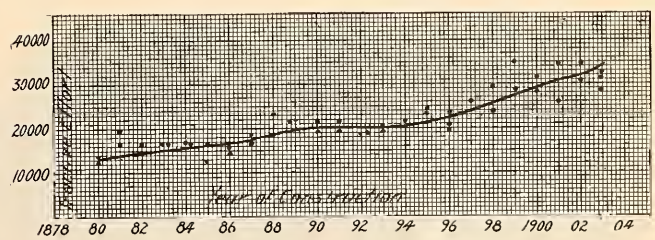


Fig. 4—Weight on Drivers.



5—Tractive Effort by Formula.

While the ratio of total heating surface to weight of one cylinder full of steam at boiler pressure varies considerably, it is in the majority of cases greater than 900 and largely greater than 1,000. In this connection we wish to rectify an error in the figures on the curves representing this proportion for freight locomotives, ap-

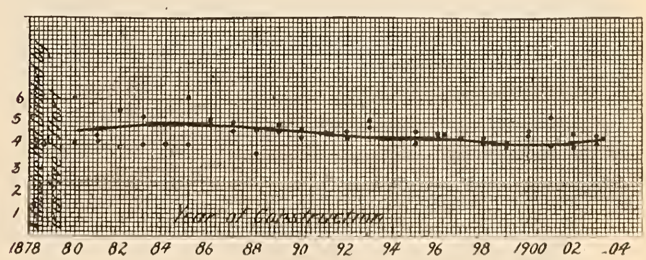


Fig. 6—Ratio of Weight on Drivers to Tractive Effort.

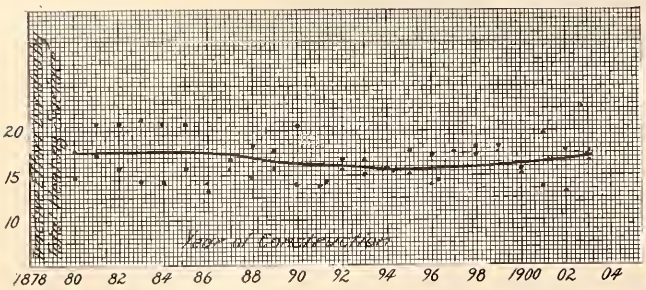


Fig. 7—Ratio of Tractive Effort to Total Heating Surface.

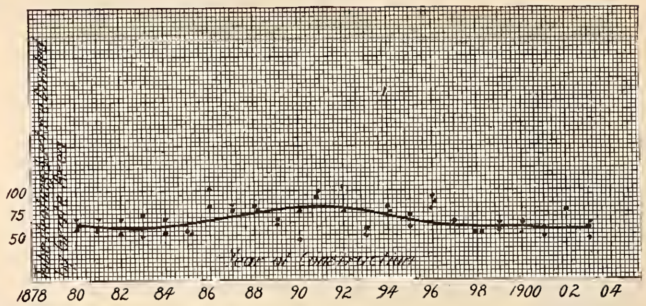


Fig. 11—Ratio of Tube Heating Surface to Grate Area.

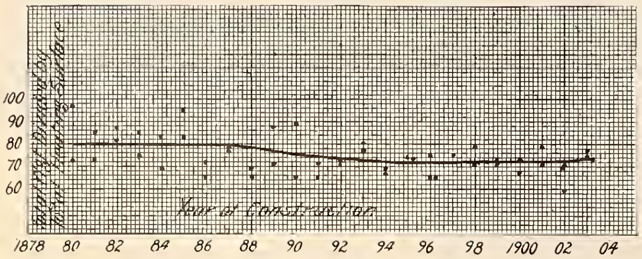


Fig. 8—Ratio of Total Weight to Total Heating Surface.

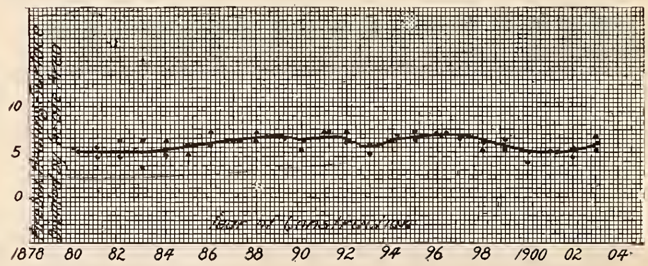


Fig. 12—Ratio of Firebox Heating to Grate Area.

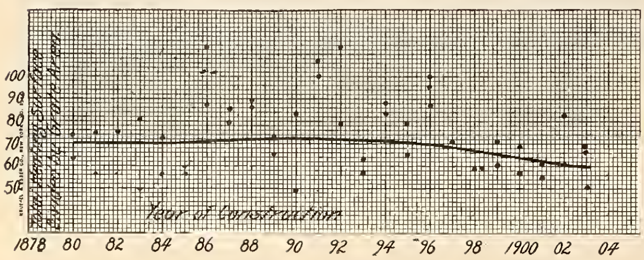


Fig. 9—Ratio of Total Heating Surface to Grate Area.

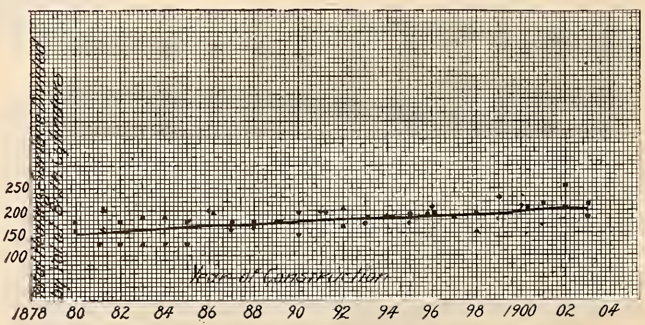


Fig. 13—Ratio of Total Heating Surface to Volume of Both Cylinders.

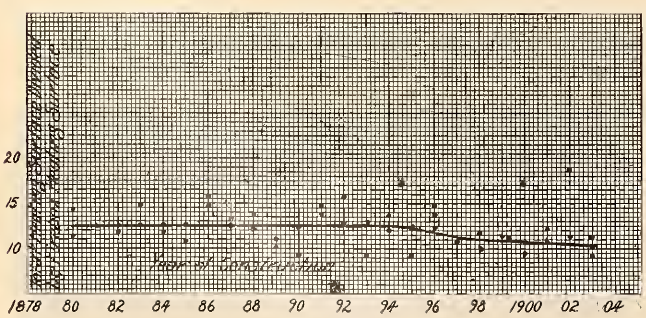


Fig. 10—Ratio of Total Heating Surface to Firebox Heating Surface.

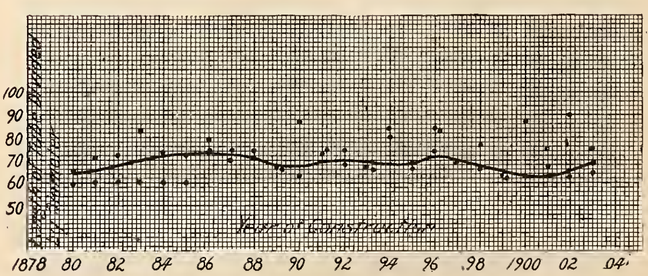


Fig. 14—Ratio of Tube Length to Diameter.

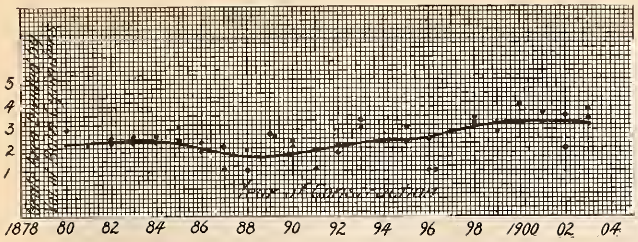


FIG. 15—RATIO OF GRATE AREA TO VOLUME OF BOTH CYLINDERS.

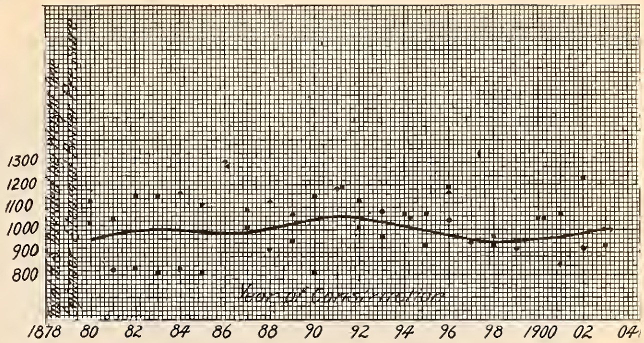


FIG. 16—RATIO OF TOTAL HEATING SURFACE TO WEIGHT OF ONE CYLINDER FULL OF STEAM AT BOILER PRESSURE.

pearing on page 6 of our January issue. The figures as they appear are from 8 to 22. They should be from 800 to 2,200 .

100,000 Lbs. Capacity Coal Cars---Chicago, Milwaukee & St. Paul Railway

AMONG the interesting designs of high capacity coal cars developed in recent years is the form of construction followed in a lot of 100,000 lbs. capacity cars now being built by the Chicago, Milwaukee & St. Paul Railway at its shops in West Milwaukee. The present order calls for five hundred cars of this type, of which over two hundred have already been built and the shops are turning them out at the rate of five per day. This design is the outcome of careful consideration and observation on the part of Mr. J. J. Hennessey, master car builder of the road. The most interesting and noticeable features apparent therein are the continuous metal center sills and continuous body bolsters, as well as the truss rods which run from side to side of the car adding to the rigidity of the coal box, and also the Hennessey friction draft gear used in connection with these cars.

The construction of the center sills and bolsters constitutes an arrangement which embodies the desirable features of both continuous metal center sills

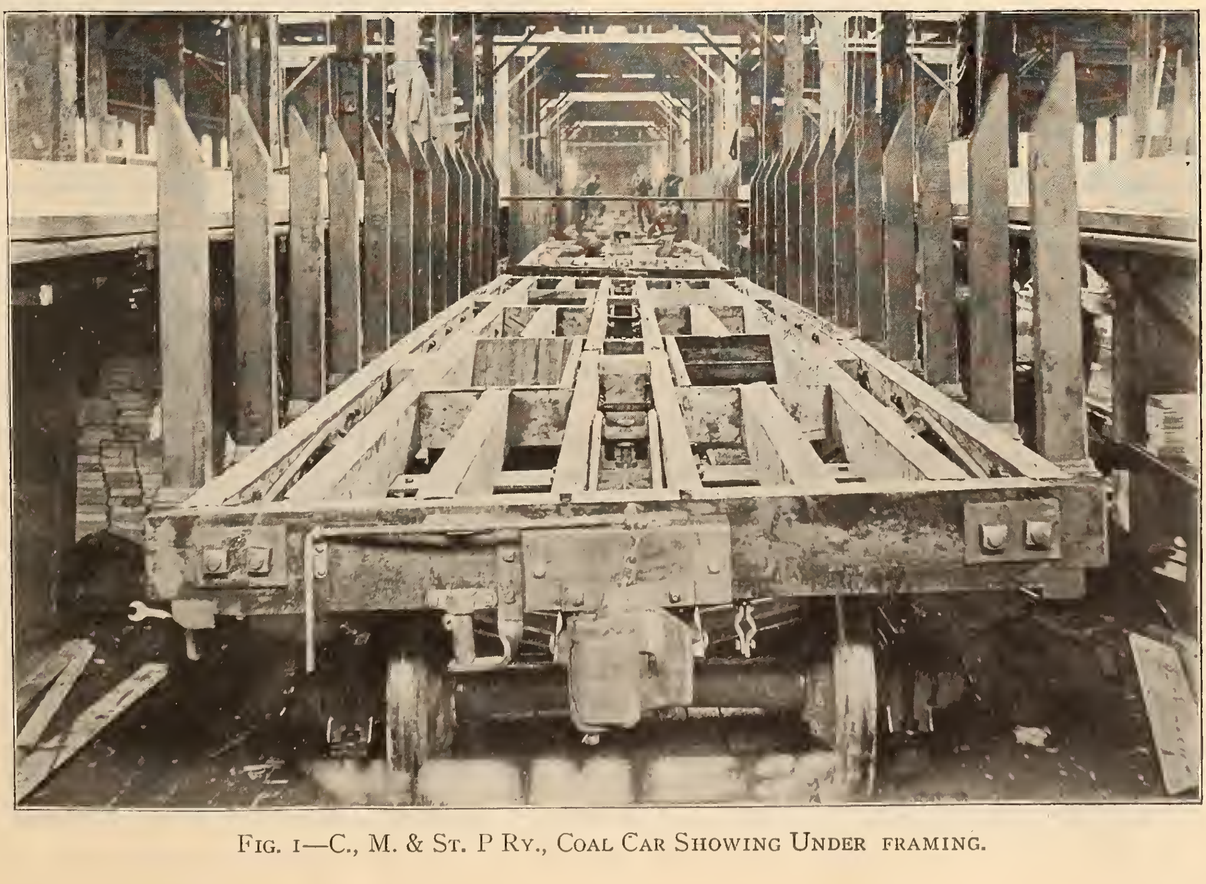


FIG. 1—C., M. & ST. P RY., COAL CAR SHOWING UNDER FRAMING.

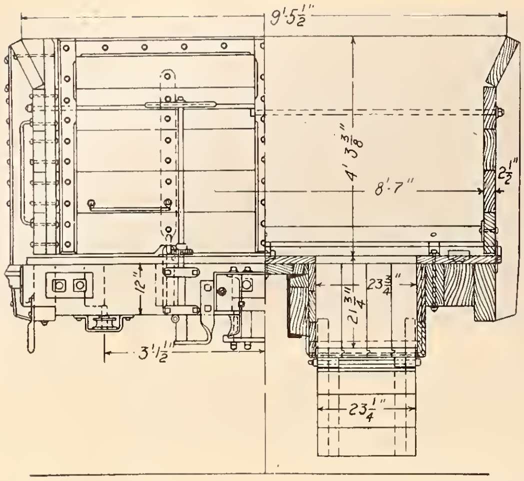


Fig. 2—Part Sectional End Views, C., M. & St. P. Ry., Coal Car.

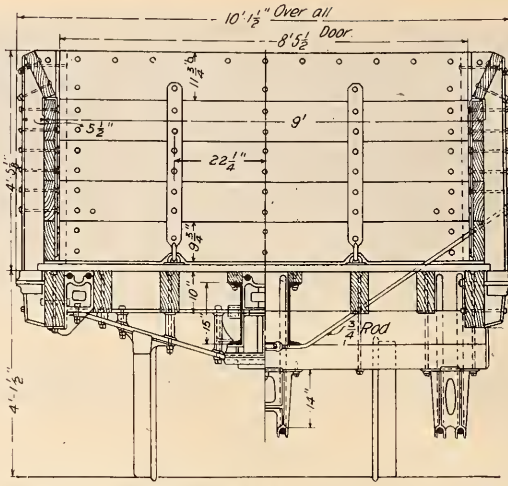


Fig. 5—Part Cross-Sectional Views, C., M. & St. P. Ry., Coal Car.

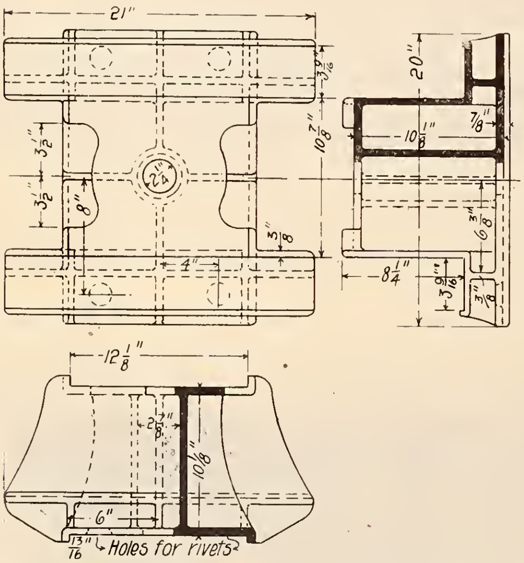


Fig. 3—Body Bolster Spider, C., M. & St. P. Ry., Coal Car.

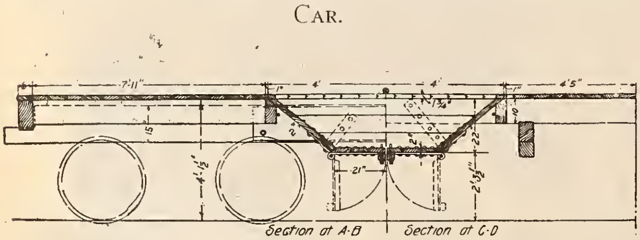


Fig. 4—C., M. & St. P. Ry., Coal Car.

and continuous body bolsters. This has been patented by Mr. Hennessey. The principal feature consists of a spider or center casting placed between the upper and lower members of the body bolster and extending lengthwise under the steel center sills. All of the weight is thus distributed from the lower flange of the channel to the center plates, making it practically equivalent to a double body bolster. The center casting and the body bolster are secured together, and the upper and lower members of the bolster are held firmly together so that any movement of parts is prevented. The center plate is riveted to the bottom of the bolster, while the top member of the latter passes through the center of the sills. The opening in the web is reinforced by brackets, which are riveted to the center sill and prevent any backward or forward motion of the bolster, and since it is in the neutral axis of the channel, this opening through the web does not detract from the strength of the sill.

The metal sills are of steel channel in commercial form, so that in case of damage by wreck they may be removed and replaced in any car shop. Malleable iron columns placed between the channels form distance pieces and bolts passing through the channels and columns secure them together. The object is to provide a continuous draw-gear arrangement, the construction of which brings the neutral axis so that it coincides with the central line of pulling and buffing forces; that is, the center of the draw-gear.

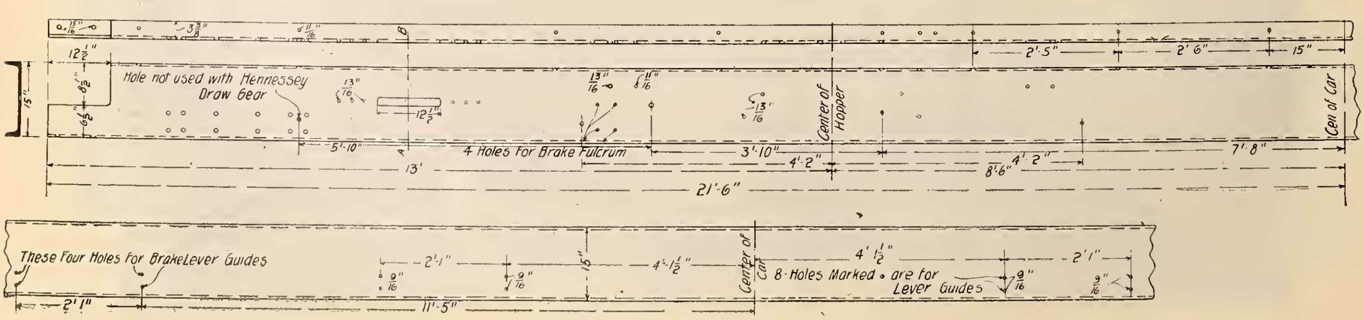


Fig. 6—Details of Center-Sill Channel, C., M. & St. P. Ry., Coal Car.

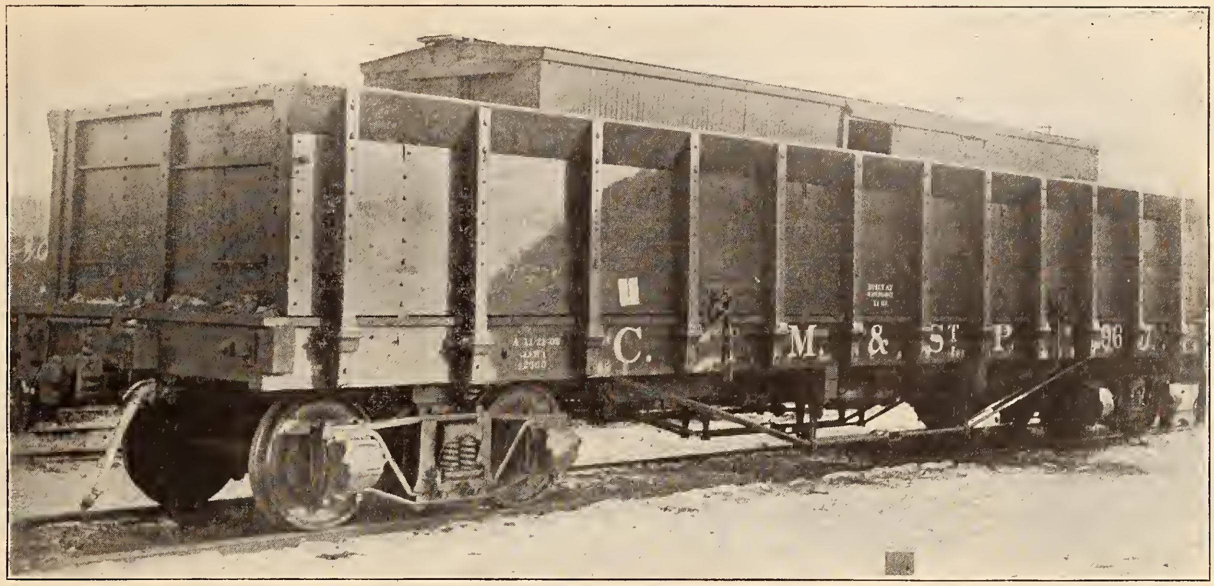


FIG. 7—C., M. & ST. P. RY. COAL CAR.

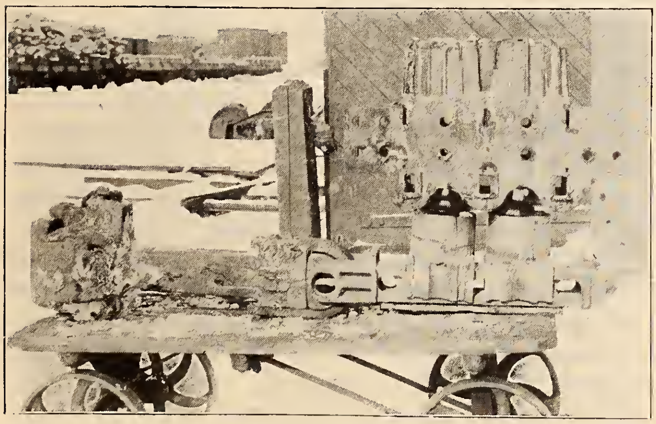


FIG. 8—HENNESSEY FRICTION DRAFT GEAR, C., M. & ST. P. RY., COAL CAR.

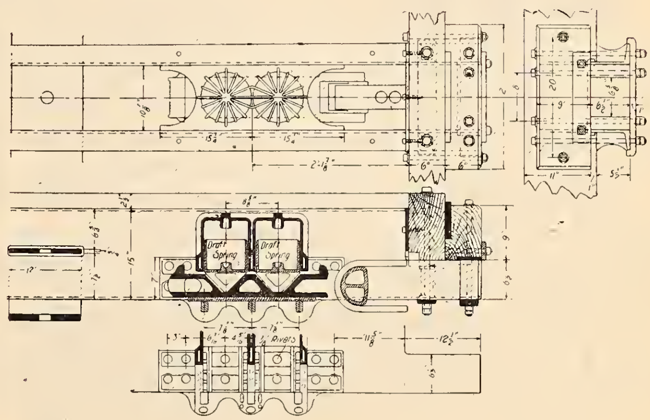


FIG. 9—FRICTION DRAFT GEAR, C., M. & ST. P. RY., COAL CAR.

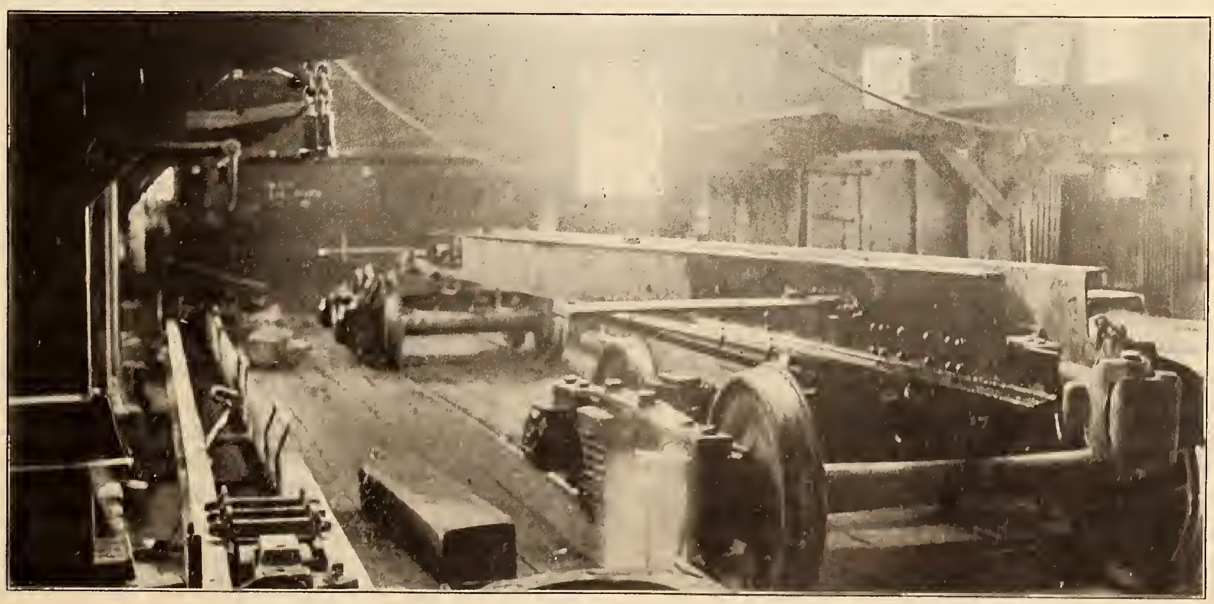


FIG. 10—C., M. & ST. P. RY., COAL CAR SHOWING STEEL CHANNEL CENTER SILLS AND BODY BOLSTER.

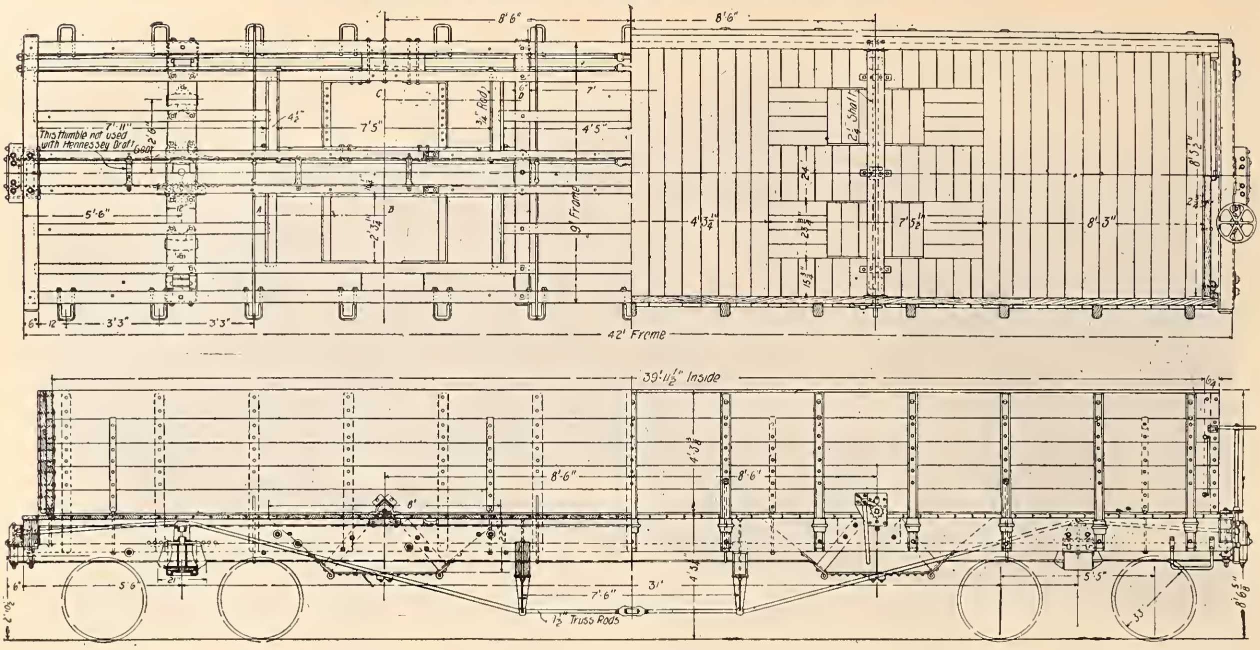


FIG. 11—SECTIONAL ELEVATION AND PLAN VIEWS, 100,000-LB. CAPACITY COAL CAR, C., M. & ST. P. RY.

The tie rods above referred to extend from side to side of the coal box, passing diagonally through the side posts and under the center sills. A tie of this type has been in service on cars of the C. M. & St. P. Railway for several years and has proved successful in preventing the sides of the coal box from spreading.

The design of the car is clearly shown in the accompanying line drawings and half tone engravings. The body is 42 ft. long over end sill and 39 ft. 11½ ins. inside length, while it is 10 ft. 1½ ins. wide over all, 9 ft. 5½ ins. wide inside the flaring top side plank, and 8 ft. 7 ins. wide inside the box. The hopper doors are located at the two ends of the car, being centered 8 ft. 6 ins. from center of the car. The full opening of each pair of hopper doors is 42 ins. long by 2 ft. 3¼ ins. wide. The diagonal truss rods previously mentioned are located at every third side stake, and consist of a ¾-in. wrought iron rod. The transverse width over framing is 9 ft., and the dimensions of the sills are as follows: Side sills, 5x13½ ins.; four intermediate sills, 4½x10 ins., and center sills, 15-in., 33-lb. Carnegie steel channels. The coal sides are made up of four 9¾x2½-in. plank, with a 11¾x2½-in. flaring timber at the top, as previously noted. There are 13 side stakes on each side, composed of 5½x3⅞-in. timbers, and in addition there are four straps formed into a ½-in. bolt at the bottom, which extend from the coal sides proper through the side sills as shown in the drawing. There are six 1½-in. body truss rods, four mounted underneath, and between the side sills and the outer intermediate sills the truss-rod bearing being of duplex type, and two are mounted underneath the center sill, the rod bearing being of a somewhat similar form. The flooring is of 1¾-in. tongue-and-groove lumber, and the hopper doors are operated by the usual ratchet and pawl device. The truck wheel base is 5 ft. 5 ins., the total car wheel base 36 ft. 5 ins., and the distance between centers of trucks 31 ft. Barr contracting chill wheels 33 ins. in diameter are applied and the trucks are of the Barber all-metal type.

DeGlehn Compound Locomotive--Great Western Railway of England

SUCH interest is being centered upon the performance of four cylinder balanced compound locomotives and the attention of railroad men and builders, both in this country and abroad, is being directed to engines of this type. In view of this fact we present the accompanying illustrations and description of a De Glehn compound locomotive recently delivered by the Sociate Alsacienne de Constructions Mecaniques to the Great Western Railway of England for trial on fast passenger trains, which we take from Transport, of London:

"The engine weighs 145,000 lbs., of which 77,300 is on the drivers, which are driven by high pressure cylinders 13 3-8 ins. in diameter outside connected to the rear drivers, and low pressure cylinders 22 1-16 ins. in diameter inside-connected to the forward driving axle; 227 lbs. of steam are carried and a maximum tractive effort of 28,814 lbs. may be developed. The valve gear adopted is of the Walschaert type and the distribution of steam to the h. p. and l. p. cylinders can be independently controlled by an ingenious arrangement of the reversing gear. For starting a valve is provided which permits the driver to admit boiler steam through a reducing valve to the l. p. cylinders, whilst valves arranged for diverting the escaping steam from the h. p. cylinders direct to the blast pipe are brought into operation by a three-

Fig. 1—De Glehn Compound Atlantic Type Locomotive, Great Western Ry., of England.

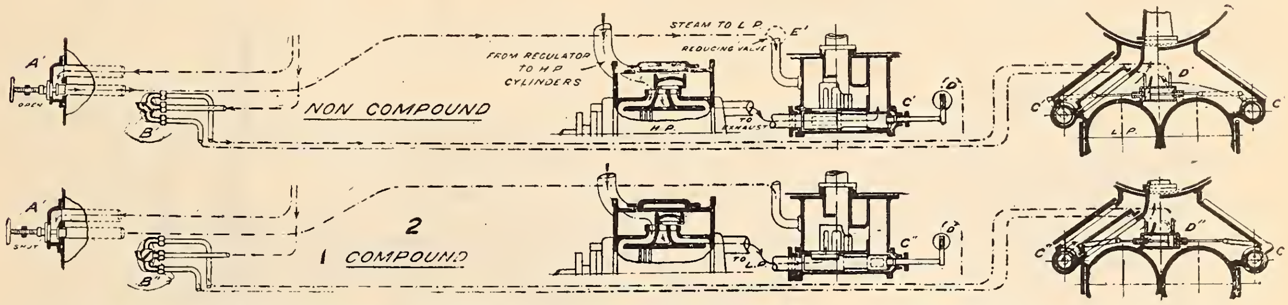


Fig. 2—Diagram Showing Simple and Compound Working of the De Glehn Locomotive.

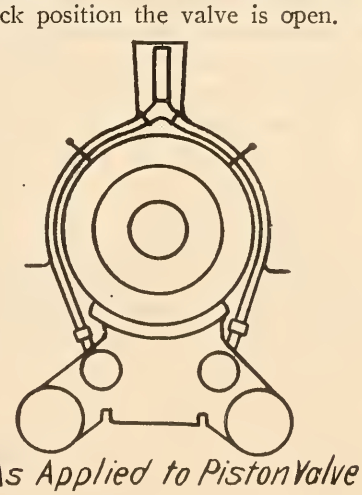
way valve and small steam cylinder. When working as a compound, the exhaust steam from the h. p. cylinders enters the l. p. steam chests through the valves above mentioned.

"The diagrams in Fig. 2 illustrate the general system of working. In the upper detail the valves are shown as when the engine is working as a four-cylinder simple engine, whilst the lower detail represents the position when operating as a compound. The letters are the same throughout. In diagram 1 the auxiliary steam valve A′ is shown open for boiler steam to pass to the reducing valve E and thence to the l. p. steam chests, whilst the three-way cock B′ stands for steam to be admitted to the transverse cylinder, D′, which moves the tubular valves C′ to the required position for h. p. exhaust to pass direct to the blast pipe. In diagram 2 the auxiliary steam valve is closed and the three-way cock B″ shown in position for steam to move the piston in cylinder D″ and alter the position of the valves C″ to give a passage for h. p. exhaust steam to the l. p. steam chests."

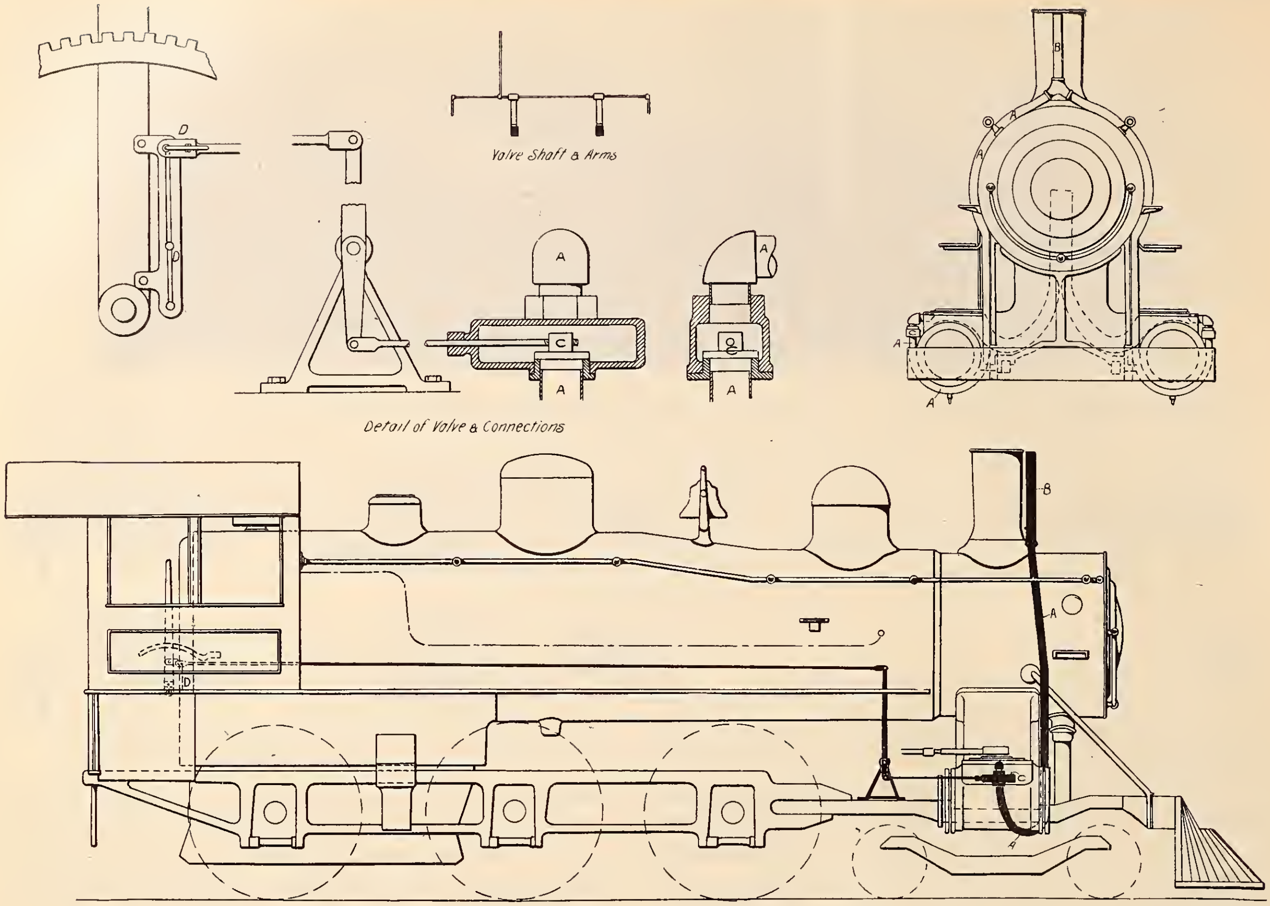
Variable Exhaust Device, C. G. W. Ry.

THE Chicago Great Western Railway has placed a device on a number of their locomotives the object of which is to reduce the exhaust when the reverse lever is in the corner, allowing a lighter fire to be carried and absolutely avoiding danger of injuring fire when starting. By softening the exhaust the effect of a large nozzle is produced, and this, by reducing back pressure, naturally increases the power and economy of the engine. It is, in effect, a variable exhaust nozzle, without its drawbacks of complication and tendency to "gum up" and get out of order.

The arrangement of the device is as follows: A hole 2 to 4 inches in diameter is drilled into the exhaust cavity of each cylinder, preferably at the valve chest, and a 2 to 4-inch pipe as indicated by A in the accompanying line drawings, inserted and led by suitable bends and fittings to an auxiliary stack, B, immediately in front of the main stack. At some point, preferably just outside the valve chest, the pipe passes through a gate valve, shown at C, so constructed that when the gate is in its central position the valve is closed, and when in its forward or back position the valve is open. This valve is



Variable Exhaust Nozzle, C. G. W. Ry.



Variable Exhaust Nozzle, C. G. W. Ry.

connected by suitable rods, and, if necessary, a rocker arm to the reverse lever, so that when the lever is in either corner the valve is open, but when near or at the center the valve is closed. Thus, when the engine is working heavily or starting out of a station with the reverse lever in or near the corner, the valves are open and permit about half the exhaust to escape directly to the atmosphere. As the engine is hooked up notch by notch, the valves close gradually, directing more and more steam through the regular exhaust nozzle until the lever is in running position, when the valves are closed and all the exhaust is used to fan the fire.

The rod operating the valve is connected by jaws and a pin through holes in the reverse lever, or bracket attached thereto, as shown at D, so that when working up a long grade where a heavy fire must be kept up the valve may be disconnected by the engineer and closed or adjusted as desired by hand.

The device is now in use on the Chicago Great Western suburban service between St. Paul and Invergrove, and the engineers give it their unqualified approval. The service is very severe and a light suburban engine is used. Before the device was applied it was always necessary to take water on the last trip of ten miles as the engine passed the roundhouse standpipe on the way to the Union depot. After the device was applied it was found that it was possible to make the ten-mile trip, run to the Union depot, and return to the roundhouse, a distance of two miles additional, and yet have enough water for a wait on the roundhouse tracks.

The engineers say that an engine is much stronger when supplied with this device and works much more easily, and the coal records show a saving of 13 per cent in coal since its application. It has shown no sign of gumming up or getting out of order, and the Great Western is now having it applied to two of the largest type of freight and to one passenger engine. It is expected to show a considerable saving on a single track road where business is heavy and stops are many. The whole device is simple and in few parts. It can be entirely renewed by a machinist and helper in half a day. The invention is patented by F. O. Whealon, locomotive engineer, C. G. W. Ry., St. Paul, Minn.

Shop Inprovements of the Chicago, Milwaukee & St. Paul Railway at West Milwaukee

IN order to pursue its policy of building its own equipment the Chicago, Milwaukee & St. Paul Railway has modernized and added materially to the locomotive department of its plant at West Milwaukee, Wisconsin. The headquarters of the motive power department and the principal shop of the road are located at this point, which is also the manufacturing establishment of the entire system. For several years the company has built all of its own cars with the exception of sleepers and the finer type of passenger equipment, and with the improved locomotive department it is expected to build about seventy-five locomotives a year in addition to the better maintenance of existing motive power equipment.

An interesting feature of the plant as it now stands is the rearrangement of yard tracks to permit additions to the buildings and to provide sufficient space for extensive freight repair yards. The trackage system shown in Fig. 1 of the accompanying line drawings is seen to be most comprehensive. The former course of the Menominee River, which crossed the yards as indicated by the dotted lines, was diverted so that it now flows in the channel indicated by the full lines. This work was necessary to arrange the system of tracks in a belt plan around the plant and was no small undertaking in itself. As shown, the tracks are arranged in a double belt line and from the lower belt line tracks lead off into all the lumber, material, scrap and store yards and to the buildings located in that vicinity. Cars and locomotives enter for shop repairs from the northeast corner of the yards and it is interesting to note a number of spur tracks arranged in the vicinity of the proposed new round house, to be used as storage tracks for locomotives, tanks, wrecking outfits, etc. The wagon road, indicated by dotted lines and seen to enter the grounds near the office, is noticed to extend to all parts of the plants, passing through the material yards and immediately near all buildings. Strict requiremens are followed in keeping this road unobstructed so that in the event of fire unimpeded access may be had to the origin of the flame.

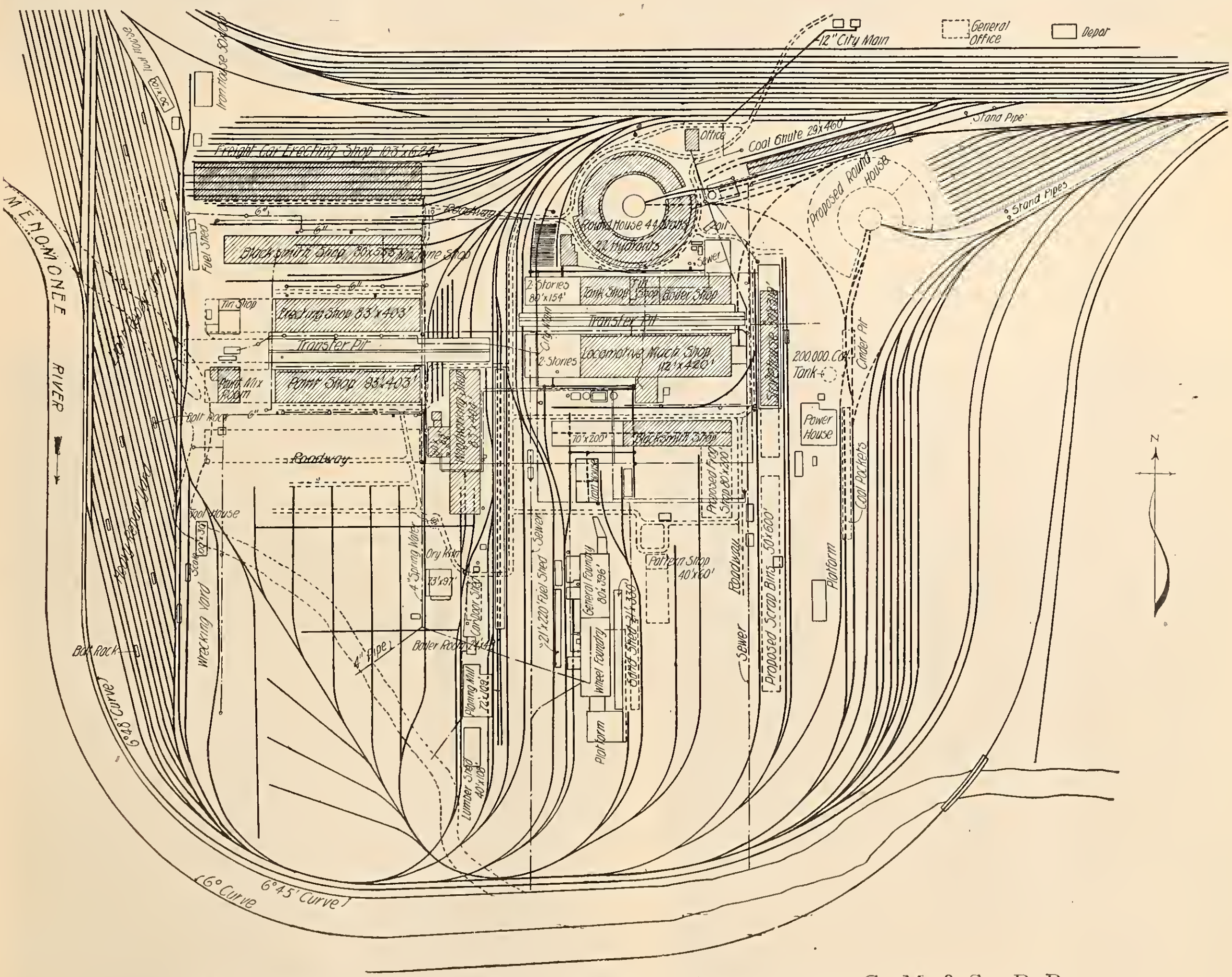


Fig. 1—General Plan, Car and Locomotive Shops of the C., M. & St. P. Ry.

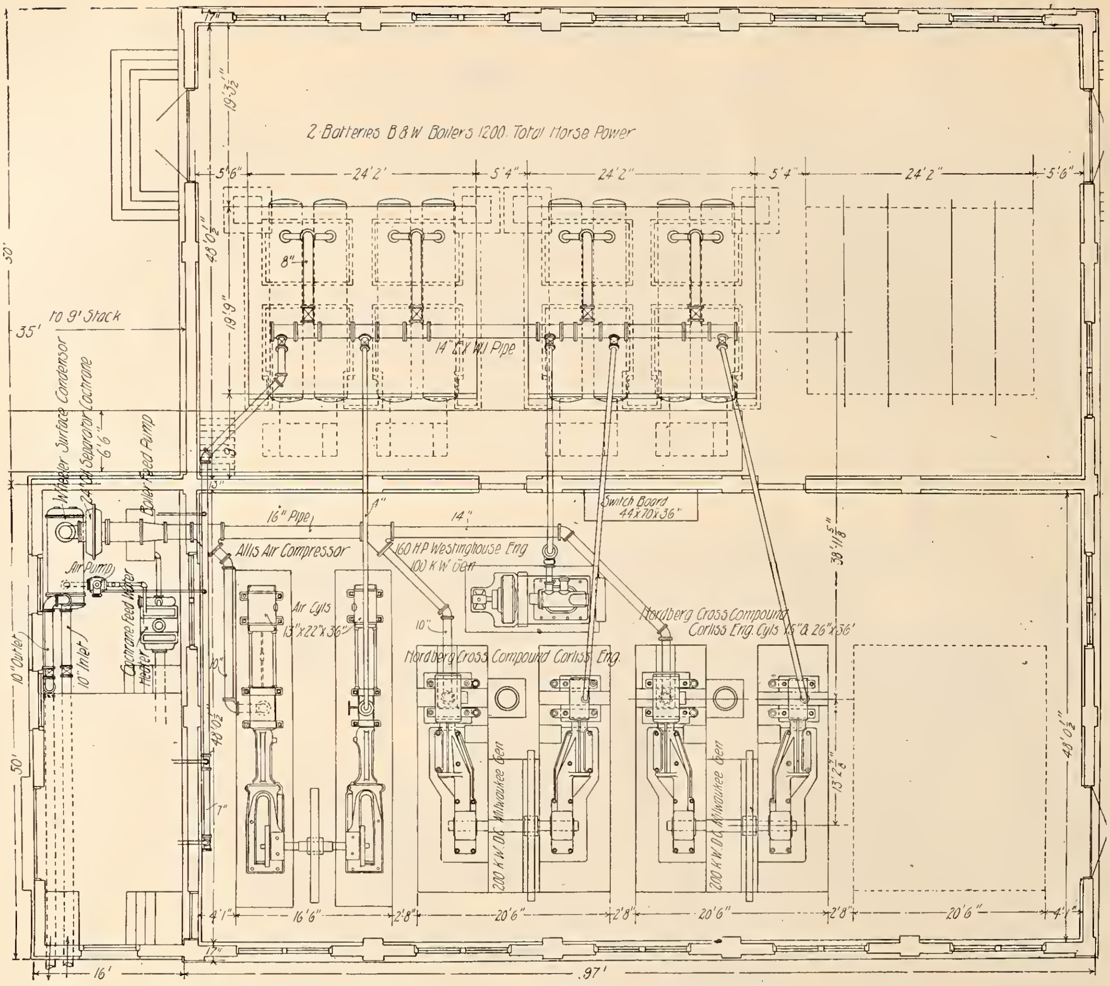


FIG. 2—PLAN OF POWER HOUSE, C., M. & ST. P. RY.

The general plan of the plant is shown by Fig. 1, in which the old buildings are indicated by section lined portions and the additions made during the improvements here considered are designated by open lines. The improvements have been planned and executed entirely by the present motive power staff consisting of Mr. A. E. Manchester, superintendent of motive power; Mr. J. Y. Hennessey, master car builder; Mr. James De Voy, mechanical engineer; with Mr. J. N. Barr, assistant to the president, in a consulting capacity, and Mr. Charles F. Loweth, superintendent of bridges and building, who assisted in the matter of structures.

The power plant is installed in a brick building of rather artistic exterior appearance. The roof trussing is of steel and reverses the usual plan by sloping inwardly to the center above the wall which divides the boiler and engine rooms. This roof is also equipped with a ventilating hood embracing both apartments. The building is 97 by 100 ft. in extent, with an addition of 16 ft. to the engine room for the condenser and feed water appliances. The building has been erected in a position that will place the boiler side of the structure alongside a connecting portion of the modern coaling pockets when the latter shall have been erected. The boiler room has been equipped with two batteries of Babcock & Wilcox water tube boilers whose total horse power is 1,200, while space has been reserved for another battery of 600 horse power when such addition shall become necessary. The breeching leads out to a brick stack 35 ft. from the wall of the boiler room in a location that will permit

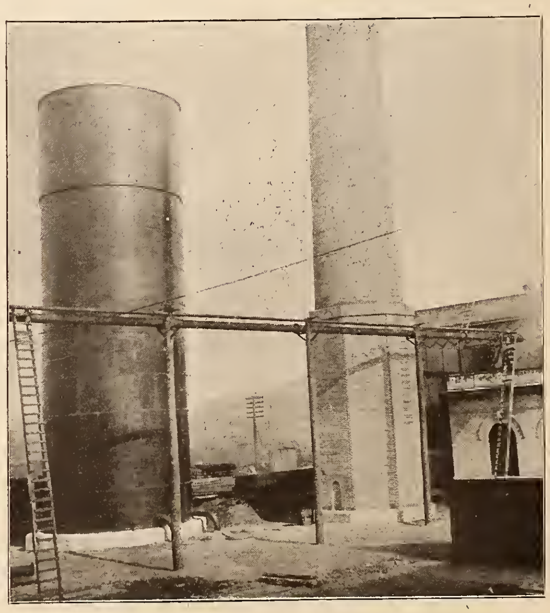


FIG. 3—VIEW NEAR POWER HOUSE, C., M. & ST. P. RY.

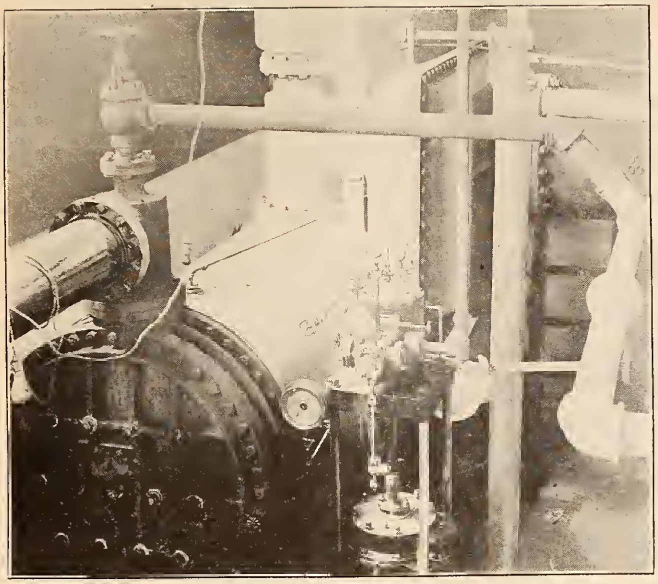


Fig. 4—Interior of Condenser and Feed Water Pit Showing Condenser Pump, Condenser and Oil Separator, C., M. & St. P. Ry.

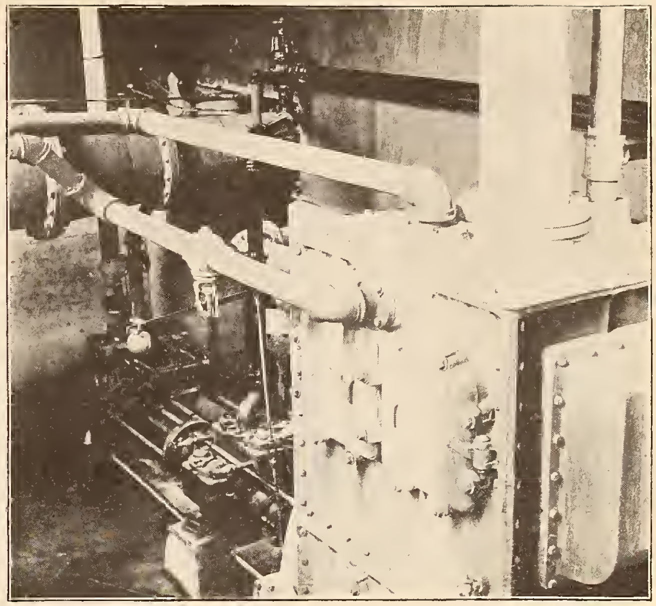


Fig. 5—Interior of Condenser and Feed Water Pit Showing Feed Water Pump and Feed Water Heater, C., M. & St. P. Ry.

of an economizer to be inserted in the line should such ultimately be deemed advisable.

The engine room is equipped with two Nordberg cross-compound Corliss engines of 330 h. p. each, and direct-connected to each of these engines is a Milwaukee 200 kw. direct-current generator. There is sufficient reserve space for the installation of still another of these units. Sunday and night lighting loads are taken care of by a

Fig. 6—R. D. Woods' Hydraulic Riveter, 17-Ft. Gap, in Boiler Shop, C., M. & St. P. Ry.

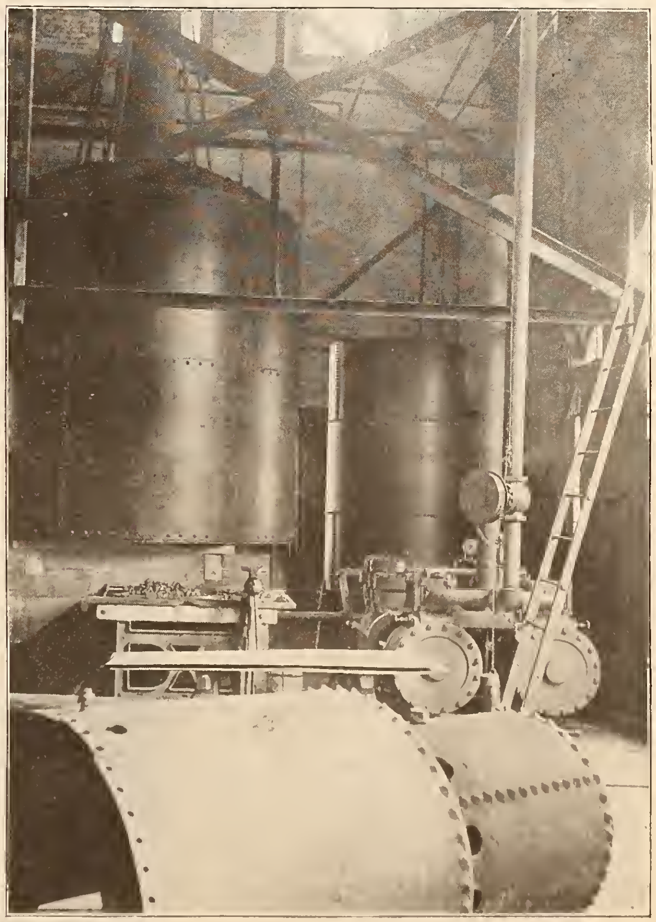


Fig. 7—Interior of Riveting Tower Showing R. D. Woods' Accumulator, C., M. & St. P. Ry.

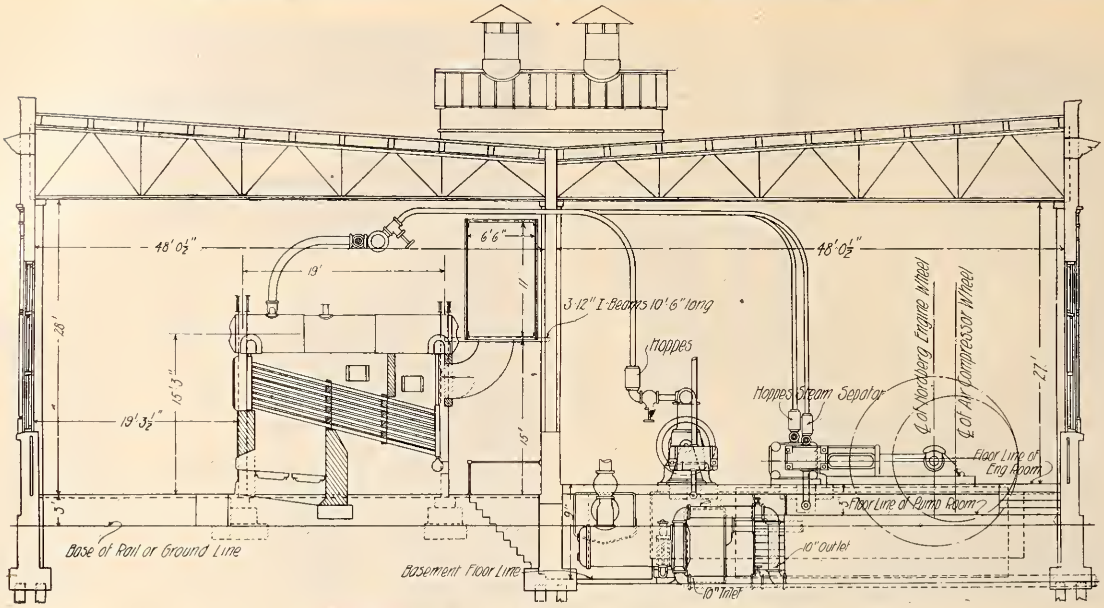


FIG. 8—CROSS SECTION OF POWER HOUSE, C., M. & ST. P. RY.

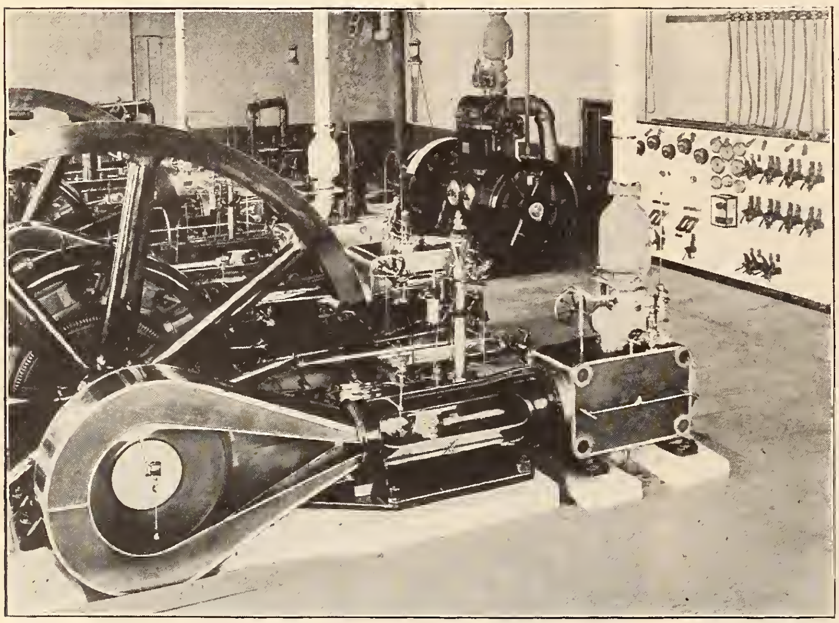


FIG. 9—INTERIOR ENGINE ROOM, C., M. & ST. P. RY.

Westinghouse verticle 160 h. p. engine, direct connected to a 100 kw. generator. At the opposite end of the room is an Allis cross-compound Corliss air compressor of 1,200 cu. ft. free air per minute capacity. All these engines operate condensing normally, but the exhaust steam header has been provided with connections that will allow any or all of them to exhaust direct to the atmosphere. In the condensing arrangement a novel adaptation of local conditions has been utilized. About 300,000 gallons of water is consumed every 24 hours by the locomotives passing through the roundhouse and for other purposes. A steel storage tank of 200,000 gallons capacity has been erected near the power plant. A Wheeler surface condenser has been installed in the apartment adjoining the engine room, as indicated in Fig. 2. The city main bringing water to the storage tank is connected to the condenser so that the latter is interposed in the line of the main, and all water passes through the condenser on its way to the storage tank. In this way three requirements are at once accomplished — necessity of a water-cooling tower is avoided, a high

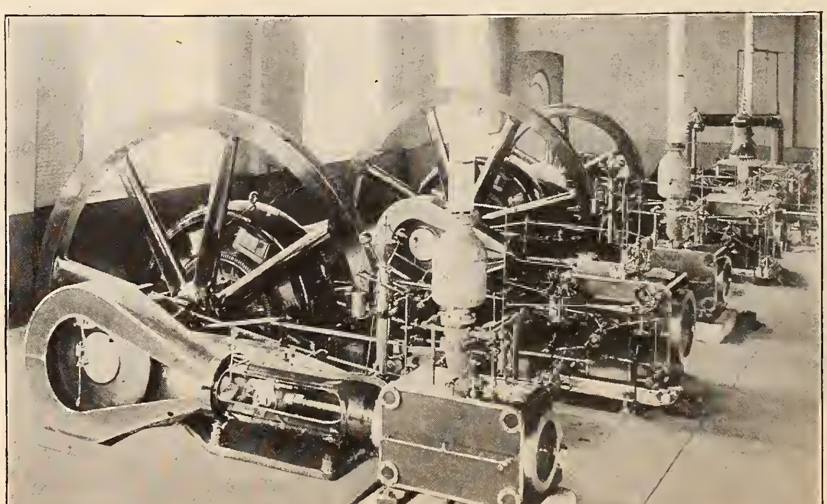


FIG. 10—GENERATING UNITS, C., M. & ST. P. RY.

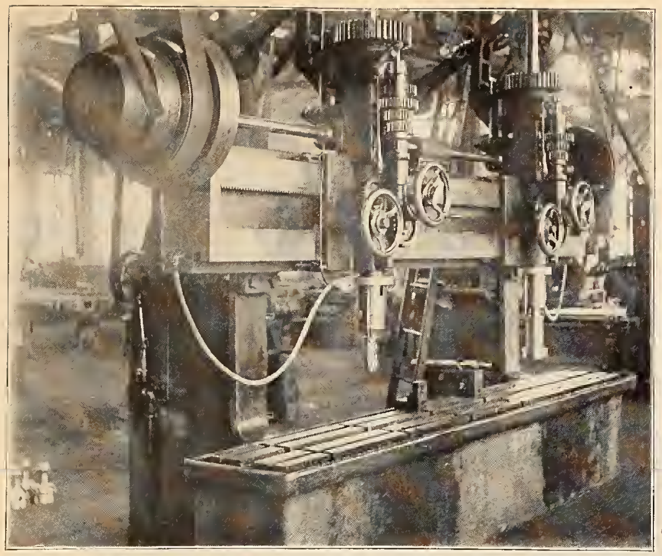


FIG. 11—NILES-BEMENT-POND TWO SPINDLE ROD BORING MACHINE IN SECOND STORY OF C., M. & ST. P. RY. SHOPS.

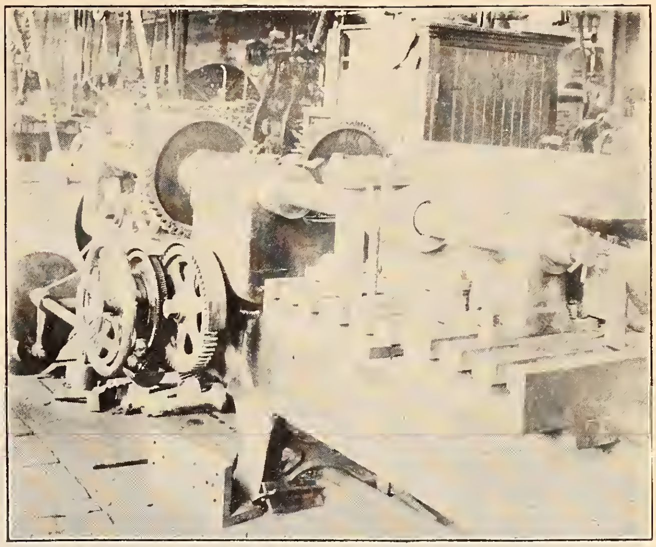


FIG. 12—NILES CROSS HEAD BORING MACHINE, C., M. & ST. P. RY. SHOPS.

vacuum is obtained, and the general water supply is supplied with a certain amount of heat which otherwise would be wasted. Tests have not been made, but a thermometer on a May day showed 27 degrees difference between the water in the storage tower and that in the mains before passing through the condenser. In this pit are also located a Cochrane 1,250 h. p. feed water heater and a 24-in. oil separator. Also a feed water pump of 104 gallons per minute capacity.

Fig. 12 shows a Niles crosshead boring machine equipped with a very handy tool or bar for boring a taper hole of any dimension. Any machine having a revolving spindle can be used with this bar. The principle upon which the tool works is that of a taper slide upon which the tool holder moves. As the bar moves the tool holder moves by means of a screw and nut, and fed by a star wheel coming in contact with a trip dog fastened to the machine.

Further improvements at this plant will be presented in our next issue.

Railroad Shop Tools

By Charles H. Fitch

X.

A MODERN Virgil would no doubt sing of man and machines, instead of men and arms, and although Russia has a vast army and is preparing to take military issue with Japan, the conflict for supremacy among modern nations will be decided by their machine shops. The rule is—the more machinery the less men. I have been through a large flour mill from top to bottom, machinery all going and no man to be found. Railroad shops are industries of a different class, obviously requiring many men because the product does not admit of a continuous process; but within my observation locomotive works for substantially the same product have reduced need of men about 3 to 1.

We now consider, however, a class of machines in which large capacity was realized at an early stage of the history—punches and shears. Any gains in capacity have been made in attachments for feeding the work, and these are not applied to ordinary punches and shears. Automatic devices displacing human attendance are not considered necessary except for continuous work on large boiler plates.

In the generality of machine tools the work done is not a maximum. When the limitation of work was in tool steel, strength of framing was often excessive. As tool steel has been developed capable of heavier cuts at higher speeds, greatly increasing the application of power at the tool point, the framing for stiffness to ensure practical inflexibility of position must be made much heavier. Hence a development now in progress in tool design which is of great significance. But this does not apply to punches and shears because they have already reached a design in which we have the greatest stress at the tool point consistent with its endurance, and are supposed to have the strongest cast iron framing practicable to meet this stress.

The paring cut is an action in which the work is distributed in time by rate of speed, and in space by rate of feed, and while time cannot be annihilated in any operation it is hardly a considerable factor in the work of a punch, in which the work is done all at a stroke.

The limit of stress which tool steel can stand is found in the punching of thick crucible steel plates with small holes. Then it is steel meet steel, and the small punch breaks—if not at once, after a few repetitions of the severe stress which crushes its internal structure and renders it brittle. Punching steel has not received the same attention as cutting steel. Punches, shears and dies are usually made from a grade of steel costing less than one-third the price of high speed tool steel, and not given so high a heat for hardening and tempering. Mr. H. J. Hinde specifies a special grade of "Carpenter" steel, Mr. F. K. Bremer an extra annealed tool steel made by the value for large punches such as are used in railroad work.

A feature characteristic of punches and shears is that they are liable to be overloaded, and broken. We often see notices upon the lighter machines warning men that the machines must not be used for sizes and thicknesses above a specified maximum, under penalty of discharge. Break pins to save the frame may be used in the power

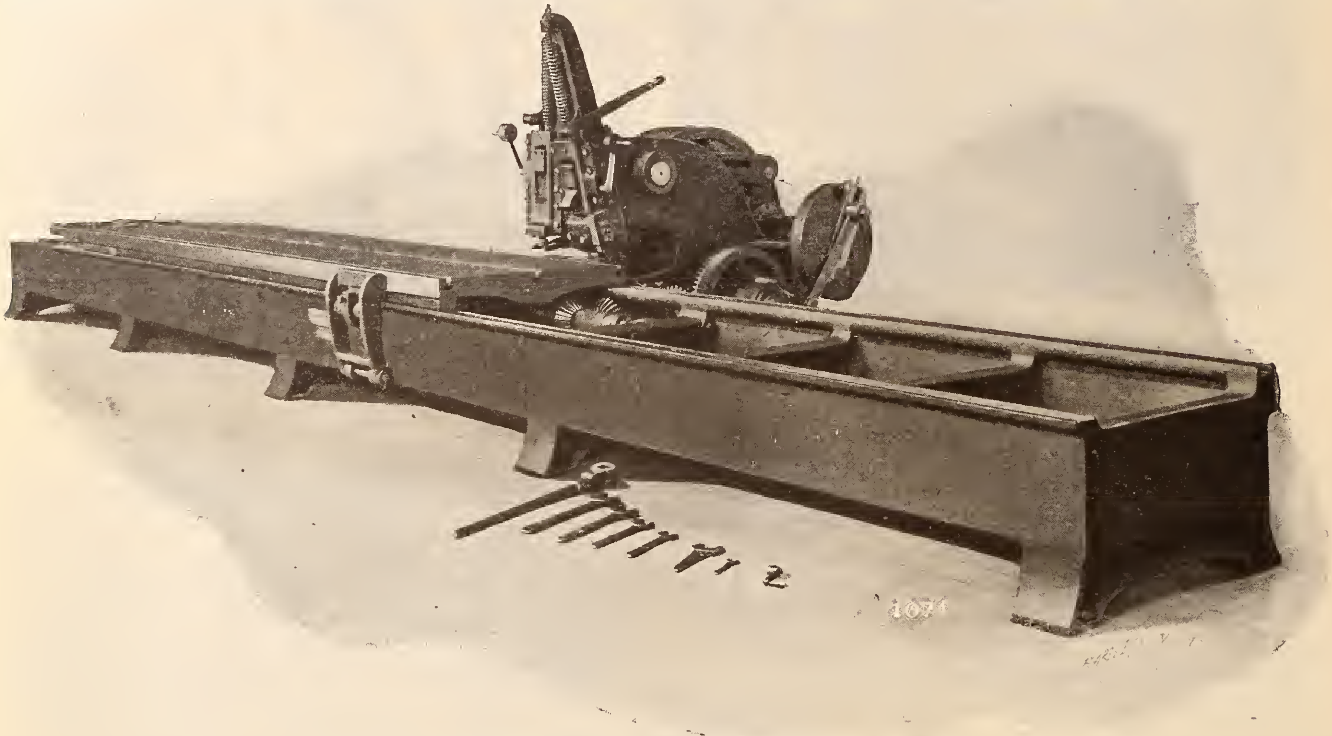


Fig. 1—Miles-Bement-Pond Co., Punch and Shear.

Colonial Co., Chicago, in fact every tool steel maker and user has his recommendations and preferences on a subject like this which does not admit of close comparisons. On fine punching such comparisons might be made based on durability under severe service, but the result would be at best only a tool steel costly out of proportion to its mechanism, but the condition shows that the punch, unlike the lathe, is a completely loaded machine liable to be stalled or broken. They are commonly installed for work of limited strength, for which they are sufficient, but too much stiffness can hardly be brought to the tool point in heavy punching and shearing, and the frames take the

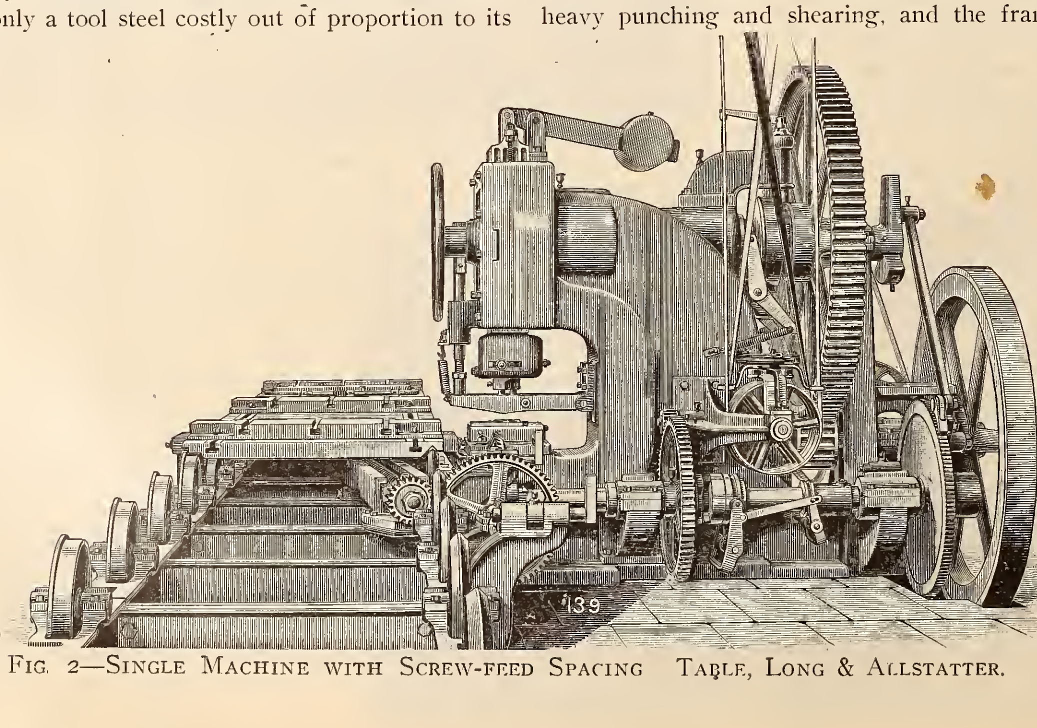


Fig. 2—Single Machine with Screw-feed Spacing Table, Long & Allstatter.

immensely massive forms of which an impression is conveyed by the words "punching bear." These forms are given such a large factor of safety that the treachery of cast iron is covered by their strength, and the forms are little liable to the breakage incident to initial strains set up by unequal contraction. We can point to these forms as ultimates towards which we must approach in other tools, as these are made so swift and powerful in action that we are brought to a simple trial of the penetrating power of an edged material against the resistance in compression of a framing material.

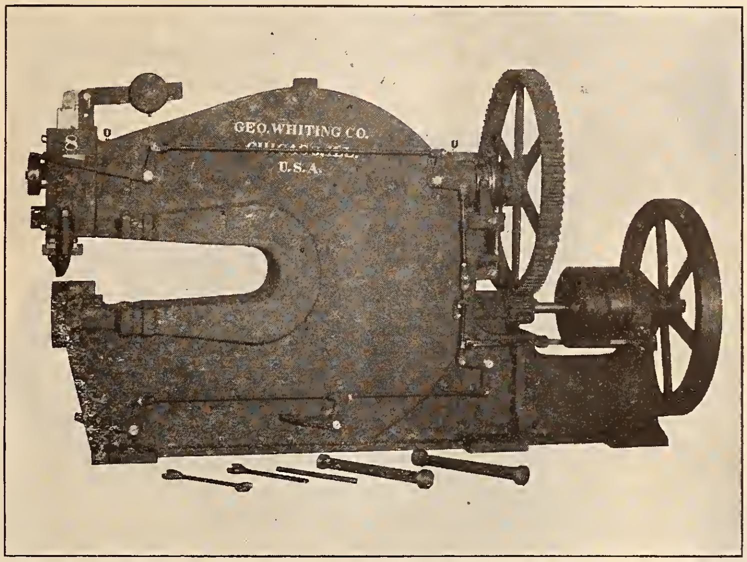


FIG. 3—BOILERMAKERS' COMBINED PUNCH AND SHEAR, GEO. WHITING CO.

The demands of railroad shops for punches and shears are simple and involve less variety than is requisite in ship-building. Owing to the disposition of foreign manufacturers to design independently where American manufacturers are less concerned with unique patterns than with effective designs, our machines conform to a few types. What I may style single and double "bear" framing is all but universal, the double machines having a punch at one end, and a short shear at the other, while for longer shear blades or gate shears a pair of these frames are set side by side.

Many types of machines are peculiar to other classes of work, such as beam punching and coping machines for structural work and multiple punches for perforated metal work, armature notching, machines, billet and bloom shears, but in railroad shops we find the vertical bearing frame punches and shears and horizontal punches, beveling and splitting shears, as well as the almost universal Lennox rolling shears for bevel and irregular work. The tools necessary are those for making firebox boilers, and in addition to these there is usually much car iron work to be handled which requires some small quick-acting punches and bar and angle-iron shears.

A characteristic tool is the punch and shear with automatic spacing table. For punching boiler plates geared spacing tables and multiple punches economize time and labor, two men punching 1,000 holes in an hour. Spacing is usually effected by pawls and escapement gearing similar to that used in gear-cutting machines. Fig. 1 shows such a machine by Bement, Miles & Co. (now Niles-Bement-Pond Co.), arranged for bevel shearing the edges and rapid punching of rivet holes in single or double rows. Fig. 2 shows a machine for punching holes in boiler plate, and having a screw-feed spacing table. This is made by the Long & Alstatter Co., Hamilton, Ohio.

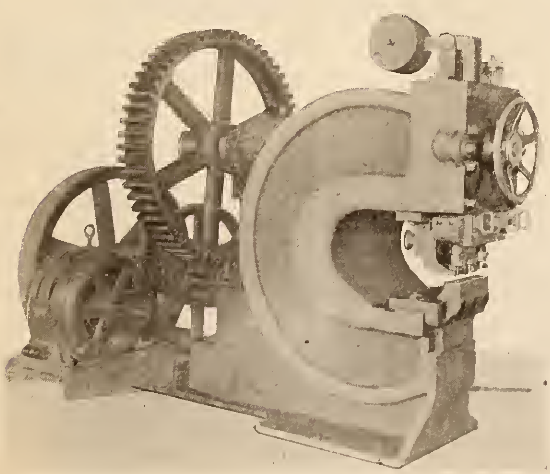


FIG. 4—20-INCH THROAT PUNCH, MOTOR DRIVEN, GEO. B. SENNETT CO., YOUNGSTOWN.

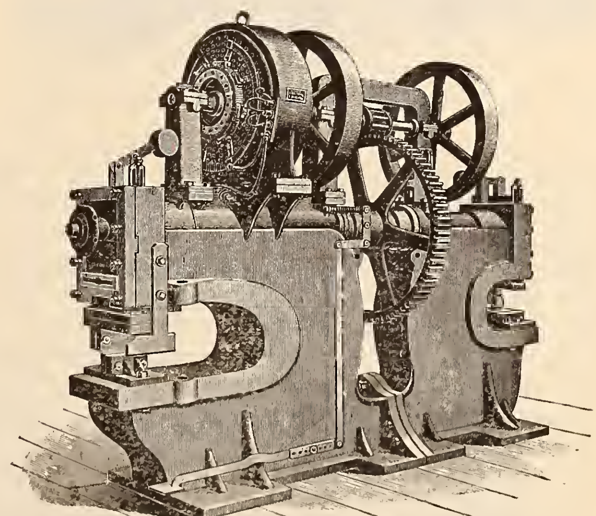


FIG. 5—DOUBLE PUNCH, MOTOR DRIVEN, CINCINNATI PUNCH & SHEAR CO.

The screw is diagonal to the bed and causes the travel of a nut moving in a slot in a revolving spacing table. The table set at zero will space the pitch of the screw, and set either way from zero will space greater or less, even sixteenths being fed through a ratchet. At the movement of punching the plate is clamped antomatically upon the die, the same device serving for a stripper.

It is the embarrassment of riches to attempt to illustrate the designs of different American builders and give their features of design adequate justice in so short an

FIG. 6—PUNCHES, DIES & COUPLINGS.

article. Most of them build full lines covering all usual requirements. In Fig. 3 is shown the No. 8 combined punch and shear, 42-in. throat, built by George Whiting Co., Chicago, expressly for boiler makers. It shows the Whiting strippers, and the machine has a special form of throat for punching small flanged heads, though made with other forms of throat.

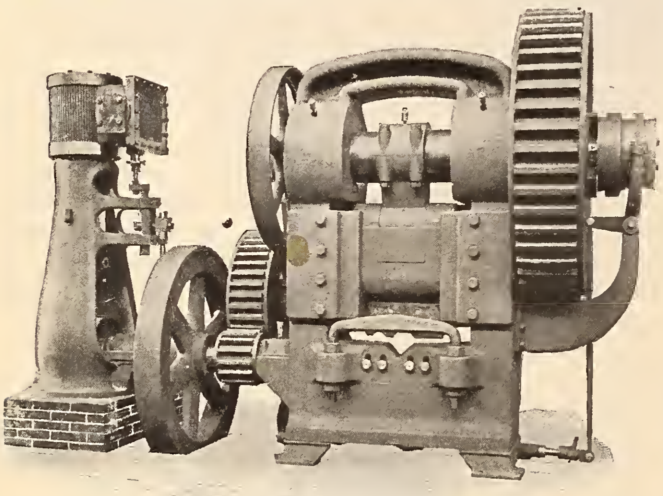


FIG. 7—BAR SHEAR, CLEVELAND PUNCH AND SHEAR CO.

The Hilles & Jones Co., of Wilmington, Del., are among the oldest makers of these tools and build them in great variety. In Fig. 4 we show a motor-driven horizontal punch of their manufacture. These punches can be used to great advantage on some classes of suspended boiler and flange work. Motor drive presents no difficulties. The machine has two punches, each provided with a gag. This is a simple and usual device for making connection between the punch proper and its driving mechanism. If for example it were required to use only one of these punches the gag of the other would be lifted out.

Fig. 4 shows a class 7-20-in. throat punch with 7½ h. p. induction motor built by the George B. Sennett Co., of Youngstown, O. It has automatic and friction clutch, and the three punches may be operated by foot lever or independently, or together, by pushing in or pulling out gags which are provided with convenient handles.

Fig. 5, by the Cincinnati Punch & Shear Co., shows a double end punch and shear of a type in very common use, direct-driven by a 5 h. p. motor. These double tools economize in gearing, but have some disadvantages incident to most combination tools. If work is moving continuously through the shop, an end to end arrangement is not always handy, though for occasional work this makes little difference. One end is also usually in a poorer light than the other, although our modern facilities in lighting may be made to remedy any such difficulty. I prefer,

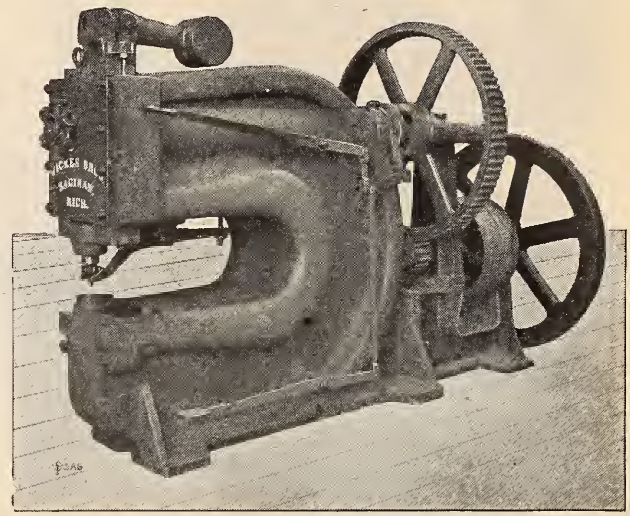


FIG. 8—WICKES BROS., PUNCH.

however, to see a tool made and placed for its work, rather than to subordinate convenience of work to any pre-arrangement in tool design.

It is interesting to note what may be called equivalence in shear and punch capacity. Solid contents punched in cubic inches is from 1-5 to 1-10 cross section sheared at a single stroke, in the larger (2-in plate) and smaller (¼-in. plate), respectively. The circumferential area punched is less than the straight area sheared.

In 1880 it was noted that two designs for actuating the shear or punch were in vogue, the eccentric with large area of rubbing surface to distribute the pressure, and the lever driven by double-acting cam, obtaining a quick return and also bringing the punch to the very end of nosing so as to punch within an inch of flange or corner. Now nearly all presses are of the eccentric type.

The die has a hole slightly larger than the punch (see Fig. 6), which is held in place by a screw coupling securing it to the punch stem. The shearing action whether of shear proper or punch is made by the cutting of the skin metal, and thereafter by the local compression under the punch tearing and forcing out the blank, and enlarging the hole downward by about 1 in 10 on either side. The metal is thus hard treated and must be annealed after punching, or else the holes must be punched small and reamed out. The Dietz system of step punches was invented 20 years ago. It left the metal strength unimpaired and was an excellent device, but was never pushed in practice.

Shear blades are secured to head and die by blocks. They conform to the section to be sheared, being angular for cutting angles, and round for rounds, but for flat bars are applied at an angle of relief or inclination as are scissors. Alligator shears are much like scissors, but the guillotine type with shears between vertical guides is suited for finer work. Fig. 7 shows such a shear built by the Cleveland Punch and Shear Works Co. and driven by independent engine. This company builds a full line of punches with dies for flue holes, hand holes and all heavy boiler work.

Fig. 8 shows the framing of a punch or shear made by Wickes Bros., Saginaw, Mich. This frame has two heavy ribs instead of one as usual, giving greater strength and a section like that of an I-beam. As the I-

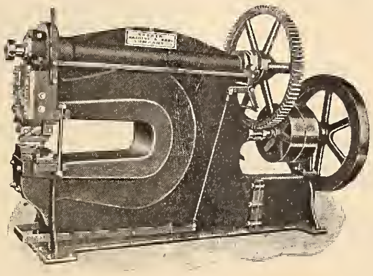


Fig. 9—Punch and Shear, Bremer Machine and Tool Co.

beam owes its form to convenience in rolling, and these forms are cast, and require the greatest strength it seems strange that no builder has adopted the box section. To resist strains frames with deep throats have bolts between the jaws. The Wickes frame has provision for such bolts to be let in sidewise like the bolts of Cornish pump valve box covers. The Wickes drive is through gear, shaft, coupling, eccentric and cam. Position of work may be tried before punching by hand wheel lowering gear in front of eccentric shaft. Regular flue hole dies furnished are 2, 2¼, 2½, 2¾, 3, 3¼ and 4 inches.

Fig. 9 shows a No. 4 shear 18 inches in throat, single built by the Bremer Machine & Tool Co., Kalamazoo, Mich. Fig. 10 shows details of eccentric, connecting rod and crosshead as built by this company.

In general throw of eccentrics or levers is varied by several simple adjustments such as eccentric sleeves, or screw elevation of lever bearings. In the ordinary eccentric press the eccentric is overhung, but greater strength can be obtained by the double connection eccentric press which is easily built to exert 200 tons pressure.

Clutches are thrown in by treadle, and can easily be

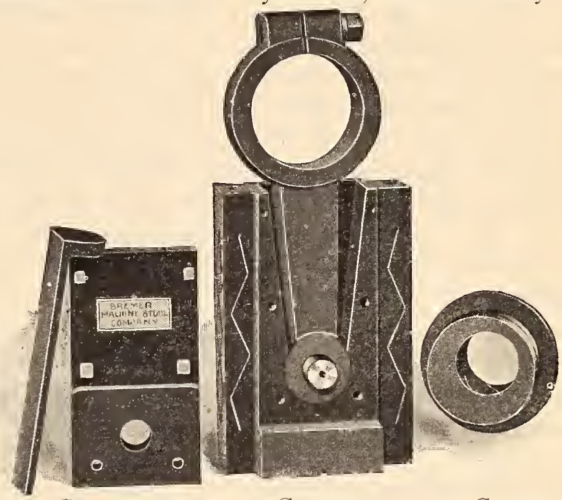


Fig. 10—Construction of Crosshead and Connecting Rod, Bremer Machine & Tool Co.

arranged for automatic throw. Rams are caused to stop at the highest point of their stroke by springs which throw the clutch out when this is permitted by an escapement at the proper point.

Guards, strippers (which prevent work from lifting when the punch rises), gauges, distance pieces, shear holders for cutting off or slitting sheets along the edges, etc., are shown in the various illustrations presented, and are tools of such obvious purpose as to require little explanation.

Shears and punches do what may be termed roughing out work, and their province has been somewhat encroached upon by the heavier cuts of modern finishing tools.

Convertible Sleeping and Parlor Car for Electric Railway

THE Holland Palace Car Company of Indianapolis, Indiana, has had two convertible sleeping and parlor cars built to be operated over an electric line by their own motors. They are to be used as compartment sleeping cars at night and as parlor cars during the day. The first of these cars, designated as the "Theodore,"

Fig. 1—Convertible Parlor and Sleeping Car for Electric Railways.

has been received by the company, and the second, the "Francis," is expected within a short time. They were built under the Holland patents at the plant of the Harlan & Hollingsworth Company, Wilmington, Delaware, under the direction of the Holland Company's mechanical engineer, Mr. Mason Pickert. It was the original intention to build but a single car and use it for exhibition purposes, but there was an immediate demand for two cars to be put in practical service and the cars here referred to have been built for that purpose. The car illustrated herewith is 56 ft. 4 in. long over all and 8 ft. 10¼ ins. wide. It is driven by four Westinghouse motors of 150 horse power each, making a total horse power of 600 per car, geared for 65 or 75 miles per hour. The exterior of the car is painted maroon, a color which has been adopted as standard by the company.

As shown by the accompanying interior views, when arranged as a parlor car the interior presents a pleasing appearance and all comforts of day travel are available. One of the views shows also the appearance of a part of the car when arranged into compartments. The compartments are on each side of a center ailse, there being in each car ten compartments 6 ft. 10 in. long by 3 ft. 6 in. wide. There is one lower and one upper berth in each compartment each 27 in. wide (regular steamer size), allowing a 15-in. dressing space between berth and aisle. The partition which forms the com-

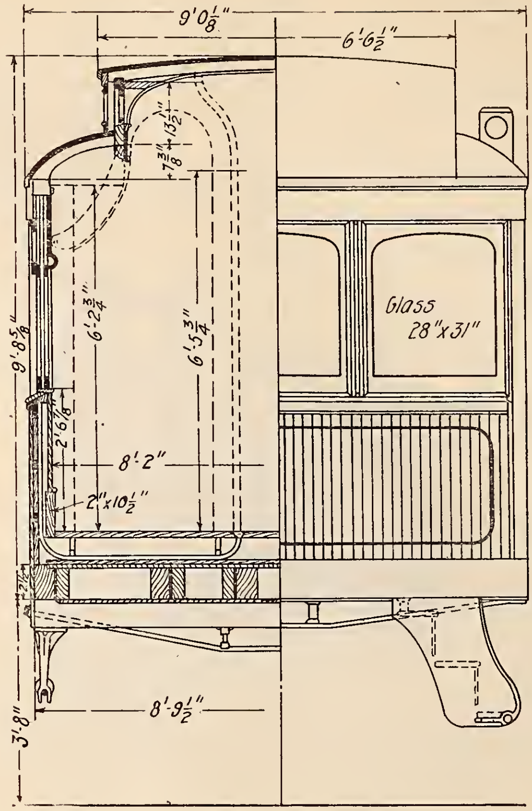


Fig. 2—Part Sectional Rear Elevation, Convertible Sleeping and Parlor Car.

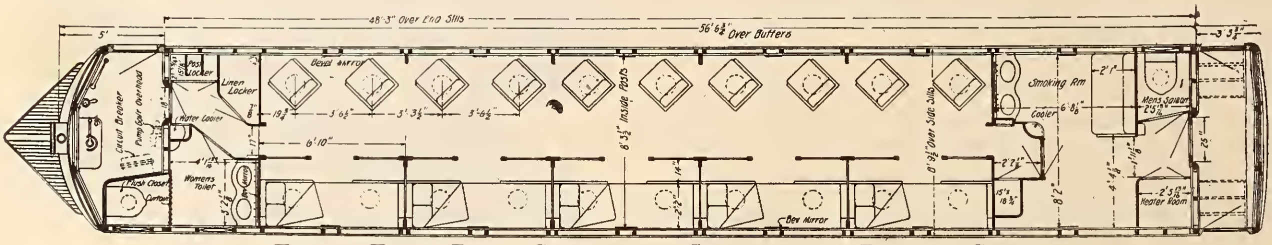


Fig. 3—Floor Plan, Convertible Sleeping and Par lor Car.

Fig. 4—Interior of Convertible Car when Used as Parlor Car.

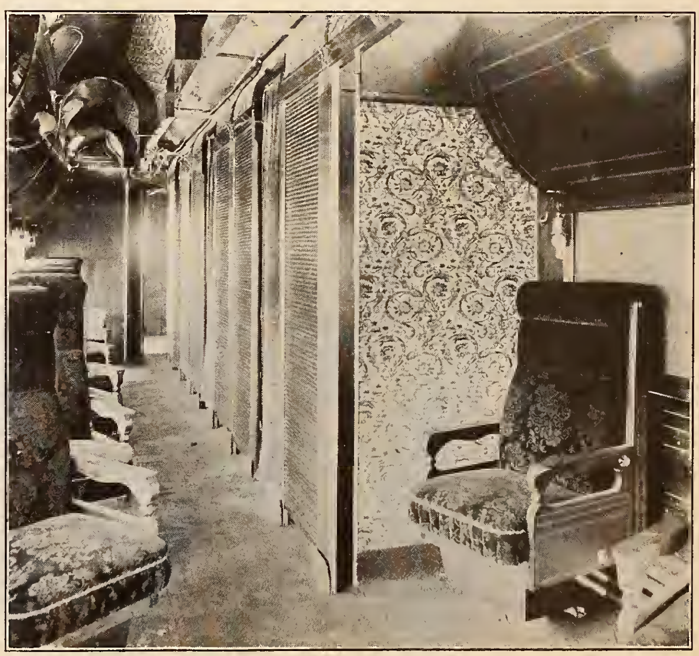


Fig. 5—Interior Convertible Car Showing Portion of Compartments Arranged as when Used as Sleeper.

partment is of the same material and is operated on the same principle as a roll-top desk and is entirely out of sight in the day time, which arrangement gives an open parlor car with 20 revolving parlor car chairs. The inside of the partition is covered with handsome tapestry, the window shades of pantasote with green silk face and the curtains in the doorways of double faced velour, which makes an exceedingly handsome compartment.

The cars are heated by the Peter Smith Heating Company's system of hot water heating for the body of the car, the motorman's cab being heated by three of the Consolidated Car Heating Co.'s electric heaters. Hot and cold water is provided for the wash stands, the hot water being heated by an electric hot water heater.

The interior decorations are of inlaid mahogany and bronze. The smoking room and men's toilet are at one end and the ladies' toilet at the other. The minor equipment includes electric curling irons for the use of lady passengers; electric cigar lighters in the smoking room. Electric fans are located at each end in the main body of the car to be operated during the day.

It is not the purpose of the Holland Company to sell their cars of this type, but instead to operate them for the electric roads in the same manner as sleeping cars are operated on the steam roads, the Holland Co. to own all cars. The officers of the Holland Palace Car Co. are: Harris F. Holland, president; Amos K. Hollowell, vice-president; Joseph W. Selvage, secretary and treasurer; Amzi L. Wheeler, assistant secretary and treasurer, and Judge James E. McCullough, general counsel, all of Indianapolis, Ind.

The principle of the car here illustrated was presented in the October, 1902, issue of the Railway Master Mechanic, on page 372.

The Western Railway Club

By J. W. Taylor, Secretary.

THE western Railway Club was organized on April 16, 1884, in Club room A of the Grand Pacific Hotel, Chicago, Ill.

Mr. Joseph Townsend, master car builder of the Chicago & Alton Railroad Company, was chairman of the first meeting, and Mr. Wm. Forsyth, mechanical engineer of the Chicago, Burlington & Quincy Railroad Company, its first secretary. Mr. B. K. Verbryck, master car builder of the Chicago, Rock Island & Pacific Railway Company, was elected its first president.

MR. D. F. CRAWFORD, PRESIDENT OF THE WESTERN RAILWAY CLUB.

Among those who were also interested in the formation of the club and were present at its first meetings are the names of Allen Cook, H. L. Cooper, Chas. D. Ettenger, H. C. Buhoup, Willard A. Smith, C. E. Smart, Jacob Johann and J. G. Riley.

As is usual in such organizations its beginning was on a small scale, but the organizers were enthusiastic, earnest men, devoted to the business of railroading, who realized the necessity of an institution where, by the exchange of ideas, a better knowledge might be had of the safe and economical operation of railways, where a means might be taken to bring about uniformity and interchangeability of the different parts of cars, and mutual understanding be arrived at for the adustment of differences growing out of the interchange and repairs of cars engaged in through traffic. The personnel of the club was made up of men interested in railroad matters generally, and from a nucleus of ten charter members in 1884 it has grown until now its membership is nearly twelve hundred, composed of men in every department of railway service.

The roster of its presiding officers includes: B. K. Verbryck (1884), C. F. Pierce (1885), W. A. Scott (1886), G. W. Rhodes (1887-8), John Hickey (1889), J. N. Barr (1890), P. H. Peck (1891), W. H. Lewis (1892), Wm. Forsyth (1893), Geo. Gibbs (1894), G. L. Potter (1895), A. M. Waitt (1896), F. A. Delano (1897), C. A. Schroyer (1898), H. G. Hetzler (1899), A. E. Manchester (1900), Prof. W. F. M. Goss (1901), F. H. Clark (1902), D. F. Crawford (1903).

The successive secretaries are Wm. Forsyth, Angus Sinclair, W. D. Crossman, W. H. Marshall, C. F. Street, F. M. Whyte.

With such prominent men at the throttle and guided by a host of others equally well known, it is but natural that the club's influence should become national in character. As expressed by President Lewis at our World's Fair banquet, on Sept. 19, 1893, "the work of the club, its contributions, recommendations and deliberations are conspicuous in the technical literature of the day and in the perfected methods employed on our railroads."

The papers presented and the discussions thereon, since the club's inception, cover practically every detail of railway construction and operation, but more particularly the locomotive and car.

Were I asked to name the most prominent work of the club I would reply, the development of the rules of interchange. Situated as we are in the greatest railroad center in the country, with roads diverging in every direction, the movement of their constantly increasing traffic through the Chicago gateway with the least congestion possible has ever been a live question. To it the Western Railway Club has devoted a great deal of attention, with the result that the rules adopted for the handling of this traffic have been adopted as part of the interchange rules of the Master Car Builders' Association.

The club is the possessor of an up-to-date mechanical library (the legacy of Mr. D. L. Barnes) second to none in the west, and in order to retain this property it became a corporate body in March, 1897.

Regarding the Handling of Scrap

COMMUNICATION.

To the Editor of the Railway Master Mechanic:

I have read with interest the articles written by Mr. J. F. Murphy, general storekeeper of the L. S. & M. S. R. R., and Mr. John Burke, general storekeeper of the Choctaw, Oklahoma & Gulf R. R., on the handling and disposition of railroad scrap, and take pleasure in contributing this paper, on the subject, as it appears from our more westerly point of view. I desire to say in the beginning that I entirely approve of this interchange of ideas between the stores department of the several railroads as contributing to a better and more intelligent administration of the department. There is no department in the railway organization that can contribute more to a satisfactory balance sheet than a store department, well organized and administered, but it has been only during the past few years that the great railroads of the country have given it the importance it justifies, but there seems now to be an awakening to the fact, that if supplies are a necessity to the operations of the railroads it is equally necessary that those supplies be as carefully surrounded by safeguards, as to their proper uses and accounting for, as the revenues of the roads are, and what road is there that does not see the importance of guarding most rigidly its earnings? There is a wide field for the discussion of the manifold advantages in having a stores department of a railroad, but as this is not the fitting time for such a discussion, I will confine my paper wholly to the topic under consideration, viz: The proper handling of scrap.

The Southern Pacific Railroad, Pacific System, which I have the honor of serving as general storekeeper, is probably affected by conditions which do not operate upon roads of the east, in that it is situated on the uttermost western rim of the continent, far from the base of supplies and manufacturers, and has perforce been compelled to be self-reliant, so that much of the scrap which eastern roads dispose of by selling, is devoted by the Southern Pacific to its own manufactures. This company has large shops situated at Sacramento, California, employing about four thousand men, and not the least important of which is its large foundry and rolling mills. It manufactures all its iron and brass castings (excepting malleable iron), including car and engine wheels, locomotive and steamboat cylinders, structural castings, the most of its bar iron, "I" beams, all of its angle bars, track spikes and bolts, much of its nuts, and everything, in fact, that is necessary to a railroad, but rails; therefore, its immense accumulation of wrought and cast scrap is used again through its foundry and rolling mills by being converted into serviceable material, so the only scrap the Southern Pacific Company sells is such as it cannot use, as cast steel, steel rail, steel fire box and boiler plate, very light sheet steel and iron.

Scrap iron rail, angle bars, spikes and bolts are rerolled and worked up into angle bars. Spikes and bolts are not considered as No. 1, wrought scrap, which scrap—the accumulation from locomotives, cars, buildings and bridges—is devoted wholly to the manufacture of the better grades of iron, for like purposes. The accumulation of scrap from the various departments is turned over to the stores department on the several divisions, and is then, with the exception of steel rail (and some steel rail is utilized in the manufacture of brake beams by this company) shipped to Sacramento, where it is carefully gone over, in unloading into its proper place, and anything serviceable put into the way of again being used as such. There is a good deal, doubtless, goes into the scrap pile which might, by expending labor, be used again, but at the same time, unless your facilities for doing this are such as to reduce the cost to the minimum, taking the cost of its being converted again into serviceable, and practically new material, we are not justified in attempting to recover it, but rather let it go the course of scrap, and be worked over. Very much depends upon the facilities given for the economic handling of scrap, and as our facilities are restricted, unquestionably much goes into scrap, which under more favorable conditions could be used. I have no doubt that a good amount of track spikes, from that turned in as scrap could be saved, and be again used as such, but as our organization on this road is a new one, in the multiplicity of duties incident to effecting an organization, we have not had the time to look into the matter, but upon a visit I made the Union Pacific Railroad last year I learned that they found it paid to look particularly after this point. We endeavor on our different divisions to have the scrap segregated and kept separately in bins provided therefor, and when a carload shall have been accumulated, load and ship it in to Sacramento; loading so that the cost of unloading may be reduced to the minimum, as the different grades have to be unloaded at different points, and if care is not exercised in its separation, and loading at the initial point, much unnecessary expense is incurred in its unloading at its destination.

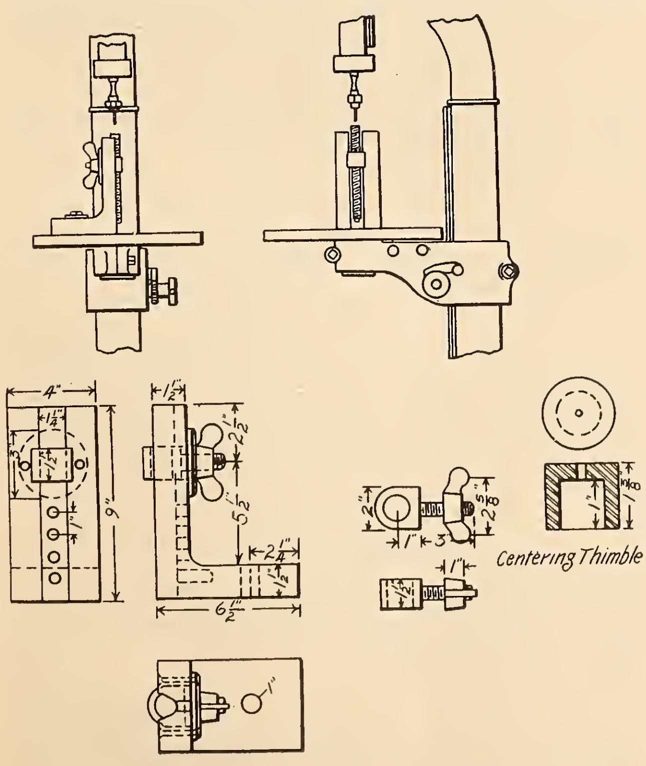
Borings must be kept clean and put into barrels, for these borings are now (under the able direction of Mr. H. J. Small, general superintendent M. P. Dept.) put through the foundry cupolas and converted into a good grade of pig iron suitable for many purposes, and as carefully looked after as any other class of iron, but which for many years simply served to fill holes, as no use could be made of, and no one would buy it. As Mr. Murphy says, most of the responsibility for the proper saving of material of all description from cars and engines undergoing repairs, or demolition, rests with the mechanic or laborer doing the work, for he should be sufficiently familiar with the mechanical side of it to know whether the material is serviceable or not: if serviceable, it should be put aside as such; if scrap, into the scrap bin, but it should always be borne in mind that such scrap should be in the first place segregated and kept so, for every time you rehandle it for the purpose of segregation, you just that much add to its unnecessary cost and resultant expenditure of money in labor. These things seem to some, infinitely small, too small to be worthy their consideration, but in these days of economies it is these little things that make a great aggregate, and are indeed worthy the attention of the management of the great roads, where the little things would be great ones, to roads of lesser magnitude. As I said in the beginning of this paper, I entirely endorse all Mr. Murphy says, but as I am afraid I am prolonging this beyond your patience, I will conclude.

Much may be said upon the affairs of a store department, and as it is almost a new one to most roads, much may be learned by each, from the exprience of the others, and the interchange of ideas, and I shall look forward with interest to the appearance of other articles in your valued journal. Yours truly,

W. R. Ormsby,
General Storekeeper ,Southern Pacific Co.

The Proper Location of Tell-Tale Holes

A RECENT criticism suggesting discrepancies in the location of tell-tale holes in staybolts, prompts us to present the accompanying line drawings illustrating the practice followed in drilling staybolts in a division shop of one of the prominent western systems. The criticism in view would imply that tell-tale holes are often drilled so hurriedly and that so little care is observed in their proper location at the centre of the end of the bolt that the hole fails to insure immediate indication of the presence of a crack in the bolt to which it is applied.



The Proper Location of Tell-Tale Holes.

That this careless practice can not be general and that the central location of the tell-tale hole is considered essential is evidenced by the use of the arrangement here presented, by means of which each staybolt may be drilled quickly and the central location of the hole insured. The appliances used are simple in application and construction. An "L" shaped stand is so constructed that it may be securely bolted to the table. In the vertical side of this stand is a semi-circular groove machined to accommodate the bolt. The bolt is maintained securely in a vertical position within this groove by a clamp which extends through the vertical plate and which terminates in a thumb-nut by means of which the clamp may be tightened and the bolt drawn securely against the plate. When the bolt is securely fastened a thimble is placed over the upper end and in the centre of this thimble is a hole of such size as to guide the drill to the centre of the end of the bolt and insure against the drill working away from the centre. This method may be followed very rapidly and the accuracy with which holes are located is clearly evident. The details of the several parts are presented in the engraving.

In presenting these illustrations we acknowledge the courtesy of Mr. J. P. Peach, general foreman of the Ft. Madison shops of the Atchison, Topeka and Santa Fe Railway.

Committee on Subjects---Master Mechanics' Association

The Committee on Subjects of the American Railway Master Mechanics' Association has sent out the following: "The duty of the above-named committee is to recommend to the next convention what subjects it believes desirable should be discussed by the association during the year 1904-5. The committee considers that the members in general should have some voice in the selection of these subjects, and therefore requests that you advise the chairman of what, in your opinion, should be investigated under the following heads:

"1. Committee Work.—The investigation of a great many subjects requires that tests and experiments be conducted, which can best be done by the co-operation of several members, and therefore it is advisable that the question be referred to a committee.

"2. Individual Papers.—In a great many instances, the presentation of a subject through individual members of the association is found desirable, because of the writer's familiarity with all its details. You probably know members who have made a careful study of some certain feature of locomotive or shop work, and the presentation of a paper by such member forms an instructive part in our program.

"3. Topical Discussions.—The noon-hour discussions have become an interesting part of our conventions. Where we have good, live topics, with sharp, snappy and to-the-point discussions, allowing each member five minutes to express himself, much valuable information is obtained, which otherwise would not be brought out.

"Please send your replies as promptly as possible to Mr. Henry Bartlett (chairman), superintendent motive power, Boston & Maine Railroad, Boston, Massachusetts. Henry Bartlett, chairman, J. F. Deems and A. W. Gibbs, committee."

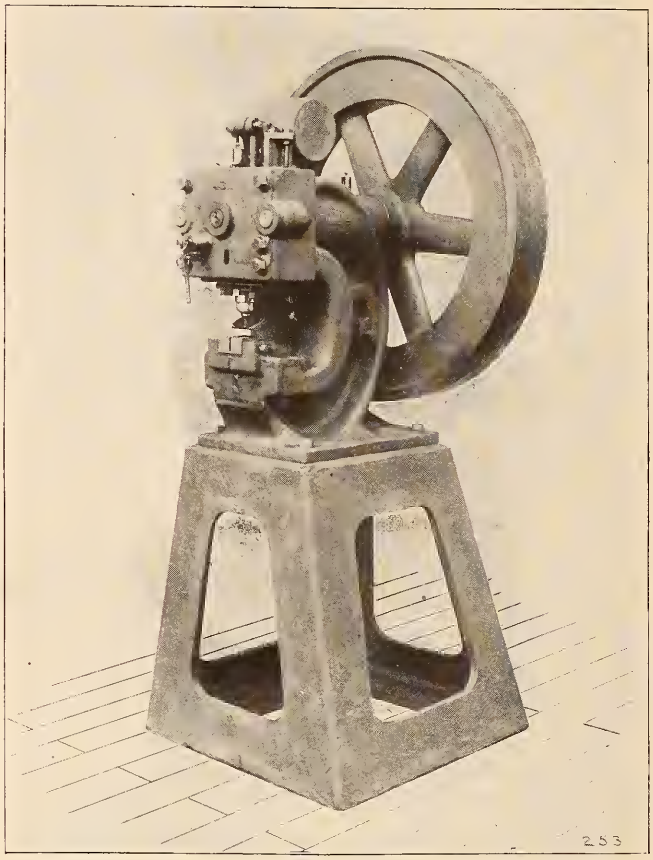
Cleveland Style "B-A" Punching Machine, Built by the Cleveland Punch & Shear Works Company

The fly wheel and shaft of this machine run continuously, and by means of an automatic gag which operates on the plunger only, the plunger can be stopped at any stroke of the machine at the highest point in its travel. The gag which is shown on the front of the cover plate is very quickly and easily operated by the small lever marked "A", which throws out automatically, stopping the entire plunger. By this means the punch can be operated at a high speed without any shock or jar.

The punch holder and die socket are adjustable, and the die block of the machine is so designed that all kinds of structural shapes, bars, plate, etc., may be punched. Shearing tools can be easily substituted for the punching attachment. The cast iron base on which the machine is mounted may be dispensed with, and the punch mounted on a bench.

The maximum punchng capacity of this machine is 5/8-in. hole through 3/8-in. plate, or 1/2-in. hole through 1/2-in. plate. Speed about sixty to seventy strokes per minute. Frame is of the solid Cleveland type.

In this machine, the makers have disposed of the clutch mechanism, which invariably gives trouble on a high speed punch, and have a means of operation which is



"B-A" PUNCHING MACHINE.

quick and sure. This punch is designed for use in small boiler shops, blacksmith shops and iron works, where a low priced tool is desired.

A Grant to Purdue University From the Carnegie Institution of Washington, D. C.

At the regular convocation of students and faculty of Purdue University, at La Fayette, Indiana, President Stone announced that a grant of $5,000 had been made by the trustees of the Carnegie Institution to Professor W. F. M. Goss to promote research in locomotive testing. In making the announcement, President Stone called attention to the large amount of research work in science, in agriculture, and in engineering, which has already been accomplished at Purdue, and expressed his appreciation of this added evidence of the confidence in Purdue's ability to do things well.

The Carnegie Institution was established and endowed by Andrew Carnegie for the purpose of extending aid to scientists whenever found in advancing important lines of scientific research. At the second annual meeting of the trustees, which was held at Washington, December 9th, more than a thousand applicants were considered, sixty-six of which received favorable action. Among these latter was the Purdue grant. Hitherto, aid has been chiefly given to workers in pure science, and generally in comparative small amounts. The grant to Purdue is probably the most significant gift yet made for work in an applied science.

Purdue has long been distinguished for its work in locomotive testing. In 1890 and 1891, in the process of developing an engineering laboratory for the instruction of students, a full sized locomotive was mounted upon a testing plant as a part of the laboratory equipment in such a way as to permit its performance to be accurately determined. Previous to this time, it had been extremely difficult to determine by means of tests on the road either the power or the efficiency of a locomotive, or to ascertain the effect upon the factors of minor changes in the adjustment of its mechanism. The advent of the testing plant solved the problem of locomotive testing. By its use the locomotive in operation becomes in effect a stationary engine and may be subjected to the same scrutiny and surrounded with the same accessory apparatus. This system of testing locomotives originated at Purdue and thus far the Purdue plant has remained the only one of its kind in the world. Since its installation, engineers from many countries have visited the university to acquaint themselves with its character. At the present time, the Pennsylvania Railroad is installing in the Transportation Department of the Louisiana Purchase Exposition, a plant which is practically a duplicate of the Purdue plant for use during the exposition.

The specific purpose of the grant which has been made by the Carnegie Institution is to aid in carrying out an elaborate study of the value of high steam pressures in locomotive service. A few years ago locomotive boilers were designed for a pressure of 150 pounds. At the present time, 180 or 200 pounds pressure are common, and designers are asking the question whether it will prove economical to still further extend the limit. In anticipation of such a study, the boiler of the present experimental locomotive of Purdue University was designed for 250 pounds, and it is in connection with this locomotive that experiments will be made.

The recipient of the grant, Professor Goss, the Dean of the Schools of Engineering of Purdue University, is the originator of the locomotive testing plant and has long been identified with the engineering work of Purdue.

Personals

Mr. L. E. Hassman has been appointed general foreman of the Illinois Central at Carbondale, Ill.

Mr. C. F. Bishop has been appointed road foreman of engines of the Chautauqua division of the Pennsylvania rialroad.

Mr. A. Becker, general master mechanic of the Louisville & Nashville Railroad at New Decatur, has resigned, taking effect February 1st, and will reside in Dayton, Ohio, where he has business interests.

The headquarters of Mr. J. W. Records, master mechanic of the Santa Fe Central, have been removed from Torrance to Estancia, N. M.

Mr. O. J. Kelly has been appointed master mechanic of the Ohio division of the Baltimore & Ohio, with office at Parkersburg, W. Va.

Mr. W. J. Bingley has been appointed assistant superintendent of machinery of the Western Maryland, with headquarters at Hanover, Pa.

Mr. W. T. Lambert has been appointed master mechanic of the Jonesboro, Lake City & Eastern, with headquarters at Jonesboro, Ark.

Mr. S. A. Hurd has been appointed assistant road foreman of engines of the Buffalo and Rochester divisions of the Pennsylvania railroad.

Mr. W. L. Calvert has been appointed master mechanic of the first division of the Denver & Rio Grande, with headquarters at Burnham, Denver, Colo.

The office of Mr. Alfred Lovell, assistant superintendent of motive power of the Atchison, Topeka & Santa Fe, has been removed from Topeka to Chicago.

Mr. A. P. Prendergast, master mechanic of the Baltimore & Ohio at Grafton, W. Va., has been transferred to Riverside, Baltimore, Md., in a similar capacity.

Mr. W. G. Wallace has been appointed superintendent of motive power and cars of the Duluth, Missabee & Northern, with headquarters at Proctor, Minn.; effective on January 1.

The office of master mechanic on the Duluth & Iron Range Railroad was recently abolished, and the office of superintendent of motive power created, Mr. H. S. Bryan being appointed to the latter position.

Taking effect February 1st, Mr. H. Swoyer, heretofore assistant superintendent of machinery of the Louisville & Nashville R. R., has resigned to become general manager of the Rogers Locomotive Works, at Paterson, N. J.

Mr. L. L. Collier has been appointed general foreman of machine shops of the Arkansas Southern, with headquarters at Ruston, La. Mr. Collier formerly held a similar position with the Southern Railway at Columbia, S. C.

Mr. J. J. Dowling has been appointed master mechanic of the Great Northern at Everett, Wash., to succeed Mr. F. J. Clark, who has been appointed master mechanic of the Spokane Falls & Northern, with headquarters at Spokane, Wash.

Mr. J. E. Anderson, who resigned about two years since as master mechanic of the International in Monterey, Mex., and engaged in the foundry business in El Paso, has given up his business there and returned to the service of the International as master mechanic at Monclova, Mex.

Mr. Peter Maher, master mechanic of the Indiana, Illinois & Iowa Railroad, has been appointed superintendent of motive power of the Lake Shore & Michigan Southern, west of Toledo, and the Indiana, Illinois & Iowa. He is to have charge of the road work, and Mr. Cross, master mechanic, will have charge of the shop work.

Mr. W. P. Garabrant, air brake inspector of the Pennsylvania R. R., sailed for Europe a few days ago for the purpose of bringing to this country the De Glehn compound constructed especially for the testing plant at the St. Louis exposition, and afterwards to be put in commission on the Pennsylvania R .R., where opportunity will be given for the demonstratinfoots ithm hmb tunity will be given for the demonstration of its good points in actual competition with the best power built in this country.

There has been a rearrangement of the territory of the superintendents of motive power on the entire Baltimore & Ohio system. Mr. E. T. White in the future will have charge of the entire main line territory which includes the old lines of the Baltimore & Ohio east of the Ohio river with the exception of the Wheeling system and the Pittsburg division, with office at Baltimore, Md., and A. Kearney will have charge of the Pittsburg division and the Chicago grand division, while Mr. G. A. Schmoll will look after the Wheeling grand division, and will have his headquarters at Wheeling, W. Va.

Friction and Lost Work in Machinery and Mill Work, by Dr. R. H. Thurston, late director of Sibley College, Cornell University. The seventh and enlarged edition of this work contains a considerable amount of new matter, and something in the nature of a summary has been added, bringing it up to date. The methods of the author and the apparatus long ago devised by him for the purpose of researches in this direction have meantime found constant and fruitful use, both at home and abroad. In some instances dealers and makers of lubricants have furnished copies of past editions of the book to their actual or prospective customers to give them a sound knowledge of the principles underlying a good practice and of the facts revealed by the experiments of scientific investigators. A new chapter has been added, in the present edition, in which the most important of the later researches, so far as they have become known to the writer, have been abstracted. Much new information has also become available in relation to the classes of lubricants, old and new, which have been found suitable to special uses, and the adaptation of its special lubricant to every rubbing part, its load and its velocity of rubbing being considered. The rsearches described in the added text relating to the high-speed work of electric generators and motors and of the turbine, have peculiar interest at this time and must have permanent influence upon future designing in this department of mechanical engineering. The work of Lasche has been summarized with exceptional detail. The continuation of the work of the earlier investigators and its smooth connection with the later researches is exhibited graphically in accompanying engravings, and the graphical method is utilized, when practicable, in giving clear and realizable presentations of the laws underlying the data obtained by experiment.—Published by John Wiley & Sons, New York City. Price, $3.

Notes of the Month

The Ajax Metal Company, of Philadelphia, Pa., have purchased the business, plant, good will and fixtures of the late Bates Metal Co., of Birmingham, Ala., and will continue the metal business in all its branches under the name and title of the Ajax Metal Company of the South, Birmingham, Ala.

Forging and special machinery, punches, shears, etc., are the subjects illustrated and described in a carefully arranged catalogue of 110 pages which is being distributed by Williams, White & Company, Moline, Ill. Those interested in forging work and desirous of observing same of the form quickly made by modern machines will do well to procure a copy of this catalogue.

The Detroit Graphite Manufacturing Company, of Detroit, Mich., have issued a handsome booklet regarding their "Superior Graphite Paint," telling "WHAT IT IS," "WHAT IT DOES," "HOW IT'S MADE," "WHAT IT'S FOR," "WHERE IT GOES," etc. The booklet is handsomely illustrated and is worth sending for to the company, who will furnish them on request.

Some of the finest work in the way of railway advertising matter has just been issued by the passenger department of the Frisco System. In a publication under the title of "There is Something to See along the Frisco System" are given some exceedingly handsome and artistic illustrations of the scenery along the line of their road. Judging from the beautiful pictures in their booklet, there is certainly something to see in the country through which runs the lines of the Frisco System. The passenger department is certainly to be congratulated on the fine manner in which their literature is being published.

Adreon & Co., of St. Louis, Mo., is a recently organized company dealing in railway supplies. The officers are E. L. Adreon, Jr., president; E. W. Hodgkins, vice-president; D. R. Niederlander, secretary and treasurer. The formation of their company is for the sale of general railway supplies and equipment and iron and steel. They will be the southwestern sales agencies for the following manufacturers: American Brake Shoe & Foundry Company, Railway Appliances Company, the T. H. Symington Company, Railroad Supply Company, American Rolling Mill Corporation, Dressel Railway Lamp Works, Paul Dickinson, Diamond State Car Spring Company, Universal Oiler Company.

The Cleveland Twist Drill Company, of Cleveland, O., have just issued a booklet on "Twist Drills, Their Uses and Abuses," and in the introduction their aim is told as follows: "It is the aim in this little leaflet to present to our friends a brief and comprehensive collection of ideas, based on our own practice and observation, on the use of twist drills, and to assist them in obtaining an increased cutting capacity combined with maximum durability and a general satisfactory performance. We are aware that this pamphlet contains very little that is new or original with us, and trust that advanced mechanics and artisans into whose hands it may fall will be fair in their criticisms, bearing in mind that while they are familiar with all that it contains, there are a large number of users of such tools who have not had the opportunity to acquire the needful information, and it is especially for this class of workmen that the leaflet is intended."

"Dallet Pneumatic Tools" is the title of a pamphlet just issued by Thos. C. Dallett Company, York street and Sedgley avenue, Philadelphia, Pa. The Dallett Company was established in 1883 and has been engaged in the manufacture of pneumatic tools for the past six years. From the establishment of the company to the present time it has been their constant aim and endeavor that their products should represent the highest development that the most skilled labor and talent were capable of producing. As this has been their policy in the past, so it shall be in the future, and no expense or pains will be spared to promote the excellence of their tools or the kindly feeling now existing between their patrons and themselves. Their business has grown far beyond their expectations and their success is attributed directly to the high standard of their tools and fair treatment of their customers. Their facilities for manufacturing are unsurpassed and are constantly being increased to meet the continually growing demand for their products.

Among the recent sales made by the Hicks Locomotive & Car Works are the following: One 45-ton locomotive to the Wisconsin & Arkansas Lumber C.; one switch engine to the Pullman Company; one 55-ton engine to the Middle States Construction Co.; one 17x24 locomotive to the James Mullins Coal Co.; one 40-ton locomotive to the Patton & Gibson Co., contractors; one 65-ton and two 55-ton locomotives and five box cars to C. the Des Moines City Ry. Co.; twelve dump cars to the Chicago Portland Cement Co.; ten tank cars to the Hollandale Oil Co.; one flat and two box cars to the Tremont Lumber Co.; four dump cars and one flat to the Western Electric Co.; four logging cars for the Northwestern Cooperage & Lumber Co.; four barrel cars to the Omaha Cooperage Co.; ten flat cars and one tank car to Patton & Gibson Co.; one box car to the Owen Lumber Co.; four flat cars to the Bon Air Coal & Iron Co.; ten flat cars to the Carolina & Western R. R. Co.; six box cars to the Wichita Valley Railway; four flat cars to the Himmelberger Lumber Co.; twelve box cars, three flats, one caboose to St. Louis, El Reno & Western Railway; ten box cars, twenty cordwood cars to the Valley Railroad; five flat cars to W. N. Sharp, contractor; seven tank cars to the United Zinc & Chemical Co.; eight flats to the Kane & Elk Railway; two passenger coaches to the Vancouver, Westminster & Yukon Ry.; one theatrical car to C. E. Beyerle; two flat cars to the Ohio River & Columbus Railway; one flat to the Electric Construction Co., Cleveland, O.; two flats to Winona & Warsaw Ry. Co.; two locomotives to Callahan Bros. & Katz, contractors; one passenger coach to the Illinois Terminal Railway; two passenger coaches to the Toledo, St. Louis & Western Railway; one theatrical car to Mrs. Harry Ward; one coach to St. Louis & Hannibal Railway; one coach to Chicago, Peoria & St. Louis Railway; one dining car to Chas. H. Gates, mgr. Gates Tours; one combination car, one passenger coach to Northwestern R. R. of South Carolina.

Fig. 2—Adjustable Pipe Stocks and Dies in Use.

Improved Bushing Pipe Plates

Attention is called to the illustration given of an improved bushing pipe plate which is at present being introduced into the market by the well-known manufacturers of screw cutting tools, Wells Brothers Company, of Greenfield, Mass.

The manufacturers claim superiority in the tools illustrated, from the fact that the adjustment of the dies is simplified by doing away with screws and bolts, as are used in a great many plates at present in the market.

Fig. 1 represents the stock used in these plates, the die being held in same by bevel both on the die and in the stock itself, while the bushings are held in a guide and can be changed very readily from one size to another.

The handles are made of pipe, so as to get lightness, and at the same time they are of ample length to give leverage for the different sizes used in the stock. They are packed for shipment in elegantly furnished cases, each stock having a compartment for the dies and bushings used in the assortment for which the box is intended.

Dies are adjustable to overcome variation in fittings; they can be resharpened, and the stocks are made of a variety of different lengths for the work required.

The experience of years in the manufacture of threading tools for both bolt and pipe has demonstrated to the manufacturers that a plate made on the principle of the one illustrated, at a moderate price, will be appreciated by the mechanic who is looking for a serviceable tool.

These plates are made to cut all sizes of pipe from 1/8 to 2 inches inclusive, and the assortments are made in the most convenient way, some of them not only including the stock with right hand dies, but left hand dies and taps for each size in the different assortments are conveniently arranged in the cases to which we have already referred.

The manufacturers would be pleased to place in the hands

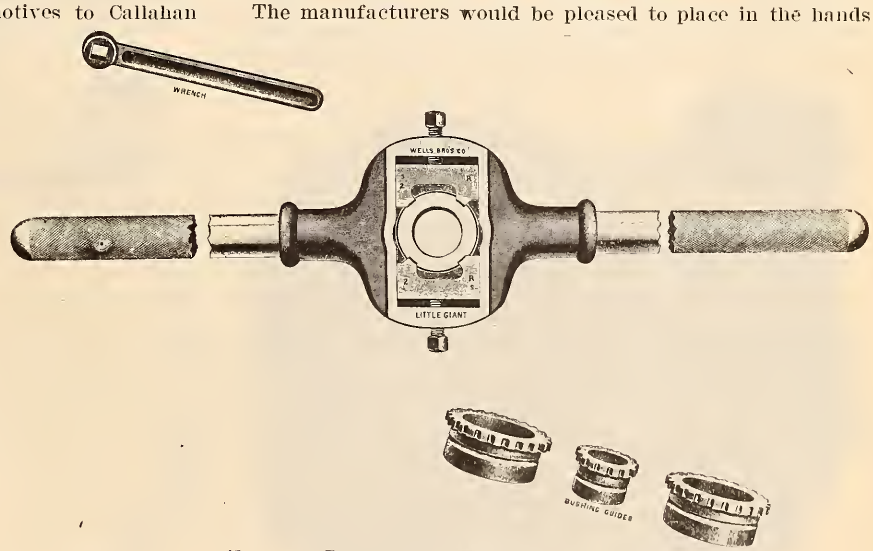


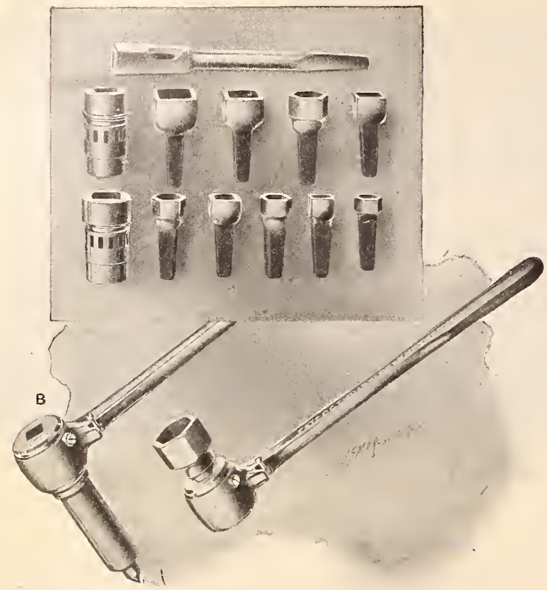
Fig. 1—Stock and Bushing Guides.

of all inquirers a copy of their catalog, giving prices and description of the goods.

Fig. 2 shows stock, complete, in case.

Reversible Ratchet Wrench

Greene, Tweed & Co., of New York, have placed on the market a very compact wrench and ratchet drill. This wrench is particularly well adapted for all kinds of work on account of being able to apply or remove the nut by a continuous motion. The nut can be screwed down any distance on account of the bolt passing through a hole in the top of the die. The nut is encompassed on all sides and thus cannot slip or injure the nut. Reverse motion is instantaneous by simply turning pawl from right to left or vice versa.



Reversible Ratchet Wrench.

The handles are of such size that they take from three to five sizes of bolts. However, these same handles can be used for drilling by applying a drill head to the handle.

McCord Journal Box

One of the chief objections made by mechanical officials to the usual designs of patented journal box and lid, is the matter of inefficient dust guards, and in the effort to obviate this difficulty a new complete journal box has been placed upon the market by McCord & Co., Old Colony building, Chicago. This device, which is illustrated in the three accompanying engravings, is understood to give superior protection to the journal at the rear of the box as well as the front. In its design the attempt to make a dust proof and oil-tight joint between a rough casting and a wood or metal guard has been abandoned and the problem solved in the manner set forth in the following description:

The dust guard slot is cut entirely off from the standard box. Around the opening for the axle in the rear a slight boss is cast which is ground to a plane surface. Flanges extending for about two-thirds of the height of the box and ¾-inch wide are cast on the sides of the box at the rear. The dust guard itself consists of a grey iron ring turned to fit the dust guard seat of the axle enclosed and carried by a malleable iron shell which is held to the back of the box by springs encased in the hook lugs overlapping the box flanges. The surface of the dust guard ring next the journal box is ground to a plane surface. The action of the guard is as follows:

The springs force the malleable iron shell against the grey iron ring and the grey iron is in turn forced against the ground surface of the boss around the rear opening of the box. The springs are strong enough to carry the entire weight of the guard so that no weight rests upon the axle. The guard is free to move with the axle in any direction. A machined joint connection is therefore obtained between the box, the guard and the axle in all positions.

It will be noticed from the illustrations that the surface of the grey iron ring in contact with the malleable shell is beveled and that there is a corresponding bevel on the shell. It is obvious that the grey iron ring can be made in sections if desired and if so made the beveled surfaces of the malleable shell and the grey iron segments coming in contact under strong pressure tend to force the segments towards the center of the circle and to take up any wear which might occur. The advantage of the compensating feature with this guard, however, is more or less theoretical, as there is so little wear on the solid guard that in service it would probably never have to be renewed during the life of the car. Tests of this guard in passenger and engine tender service have shown a mileage of upwards of 100,000 miles with less than 1-64 of an inch wear. The dust guard seat on the axles used in this test were turned with a rough cut and the tool

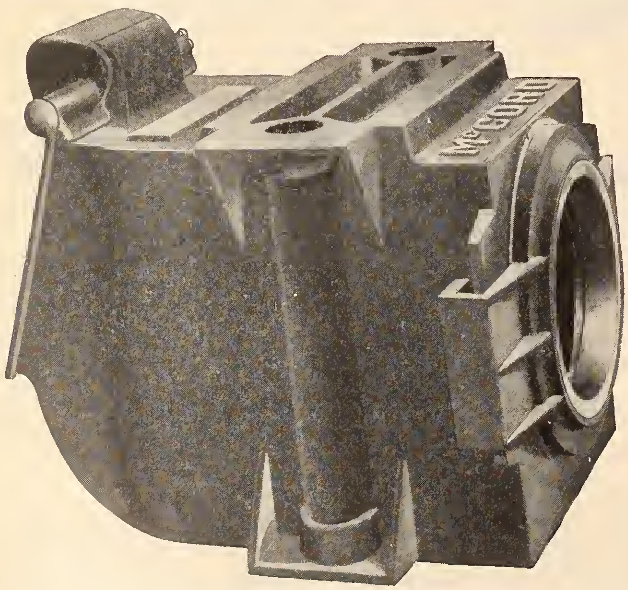


Fig. 1—McCord Journal Box With Outside Dust Guard.

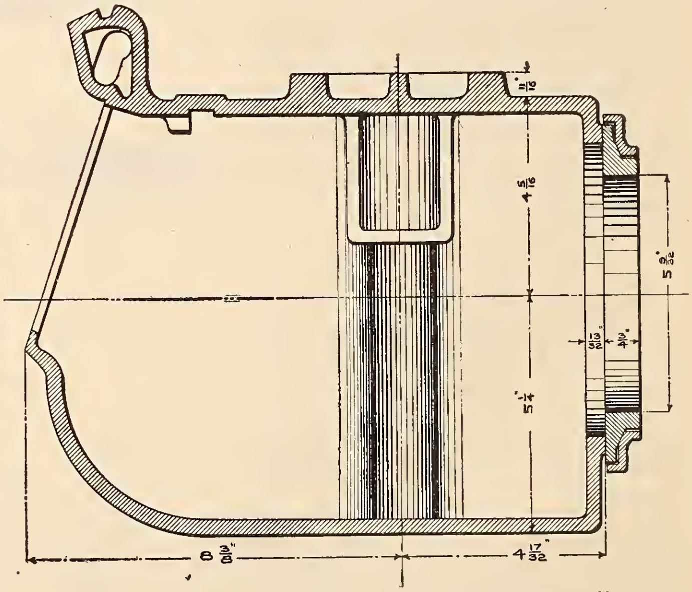


Fig. 2—Sectional View, McCord Journal Box.

marks were still visible at the last examination, showing no wear on the dust guard seat. The mileage so far made demonstrates that the dust guard will undoubtedly last as long as the ordinary freight car.

Among the advantages claimed for the guard are the following: It consists of fewer parts than any other dust guard, four pieces forming a complete guard. It is composed entirely of metal and cannot be destroyed by a hot box. It raises the oil level at the back of the box as high as the center of the journal, amounting to from 3⅛ to 4 inches.

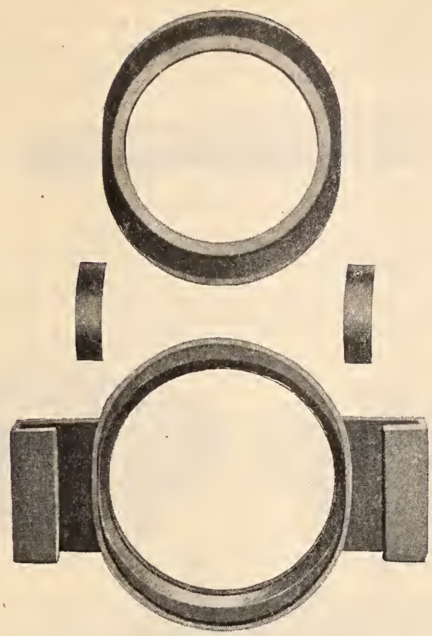


Fig. 3—Outside Dust Guard for McCord Journal Box.

The dust guard slot being eliminated the guard cannot become clogged. If the compensating guard is used there is no possibility of dirt interfering with its action. It gives ⅜ of an inch more clearance between the back of the guard and the hub of the wheel than exists in the box with the dust guard slot, this additional clearance eliminating hub wear on the back of the box.

The same malleable iron shell is interchangeable for either compensating or solid dust guard ring. If it is ever necessary to apply new wearing rings, they can be made by the railroad company or purchased at a cost of about five cents per box. On account of the saving in the weight of the box proper, the cost of the box complete with this guard is very little in excess of the ordinary box with wooden dust guard.

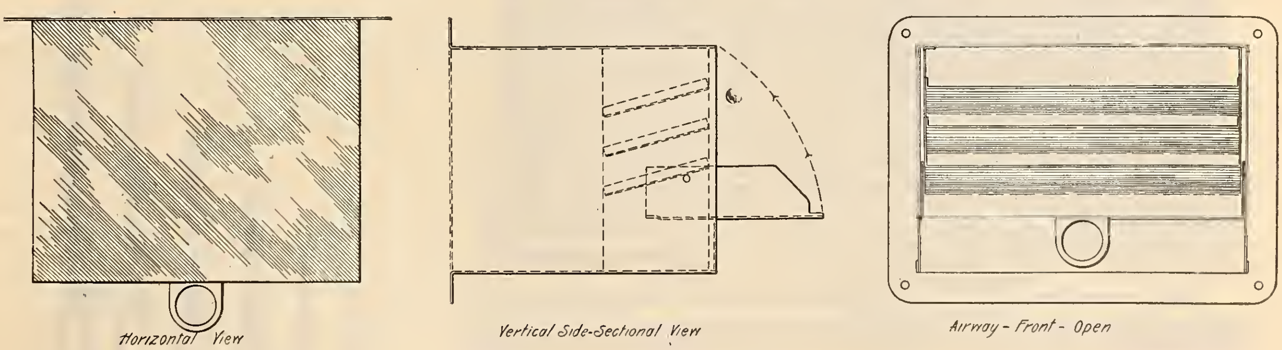
The McCord box with the outside dust guard has been specified on about 5000 cars, among which are 1000 New York Central & Hudson River R. R. and 100 Denver, Northwestern & Pacific now being built.

Automatic Car Ventilator

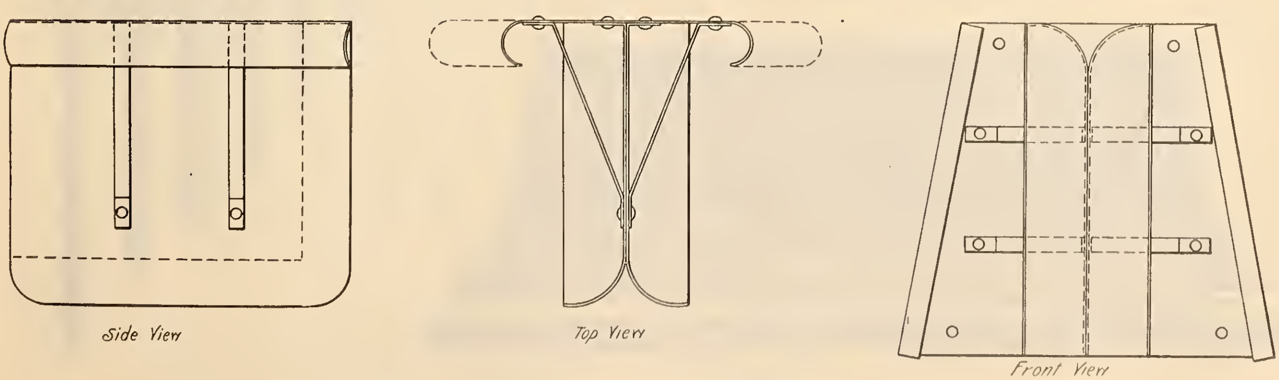
The accompanying line drawings show a recent invention for car ventilation. The details of the ventilator are plainly shown in the drawings.

When the car is in motion the air striking the extended double wing is deflected, without a particle of smoke, cinders, dust, rain or snow, into the forward airway. The slanting louvres in the inner end of the airway project the air to the roof of the car, precluding all draft. The action of the air on the extended double wing maintains a partial vacuum behind it which produces a strong suction through the rear airway. When the direction of the car is changed the action of the ventilator reverses. The shutter provides perfect control of the intake of air, but requires no attention, except that in very cold weather it is partly closed. An entire change of air in from sixty to ninety seconds can be made if desired, and without draft. The ventilators are installed in the deck sash, ten sets being required for an ordinary coach. They are made of chilled steel, japanned; and there is no possibility of their getting out of order.

They have been successfully tested on a number of electric roads, but our readers will be more especially interested in the fact that they have the endorsement of the New York Central, have been specified by the Delaware, Lackawanna & Western for the new dining cars building for them, and have been adopted by the Central Railroad of New Jersey as standard on their system. Further information will be furnished by the Automatic Car Ventilator Company, 39 Cortlandt St., New York City.



Automatic Car Ventilator.



Automatic Car Ventilator.

Taps and Dies

The accompanying illustrations represent some of the specialties of the Wiley & Russell Manufacturing Company, Greenfield, Mass. These screw cutting tools, which they first introduced when the "jam plate" was the only thing in general use, are now approved and adopted on a large scale. The work they do is much better, and it is done with far less difficulty than by the old methods. The adjustable tap wrenches will be found to be well fitted and serviceable; the stocks are drop forged and the dies milled out of the best tool steel, so as to grip the squares of the taps evenly and firmly.

Figures 1 and 2 show sets of their regular screw plates

FIG. 3—PATENT ELASTIC STOCK.

and dies. There are three tops to each size, taper, plug and bottoming, instead of one to a size.

Fig. 3 illustrates the elastic stock used with all "Green River" screw plates. The quality of the "Green River" screw plate, both as to material and workmanship, is up to the company's standard, and its simplicity and durability, with its moderate price, make it particularly attractive. Like the "Lightning" plate, it does its work at a single cut. The die is adjustable for wear, and to make bolts or nuts fit tightly or loosely, as may be desired. The stock used is similar to the "Lightning" and the taps the same.

The principle of the die will be understood by an examination of Fig. 4. One of the illustrations of this figure represents a die and guide complete; the other a die and guide divided to show the mechanism. The cup-headed screw on the left holds the halves firmly together, acting as a hinge, while the size is regulated by the wedge-shaped (taper-head)

FIG. 6—HAND TAPER TAP.

screw on the right, the whole being clamped in the elastic stock shown in Fig. 3.

For cutting close up to a shoulder, use the face side of die after starting the thread with the guide side.

The tap wrenches are made thoroughly strong and dur-

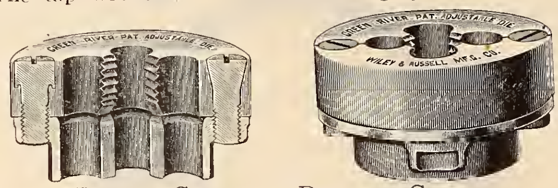


FIG. 4—COMPLETE DIE AND GUIDE.

able. The stocks are drop forged, the jaws of tool steel closely fitted, the handles of best bicycle tubing.

Both handles are firmly fixed, the motion to the jaw being given by means of the knurled thumb nut through differential screws.

The Porteous Injector

The important duty of an injector in the operation of a boiler and the annoyance consequent upon the failure of this appliance render it worthy of the greatest care both in its selection and the condition in which it is kept after being placed in service. It is necessary that the injector supplies the requisite amount of water to provide for the evaporation within the boiler, that it can be depended upon

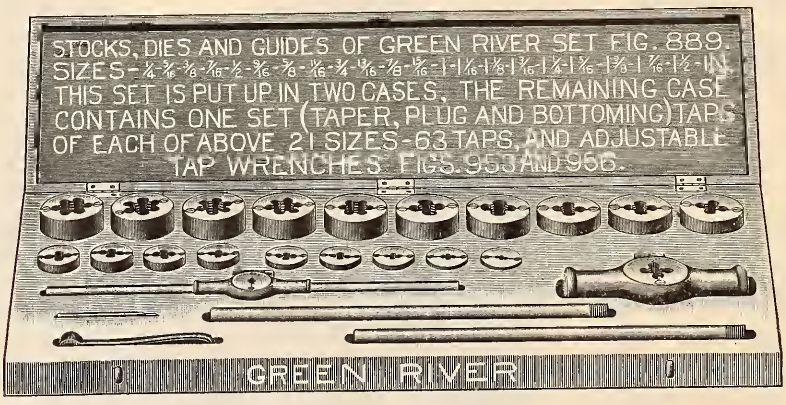


FIG. 1—WILEY & RUSSELL TAPS AND DIES.

FIG. 2—WILEY & RUSSELL TAPS AND DIES.

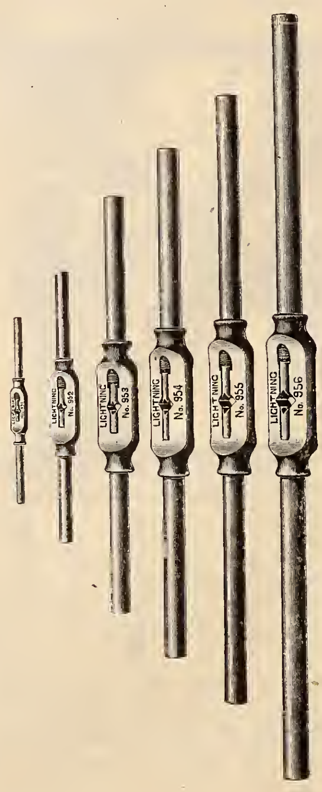


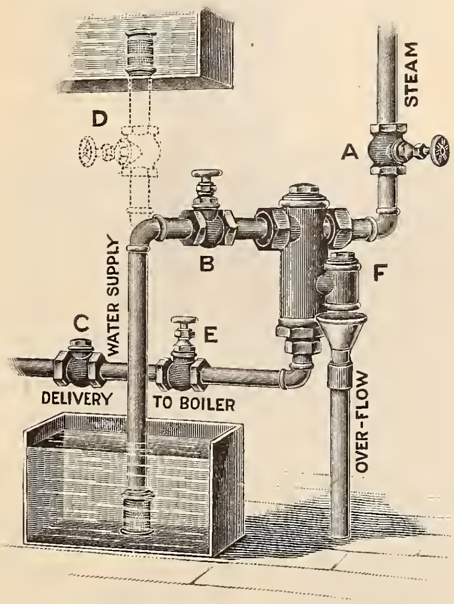
FIG. 5—ADJUSTABLE WRENCHES.

to supply this water and with certainty. To do its maximum amount of work the injector must be in perfect condition and must be kept in perfect condition with all passages free.

The Porteous injector is one for which its manufacturers claim that it is automatic and thoroughly reliable under extreme conditions, while retaining the utmost simplicity of construction. When this injector is working and forcing the water to the boiler and the current of water is suddenly broken by any cause, such as a sudden jar or jolt, the injector will pick up the water and again establish the current to the boiler automatically without the least attention from the engineer.

When this device is being applied it is well to bear in mind the following suggestions:

First—All the pipes, valves and fittings must be of the full



THE PORTEOUS INJECTOR.

size to correspond with the size of the injector, except when the water must be drawn from a long distance, then the ordinary suction pipe should be a size or more larger than the injector fittings call for.

Second—All the joints and connections must be perfectly air tight.

Third—A strainer should be fixed on the end of the water supply pipe to prevent the admission to the injector of foreign matter, such as chips, shavings, weeds, etc.

Fourth—A globe valve and check valve is necessary on the steam supply pipe between the boiler and injector. Between the injector and the boiler it is also necessary that the connections should have as few bends as possible and they should invariably be round.

Fifth—All pipes and connections must be blown out clean. This is of vital importance, as dust and pipe cuttings cause nine-tenths of the leakage in new valves.

Sixth—Take steam from the highest point of boiler possible and never connect with any steam pipe used for any other purposes.

Seventh—Repack stem of globe valve, as nine out of ten leak. Put the globe valve near the injector, so that it shuts against the supply; that is, so the water comes up under the seat. Many people put these on just the reverse. If water supply comes from water pressure of over 25 lbs., we advise a smaller valve and water supply pipe than injector couplings; that is, for a one-inch injector use a three-fourths inch globe valve and water supply pipe. Never use a pipe smaller than the injector connections when water supply is taken from a lift. If more than ten feet, the suction pipe should be one or two sizes larger, reducing to injector size as near injector as possible, and have the globe valve the same size as the large pipe. If you have a long pull in addition to a very long lift, a pipe two sizes larger is preferable; this pipe must be tight. When forcing water through a heater, place a check valve between the heater and the injector.

Eighth—On a lift of over ten feet, a foot valve on the lower end of the water supply pipe is a great advantage in starting the injector and a great saving in steam.

Ninth—Place a check valve at least two feet from the injector if possible, and be sure the valve lifts freely.

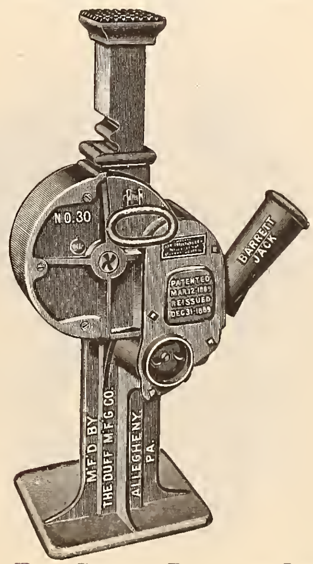
Tenth—A short piece of pipe may be screwed into the overflow, to carry off waste. A long piece interferes with the vacuum and must not be used on a long lift or draw. Place a large piece of pipe under overflow as shown in the cut.

Eleventh—A pet cock or tee with globe valve anywhere between the check valve "C" and the injector will help very materially in starting on low steam pressure. Leave open until the injector is started, then close. This is also convenient for draining discharge pipe in winter.

New Barrett Geared Ratchet Lever Jack of 30-Ton Capacity

The demand for a quick, positive and durable lifting jack, for handling loaded freight cars, heavy passenger and Pullman coaches, etc., has been met by the Duff Manufacturing Company of Pittsburgh, Pa., in their new Barrett geared ratchet lever jack of 30 tons lifting capacity.

This jack is designated as the No. 30 Barrett jack, and has many features which will commend it to those having



BARRET 30-TON GEARED RATCHET LEVER JACK.

heavy loads to be raised quickly and easily. It is made of refined malleable iron and steel throughout in a substantial manner, and is operated in the same manner as the well known No. 19 Barrett jack. The jack is single acting and automatic lowering.

The lifting bar or rack is of high grade open hearth steel, and is raised by a machine cut steel pinion. This pinion is integral with a large steel gear having ratchet teeth on its circumference. The gear is rotated by means of a socket lever and pawl, and the retaining pawl together with the automatic lowering device is the same as is used in the No 19 Barrett single acting automatic lowering jack.

All parts are accessible by removing the shield and gear cover, the removal of which does not in any way impair the working of the jack.

The direction is controlled by an eccentric at the side of the frame.

The method of rotating the gear by a socket lever and pawl requires no special care on the part of the operator, as it is not necessary to pull the socket lever out a short distance in order to engage the next tooth of the gear. The method of operation is simply raising and lowering the socket lever, as in the other sizes of Barrett jacks.

This new Barrett jack is an improved quick acting jack for the rapid handling of heavy loads of any character. It has the simplicity of an ordinary lever jack, the leverage being especially compounded to permit ease of operation and quick action. The jack has no complicated features and canot get out of order.

This jack displaces the slow cumbersome hydraulic jacks, as it lifts rapidly and easily. It is reliable with no intricate parts, and is less expensive in first cost and cost of operation. There are several important features of this new jack covered by patents.

The Duff Manufacturing Company will make several designs of this geared ratchet lever jack in sizes to meet all heavy lifting purposes.

Automatic Friation Board Lift Drop Hammer

The principal improvement in the hammer here illustrated consists in a new design of head, or lifter, which is claimed to be the simplest and most effective yet offered. The hammer can be made to strike either a heavy or light blow, at the will of the operator; or, by the automatic attachment, a succession of heavy blows can be given without raising the foot. The weight of the ram, the height of the uprights, or the distance between them can be varied to suit those installing the machine.

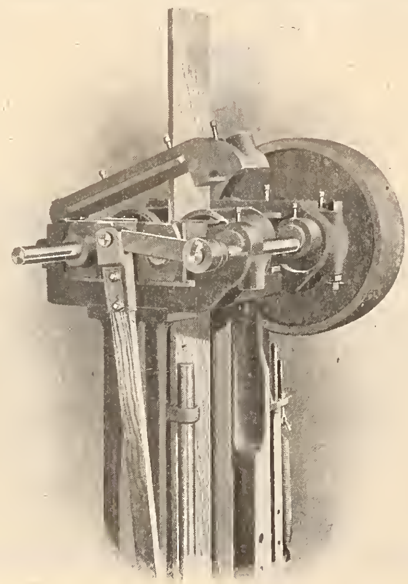


Fig. 1—Drop Hammer Head.

In this new head, or lifter, the brass eccentrics formerly used have been discarded, and a forged steel cam shaft has been substituted, which is fixed solidly at both ends into the head casting, and connected to a wooden rod by a lever forging. This straight wooden rod entirely prevents any shock being received by the lifter.

The friction roll shafts are babbitted into sliding boxes. The front boxes are connected by links to the steel cam shaft, which, when rotated through a small angle, moves the front roll in a horizontal direction, to and from the lifting board attached to the ram. In use, the rear roll boxes are stationary, but can be adjusted horizontally to compensate for wear of board.

By this arrangement of sliding boxes and horizontal motion, the movable roll advances in lines with the center of the opposite fixed roll, which insures the pressure of each roll against the lifting board, being directly opposite.

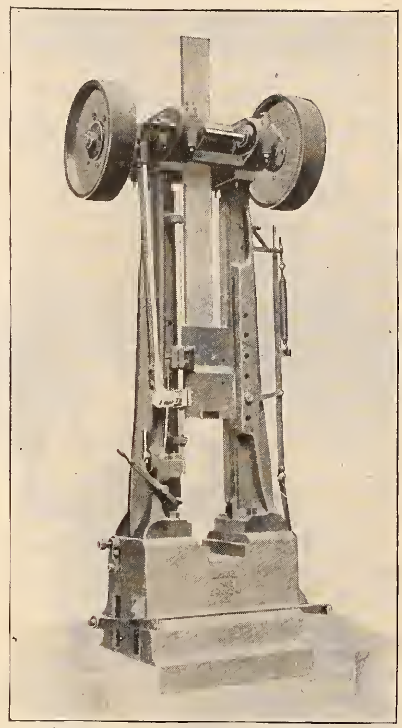


Fig. 2—Automatic Friction Board Lift Drop Hammer.

Furthermore, in case the friction rolls should not be properly adjusted, it is impossible for the rod to fall far enough to allow the cam to pass beyond the center, and thereby causing the rolls to bind and throw off the belts.

The rolls are a driven fit to the shafts, and keyed to the same.

The lifting board is fastened in the hammer by means of wedges, which permit the use of straight boards as received from planing mill and without further preparation. Further information may be obtained from the manufacturers, Merrill Bros., Brooklyn, N. Y.

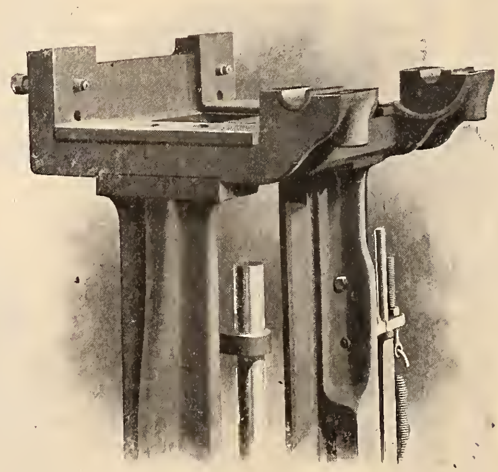


Fig. 3—Drop Hammer Lifting Frame.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. A. Portrait Gallery

Fred W. Bowers.

Mr. Bowers, who succeeded Mr. Robert McKeon, in charge of the Kent, Ohio, paint shop of the Erie, was born at Columbus, O., Sept. 21, 1862, and served his apprenticeship as car and locomotive painter at the Hocking Valley R. R. shops at Columbus; and, after a six years' term of service, he left that company and served in the capacity of journeyman for the Chicago, Rock Island & Pacific Ry., which latter position he resigned to accept the foremanship at the Connotton Valley (now W. & L. E.) shops at Canton, O., which he retained for three years, leaving this road to accept a similar position

Mr. Fred W. Bowers.

on the Valley R. R. (now B. & O.) at Cleveland, O., and stayed there two and one-half years, when he accepted the foremanship of the Erie R. R. paint shop at Cleveland, O., being employed there eleven years, when he was transferred to the Kent shop to fill the position made vacant by our worthy secretary, Robert McKeon, he having resigned October 1, 1901, and has been located there since.

He serves as a member on the Board of Education of Kent, with Bro. McKeon; also he was re-elected the 11th inst. to serve as president of the Kent Shops and Round House Relief Association for the second term.

Mr. Bowers became a member of the M. C. & L. P. A. in 1889 at the Chicago convention held that year, and is a member of the Committee on Information for the present year.

The Advisory Committee will meet in Pittsburg, Feb. 20, at the Hotel Lincoln. All railway foreman painters who can attend will be welcome.—J. H. Kahler, Chairman Advisory Committee.

A Visit to Another Convention

Mr. "Sam" Brown, of the New York & New Haven road, and the writer, were invited guests at the convention of the Society of Master House Painters and Decorators of Massachusetts, held at the American House, Boston, January 13-14. We were very cordially received, being escorted to the platform by Secretary Wall and introduced to the president and vice-president, and in turn to the assembly, by the president, and invited to address them, which we did, Brown first—"age before beauty." It really seemed as though we had awakened from sleep and dreams to one of our own conventions, as the members were all ablaze in the usual badges. They rather discount us in many ways, and from them we might learn some things to our advantage and follow suit. Though only a state association, and bad winter weather, there were 140 members in the hall by actual count, and Mr. Edward Hurst Brown, representing the Painter's Magazine there, told us that at the National convention, which is to be held at Toronto next month, there would doubtless be 195 members present from Canada alone. We were invited by Secretary Wall to give him the addresses of any of our members in that vicinity that he might send them invitations to attend.

The Boston convention had a good program with excellent papers on several subjects, that upon "Substitutes for Turpentine" in particular, which brought forth much discussion, in which we were invited to take part, and did so. There is no doubt in our mind but that there is much material parading under the name of the pure article that would properly be labeled "Substitute." We are told that one concern in Boston receives and distributes the pure product and that every barrel is tested on the wharf before it is received. If this product is obtained one gets a good article; but it has to be paid for. It is about 70 cents per gallon—more than twice its price of a few years ago. Now there is much hypothecated or sophisticated turpentine, or whatever you may call it, that comes from the Keystone state. We wonder if the long-leaf Southern pine abounds in that locality? The gentleman who presented the paper tested many substitutes and has promised us an analysis of one we are interested in. It would certainly be a great boon to the trade and a damper on trusts and combines if chemistry could come to us with a good substitute for this important article in the paint shop, at about half its price. We should divest ourselves of all prejudice and look into these things candidly and see if something else will not do equally well. We are informed that a certain street car system in Massachusetts is using a substitute with good success and we may try it ourselves to see what it is like. During the Civil War somehow the railroads North got along without turpentine, because they had to. We may have to again—from lack of the product on account of the depletion of the forests, if for nothing else. There is a book, or rather pamphlet, on this subject, that would interest painters generally, and may be obtained by writing one's own Congressman at Washington, no doubt. It is "A New Method of Turpentine Orcharding," and published by the Department of Agriculture. It is "Bureau of Forestry Bulletin No. 40," and by Dr. Chas. H. Hertz, 1903, illustrated.

To return to the convention, this society hires a large banquet hall of the hotel people and divides it up into floor space for exhibitors of painting materials, who have some fine booths, and thus more than $600 is gathered in to the good of the society's treasury. In another room is another display of the handicraft of members, in graining, marbling, etc. Mr. Wall, the secretary, is an expert grainer, having received first prizes at two Massachusetts State Mechanics Exhibitions, and also at the World's Fair, Chicago, 1893.

It seems that the M. C. &. L. P. A. might copy this last feature to good advantage. Supposing cars are plain now, let "the boys" show what they can do if called upon, and paint some nice scrolls, letters, designs and even pictures, and get up a good exhibit, with a tool appliance show also. They have extensive exhibits from supply men at Saratoga; why not with us on a smaller scale? Many things might be shown to good intent and advantage to all concerned. We make the suggestion for what it is worth.

All in all, the convention was a good one and took a large room for its meetings. A delegation of ladies came in during the business session and remained through—quite a novelty. We advise our members to fraternize with these associations and conventions when convenient as much may be learned from the house painters. No one knows it all.

The officers have a distinctive, official badge, very handsome, bearing the title of each office on a bar at the top. These are a permanent feature and are passed along to others as they are elected. What friend of the M. C. & L. P. A. will get up three badges for president, vice-president and secretary, and present them to the association "for the good of the order" in the near future? Here's an opportunity. Also, there's another—badges for past presidents. The M. C. B. Association past presidents received the latter some years ago.

The Essentials of a Modern Railway Paint Shop

By W. O. Quest, Master Painter, P. & L. E. R. R. Co.

The twentieth century is truly a wonderful railway age. As seeming betterments we have the merging of the great railway financial interests. We have the beneficial influence of the modern railway club and technical association, zealously fostered by the progressive railway official. We also have the especially devoted railway publication, which is the many tongued voice and beacon light of that world of interested people. We have the palatial million dollar railway depot and a worldwide noted, cultured, traveling public, ever willing to pay for the best railroad comforts and accommodations. To cater to this exacting class of pleasure loving people, the railway company must ever be on the alert, with the newest novelties in the way of the fast locomotive and modern passenger equipment. To take care of this vast equipment, involves large expenditures of time and money.

In our favorite journal we read accounts of the great modern railway shop plants that are being erected all over the country; how the A. B. C. and X. Y. Z. companies are installing a group of shops as good as brains can devise and money buy, and in a friendly way are vying with each other for the supremacy points in completeness. We also read the valuable opinions and view the photographed details of the specially designed machinery, illustrating the many particular fads and kinks of our country's most noted mechanical engineers, also of the recognized railway shop experts, a class of men always seeking and working in the unexplored territories for progressive knowledge, which, when found, is usually imparted to the railway reading world in able mechanical papers.

As a part of these new shop systems comes the advent of the modernly proportioned, arranged and equipped car and locomotive paint shop, which, in some long neglected localities, are hailed as a twentieth century innovation, and as such, are creating a great deal of interest among the readers of the car painting fraternity.

The installation of the new era railway paint shop, we judge to be synonymous with the coming of the almost wonderfully beautiful passenger equipment of today, which, as a matter of greatest economy, requires the greatest of care. This betterment of rolling stock, which is almost general, seems to have evolved a more liberal paint shop policy, especially liberal where compared with the almost drastic economy measures practiced in the past, which, with few exceptions, were to the effect that the paint shop was a good place to originate all shop retrenchment, also that some old building not fit for other use was good enough to convert into a car paint shop. It is a matter of history that there has existed a limited class of hard headed, old time shop officials, whose policy was such as to make one believe they thought a locomotive or passenger car should be painted like a fence or barn, and that a shop with a sky roof was good enough for the purpose. Modern times seemingly has obliterated all such characters. The conservative man of today is fully aware that it takes a dollar to catch a dollar and, as a consequence, the painting and maintaining of railway equipment has been stimulated to the extent that there is a demand for better paint shops, better materials, better work, better facilities and appliances, and, last, but not least, that the foreman of painters be also an up-to-date betterment, that he may be equal to the demands of modern times and conditions.

The matter of locating a car paint shop is, in our estimation, one of much moment. It should be so placed as to obviate all unnecessary handling of unfinished work, from fact that the practice of transferring passenger cars, which are undergoing paint repairs, about a shop yard, can be very readily attended with bad after results, caused by half dried coatings coming in contact with flying smoke-stack water, soot, coal and cinder dust, also the greasy, dirty hand of yard help, or the knock of the careless, or the touch of the inquisitive fellow always in evidence about large plants, who will, regardless of signs, surreptitiously leave his trade-mark in ascertaining whether or not the applied coatings of paint and varnish are dry enough to be fool proof.

In grouping the shops, the car building and painting departments should be as close together as possible, from the fact that there is much of the priming and surfacing work that can be brought up in building shop, which, if located at too great distance, involves the expense of much lost time in having men travel back and forth in the many coating operations. The location should also be such as to avoid all unnecessary vibratory motion, such as the running of heavy machinery, or train service, or other concussive elements calculated to keep the finer particles of shop dust in circulation, much to the detriment of clean work, especially the clean applied varnish, which is usually much sought for by the ambitious foreman, who is delighted when his shop environments are such as to permit him to produce that beautiful interior polished finish, always so critically admired by the cultured mind and eye.

THE ESSENTIAL CAPACITY OF A RAILWAY PAINT SHOP

would be, in our estimation, a shop large enough to monthly accommodate ten per cent of the company's passenger equipment, as a shop of this capacity would permit the entire equipment to remain in service during the busy passenger traffic season of mid-summer months, which is a shopping system that we have been given to understand affords very satisfactory results to railways having somewhat similar shopping schedules. In anticipation to the question as to what we would do with the car painting force during the unemployed months, we would answer by saying that we would employ the time and force in rushing the rapidly increasing caboose and freight equipment through the shops and repair yards. Such systematizing of freight car repairs would result in having all equipment which is to be repaired in good condition for the busy fall and winter freight traffic.

As viewed from a car painter's standpoint, the chief advantage of such freight shopping system would be that the best of results could be expected from both labor and paint applied out of doors in the good drying weather.

THE NATURAL LIGHT ESSENTIALS OF THE RAILWAY PAINT SHOP,

should be that of a steady volume of natural light radiated into shop, the amount being equal to if not greater than any kindred department shop in the group. The light should be so distributed as to cast as little shadow reflection as possible, also to shed a uniform light over the entire interior, regardless of number of cars standing in shop. A controlled sunshine should be invited into the building through an ample skylight, and as much side and end wall glass sections as would insure at least 60 per cent of glass openings. In order to shed a low floor line light, all shop window sills should have a line elevation not to exceed thirty-six inches above floor line of shop. As a mechanical help to both natural and electric light radiation, the paint shop interior should be white coated—white paint for the whole interior preferred—but, in any event, that the ceiling should invariably be coated with a good honest white lead paint, used to insure against all flaking up and falliug down, a trouble that inevitably occurs where the water mixed gypsum (sulphate of lime) or common whitewash (carbonate of lime) coatings are applied on the usual dressed lumber surface of a modern shop ceiling, which, we presume, is caused by the alternating atmospheric changes in heat, cold and moisture, which is said to cause this class of white coating to lime and disintegrate, especially where used on ceiling.

The essentials of heatiug and ventilating a railway paint shop according to requirements, should be so mathematically adjusted as to conform to interior shop space in such a manner as to prevent these opposite elements from conflicting with shop cleanliness. A controlled volume of circulated air should be secured through a series of easily manipulated ventilator openings located in the ceiling, or other similar mechanical appliance that will insure a fresh air supply, and at the same time prevent the generated heat from being carried away from work line of shop. Without question, all heat should be either generated or discharged at a low floor line, in order that all moisture resulting from car washing, etc., will quickly dry up. Piped dry steam and hot water, the re-circulating system of hot air, for heating the car paint shop, all have their interested aud enthusiastic advocates. According to the available practical authority, the installation of the re-circulating system of hot air heating and ventilating, the shop should be so constructed as to insure a fifty to sixty per cent foul air displacement in a given time, as it is claimed that the constaut churning over of foul air of a paint shop, without taking in at least fifty per cent of fresh air hourly from outside, will be productive of bad results in the form of both moisture and a poisonous gaseous air, which are extremely injurious to both fresh applied paint and varnish and to the health of the men compelled to work under such conditions. There is an inevitable law that all heat ascends and never descends only when in such volume as to entirely displace the pure air, showing conclusively that all heat should be generated as near floor line as possible, which will, with necessary top ventilation, produce an ideal shop atmosphere on an old established law which, when put to the test, usually shows that it is the most practical, and not the most scientific of heating and ventilating system that is wanted in the railway car paint shop.

As time and labor saving essentials, regardless of first cost, the following facility appliances and tools should be installed in the railway paint shop.

First.—That the entire machinery painting department, regardless of capacity, be equipped with a light, strongly built stationary, quick adjustable scaffolding, which is, as a shop convenience and labor saving device, hard to equal, especially where compared with the old time scaffolding system, which includes the old cumbersome antiquated trestle and plank.

Second.—That an ample compressed air supply be delivered at such shop and yard points as will insure greatest labor economy in its manipulation.

Third.—That the tool equipment includes an up-to-date pneumatic atomizing paint machine, which on class work, regardless of all craft prejudice and opposition, is one of the greatest time and labor saving devices ever introduced into the railway car and locomotive paint shop.

Fourth.—That the tool equipment iucludes a modern sandblast machine, operated by compressed air, which is a full two hundred per cent labor saving investment, especially where compared with hand labor cost in cleaning the iron and steel parts of the locomotive. A labor saving factor that can also be relied upon in figuring up the future paint maintenance problem of the modern steel car.

Fifth.—That the railway car painting department be fully equipped with a modern glass etching, mirroring and embossing plant, to economize and better facilitate the maintenance of the coach lavatory mirror, the acid cut deck light and silver embossed gothic; also for the etching of the brass sign and for the cutting out of the shop standard zinc plate freight car stencil.

ffhe main essentials of a railway paint shop call for a foreman always on the alert in keeping abreast of modern times. He should not only be master of his calliug, but of himself, also have the executive ability to control men under his charge, who, as a rule, soon learn that if the welfare of the shop is to be made a mutual success, they must respect the authority of their foreman, held for general results—but who are also quick to discover the weak places in his character, which if not corrected will soon destroy his usefulness as a foreman. To fit the requirements of a general railway paint shop, the foreman should be ever courteous and never overstep the bounds of reason in his dealing with his kindred fellow employees, who, perhaps, through not knowing the extent of his material worries, damage some unfinished work, which, when done, can never be remedied by any amount of growling on part of the foreman. He should be ever ready to cousult with his superiors on labor and material matters, which never should be shrouded in craft mystery from the fact that there are no trade secrets that will warrant any such arbitrary action.

As the conclusive essential to paint department's success, the official management should see that the foreman's position is the co-equal of all kindred departmeuts. He should have full control of his department, hire and dismiss his men when such action is warranted. If his efficiency will not warrant the full confidence of superiors as an executive and craftsman, another man should be put in his place, but never over him while acting as foreman. In all instances the official should see that there is no superficial bossing in the paint shop by the class of foremeu who still cling to the old antiquated practice, when the opportunity is afforded, to continue this sort of nagging interference. The painter should be firmly fixed in his positiou, which can be done without the least curtailment in power of the official, who, if up-to-date, knows he is simply transferring the authority to where it belongs, thus providing the chief essential—namely, the recognized brains which operate the Modern Railway Car and Locomotive Paint Shop.

(To be continued.)

Notes and Comments

Mr. Wm. E. Dyer, formerly foreman painter for the C. V. R. R. at St. Albans, Vt., and later working for G. W. Lord at the Fitchburg shops of the B. & M., went to the Lyndonville, Vt. shop of the B. & M., Jan. 25, as foreman painter, conditioned upon the recovery of Mr. F. C. Steele, who is an invalid with little hope of resuming the position again.

"What say you, Mr. Foreman, guilty or not guilty?" Our associate, "Davy" Little, of Altoona, is foreman of the grand jury as well as of the Juniata paint shop.

A foreman painter in Maine writes: "Speaking about cold weather, the 3d, 4th, 5th and 6th of January the thermometer stood at 20, 22, 20 and 26 below zero respectively." How's that, you thin-skinned Southerners?

The editor was, Jan. 11th, elected to his fifth term as President of the B. & M. R. R. Relief Association, which was rather a red-letter day in its nineteen years of history, inasmuch as the President of the road was present and made a rattling good speech in its indorsement and announced a donation of $5,000 from the road to its reserve fund, with more to follow annually. The Comptroller of the road was also present and spoke in its favor. It is a voluntary institution under the management of the employes, among whom it originated.

The total output from the paint shops of the Boston & Maine was 178 cars ot its passenger equipment for the month of December. This was only one car less than for the same month of preceding year. Of this number 14 were burnt off and four resheathed, 141 were cut in. They are still 106 cars behind the preceding year for the six months ending Dec. 31. This is largely on account of equipping the balance of its cars with M. C. B. couplers in place of the Miller hook during the months of October and November. This deficiency will likely be made up by the end of the next six months—June 30.

Our associate, John T. McCracken, of Wilmington, Del., seems to be having more than his share of ill-fortune. Since resigning his position as Foreman Painter at the Jackson-Sharpe Co. plant he has lost his wife by sudden death, and now he has had his paint store burned out which he so recently established, we are informed. Our sincere sympathies go out to him.

The Trunk Line Agreement.—"It is announced that the trunk lines have renewed for the coming year their agreement, first made in 1902, to refrain from issuing passes to the officers of other railroads. It is stated that in general the agreement has proved satisfactory, although it is admitted that there are some exceptions to the rule." We clip the above from an exchange and hope that one of those exceptions is railroad convention trips. Still, from the same exchange, we get the following, which shows that the "frost" has struck the west as well as the east: "The Pass Agreement. About seventy railroads have adopted the western pass agreement, which will take effect Jan. 1 next, to regulate and draw lines closer on the issuance of free transportation. The object is to prohibit as far as possible annual and trip passes, and special tickets of all kinds." However, when the time comes ask for your transportation to Atlantic City just the same; a man doesn't get what he doesn't ask for.

We clip the following from an Altoona paper concerning the discussion of trades unionism at the convention of Master House Painters and Decorators recently held there: "When business was resumed, Delegate A. Yeager, of Wilkesbarre, told some yarns apropos of the union differences. The loudest laugh was raised by the narration of the episode of the woman who went to the butcher's to buy a calf's head. "Is it a union head?" she asked when the meat was exhibited. "No ma'am," said the butcher, "wait a minute." He went back to the ice house, returning in three minutes with the head. "Isn't that the same thing?" asked the woman. "Oh no," said the butcher, "it's a union head now—it's had the brains taken out."

In temperature below zero look out for that newly painted old tin roof of a car that you had shifted out of a warm shop yesterday before it gets away today. When all the signs are right, i. e., when the old paint underneath, put on a dozen or fifteen years ago, has lost its adhesion, the action of the new paint just put on and the sudden chill and contraction from a chop at 60 to 70 degrees to an outside temperature of zero, or below, is bound to so act on that tin as to throw the paint off, if it has lost its grip. We have recently had two such cars. But we have the remedy: We whip them with a hoop iron beater, with a handle wound on it of cloth, as you would beat a carpet, and the old paint flies off of the tin like chips. Then the tinsmith looks it over a little with solder and we apply the roof paint and no further trouble will be had with that car for another dozen or more years. But the roof must be whipped while cool—indoors in summer and outdoors in winter—or it will not fly off readily.

Obituary

The following note, and clipping from an Altoona paper, came to us from Assistant Foreman Gearhart, of the P. R. R. paint shops at Altoona, and will be read with sadness by all, as Mrs. Ball was a well-known attendant at our conventions. The editor of these columns has enjoyed the hospitality of her home. Mr. Ball will have the sympathy of a wide circle of friends.

Editor Railroad Paint Shop: It is with sincere sorrow that I send you the enclosed notice of the death of the wife of our esteemed friend and fellow member, Mr. F. S. Ball. Last September she attended the Chicago convention with Mr. Ball. Her health at that time was poor, and has been failing ever since.

Yours truly,

John T. Gearhart.

Altoona, Jan. 13th.

MRS. LIZETTA BALL.

At 3 o'clock Monday morning, January 11, Mrs. Lizetta Ball, wife of Foreman Frederick S. Ball, of the car shop paint department, died at her home, 707 Lexington avenue, of cancer. She had been ailing for some time. Deceased's maiden name was Lizetta Greison, and she was born in Philadelphia, April 29, 1843. On February 5, 1867, she married Mr. Ball and had since resided in the city. She was a member of St. Mark's Catholic church, was esteemed in a wide circle of friends and besides her husband is survived by four sons—Herman, superintendent of motive power of the Lake Shore and Michigan Southern railroad, at Cleveland; Frederick, Edward and William, all of Altoona. She also leaves one brother, Anthony Greison, of Altoona, and two sisters, Mrs. F. D. Casanave, and Mrs. Louisa Kime, both of Philadelphia.

Railway Master Mechanic's Table of Switching Locomotive Proportions

Road	St.L.I.M.&S.		M.P.		R.&D.		St.L.&S.		C.V.				S.F.&W.		St.P.M.&O.	L.N.O.&T.
Builder	Rogers	Am.	Rogers	Am.	Rogers	Am.	Rogers	Am.	Rogers	Am.	Rogers	Am	Rogers	Am.	Rogers	Rogers
Fuel	Bit.	Bit.	Bit.	Bit.	Bit.	Bit	Bit.	Bit.	Bit.	Bit.	Bit	Bit.	Wood	Bit.	Bit.	Bit.
Type of Locomotive	0-6-0	0-4-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0
Year of Construction	1880	1880	1881	1881	1882	1882	1883	1883	1884	1884	1885	1885	1886	1886	1887	1887
Type of Boiler	Str'ght	Str'ght	Str'ght	Wag.Top	Str'ght	Wag.Top	Str'ght	Wag.Top	Str'ght	Wag.Top	Str'ght	Wag.Top	Str'ght	Str'ght	Str'ght	Str'ght
Type of Firebox	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow
Type of Engine	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Dia. of Driving Wheels - Ins.	46	46	46	48	46	48	50	48	50	48	48	48	44½	49	49	50
Dia. of Cylinders - Ins.	15	15	19	17	16	17	17	17	18	17	15	17	16	16	18	17
Length of Stroke - Ins.	22	24	22	24	22	24	24	24	22	24	22	24	24	24	24	24
Volume of Both Cyls. - Cu. Ft.	4.49	4.9	7.21	6.3	5.11	6.3	6.3	6.3	6.47	6.3	4.49	6.3	5.58	5.58	7.06	6.3
Kind of Valve	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide
Steam Pressure - lbs.	135	135	135	135	138	135	140	135	140	135	140	135	135	135	140	140
Dia. of Boiler Shell at Front - Ins.	45⅜	46	52	48	47	48	50	48	52	48	46	48	51	50	53	51
Height Ctr. of Boiler Above Rail - Ft. & Ins.															6-2½	6-4
Total Wgt. of Locomotive - lbs.	75500	55000	83500	67000	78000	64000	85000	65900	82800	65900	75000	66000	80000	70300	87000	85000
Wgt. on Drivers - lbs.	75500	55000	83500	67000	78000	64000	85000	65900	82800	65900	75000	66000	80000	70300	87000	85000
Number of Boiler Tubes	90	126	134	140	105	140	144	140	134	140	90	140	162	148	134	123
Dia. of Boiler Tubes - Ins.	2¼	2	2¼	2	2¼	2	2	2	2¼	2	2¼	2	2	2	2¼	2¼
Length of Boiler Tubes - Ft. & Ins.	11-1	10-10	13-5	10-0	13-5½	10-0	13-11½	10-0	13-9½	10-0	13-6½	10-0	12-4½	13-2¾	13-1½	13-10½
Length of Tube Divided by Dia.	59.1	65	71.5	60	72	60	83.7	60	73.5	60	72.2	60	74.2	79.3	70	74
Tube Heating Surface - Sq. Ft.	704	709	1058	728	832	728	1052	719.6	1088	728	717	728	1050	1019	1035	1005
Firebox Heating Surface - Sq. Ft.	68	53	84	63	76	63	91	52	100	63	74	63	71	74	89.6	81.3
Total Heating Surface - Sq. Ft.	772	762	1142	791	908	791	1143	771.6	1188	791	791	791	1121	1093	1124.6	1086.3
Grate Area - Sq. Ft.	12.39	10.3	15.34	14.1	12.04	14.1	14.16	15.7	16.29	14.1	13.22	14.1	9.91	12.5	14.1	12.7
Wheel Base, Driving - Ft. & Ins.		7-0		10-0		10-0		10-0		10-0		10-0		10-0	9-10	10-6
Wheel Base, Total - Ft. & Ins.		7-0		10-0		10-0		10-0		10-0		10-0		10-0	9-10	10-6
Tractive Effort by Formula - lbs.	12300	13500	19700	16500	14300	16500	16500	16500	16900	16500	12300	16500	15800	14400	18800	17000
Tractive Effort by ¼ Wgt. on Drivers - lbs.	18875	13750	20875	16750	19500	16000	21250	16475	20700	16475	18750	16500	20000	17575	21750	21250
Wgt. on Drivers Divided by Tractive Effort	6.13	4.07	4.23	4.06	5.45	3.87	5.15	3.99	4.86	3.99	6.09	4	5.06	4.88	4.62	5
Tractive Effort Divided by Total Heating Surface	14.6	17.7	17.2	20.8	15.7	20.8	14.4	21.3	14.2	20.8	15.8	20.8	14	13.1	16.7	15.6
Total Wgt. Divided by Total Heating Surface	97.7	72.1	73.1	84.7	85.9	80.9	74.3	85.4	69.7	83.3	94.8	83.4	71.3	64.3	77.3	78
Total Heating Surface Divided by Grate Area	62.3	73.9	74.4	56	75.4	56	80.7	49.1	72.9	56	59.8	56	113	87.4	79.7	85.8
Total Heating Surface Divided by Tube Heating Surface	1.09	1.07	1.07	1.08	1.09	1.08	1.08	1.07	1.09	1.08	1.10	1.08	1.06	1.07	1.08	1.08
Total Heating Surface Divided by Firebox Heating Surface	11.3	14.3	13.5	12.5	11.9	12.5	12.5	14.8	11.8	12.5	10.6	12.5	15.7	14.7	12.5	13.3
Tube Heating Surface Divided by Firebox Heating Surface	10.3	13.3	12.5	11.5	10.9	11.5	11.5	13.8	10.8	11.5	9.6	11.5	14.7	13.7	11.5	12.3
Tube Heating Surface Divided by Grate Area	56.8	68.8	68.9	51.6	69.1	51.6	73.5	45.1	66.7	51.6	54.2	51.6	105	81.5	73.4	79.1
Firebox Heating Surface Divided by Grate Area	5.48	5.14	5.47	4.46	6.31	4.46	6.42	3.31	6.13	4.46	5.59	4.46	7.16	5.92	6.35	6.4
Total Heating Surface Divided by Volume of Both Cylinders	171	155	158	125	177	125	181	122	183	125	176	125	200	195	159.2	172.4
Grate Area Divided by Volume of Both Cylinders	2.75	2.10	2.12	2.23	2.35	2.23	2.24	2.49	2.51	2.23	2.94	2.23	1.77	2.24	1.99	2.01
Total H.S. Divided by Wgt. One Cyl. Steam of Boiler Pressure	1135	1029	1047	823.9	1149	823.9	1154	803.7	1164	823.9	1115	803.7	1318	1285	1013	1097

Road	N.&W	N.O.&W.	P.&P.U.	C.&O.	H	L.S.&M.S.	N.C.&St.L.	W.N.Y.&P.	C.B.&Q.	S.F.&W.	St.L.C.&St.P.		P.S.&L.E.	C. of Ga	B.&O.	L.&J.B.
Builder	Rogers	Rogers	Am.	Schdy	Rogers	Rogers	Rogers	Baldw.	Rogers	Rogers	Am.	Schdy	Pitts.	Baldw.	B.&O.	Richm.
Fuel	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Wood	Bit	Bit.	Bit.	Bit	Bit.	Bit.
Type of Locomotive	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0
Year of Construction	1888	1888	1889	1889	1890	1890	1891	1891	1892	1892	1893	1893	1894	1894	1895	1895
Type of Boiler	Str'ght	Str'ght	Belp.	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght
Type of Firebox	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow
Type of Engine	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Dia. of Driving Wheels - Ins.	50	50	50	50	50	52	50	51¼	52	44½	52	51	50	51	50	50
Dia. of Cylinders - Ins.	18	19	18	19	18	18	18	19	18	16	18	18	18	18	19	19
Length of Stroke - Ins.	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Volume of Both Cyls. - Cu. Ft.	7.06	7.87	7.06	7.87	7.06	7.06	7.06	7.87	7.06	5.58	7.06	7.06	7.06	7.06	7.87	7.87
Kind of Valve	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide
Steam Pressure - lbs.	140	160	165	150	160	150	150	150	145	160	160	150	160	160	165	160
Dia. of Boiler Shell at Front - Ins.	53	52¾	56	54	54	53⅞	56	56	51	51	56	56	54	52	53	60⅛
Height Ctr. of Boiler Above Rail - Ft. & Ins.	6-5		7-4½	6-9 15/16	7-0	6-7	6-7	7-3¼	6-4	5-11½	7-0⅞			6-6¼	6-5½	6-7
Total Wgt. of Locomotive - lbs.	87200	84000	107300	100710	90000	90000	90000	95920	85000	80000	97000	99000	91000	90000	100600	109000
Wgt. on Drivers - lbs.	87200	84000	107300	100710	90000	90000	90000	95920	85000	80000	97000	99000	91000	90000	100600	109000
Number of Boiler Tubes	142	122	190	222	167	150	160	180	115	163	194	200	180	185	134	232
Dia. of Boiler Tubes - Ins.	2¼	2½	2	2	2	2¼	2¼	2¼	2½	2	2	2	2	2	2½	2
Length of Boiler Tubes - Ft. & Ins.	13-10½	14-9½	11-1⅛	71	10-5	14-6	13-10	13-9	14-2	12-4	11-1	11-0	13-3	14	14-4	11-0
Length of Tube Divided by Dia.	74	71	66.5	66	62.5	87	73.7	73.3	68	74	66.5	66	79.5	84	68.8	66
Tube Heating Surface - Sq. Ft.	1160	1181	1098	1278.6	911	1246	1303	1446.5	1079	1051	1117	1147.5	1241	1221	1249.74	1332.5
Firebox Heating Surface - Sq. Ft.	90	104.8	122	127.4	111	109.3	93.5	112	90	71.1	94	131.2	98	108.5	108.77	165.5
Total Heating Surface - Sq. Ft.	1250	1285.8	1220	1406	1022	1355.3	1396.5	1558.5	1169	1122.1	1211	1278.7	1339	1329.5	1358.51	1498
Grate Area - Sq. Ft.	14.1	14.97	18.6	19.5	20.1	16.27	13.09	15.5	14.9	9.9	19.5	22.6	15.25	16	17.25	22.8
Wheel Base, Driving - Ft. & Ins.	10-8	10-10	11-11	11-0	10-0	11-3	10-6	10-10	10-10	9-0	11-0	11-0	10-6	10-6	11-0	11-6
Wheel Base, Total - Ft. & Ins.	10-8	10-10	11-11	11-0	10-0	11-3	10-6	10-10	10-10	9-0	11-0	11-0	10-6	10-6	11-0	11-6
Tractive Effort by Formula - lbs.	18500	23200	21800	22000	21100	19000	19800	21500	18400	18800	20300	19300	21100	20700	24300	23500
Tractive Effort by ¼ Wgt. on Drivers - lbs.	21800	21000	26825	25177	22500	22500	22500	23980	21250	20000	24250	24750	22750	22500	25150	27250
Wgt. on Drivers Divided by Tractive Effort	4.72	3.62	4.92	4.57	4.26	4.73	4.54	4.46	4.62	4.25	4.77	5.12	4.31	4.34	4.13	4.63
Tractive Effort Divided by Total Heating Surface	14.8	18.1	17.8	15.6	20.5	14.01	14.1	13.7	15.7	16.8	16.7	15	15.7	15.5	17.8	15
Total Wgt. Divided by Total Heating Surface	69.7	65.3	87.9	71.6	88.05	65.6	64.4	61.5	72.7	71.2	80	77.4	68.4	67.6	74	72.7
Total Heating Surface Divided by Grate Area	88.6	85.9	65.5	72.1	48.8	83.2	106.6	100	78.4	113.3	62.1	56.5	87.8	83	78.7	65.7
Total Heating Surface Divided by Tube Heating Surface	1.07	1.08	1.11	1.09	1.12	1.08	1.07	1.07	1.08	1.06	1.08	1.11	1.07	1.08	1.08	1.12
Total Heating Surface Divided by Firebox Heating Surface	13.9	12.2	10	11	9.2	12.4	14.9	13.9	12.9	15.7	12.8	9.07	13.6	12.2	12.4	9.05
Tube Heating Surface Divided by Firebox Heating Surface	12.9	11.2	9	10	8.2	11.4	13.9	12.9	11.9	14.7	11.8	8.07	12.6	11.2	11.4	8.05
Tube Heating Surface Divided by Grate Area	82.2	78.8	60.1	65.5	43.5	76.5	99.5	93.3	75.1	105.1	57.2	50.7	81.3	76.3	72.4	58.4
Firebox Heating Surface Divided by Grate Area	6.38	7	6.55	6.53	5.31	6.71	7.14	7.22	6.04	7.18	4.82	5.8	6.42	6.78	6.3	7.25
Total Heating Surface Divided by Volume of Both Cylinders	177	163.3	172	178	144.7	191.9	197.8	198	165.5	201.09	171	181	189	188	172	190
Grate Area Divided by Volume of Both Cylinders	1.99	1.90	2.63	2.47	2.96	2.34	1.85	1.96	2.11	1.75	2.76	3.20	2.16	2.26	2.19	2.89
Total H.S. Divided by Wgt. One Cyl. Steam of Boiler Pressure	1126	918.4	945.7	1065	811.1	1148	1183	1180	1016	1133	960.3	1082	1062	1055	936.9	1070

Road	St.P.&D.	N.C.&St.L.	W. of A.	T.R.A.	U.S.A.	C.M.&St.P.	P.B.&L.E.	Camb Steel	C.B.&Q.	O.S.L.	S.P.	O.S.L.	L.S.&M.S.	T.R.A.	C.M.&St.P.	Gt.N.	E.P.N.
Builder	Baldw.	Rogers	Rogers	Baldw.	Baldw	C.M.&St.P.	P.B.&L.E.	Baldw	C.B.&Q.	Baldw	Baldw	Cooke	Am.	Baldw	C.M.&St.P.	Rogers	Baldw
Fuel	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit	Bit.	Bit.	Bit	Bit.	Bit	Bit.	Bit.	Bit	Bit.
Type of Locomotive	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0	0-6-0
Year of Construction	1896	1896	1896	1897	1898	1898	1899	1899	1900	1900	1901	1901	1902	1902	1903	1903	1903
Type of Boiler	Str'ght	Str'ght	Str'ght	Ext. Wag. Top	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Str'ght	Belp St.	Str'ght
Type of Firebox	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Mod. Wide	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow
Type of Engine	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Dia. of Driving Wheels - Ins.	51	50	51	51	50	50	50	50	52	51	57	51	52	51	50	49	51
Dia. of Cylinders - Ins.	18	18	18	19	20	18	19	21	20	20	19	21	20	20	19	19	20
Length of Stroke - Ins.	24	24	24	24	24	24	26	26	24	26	26	26	26	26	26	26	26
Volume of Both Cyls. - Cu. Ft.	7.06	7.06	7.06	7.87	8.72	7.06	8.53	10.4	8.72	9.44	8.53	10.4	9.44	9.44	8.53	8.53	9.44
Kind of Valve	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Piston	Slide	Slide	Slide	Piston	Slide	Slide	Slide	Slide
Steam Pressure - lbs.	160	150	165	180	180	180	180	180	180	180	180	180	180	200	180	200	180
Dia. of Boiler Shell at Front - Ins.	54	56	56	58	64	60	64	68	60	68	65¼	67⅝	64⅛	68	62	67½	68
Height Ctr. of Boiler Above Rail - Ft. & Ins.		6-4	6-10½			7-8½	7-8½		7-10½			8-2			8-4		
Total Wgt. of Locomotive - lbs.	94000	90000	101000	110995	120000	103000	119000	137080	122000	144930	129900	137300	139000	134530	127000	138000	134660
Wgt. on Drivers - lbs.	94000	90000	101000	110995	120000	103000	119000	137080	122000	144930	129900	137300	139000	134530	127000	138000	134660
Number of Boiler Tubes	186	160	173	2.24	270	178	271	323	204	324	260	275	279	323	238	291	288
Dia. of Boiler Tubes - Ins.	2	2¼	2	2	2	2	2	2	2¼	2	2	2	2	2	2	2	2
Length of Boiler Tubes - Ft. & Ins.	14-0	13-10	13-9	11-6	10-11¾	12-10	10-6	10-5	14-6	10-6	12-6	11-1	15-0⅝	10-5	12-5⅛	11-3	10-7
Length of Tube Divided by Dia.	84	73.7	82.5	69	65.8	77	63	62.2	87	63	75	66.5	90	62.2	74.5	67.5	63.5
Tube Heating Surface - Sq. Ft.	1354.6	1303	1245	1339.8	1540.3	1180	1478	1738.3	1732	1765.8	1691.6	1588.88	2185.63	1744.3	1538	1708	1576
Firebox Heating Surface - Sq. Ft.	120	93.5	98.6	137.64	143.7	132	144	169.7	106	209.2	150.6	160	123.51	169.7	170	164	187
Total Heating Surface - Sq. Ft.	1474.6	1396.5	1343.6	1476.65	1684	1312	1622	1908	1838	1975	1842.2	1748.88	W.T. 20.74 2329.88	1914	1708	1872	1763
Grate Area - Sq. Ft.	17.1	13.9	14.1	21	28.43	22	22.9	31.57	27	35.15	30.18	31.8	28.2	31.64	25.8	27.2	35
Wheel Base, Driving - Ft. & Ins.	10-6	10-6	10-6	11-6	11-2	11-0	11-0	11-0	10-10	11-0	13-0	11-0	11-3	11-0	11-0	10-9	11-0
Wheel Base, Total - Ft. & Ins.	10-6	10-6	10-6	11-6	11-2	11-0	11-0	11-0	10-10	11-0	13-0	11-0	11-3	11-0	11-0	10-9	11-0
Tractive Effort by Formula - lbs.	20700	19800	23300	26000	29300	23800	28700	35000	28000	31200	25200	34700	30600	34600	28700	32500	31200
Tractive Effort by ¼ Wgt. on Drivers - lbs.	23500	22500	25250	27749	30000	25750	29750	34270	30500	36232	32475	34325	34750	33632	31750	34500	33415
Wgt. on Drivers Divided by Tractive Effort	4.54	4.54	4.33	4.26	4.09	4.32	4.14	3.91	4.35	4.64	5.16	3.99	4.54	3.88	4.42	4.12	4.31
Tractive Effort Divided by Total Heating Surface	14.03	14.1	17.3	17.6	17.4	18.1	17.6	18.3	15.2	15.8	13.6	19.6	13.1	18	16.8	17.3	17.6
Total Wgt. Divided by Total Heating Surface	64.4	64.4	75.9	75.1	71.2	78.5	73.3	71.8	66.3	73.3	70.5	78.5	59.6	70.2	74.3	73.7	76.3
Total Heating Surface Divided by Grate Area	86.2	100.4	95.2	70.3	59.2	59.6	70.8	60.4	68	56.1	61	54.6	82.6	60.4	66.2	68.8	50.2
Total Heating Surface Divided by Tube Heating Surface	1.08	1.07	1.07	1.10	1.09	1.11	1.09	1.09	1.06	1.11	1.08	1.03	1.06	1.09	1.11	1.09	1.11
Total Heating Surface Divided by Firebox Heating Surface	12.3	14.9	13.7	10.7	11.7	9.91	11.2	11.2	17.3	9.44	12.2	10.9	18.8	11.2	10	11.4	9.42
Tube Heating Surface Divided by Firebox Heating Surface	11.3	13.9	12.7	9.73	10.7	8.91	10.2	10.2	16.3	8.44	11.2	9.92	17.6	10.2	9.04	10.4	8.42
Tube Heating Surface Divided by Grate Area	79.2	93.7	88.3	63.8	54.2	53.6	64.5	55	64.1	50.2	56	49.9	77.5	55.1	59.6	62.7	45.
Firebox Heating Surface Divided by Grate Area	7	6.7	7	6.55	5.06	6	6.28	5.37	3.92	5.95	4.99	5.03	4.37	5.36	6.58	6.02	5.34
Total Heating Surface Divided by Volume of Both Cylinders	208.8	197.8	190.3	187	193.1	150	229	183	210	209	215	168	257	202	200	219	186
Grate Area Divided by Volume of Both Cylinders	2.42	1.96	1.99	2.66	3.26	3.11	2.68	3.03	3.09	3.72	3.53	3.05	2.98	3.35	3.02	3.18	3.70
Total H.S. Divided by Wgt. One Cyl. Steam of Boiler Pressure	1170	1183	1041	940.5	967.8	930.4	948.5	917.3	1056	1044	1077	840.8	1232	915.7	998.8	995.7	932.8

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WHILE the steel car is proving satisfactory on a number of roads, and its operation and maintenance are largely considered more economical than the wooden car, still there are certain existing conditions which make the wooden car more of a paying investment. This is dependent upon the location of the manufacturing plant and the territory covered by the purchasing road. For if these be in close proximity to a good supply of timber, the advantage of location will reduce the cost of lumber to a minimum. The situation of a car building establishment in easy reach of good timber, reduces the price of timber by eliminating freight charges, and in the event of a road covering a territory which permits its orders to be placed with such a building plant situated on its line there is no cost of delivery. A prominent southern road advises us that these and other conditions affecting the wooden car, together with the cost and facilities for maintenance, so increase the earning capacity of a car of this type, as compared to a steel car, as to enable them to operate the wooden car 20.8 per cent cheaper, when the interest and depreciation on the additional capital required for a steel car is taken into consideration.

THE effect upon questions constantly at issue in railroad work is so frequently changed by circumstances and environment that the standpoint from which a given subject is viewed is dependent upon different conditions; and criticisms offered are naturally dissimilar as they are prompted by the teachings of experience which vary more or less according to surroundings. For this reason we wish to induce discussions through our columns in order to bring out the important features of the several sides of questions. Following the presentation of a subject we are sometimes told by our visitors or correspondents that the practice we advocate is proving quite successful and is identical with the lines along which they are working, while others advance objections that the same course is not suitable to their conditions and others again suggest modifications of different practices.

We like to see experiences exchanged and therefore advocate discussions. We feel that an editorial or communication which excites discussion is productive of good results, as it induces an exchange of views among men who have given a subject deep consideration by whose experience others may benefit.

In this connection the railroad clubs might be consistently reminded of the benefit of critical discussion. We know men who have been disappointed at the reception of papers presented, not because of any lack of appreciation of their efforts or of the value of their papers, but because of the seeming lack of interest in the subject through absence of discussion followed by accepting the ceremonious disposition of the paper. When presenting a paper it is not uncommon for the author to prepare to meet arguments which may arise during the consideration of the subject matter, by bringing with him data and statistics with which to convince those who may take exception to his statements or may not agree with theories advanced. Furthermore the treatise of a subject not in accordance with generally accepted practice, yet based on practical demonstration, is valuable in drawing forth criticisms and suggestions for further research.

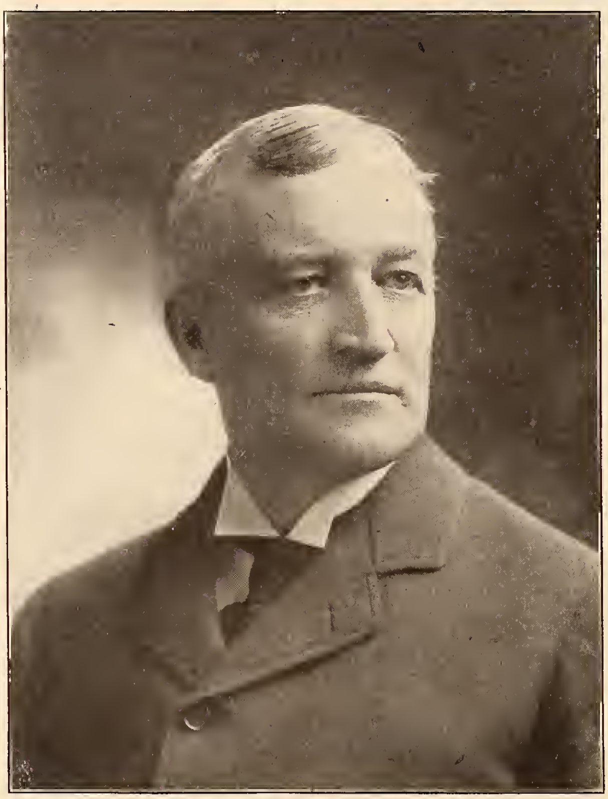
It is of course impossible to treat all papers alike, yet a critical discussion and the presentation of the same subject from several vantage points, will seldom fail to bring out more than the original paper contained and add materially to the information gathered. Mr. Forney once appropriately compared a railroad club meeting to the action of flues upon each other while in a rattler; discussion removing the scale, and contact brightening the minds.

IT is sometimes the way of a master mechanic when entering upon new duties, to disregard the methods by which his predecessor met existing conditions and substitute new directions which served for the exigencies to which he had previously been accustomed. The peculiarities of different roads, and those of the several divisions of the same road, are so unlike as to render such a custom impractical. From the very fact of his having observed local conditions and studied results, a man who has been in charge of a division for a number of years is, perforce, in a better position to judge its requirements than one who is assuming new duties. Therefore, rather than disregarding previous practices and discouraging attention along certain lines which have been previously watched with much care, would it not be safer to follow carefully in the footsteps of one's predecessor and continue his methods until we become familiar with existing peculiarities, gradually changing instructions which we see fail to meet conditions and continue those which are proving satisfactory?

We know of a division on which a master mechanic followed flue troubles so closely as to make engine failures from this cause almost unknown, having gradually reached this condition in spite of the fact that engine failures had been previously a serious trouble. Upon his removal by promotion to another position, engine failures on his old division suddenly increased and it was found that his successor had lost no time in introducing his own system of management with but little regard for the past practice of this division.

It is not unusual that the personal influence and close attention of a master mechanic, or superintendent of motive power, are responsible for the success of a given division in overcoming small defects which when permitted to continue cause much trouble and expense, such as leaky flues, oil wastes, steam leaks, frame breakages, recording failures of parts thus evidencing weak points which might be improved by re-design, etc., etc.

It is also good policy for him in assuming new duties and authority over a new set of men to show consideration and respect for the custom and method which they have in practice. By so doing he will win their regard and confidence and find that they will more readily accept his new methods and conform to such changes as he may introduce.



Mr. William H. Bancroft.
GENERAL MANAGER OF THE UNION PACIFIC R. R.

Mr. Bancroft was born at Newberg, O., on October 20, 1840, and began his railway career in April, 1856, as telegraph operator and ticket clerk on the Michigan Southern Railway. He has been connected with the Erie, Santa Fe, M. K. & T., D. & R. G., and other roads and is one of those who has risen from the ranks to the top of the ladder. For the past seven years he has been vice-president and general manager of the Oregon Short Line, which position he left a few weeks ago to take up his new duties as general manager of the Union Pacific.

THE Chicago, Burlington & Quincy Railway has recently opened a new rest house for engineers and firemen in Chicago. The company owns the ground and building and will maintain it solely for the benefit of the men who do not live in the city and who are waiting for their return trips. The house is fitted out with large reading room, bath room, lockers, dormitory, etc. The company pays all expenses of the maintenance and the men make this house their home when in Chicago. This goes to show that the railroads are not only continually offering better service to the public, but are each year taking more thought for the comfort of their employees. Many of the railroads are contributing either wholly or in part toward expenses of various Y. M. C. A. buildings and reading rooms along their lines, and some of the roads have adopted the pension system, which is such a decided advantage to the employees who stay with them. The road which is giving the public the very best service possible for the money is certainly to be commended, but the railroad which spends its money in looking after the comfort of its employees is to be even more highly commended, and while it is often looked at as somewhat of a matter of charity, the fact is that it is fast becoming recognized that for the railroad to treat its employees in the best possible manner is good sound business policy, and the company who spends a few thousand dollars in looking after the comforts of its men is going to be repaid many times over by more efficient and better service.

COMMENTING upon the adoption of the pension system by the Atlantic Coast Line as a means of providing for superannuated employes, the Atlanta Constitution devotes an extended editorial to "The Right Kind of Paternalism" and commends the principle involved as not only humane but one which tends to induce a better understanding between capital and the wage earner. While the pension system has been already instituted on several railway systems and its consideration is therefore no new feature, we deem the broad-minded view of the "Constitution" worthy of repetition and here present some of its words: "* * * * No doubt within a few years the corporation pension system will have become quite a matter-of-fact institution in the United States. Already the plan is in successful operation in several branches of industry, and the result is beneficent in more ways than one. Men who believe the system of individualism which supports the great material fabric of our modern civilization is absolutely essential to continued progress, are not blind to the justice of the contentions of the collectivists in some phases of the social question. They recognize the fact that a wage-earner who must necessarily exhaust his annual income in the proper support and education of his family is in sorry shape to meet the burdens of advanced age. * * * * When capital recognizes the true inwardness of the labor question—what is implied in the 'Master and Man' hypothesis of Tolstoi—there will be an end of class wars and strikes. * * * *"

Shop Improvements of the Chicago, Milwaukee & St. Paul Railway at West Milwaukee

(Continued from page 47.)

THE improvements of the machine and erecting shop comprise the addition of a two-story structure 154 ft. in extent. The side of the first floor adjacent to the transfer pit has been supplied with seven new pits, making a continuation of the pit system existing in the old shop and a total number of 26. This structure, in common with all the new buildings, has brick walls, steel roof trussing and is roofed with slate. The walls and columns and deck members for the upper floor are exceptionally heavy, as the second floor is being equipped with machine tools of capacity for all but the very heaviest character of work. The two rows of columns divide both the new and old departments into two bays. The erecting pits extend into the center bay, and two vertical traveling cranes are thus enabled to serve the machines and pits, a supply car track also running through this central bay which connects with a cross track at the center of the shop. Four of the largest machines, driven with individual motors, are located in the central bay, at the end of the old section of the shop. One of these is a new frame slotter, which has been equipped with a balance wheel to take the crest of the load otherwise thrown on the motor at the moment of head reversals, particularly at the lower point of the stroke. Another of these machines is a specially built tire lathe, which is the largest that has come to our notice and which we illustrate herewith. This machine is built in massive proportions and soon after its installation a number of tool men were invited to compete thereon. One result of the trial was the substitution of a 20 horse power motor for the original one of 15 horse power. We have been favored with the results of two of these tests which

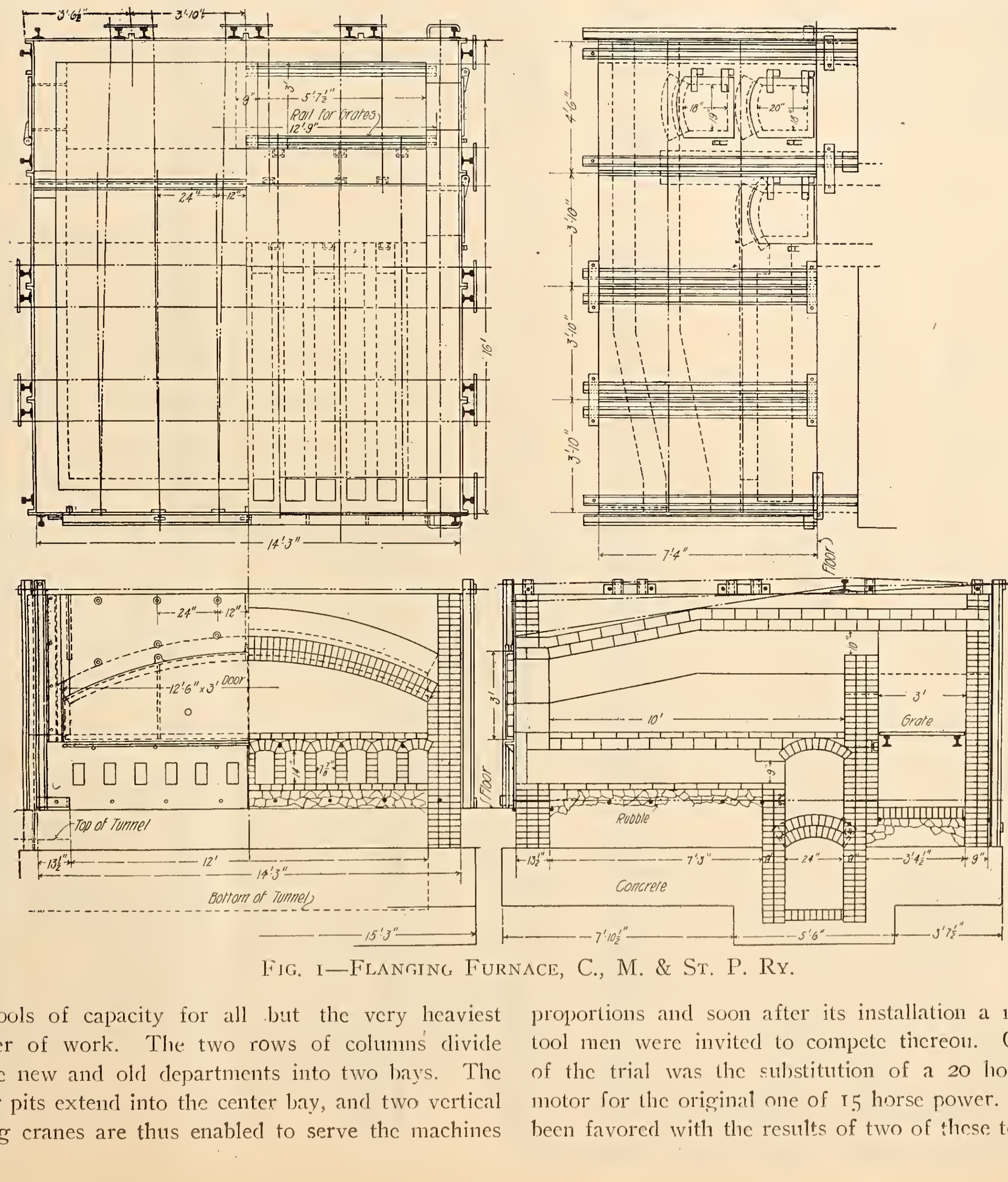


Fig. 1—Flanging Furnace, C., M. & St. P. Ry.

we reproduce herewith and it is but fair to say that the work here shown is being fulfilled as an every-day matter.

Tests of 100-in. Wheel Lathe.

Cutting speed.....................$12\frac{1}{2}$ ft. per minute
Size of motor.......................20 h. p. 220 volts.
Speed...........................600 to 850 R. P. M.
Kind of tool steel......Novo on right; Zenith on left.
Cut.......................$\frac{1}{2}$-in. deep; 5-32-in. feed.
Total average h. p. required.....................15.5

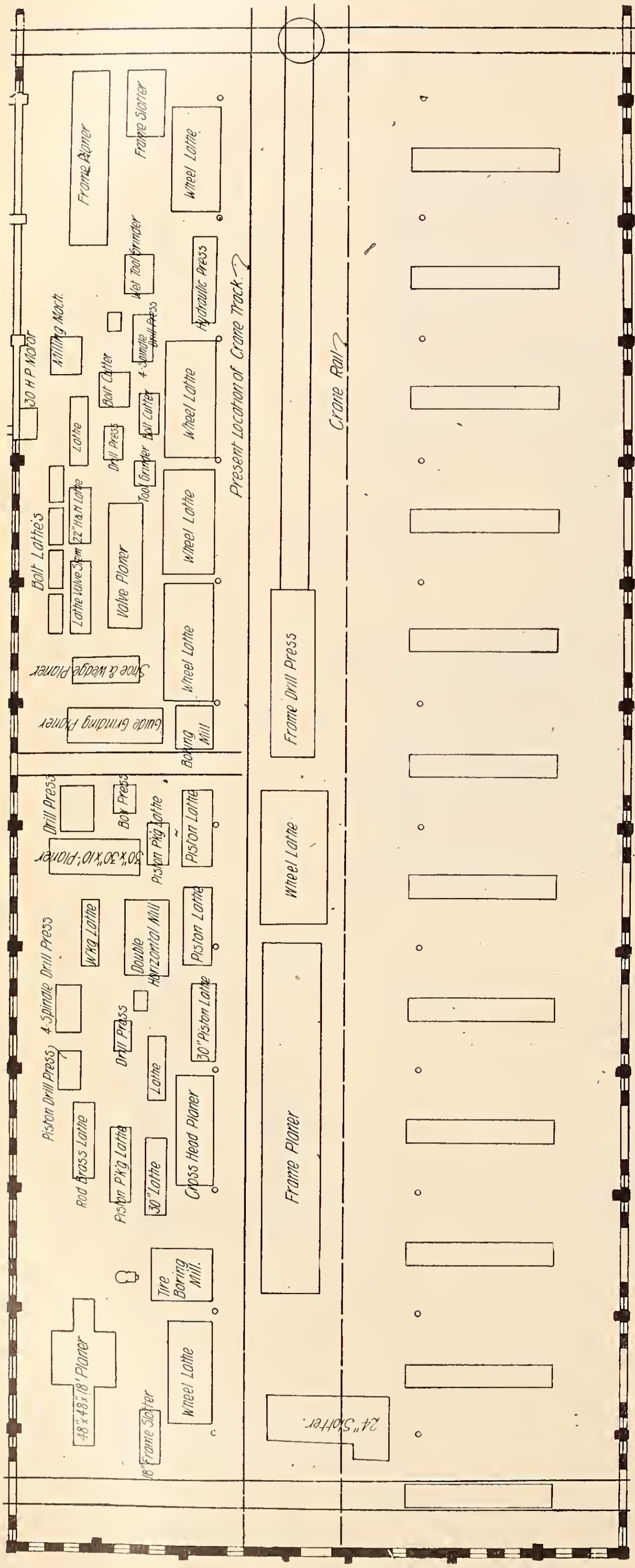


Fig. 2—Plan of Old Section of Machine and Erecting Shop, C., M. & St. P. Ry.

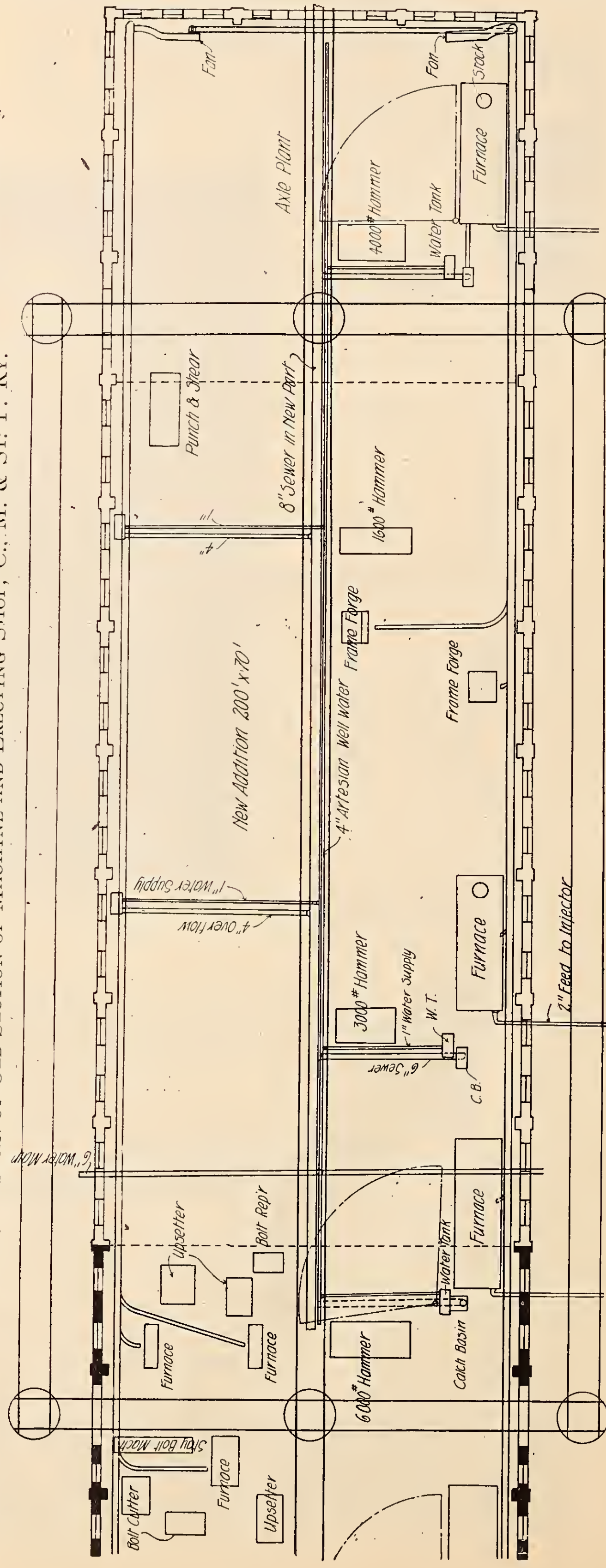


Fig. 3—Plan of New Section of Blacksmith Shop, C., M. & St. P. Ry.

H. p. required to operate lathe....................3.4
H. p. required by the two cutting tools...........12.1
Note—Zenith tool in A1 condition after cutting across the tire; Novo steel tool in fair condition.

Cutting Speed 18½ ft. Per Minute.

Work.....................Pair of 84-in. Blind Tires.
Speed..........................18½ ft. per minute.
Tools.........Novo Steel on right; Zenith steel on left.

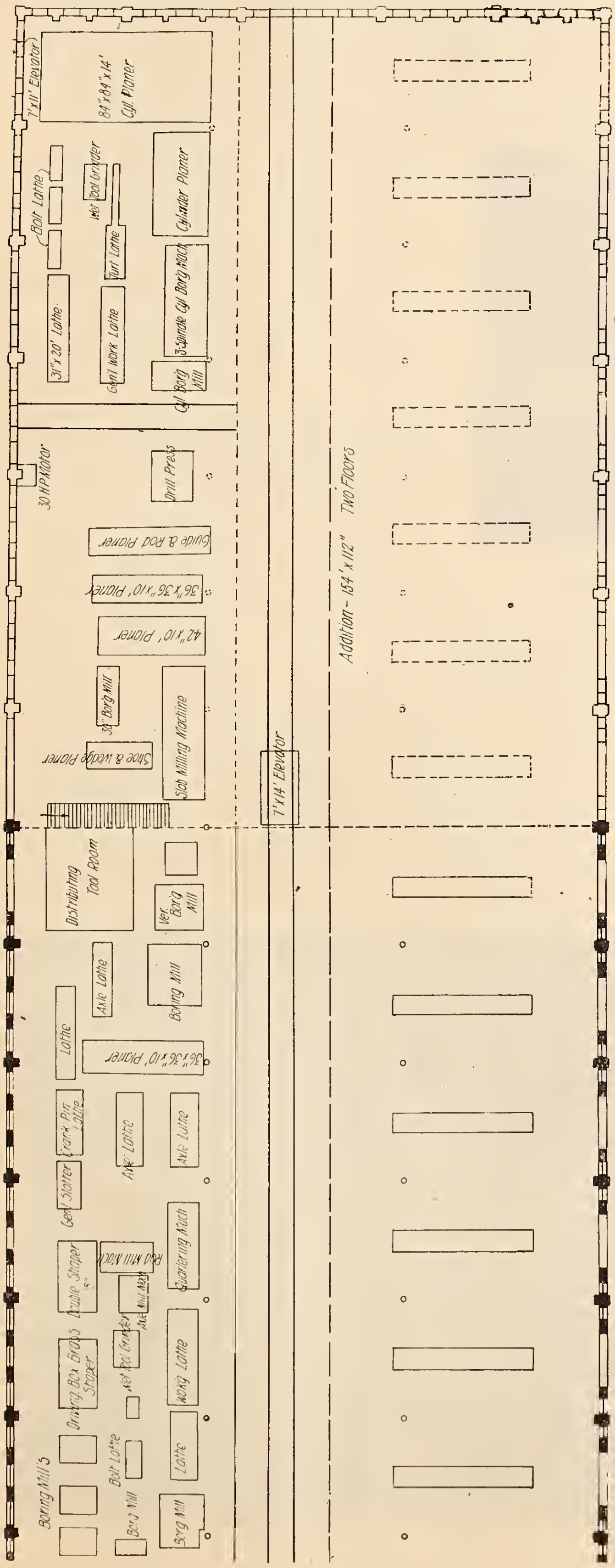


Fig. 4—Plan of New Section of Machine and Erecting Shop, Ground Floor, C., M. & St. P. Ry.

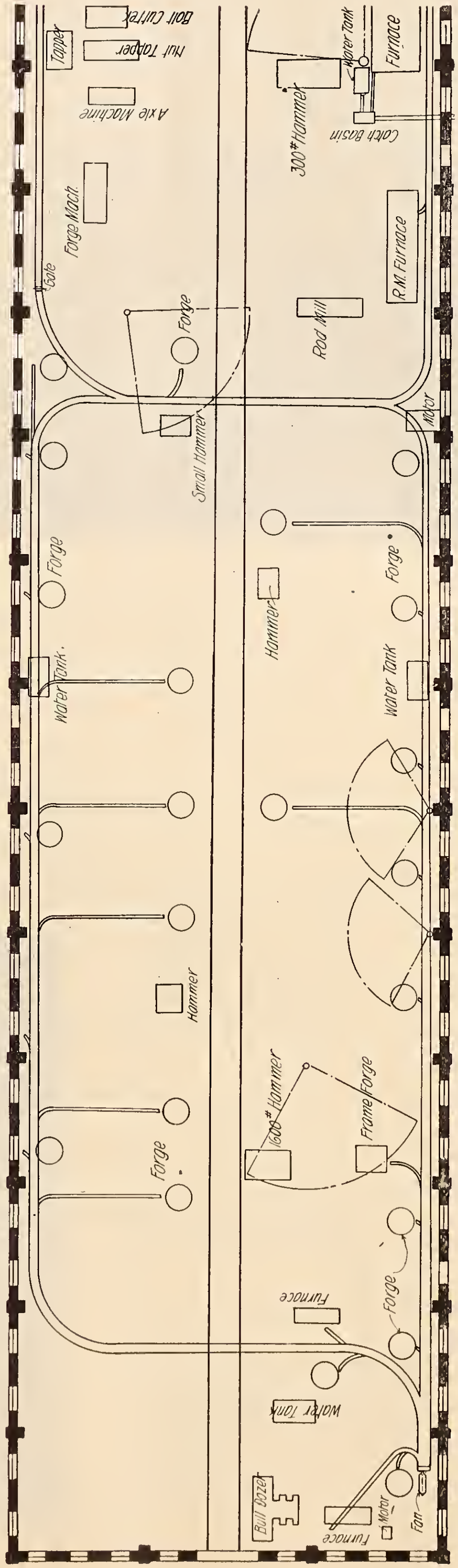


Fig. 5—Plan of Old Section of Blacksmith Shop, C., M. & St. P. Ry.

Average cut..............5-16 in. deep; 3-16 in. feed.
Average h. p. required........................16.5
Maximum h. p. at hard places.................22.5

Zenith tool cut across the tire and was in good condition; Novo Tool gave out after cutting 1½ in., 2d tool gave out after cutting 4 in. Right tire was finished with Zenith tool just as it came from the left hand tire.

Time of cutting across tire..........1 hour and 3 min.

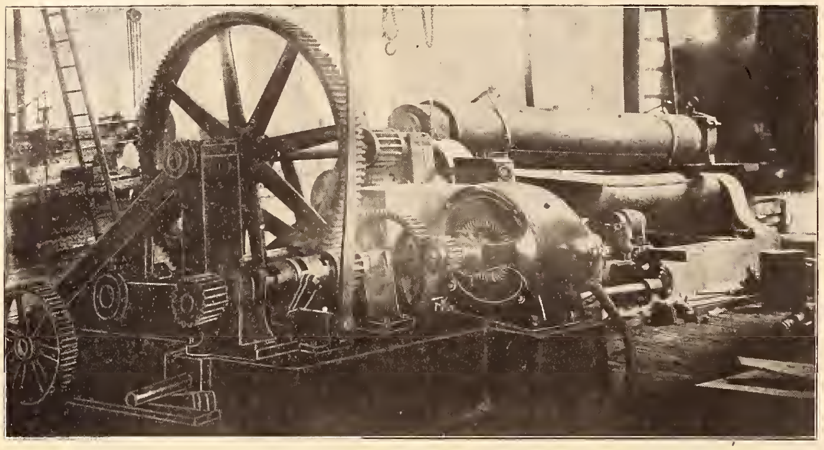


Fig. 6—Sheet Rolls Driven by Individual Motor, C., M. & St. P. Ry.

The entire upper floor of the new section is equipped with machine tools, so that while increasing the erecting department by seven pits, the machine shop has received three times such increase in capacity, or even more, as the wheel and axle work for engine trucks and tenders is being removed from the machine shop and placed in the lower floor of the new addition to the tank shop across the transfer table. The upper floor of the new addition is served with two elevators, one electric located in the center of the floor, and one hydraulic, for heavy material, located outside the building at the corner, as indicated in Fig. 4. The list of new machine tools being installed in this shop and in the lower floor of the tank shop addition mentioned, is as follows:

1 84 x 84 ins. x 14 ft. Pond cylinder planer.

2 Foote, Burte & Co.'s No. 4 Four spindle drill presses.

1 48 x 48 ins. x 16 ft. Putnam planer.

1 Three spindle Foote-Burt locomotive frame drill.

1 Bement & Miles three bar cylinder boring machine.

1 42 ins. Pond steel tire car wheel lathe. To be put in tank shop.

1 25 ins. x 10 ft. Bullard engine lathe.

2 25 ins. x 14 ft. Bullard engine lathes.

1 Whiting Fdy. & Equipt. Co.'s walking jib crane.

2 37-in. Bullard double head vertical boring and turning mills.

1 No. 2 Kearney & Trecker universal milling machine.

1 No. 1½-in. Acme triple head bolt cutter. Talked of going in tank shop.

1 15-in. Swing, 6-ft. bed Putnam back geared lathe.

2 20-in. Barnes upright drills.

1 Hendey-Norton 24-in. swing, 10-ft. bed lathe.

1 24 x 24 ins. x 6 ft. Gray planer.

2 34-in. Barnes upright drill presses.

1 42-in. Barnes upright drill press.

1 42-in. Barnes upright drill.

1 26-in. Barnes upright drill press.

1 76-in. Bullard double head vertical boring and turning mill.

1 300-ton Schaffer car wheel press. Going in tank shop.

1 Schumacher & Boye 36-in. swing, heavy pattern engine lathe, 14-ft. bed with taper attachment.

1 30-in. 10-ft. bed back geared Schumacher & Boye engine lathe.

1 31-in. 20-ft. bed back geared Schumacher & Boye engine lathe.

1 30-in. 12-ft. bed back geared Schumacher & Boye engine lathe.

1 14-in. stroke Niles single head slotter.

3 18-in. 8-ft. bed Hendey-Norton lathes.

3 20-in. 8-ft. bed Hendey-Norton lathes.

2 15-in. swing 6-ft. bed back geared Putnam lathes.

1 15-in. swing 6-ft. bed back geared Putnam lathe.

1 No. 2 American turret lathe.

1 Dresses 5 ft., arm full universal radial drill.

1 Foote-Burt No. 2 four spindle multiple drill press.

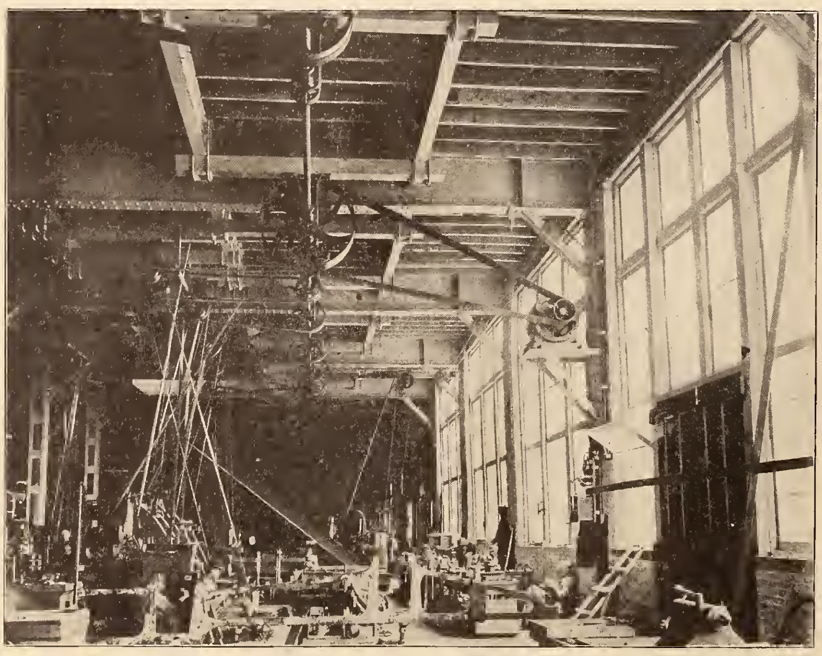


Fig. 7—Showing Arrangement of Motor Drive for Group of Machine Tools, C., M. & St. P. Ry.

1 style "F" Yankee wet tool grinder.

2 14-in. Gould & Eberhardt single geared crank shapers.

1 60-in. Bullard boring and turning mill.

1 30-in. Bullard vertical turret head boring mill.

2 30 x 30 ins. x 8 ft. single head Putnam planers.

2 48-in. Safety Emery Wheel Co. wet tool grinders.

4 No. 5 Safety Emery Wheel Co. wet tool grinders.

1 Safety Emery Wheel Co. open side surface planer.

1 26 x 36 ins. x 12 ft. Ingersoll slab milling machine.

1 No. 1 Harrington four spindle multiple drill. Going in boiler shop.

2 Cincinnati 18-in. double head traverse shapers.

1 No. 9 Bement & Miles vertical milling machine.

1 Niles 24-in. single head slotter.

1 Bement & Miles two spindle rod boring machine.

1 18-in. stroke Bement & Miles single head slotting machine.

3 37-in. Bullard double head vertical boring mills.

1 42 x 42 ins. x 10 ft. Pond planer.

1 Bement & Miles two spindle horizontal boring machine.

1 2½-in. Acme double head bolt cutter.

2 36 x 36 ins. x 10 ft. Pond double head planers.

In addition to these it is intended to order another tool grinder, three bolt centerers, a 16 ins. back geared friction head monitor lathe, a 10-ton hydraulic press, and a 35 ft. 10-ton hydraulic press. All the machine tools are group driven in units of 30 h. p. electric motor located overhead. The motors are supplied with exceptionally wide bearings and pulley faces. A few of the very largest tools are individually driven with motors of a size adapted to the particular machine. Before leaving the machine shop it may be remarked that driver removals and replacements are carried on by use of an electricially operated drop table, and as the stripping is done at the same time, lye vats are located in the apartment which encloses the table.

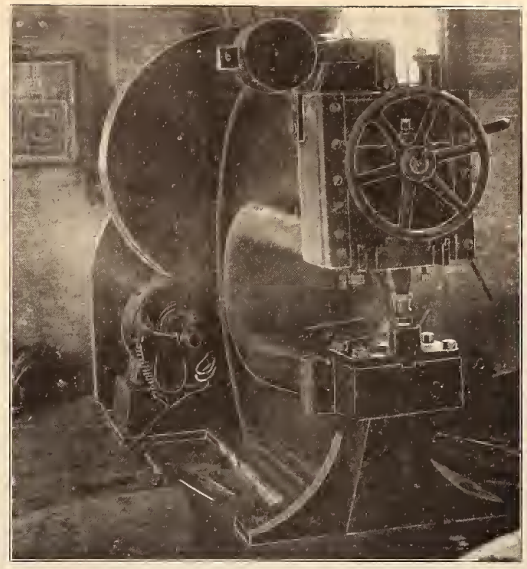


Fig. 8—Individual Motor Drive Applied to Plate Punch, C., M. & St. P. Ry.

To the boiler shop end of the building constituting tank and boiler shops has been added a wing at right angles to the main building. This is a high single story structure. At this end of the building a new riveting plant has been installed in the corner opposite the new addition. The old machinery has been rearranged, and a number of new machines added. Many of the new machines are driven by individual electric motors. A very satisfactory furnace installed in the new wing is illustrated herewith by a line drawing. In this illustration will be observed a series of openings under the hearth in front. These are closed with loose brick and mud normally, but when working the sheet the amount of heat delivered at any portion of the sheet is controllable by the removal of these loose bricks, and thus allowing a cooling current of air to play over any portion of the sheet.

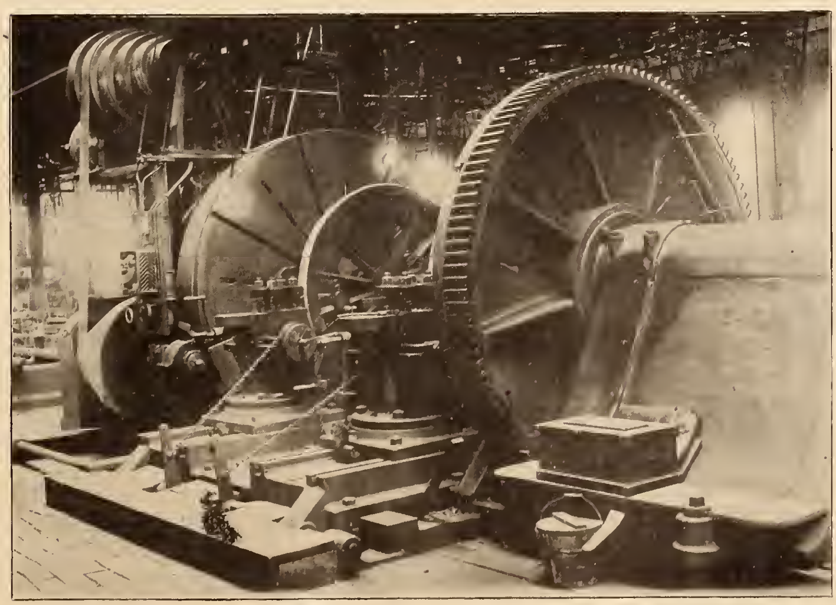


Fig. 9—Heavy 100-Inch Wheel Lathe, C., M. & St. P. Ry.

The new machinery in this shop includes the following:

1 Scully 40-in. throat automatic punch.

1 set of Niles 12-ft. bending rolls.

1 R. D. Wood & Co. 17-ft. gap triple riveter.

1 R. D. Wood & Co. 12 ins. x 15 ft. hydraulic accumulator.

1 duplex steam pump 20 x 4½ x 15 ins.

1 R. D. Wood & Co. 10-in. gap, 50-ton mud ring riveter.

1 Pawling & Harnischfeger 25-ton 25-ft. span electric tower crane.

1 No. 1 Baird stay bolt cutter.

1 Wangler rotary bevel shears.

1 Baird 80-in. throat tank riveter.

1 No. 2 Hilles & Jones horizontal punch.

1 No. 4 Hilles & Jones single punch.

1 Foote, Burt & Co. six spindle boiler shop drill.

1 Scully rotary splitting shears.

1 36-in. Scully single punch.

A new two-story structure 80 ft. by 154 ft. has been built at the opposite end of this building. The second story of this addition is to be used for incidental departments and the following machines have been added for the copper and tin shop:

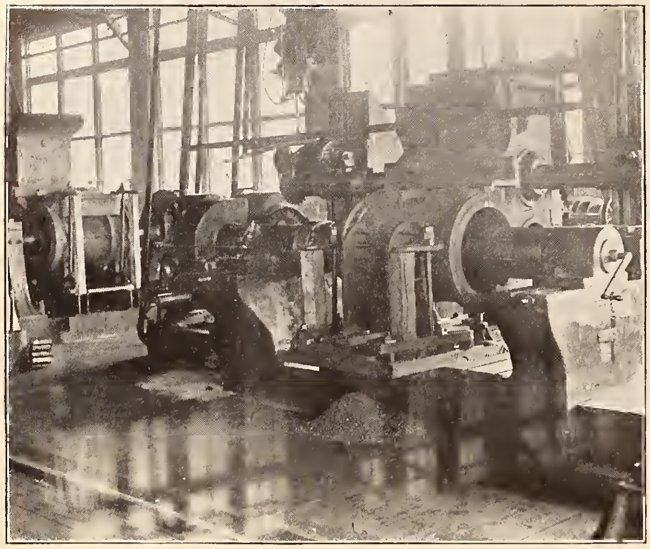


FIG. 10—BEMENT-MILES 3-SPINDLE BORING MACHINE AT C., M. & ST. P. RY. SHOPS.

FIG. 12—76-INCH BORING MILL, BULLARD MACHINE TOOL CO., IN SERVICE AT C., M. & ST. P. RY. SHOPS.

1 No. 2 P. D. Q. C. pipe threading machine.

1 No. 2 Hill, Clarke & Co.'s 20-in. improved friction drill press.

1 Niagara No. 4 sheet iron folder.

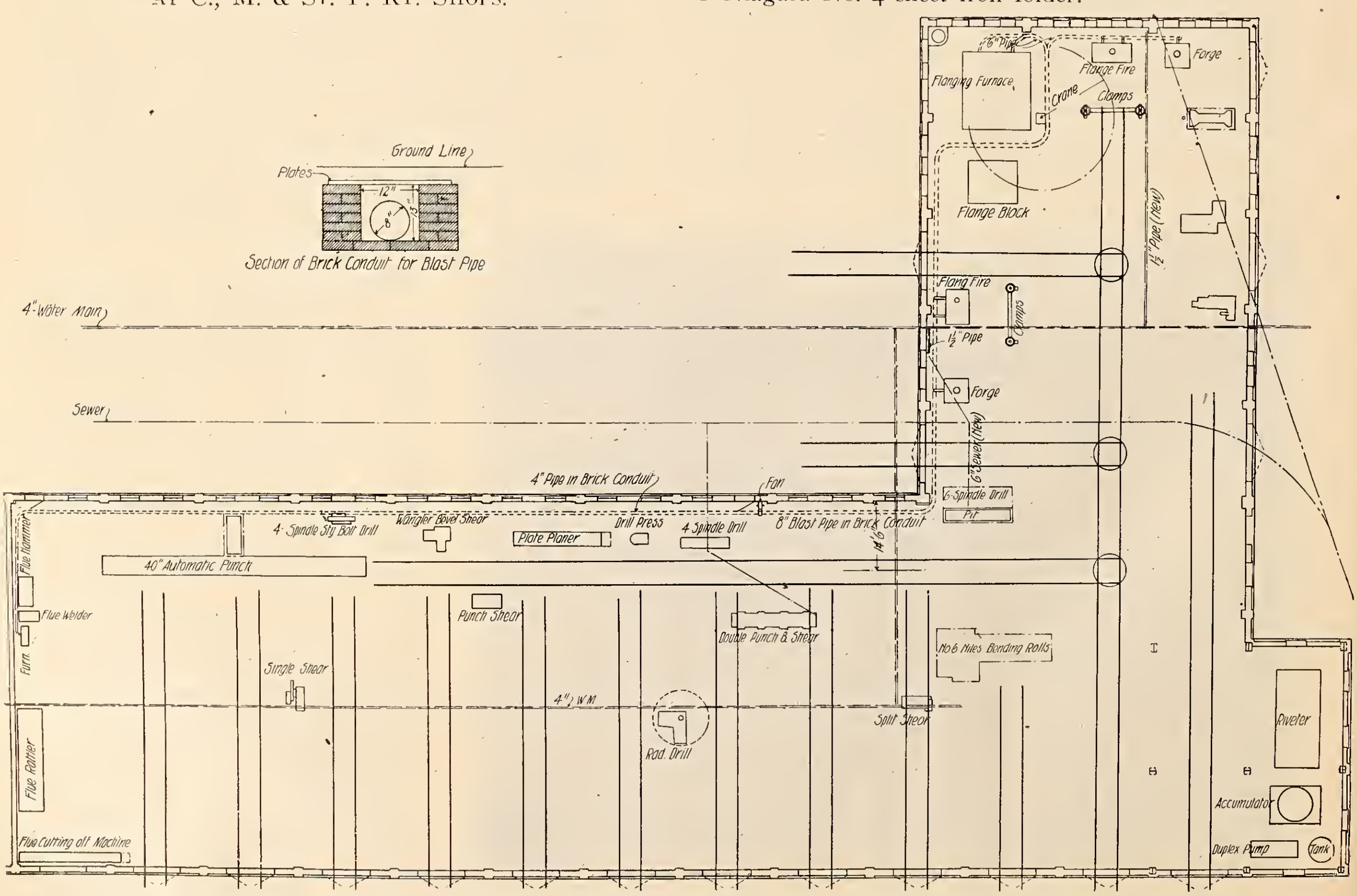


FIG. 11—PLAN OF BOILER SHOP, C., M. & ST. P. RY.

1 Niagara No. 644 gap power shears.

1 D. Saunders' Sons No. 7 standard pipe threading and cutting off machine.

The blacksmith shop has been extended by continuing the present single story building 200 ft. The equipment for this shop is generous, as the work therein includes the manufacture of axles, frames, etc., from scrap material and rolls small sizes of bar iron for bolts. The serving tracks of the old section have been extended to serve the new extension. The following include the new equipment for this shop:

1 100-lb. Bradley rubber cushion Helve hammer.

1 6,000-lb. Chambersburg double frame steam hammer.

1 2-in. Ajax bolt heading, upsetting and forging machine.

1 No. 1 ½-in. Higley cold saw.

1 No. 3 Higley automatic grinder.

2 Safety Emery Wheel Co. No. 5 wet tool grinders.

1 1,600-lb. Bement & Miles single frame steam hammer.

1 3,000-lb. Bement & Miles double frame steam hammer.

1 No. 5 Hilles & Jones double punch and shears.

The transfer pit has been extended to serve the additions to the machine and boiler shops. Further contemplated improvements include a three-quarter circle round house with modern coal and cinder handling plants, a scrap bin 50 by 600 ft., a pattern storage building 60 by 150 ft. and a frog shop 80 by 200 ft. for the engineering department.

Piping For Hydraulic Machinery

By Frank B. Kleinans

THE arrangement of piping is one of the most important features of the installation of hydraulic machinery. Upon it depends much of the success of the machines installed. Where the accumulator and pumping plant are located some distance from the machines being operated, care should be taken to avoid undue drop in pressure resulting from friction of the surface of the pipes and elbows. Instances have been known where the pipes were of the proper size and located to good advantage and yet the valves were too small to permit the free flow of water. The presence of a valve whose diameter is too small causes a slow operation of the machine, as the flow of water is throttled and its movement is therefore sluggish resulting in a correspondingly slow movement of the press table or riveting machine. As an illustration of the movement of hydraulic machinery, let us take a case of an hydraulic flanging press with a ram 36 inches in diameter. The average stroke of a machine of this capacity is 36 inches and we will assume it to be supplied by a 2½-inch valve. In this connection we are first to determine the velocity of the flow of water and then obtain the time which will be required to move the table through a distance of 36 inches. By the usual formula for the velocity of water in feet per second flowing within a pipe and neglecting friction losses.

$V = \sqrt{2\,GH}$ where

V = velocity and

H = head in feet

The weight of a foot of water one inch in area is equal to .433, hence

H is equal to $\dfrac{P}{.433}$ where P = pressure per square inch

therefore

$$V = \sqrt{\frac{2\,G\,P}{.433}} = 12.182\sqrt{P}$$

Assuming a pressure of 1,500 pounds per square inch, a figure not uncommon in hydraulic work, we will have

$V = 12.182\sqrt{1500} = 470$ feet per second

From a number of experiments in frictional losses at this pressure under the ordinary conditions of piping, the actual flow has been found to be less than that given by the formula, 70 per cent being taken as the average efficiency.

The volume of water required for the ram equals the velocity of the flow times the internal diameter of the pipe times the number of seconds required to fill the cylinder. Our figures will therefore give

$1016 \times 36 = 470 \times 2.4 \times N$ from which

$N = \dfrac{1016 \times 36}{470 \times 2.4} = 33$ seconds, and as the actual flow is 70 per cent of the figure just determined, we have a

$\dfrac{N}{.7} = 47$ seconds, which is the actual time required to move the ram through a stroke of 36 inches. In many cases of actual practice this would be slow. Recourse should then be made to the use of larger pipes and valves. Therefore, by increasing the diameter of the supply pipes and valves connected therewith, any required speed may be had within reasonable limits. The velocity in any given case may be determined in a manner similar to that which has just been explained, from which the most desirable size of valves may be decided upon.

Machines of the inverted cylinder type have drawback cylinders for returning the ram, and in arranging the pipe connections to the two cylinders instances have been known of very annoying results being caused by discrepancies in the pipe connections. We here call attention to an incident resulting from connecting the drawback cylinder to the main supply pipe by a right-angle T. As there is no resistance to the motion of the ram during a portion of the stroke the water passes into the main cylinder very rapidly until the ram reaches a point at which it is called upon to exert a certain amount of power. During this rapid flow of water through the supply pipe into the main cylinder, the force of the flow passing the T connection induces the water from the drawback cylinder and consequently reduces the pressure therein. In the case in view the weight of the ram was such as to overcome the reduced pressure in the drawback cylinder and it fell upon the work, where it rested, exerting no more pressure than that of its own weight, until the main cylinder became entirely filled with water and the force of the machine was exerted. The suddenness and uncertainty of such a performance on the part of the ram renders it very annoying in accomplishing satisfactory work and to alleviate this difficulty the better plan is to run the direct line of pipes to the drawback cylinder and arrange a branch to supply the main cylinder.

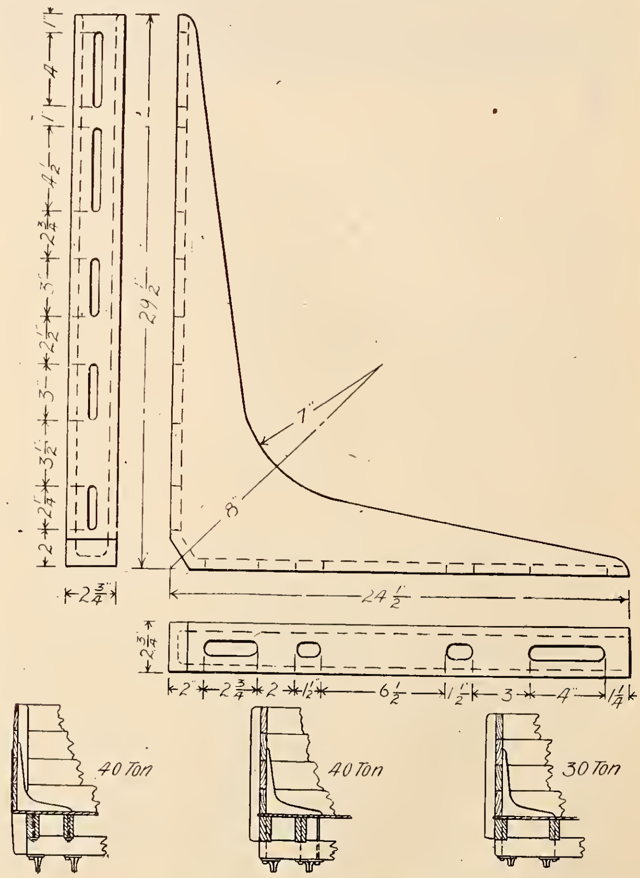
It is not uncommon to hear more or less "hammering" within the piping connected to hydraulic machinery. This may be attributed invariably to one of two things: First, the sudden check of a volume of water flowing at high speed, is invariably accompanied by a sudden jerk or "thug," and if no provision is made to take care of this thrust, the hammering is likely to occur; second, as the drawback cylinders are proportioned for speed rather than for the mere return of the ram, it is usual to have a high velocity of water in the discharge pipes when the ram reaches the end of its stroke. It is, of course, suddenly brought to a stop. The water in the discharge pipe, however, continues to flow for a short time, creating a vacuum behind it. When this water has lost its energy it is forced toward the machine by the pressure of the atmosphere, and the vacuum just caused is filled with water whose return is at a high velocity and whose instant checking will naturally result in a blow. This objection can be easily overcome by connecting a vertical pipe several feet long and having a cap at its upper end, with the discharge pipe, so that the air therein will act as a cushion for the water upon its return.

In view of the repairs which have been necessitated on hydraulic accumulators, hoists, etc., by water being frozen within the cylinders, ample provision should always be made for draining them. To accomplish this end holes should be drilled through the wall of the cylinder and tapped to accommodate a plug ¼ or ⅜ of an inch in diameter. These holes, which practically take the place of drainage cocks, should be located at the highest and lowest points in the cylinder, the former is to admit air, while the latter drains the cylinder of water. When starting the machine the upper plug should be removed until the cylinder is filled with water, thus insuring against a cushion within the cylinder.

With the hydraulic hoist the presence of an air cushion causes a vibration of the piston and hook during their travel so that a load can not be lifted carefully and with perfect safety. By an arrangement such as that just described the air present in the cylinder may be released upon the admission of water and the motion of the hook will be perfectly steady.

Inside Braces for Flat Bottom Gondola Cars

THE accompanying line drawings illustrate a type of inside brace, to be used for staying the sides of flat bottom gondola cars. Where such cars are used in transporting logs, it has been observed that the workmen are in the habit of breaking or cutting out tie rods supporting the sides of the boxes, and as a result of this practice the sides sag to such an extent as to interfere with obstructions along the road. In order to overcome this difficulty, the Chesapeake & Ohio railway has designed the braces here represented, in order to so brace the sides of the cars as



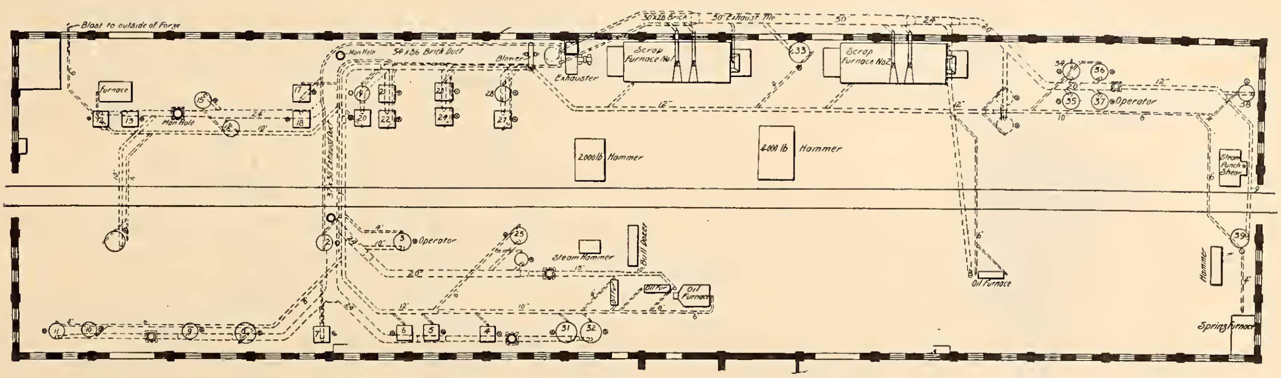
INSIDE BRACES FOR FLAT BOTTOM GONDOLA CARS.

to hold them rigidly, and at the same time offer no obstruction in loading the cars. A glance at the wedge shape form in the design would lead one to believe that the heavy logs jamming together would have a tendency to break the braces in the fillet; however, no difficulty has been encountered with this point, and the braces are giving good satisfaction. Three braces of this type are applied per side on forty-ton cars, and two are applied per side on twenty-five or thirty-ton capacity. They are of malleable iron.

Ventilating System in Blacksmith Shop, Northern Pacific Railway

ESPECIAL interest attaches to the ventilating system recently installed in the blacksmith shop of the Brainerd (Minn.) plant of the Northern Pacific Railway, because of the difficulty which has been experienced in keeping this building free from smoke and gases. No trouble existed during the summer months when the doors and windows could be kept open, but during the extreme cold winters in that section of the country it is necessary to keep the building carefully closed to provide for the comfort of the men at work; and under such conditions the accumulation of gases in this building became a serious objection. The shop is equipped with the usual machines and appliances for all classes of railway forging, and, being located at the principal shops of the company, is operated to its full capacity throughout the year. The two steam generating scrap furnaces serving two large hammers have been the source of the greatest annoyance. A 9-inch blast pipe supplies each fire, and when full pressure has been applied large volumes of smoke and gases have previously escaped into the shop.

After making several attempts to remove the objectionable gases resulting from the furnaces and forges the down draft system was finally installed, and this method has given very gratifying results. This system employs a blower to supply blast to the several forges and furnaces, an exhaust fan to draw the smoke and gases away from the fires and deliver them through a stack beyond the building, a hood over each fire to direct the smoke and gases into the exhaust ducts, and two systems of pipes, or ducts, to conduct the blast and dispose of the exhaust gases. The accompanying plan drawing shows the general layout of the system, together with the courses of tht blast and exhaust ducts. In designing the system it was endeavored to locate the fans as nearly central as convenient in the attempt to make the various branches as near the same length as possible. The exhaust duct serving the north end of the shop is 60 by 36 inches, of brick construction near the fan, tapering to 30 by 36 inches, and beyond the brick work it consist of 30-inch tile, which varies in diameter to 8 inches at the last forge. Branches of 10-inch tile lead from the main duct to the several forges. It was found necessary to run the exhaust line for the south end of the shop on the outside of the building, as it was impossible to pass the duct between the foundations of the scrap furnaces and the foundation of the wall. It was also equally impossible to pass the duct between the foundations of the furnaces and the foundations of the hammers shown in the plan near the furnaces, on account of the jar from the hammers.

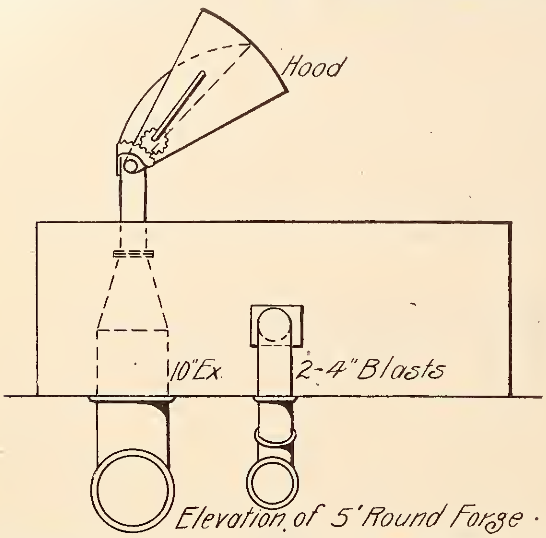


General Layout of Down Draft System, Forges, Etc., in Blacksmith Shop of N. P. Ry. at Brainerd, Minn.

Forges in Blacksmith Shop Equipped with Down Draft Hoods, N. P. Ry., Brainerd, Minn.

Forges Equipped with Down Draft Hoods, Brainerd, Minn., Blacksmith Shop, N. P. Ry.

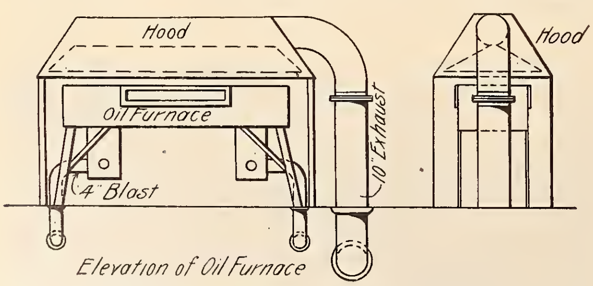
The exhaust duct to the south end is of brick construction near the fan, 30 by 28 inches, continuing in 30-inch tile, being finally reduced in cross section to accommodate the forges. Each scrap furnace is supplied with two 10-inch branch pipes and one 6-inch branch pipe to cover the leakage at doors. In arranging the course of the ducts it was necessary to so locate them as to avoid various sewer, water and gas connections. On account of its extreme distance from the exhaust fan, forge No. 39 was provided with a special connection. It was deemed advisable to



CONNECTIONS TO ROUND FORGE AT BRAINERD, MINN., SHOP OF N. P. RY.

carry a 9-inch exhaust line up to the forge and connect by an 8-inch "Y" to the hood, capping over the end of the "Y" with a 9-inch cap, as shown in accompanying drawing. This overcomes the additional friction on this exhaust line and tends to equalize the draft for the other forges which are located nearer the fan. It will also be noted that on the exhaust line various manholes are distributed throughout its length. These holes at all times give access to the exhaust duct and allow them to be cleaned of cinders which might accumulate therein.

The main blast duct is of 12-inch tile, tapering as it approaches the end of the line. From this branches

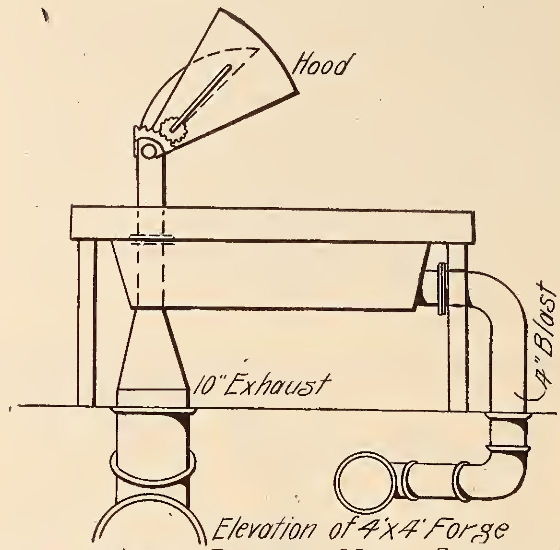


SHOWING EXHAUST AND BLAST CONNECTIONS TO OIL FURNACE IN N. P. RY. SHOPS, BRAINERD, MINN.

are led to the various forges and furnaces as shown in the drawing, the diameter of pipe to each forge being 4 inches.

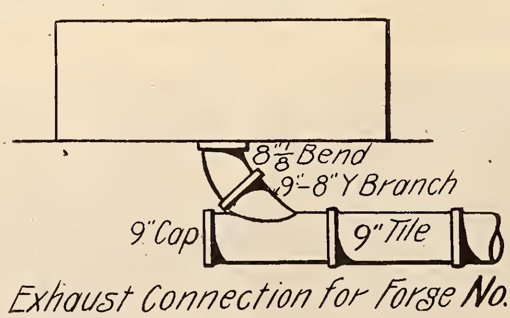
The forges and furnaces in use before the installation of the system were continued in service. The square forges are of cast iron construction and the round forges of the ordinary steel cylinder type filled in with clay. No changes were made thereon, with the exception of the addition of the hood shown in the accompanying illustration, and all telescoping hoods previously leading to the roof were dispensed with.

The ventilating system was designed by the Buffalo Forge Company, of Buffalo, N. Y., who furnished the fans, counter-shaft and the various draft hoods. The



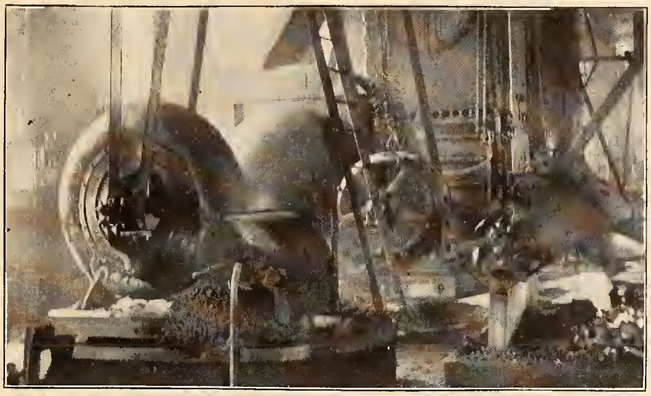
SQUARE FORGE AT BRAINERD, MINN., SHOPS OF N. P. RY., SHOWING CONNECTIONS FOR DOWN DRAFT SYSTEM.

hoods furnished to the forges were their standard patented construction cast iron, each hood being furnished with 10-inch exhaust line. The tuyeres on the forges are the ordinary pipe tuyeres. The hoods for the various furnaces are of sheet steel construction and the elevation of the oil furnaces presented in the accompanying line drawings shows the details of construction. It will be seen that the hood is what might be termed a double hood; the larger outside hood has false plates within, which intensify the draft around the outer edge of the hood, preventing the smoke and gases escaping outside of its confines.

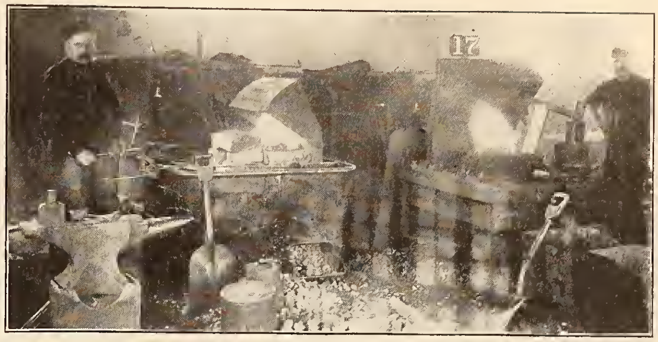


CONNECTION TO FORGE FURTHEST REMOVED FROM FAN, BRAINERD, MINN., SHOPS, N. P. RY.

All the hoods for the forges are identical to the illustration presented, with the exception of the central 5-foot round forge No. 1. This forge is used as a "frame" forge, requiring special height from the top of the forge to the underside shank of the hood, and at



Fans and Electric Motor Driving Counter Shaft in Brainerd, Minn., Blacksmith Shop, N. P. Ry.



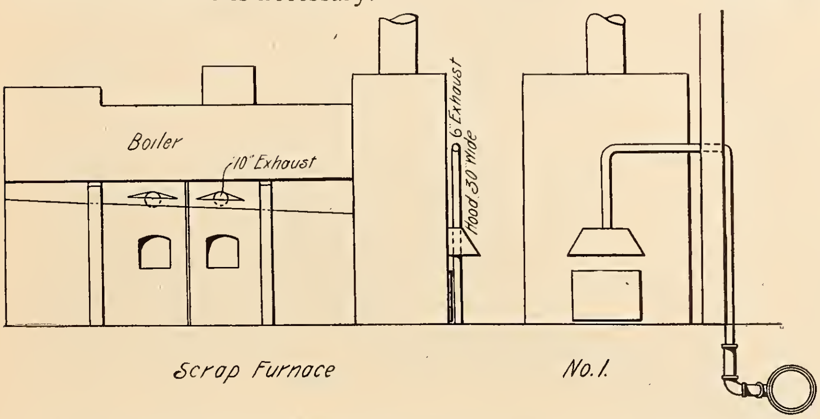
Forges Equipped with Down Draft Hood, N. P. Ry., Brainerd, Minn.

times it is desired to have the entire height above the forge, consequently the hood was arranged to "break" and swing at the level of the forge, a damper being provided in the exhaust connection which could be closed, preventing ashes and coal from falling into the exhaust line. Of course the down draft cannot be used on the forge when the hood is swung back, but it is seldom that this is necessary.

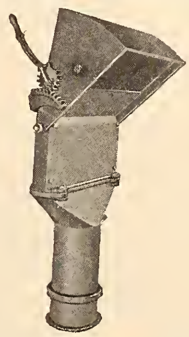
The blower and exhausters are driven by a two-phase motor, power being furnished from the main power station.

The building is heated by a hot air blast system, steam being furnished from two locomotive type boilers and the blast pipes run along the walls near the eaves.

The supply of air for the heating system is drawn



Scrap Furnace in Brainerd Blacksmith Shop, N. P. Ry., Showing Connections to Cover Smoke Escaping from Doors.



Buffalo Down Draft Hood Applied to Old Forges in Brainerd, Minn., Blacksmith Shop of N. P. Ry.

The blower furnishing the blast is a No. 11½ Buffalo steel pressure blower running at 1,700 revolutions. The exhaust fan which handles the smoke and gases is a 110-inch Buffalo steel plate fan having blast wheel 78 inches in diameter, wheel overhung from the shaft. This fan runs at 425 revolutions.

from the outside, thus materially assisting the ventilation of the buildings. The entire work of remodeling this shop was accomplished without the necessity of shutting down or stopping work in the shop, the work being done under the supervision of the Buffalo Forge Company's superintendent.

Renewal of the Car Department at the Portsmouth Shops--Seaboard Air Line Railway

THE Seaboard Air Line Railway operates 2,610.97 miles of road in the South Atlantic states and Alabama, owning 308 locomotives, 277 passenger cars and 10,117 freight and miscellaneous cars. In May last the car department of the principal shops, located at Portsmouth, Va., was entirely wiped out by fire. The general lay-out of the shop is shown by Figure 1, and the section burned may be readily seen by locating an imaginary line between the check house and the office building of the works. The buildings shown in the present view, east of this line, are all new with the exception of the paint and varnish storeroom.

The fire occurred one Friday night, and by the following Sunday morning the debris was entirely removed. This work having been pushed very rapidly under the personal supervision of Mr. J. M. Barr, first vice-president and general manager. Mr. R. P. C. Sanderson, superintendent of motive power, was at some other point on the line on this occasion, and returned to Portsmouth by Sunday night, immediately assuming control of the reconstruction. Besides destroying all the buildings above referred to, the heat of the fire was so intense that the cross ties in the repair yard were burned and the rails badly damaged. These tracks were immediately replaced by temporary ones, and by 9 o'clock Monday morning forty-nine cars were placed thereon; by that night forty-four of these cars had been repaired and were again placed in service. Of course, however, the work done during that day constituted light repairs. Besides the old coach shop, mill, storehouse and lumber piles, about forty flat cars and several coaches were lost in the fire.

In order to continue the necessary repair to the car equipment, a temporary mill building was erected and a number of air motors and air tools, together with several wood working machines, were brought in from several outlying division plants, and the other roads in the vicinity kindly offered their assistance by loaning light tools, etc. With this temporary equipment it was possible to maintain car repairs to some small extent. Work was immediately pushed in preparing to renew the permanent buildings and equipment at as early a date as possible, and it was necessary to confine the cost of the new buildings almost to the money which was obtained from insurance on the previous buildings. Because of the imperative demand for new buildings, it was impossible to take time to prepare elaborate plans, and the buildings were, therefore, erected from rough pencil drawings, and the work of erection continued during July and August.

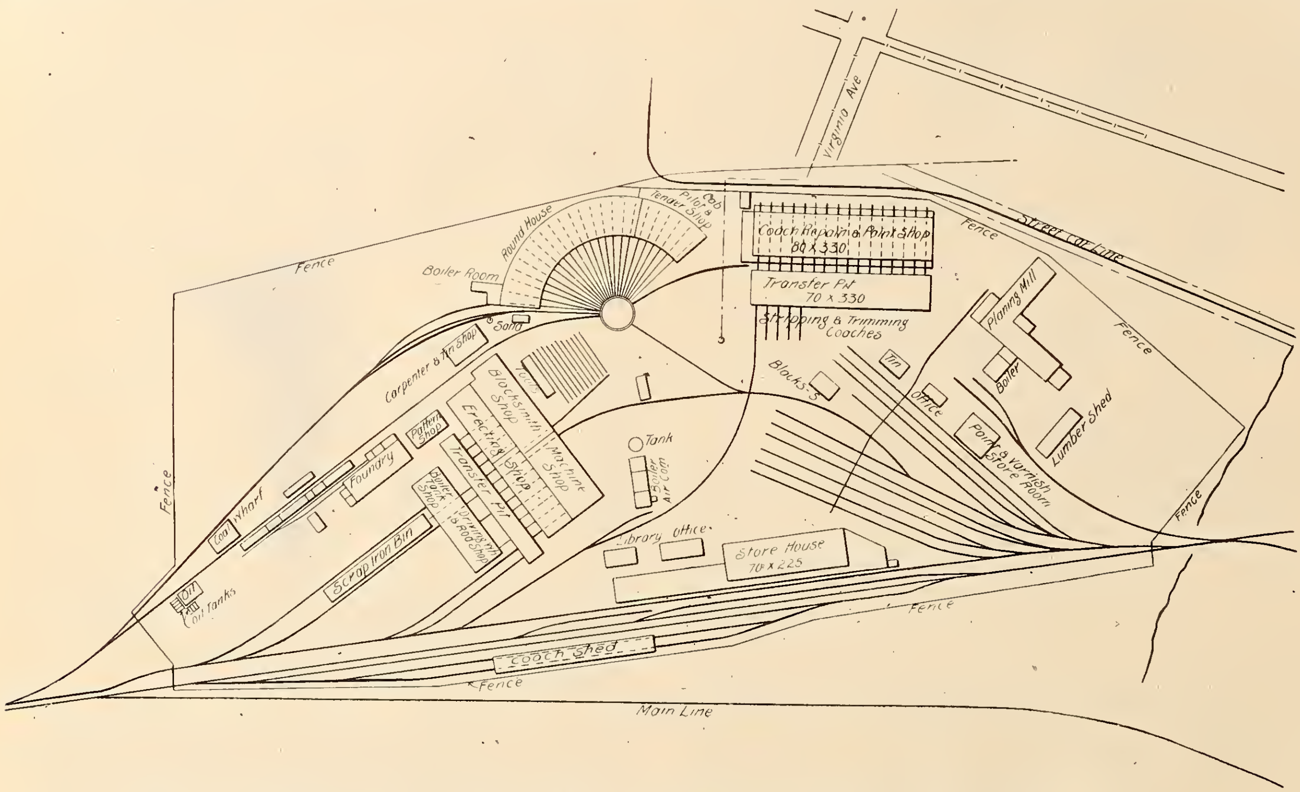


FIG. 1—GENERAL LAYOUT OF SHOP PLANT OF SEABOARD AIR LINE AT PORTSMOUTH, VA.

In arranging the plans for renewing this department, the entire equipment was made much more extensive and convenient. A coach repair and paint shop 80 feet by 330 feet, containing sixteen repair

Fig. 2—Showing Relative Positions of Coach Repair and Paint Shop, Transfer Table and Mill Building. The Mill is at Right of Illustration and Coach Repair Shop at Left.

tracks, was erected. This building is served by a transfer table, operating in a pit 70 feet by 330 feet. In order to gain space, four tracks were arranged on the opposite of the transfer pit, for stripping and trimming coaches, so that, by the time the coaches are placed in the shop they have been thoroughly stripped and cleaned, thereby keeping the objectionable and dirty work outside of the shop. Connected with the repair and paint shop by a board walk is a planing mill arranged in the form of an L, one leg of which is 44 feet by 165 feet, and the other 165 feet by 44 feet, to which is added an engine and boiler room, as shown in the plan. The old oil house, which was located in the section of the plan given up to car work, escaped the fire, and this building still remains standing; it is no longer used, however, as an oil house, as a new building for this material has been erected in the locomotive department, as also shown in the plan. The old building is now used for a paint and varnish storeroom. The other buildings include a tin shop and burnishing room, a lumber shed, a blacksmith shop, and a small office for the foreman in charge of car repairs.

The building used for the coach repair and paint shop is shown in the accompanying illustration, Fig. 2. It is of brick construction to the height of the bottom of the windows, above which a wooden frame is covered by corrugated, galvanized iron. The high windows shown provide ample light, adding materially to the convenience of working within the building. The roof is covered with five-ply tar paper, over which is spread a coating of tar and pebbles. The large doors,

Fig. 3—Mill Building, Power House Annex Being Shown at Right.

through which cars are taken into the building, are of the Kinear rolling steel door type, and at the back of the building there are double swing iron sheathed doors, eight feet high, through which trucks are rolled to the tracks extending about twenty-five feet beyond the building, on which truck repair work is done. In the roof of the building is a monitor, extending the entire length, with side window lights. In the east end of the building a section within the monitor is floored over, and constitutes a room in which upholstery work is done. This is connected by a stairway with the first floor, and a small hand elevator for delivering material. The flooring of the building is cement between the tracks, the cement extending to a jack beam on each side of the track and flush with the flooring; the space between the rails is left open above the cross ties, except at the end of the tracks the systematic location of the cars as they are brought into the shop; by this method two or three cars are standing between those in which work is being done and those which are being varnished.

The transfer table used in connection with this building is a decided improvement over any facilities which were provided in the previous equipment. This table was prepared at an exceedingly small cost; the entire material of which it was constructed amounting to but $1,600. The table is carried on three old arch bar trucks, and is operated by two marine engines connected together. A clutch is so arranged that the shaft for propelling the table may be thrown out, and the engines connected with a drum for drawing cars to or from the table. The engines are operated by air, the table carrying a large tank of a capacity sufficient for two round trips. Several air connections are provided

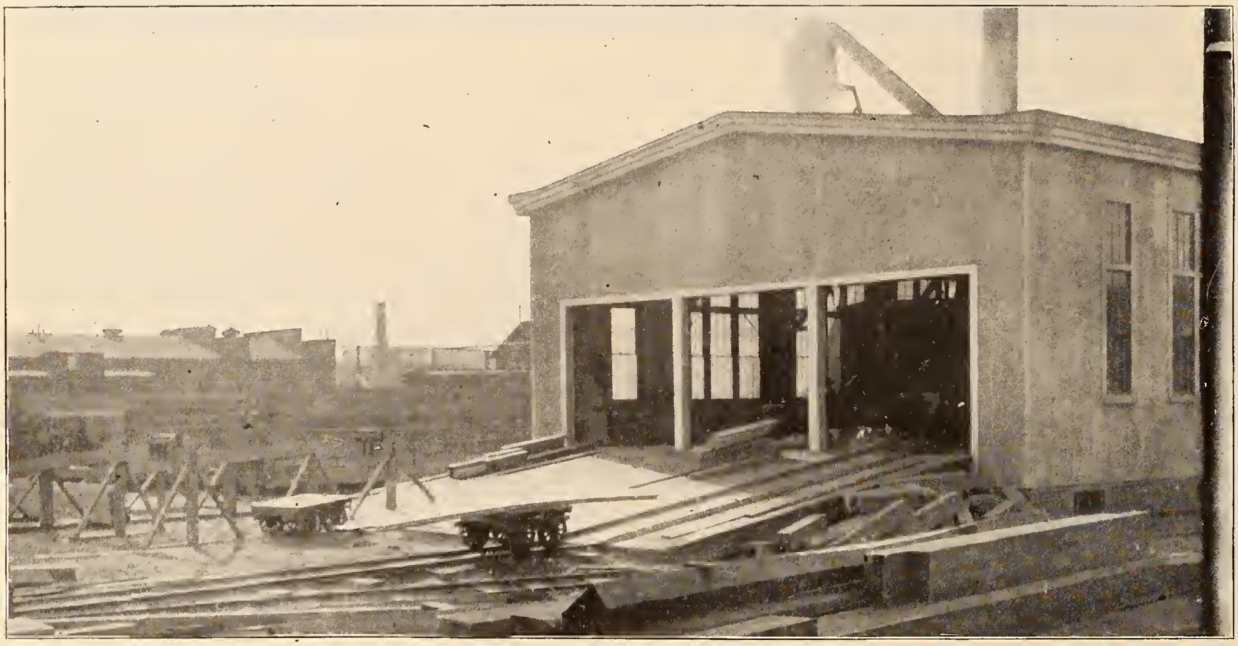


Fig. 4—Showing Large Doors for Delivering Material to Machines in Mill—Skids for Delivering Sills and Lumber Piles Are Seen to Left of Illustration.

near the doors, which is boarded over to provide for trucking material up and down the shop. Gutters are provided on each side of each track in such a position as to be immediately under the eaves of the car, so that water is drained towards the transfer pit. The building is heated by direct steam system, pipe radiators being arranged longitudinally between the posts and beneath work benches, which are supported by the posts, the arrangement being such that a radiator is located between each track. Cupboards for the use of the workmen are arranged along the ends and one side of the building, and these cupboards also include a set, which are numbered to correspond to the several working tracks, each large enough to hold the brass trimmings, lamps, etc., from one car.

No separate department has been provided for paint work, as all varnishing, etc., is done within the coach repair and paint shop. The only provision made for working against dust, while cars are being painted, is throughout the length of the pit, so that the tank may be supplied at several points in its travel.

The walls and roof of the mill building are of the same construction as that described for the coach repair and paint shop. In preparing for the foundations of this building quicksand was encountered, which added material difficulty in its erection. The building is supported upon posts, each one of which rests upon two wooden piles driven deep into the ground. One L of the building is used principally for heavy work, and an interesting feature is the provision of large doors for handling timber through the walls of the building. Car sills, etc., which require multiple operations, are entered at the east end of the building, and progress from one machine to another, until they are finally finished and delivered at the opposite end. In this connection it may be mentioned that a pair of skids, upon each of which operates a small traveling carriage, is provided near the lumber pile; by the use

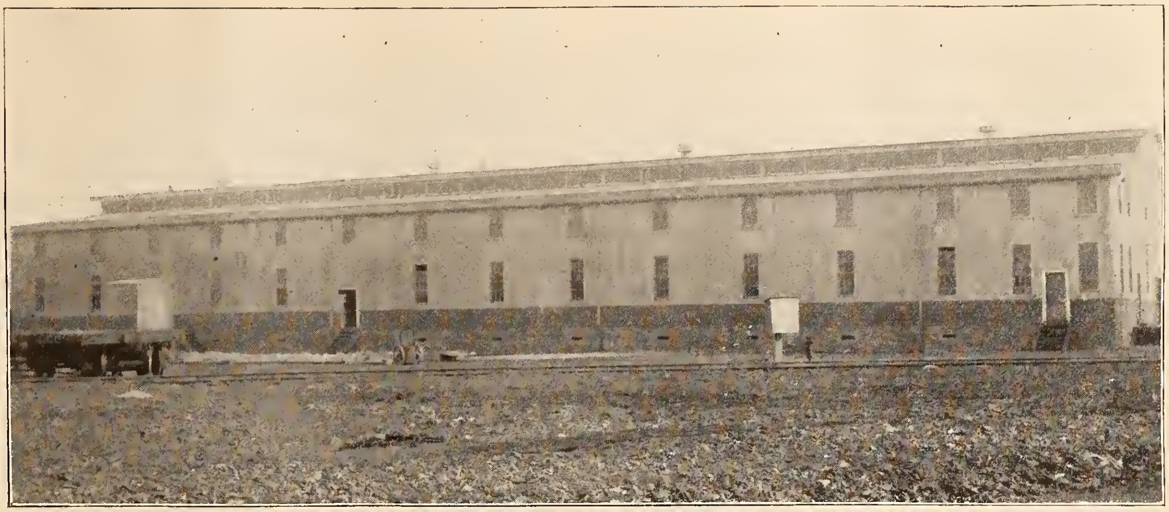


Fig. 5—Store House.

of this arrangement sills may be delivered opposite the large doors, from which they are readily passed on to the machines. This arrangement is illustrated by the half-tone engraving, figure 4. Those pieces requiring less machining are delivered at the same end of the building, but through the doors on the other side of the floor, and they, too, pass through the building, and are delivered at the end of the leg toward the coach repair shop. The other leg of the building is given over to cabinet work, and the machines used therewith. By placing these machines near the cabinet shop, each man who has a small amount of machine work to do, upon the job in which he is engaged, finds the machines easily accessible, and loses but little time between the machines and his bench. The simpler machines are operated in this connection by the cabinet workers, and operators are provided for the more complicated machines, who assist the cabinet workers in the heavier work, so that no time is lost by the men standing around while others are doing their work. Another feature of this building is that all shafts and counter shafts are placed in a basement beneath the flooring. These shafts are supported on special roller bearings, which reduce the friction to a minimum. The friction of the bearings amounts to so little that it is possible for two men to start the shafting by pulling on the belt, and it may be continued in motion by one man.

Shavings are removed from this building by an air conduit system, which delivers them either to an automatic stoker, or to a storage tank placed near the boiler room. The shavings are taken care of systematically. Several connections to the chutes are placed at different points throughout the floor and kept closed until needed by small doors. When the heavy machines are running these openings are kept closed, and shavings from the machines are fed to the boiler room; when but few or none of the machines are running, the man employed to keep the floor thoroughly swept, sweeps a pile of shavings to each opening, which is in turn delivered to the boiler room, as heretofore explained for the machines.

In addition those heretofore mentioned, a large two-story building has been constructed for a storehouse.

Fig. 6—Coach Repair and Paint Shop—Transfer Table is Shown in Foreground.

The building is of the same construction as that described for the repair shop and mill. It is shown in the accompanying photo engraving, figure 5, its location being shown in the general lay out in figure 1. It is 70 feet by 225 feet, and located convenient to the main supply track. This department is under the supervision of Mr. R. E. Dickinson, General Store Keeper of the system. He has given careful attention to the equipment of the interior, in arranging racks, pigeon holes, etc., for the systematic storage of material, and special attention has been given to ease in locating material, and removing same from the several bins. At the east end, immediately south of the building, are bins for the storage of car supplies, bolts, etc., and at the west end are racks with umbrella roofs, for the storage of pipe, flues, bar iron, etc.

Narrow gauge side-tracks are being arranged about the plant to facilitate the transportation of material.

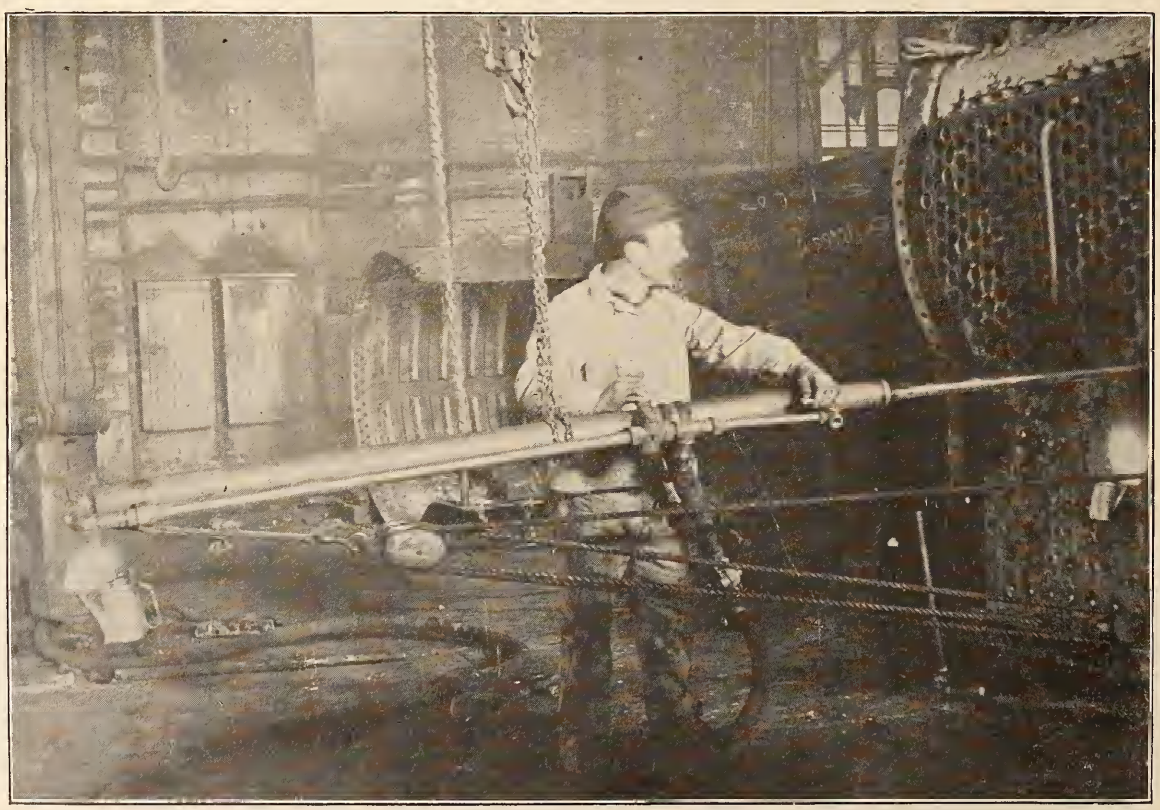
But little change, which is worthy of mention, has been made in the locomotive department, although minor improvements and changes are constantly going on. More important improvements are in view for this department, but have not yet been sufficiently developed to be commented upon.

A Pneumatic Hammer for the Boiler Shop

AMONG the many pneumatic tools designed in various shops for local use the tool herewith illustrated presents a simple design arranged in the Topeka shops of the Atchison, Topeka & Santa Fe Railway, which is noteworthy as a time and labor saver. The construction of the tool and the manner in which it is supported while in use are shown in the accompanying line drawing and half-tone engraving. The end of the chisel bar extends within the cylinder so as to receive the full force of the hammer blow. The operation of the hammer may be clearly seen by reference to the line drawing, which shows the air connections and operating three-way valves. By operating the three-way valves alternately the air may be exhausted to the atmosphere while air is admitted behind the hammer, either to drive it against the chisel bar or return it to the opposite end of the cylinder preparatory to delivering a blow. To withstand the blow of the back stroke of the hammer a rubber cushion is placed at the end of the cylinder, as shown.

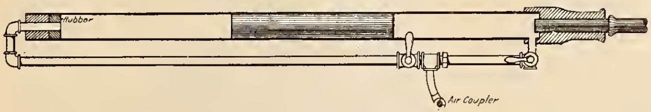
While there are many uses in the boiler shop to which this hammer may be applied, the service for which it is most appropriate is that represented in the illustration, where the staybolts are being cut in the right water leg of the boiler.

The tool is operated by two men. One man manipu-



A PNEUMATIC HAMMER FOR THE BOILER SHOP.

lates the valves controlling the hammer, while the second man, by means of a crank and drum, tightens the tackle which holds the tool against the work.



A Pneumatic Hammer for the Boiler Shop.

With this tool all the staybolts of a firebox may be cut in one day, while with the old hand method it took several days to accomplish the same result. The cylinder is 5 feet long, of 3-inch wrought iron pipe, and the hammer weighs about 40 pounds. The plug at the forward end is screwed to the end of the cylinder, while the plug in the opposite end is welded, as it has to withstand and stop the return blow of the hammer.

This tool is the design of Mr. Alfred Parfitt, foreman boilermaker of the shops above mentioned, who has covered the device by patents.

Railroad Shop Tools

By Charles H. Fitch

IN our treatment of the subject of milling machines we anticipate an objection or criticism which may be made, namely, that so far as railroad shop practice is concerned we scatter shot. Much that we have to say will relate either to old and outlived conditions, or to future and as yet unrealized conditions. But the reason for this is inherent in the facts of the case. Milling machines are of great utility in railroad shops, but their use and development is not nearly as characteristic of railroad shops, certainly not of railroad repair shops as it is of some shops devoted to other lines of manufacture. Yet we do not know of any machine-shop subject more interesting and suggestive than that of the development and field of work of the milling machine. It is more than probable that this field will be greatly enlarged in locomotive work.

In presenting the subject of "Manufactures of Interchangeable Mechanism" in the U. S. Census Report of 1880 I proceeded by gradations from the small end of the horn in the order, watches, clocks, fire-arms, sewing machines, locomotives, stationary and marine engines. In watch factories the amount of stock to be removed was so small, and accuracy so essential, that, the single point tool seeming to serve the purposes of precision the operations except automatic gear cutting were chiefly upon the lathe. But in the large gun, pistol and sewing machine factories whole floors were occupied with ranks of milling machines, and the type of machine used was modeled after that of Geo. S. Lincoln & Co., Hartford, Conn., shown in Fig. 1.

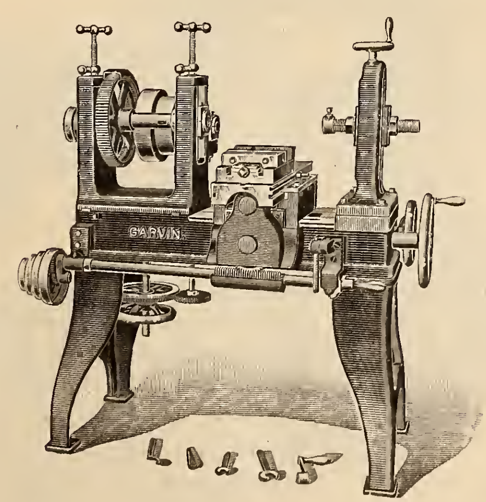


Fig. 1.—Lincoln Milling Machine.

This cut shows a modern machine by Garvin Machine Company, of New York, who build a great variety of up-to-date plain and universal milling machines. We may as well say that the improved models of special and universal milling machines produced by American tool builders are very numerous and embody more meritorious features of design than can be fully considered in a single article. The problem which appealed most strongly to early designers was to preserve the alignment of the mill spindle while adjusting it to different heights. Later designers made the mill spindle fixed in position and put the vertical adjustment in the table as shown in Fig. 2 by the Becker-Brainard Company, an excellent design of a type of tool made by many builders. Fig. 1 shows the underneath gearing and the stop screws and nuts at the top for live spindle adjustment, also the automatic disengagement of work by causing a worm on a pivoted feed shaft to drop out of gear with its worm wheel.

On heavy locomotive and engine work there was no use for these machines, and the planer and lathe were preferred tools, the universal milling machines being, however, most essential for the equipment of tool rooms.

The milling machine is almost the alpha and omega of shop tools because it was one of the earliest machines introduced, and on the other hand in its present shape it is one of the most advanced of modern tools. Before planers were used, when approximately "plane" surfaces were made by clipping and filing, and were sometimes left so bad that slides had to be worked with heavy leaf springs to take up the slack of unevenness, milling machines were devised to make narrow plane surfaces, and these were

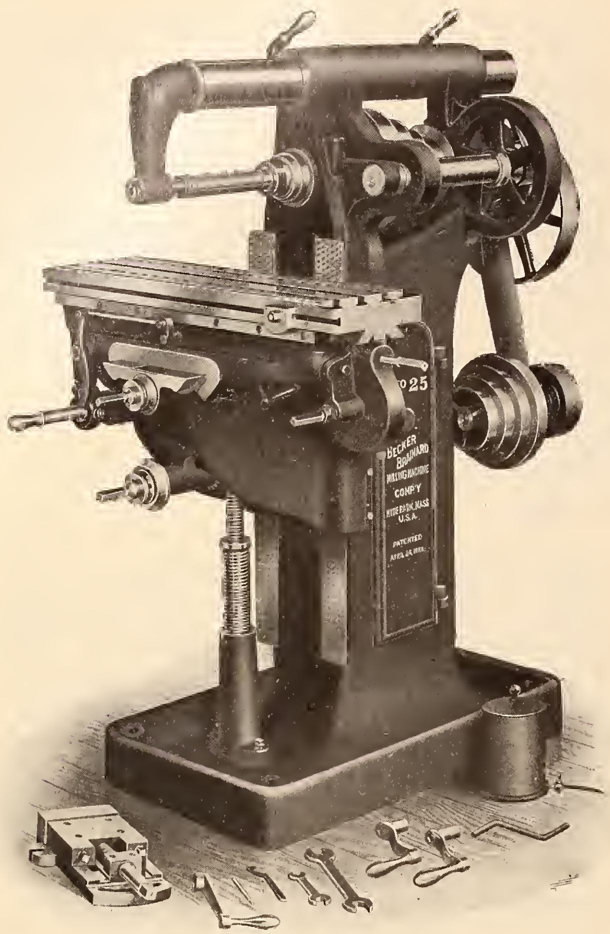


Fig. 2.—Plain Milling Machine With Non-Adjustable Spindle.

called slabbing machines. They were used in the gun works of Whitney before the close of the eighteenth century, and when locomotives began to be built were used in making side rods.

Another use of milling machines was in making forms neither plane nor cylindrical such as the fillets of connecting rods. These shapes appeared to defy the planer and

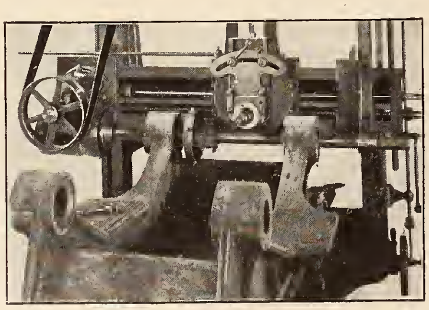


Fig. 3.—Boring on A Milling Machine.

the lathe in the then-existing state of the art, and the problem was solved by rough milling.

Slabbing machines were suggested by grinding which is historically older than lathe work as a stone is earlier than a good pointed tool. To rib a steel roll with teeth pantagraphic devices for making cutters so that they and harden it, or to file the teeth of a gear for cutting were early and obvious expedients. Much later came the could be sharpened without change of form, and the development of precise milling with which the names of Brown and Sharpe must ever be associated.

Yet what for the practice of the future is more promising than the milling tool? The cutting edges unlike those of single tools required for lathes and planers are in use only for a moment and then cool through a revolution. Mills did rapid work without losing temper before the high speed steel was discovered. And with high speed steel they afford a possible field for greater rapidity of action and heavier work which has scarcely been considered or entered upon. Machines contemplating such action would have to be designed with framing to resist very heavy stresses such as those imposed by punching and shearing.

Such types of machine may be prophesied, but they have not yet appeared. No machine tool, however, is of such protean form as a milling machine. Wherever a spindle can be arranged to turn we can have a milling machine. Hence we have milling machines of what may be called the lathe type, the planer type and the boring mill type so far as framing is concerned.

For boring the mill becomes a reamer, and the peculiar advantages of relief of action and repetition obtained by the mill in outside work disappear in boring. In Fig. 3 is shown a boring mill job with the usual boring bar and tool rigged up on a planer converted into a milling machine by the Farwell system of the Adams Company of Dubuque, Iowa. This system permits the use of a machine either as milling machine or planer by rigging upon the planer cross-rail without interference with the planing tool heads brackets constituting the live and tail stocks of a milling machine.

Figure 4 shows one of these machines making a broad slabbing cut upon pieces in multiple using a long cylindrical mill with inserted cutters. This does the work in less than half the time required in planing, but will be seen to require considerable additional equipment and tool-making work, a special system in fact which few railroad repair shops would be ready to put into operation. Sometime with a different system for replacements and interchangeability of parts they will be ready and the tendency of such a system will be to remove machine work from local repair shops and concentrate it at large division shops. In such large shops two purpose machines will not be wanted, but in a small shop they serve a valuable purpose.

The milling machine in its universal or simple form is its own tool maker, and in this connection we show in Figure 5 the method of grinding inserted tooth face mills on the Farwell system.

The framing of any machine might be utilized for similar applications. Separate arrangements for belt drive and tightening, and countershafts must be provided. A

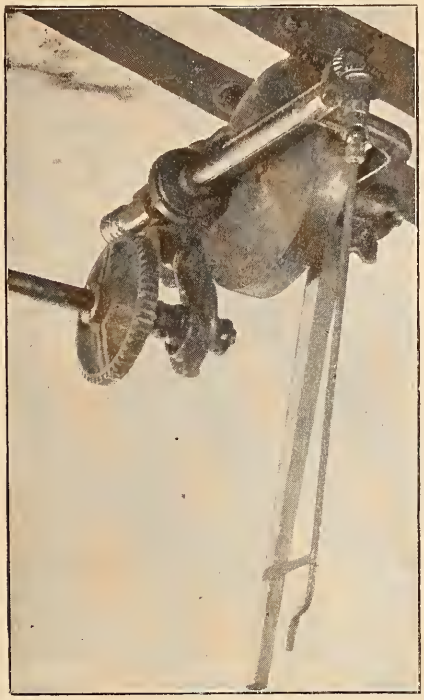


Fig. 6.—Variable Speed Countershaft.

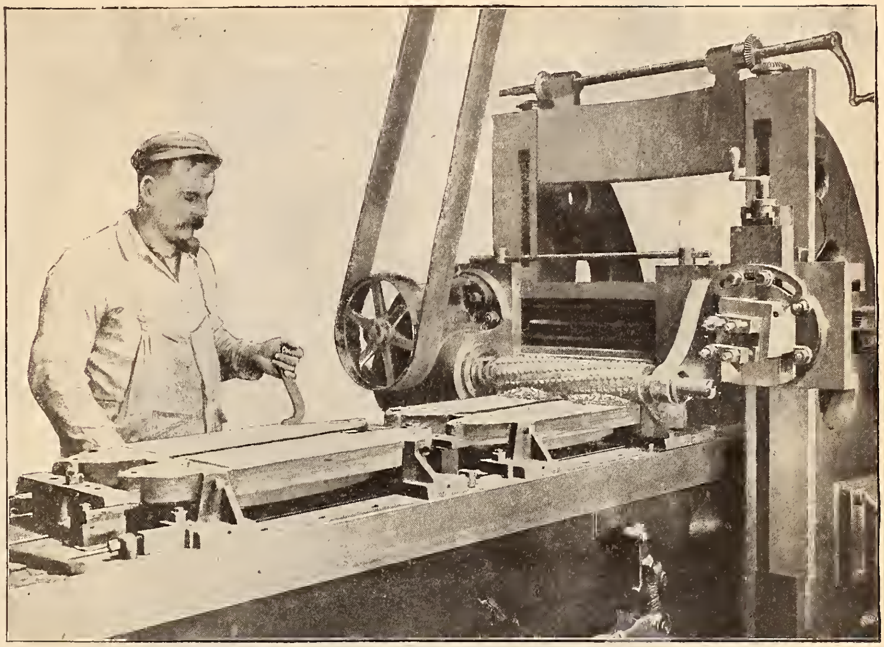


Fig. 4.—Slabbing Cut.

countershaft mechanism is shown in Fig. 6 by which speed of table may be varied from 0 to 6 inches per minute either direction. A friction disc gives variable feed to worm gearing on the planer countershaft. This is practically the same device as commonly used on planer frames, Newton cold sawing machines and many other machine tools.

In Figure 7 we show the Ingersoll milling machine made at Rockford, Ill., and in considerable use in railroad as well as in general shops. This is a machine of great power and rigidity designed for milling only. As shown it is arranged for vertical milling, but it is largely used for horizontal milling and slabbing cuts. It is obviously of the planer type.

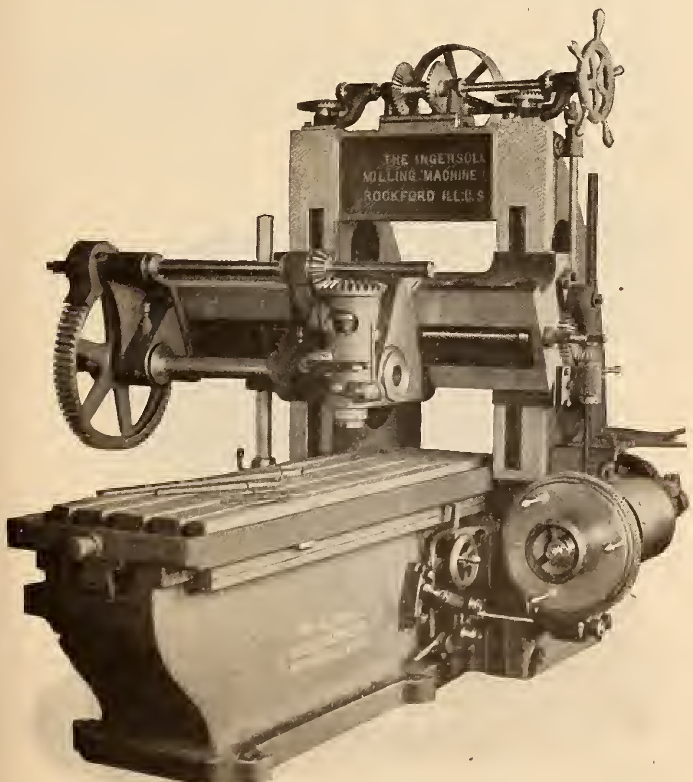


Fig. 7.—Milling Machine of the Planer Type.

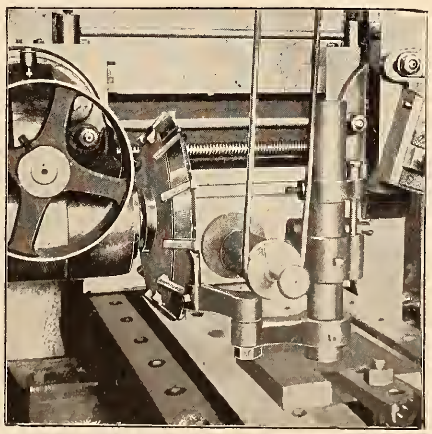


Fig. 5.—Grinding Cutters on A Milling Machine.

The mill is a producer of all surfaces, round, flat, and curved either by profile of the mill or by giving a movement to the work or the mill. Curved links can be milled by an attachment which swings the work as it is fed forward. Even keyways and corners may be worked with them, the Newton Company of Philadelphia having developed an excellent practical system of keyway cutting, using a horizontal in combination with a small vertical mill.

The ordinary milling machine for use on comparatively small parts is of the pillar or box column type similar to

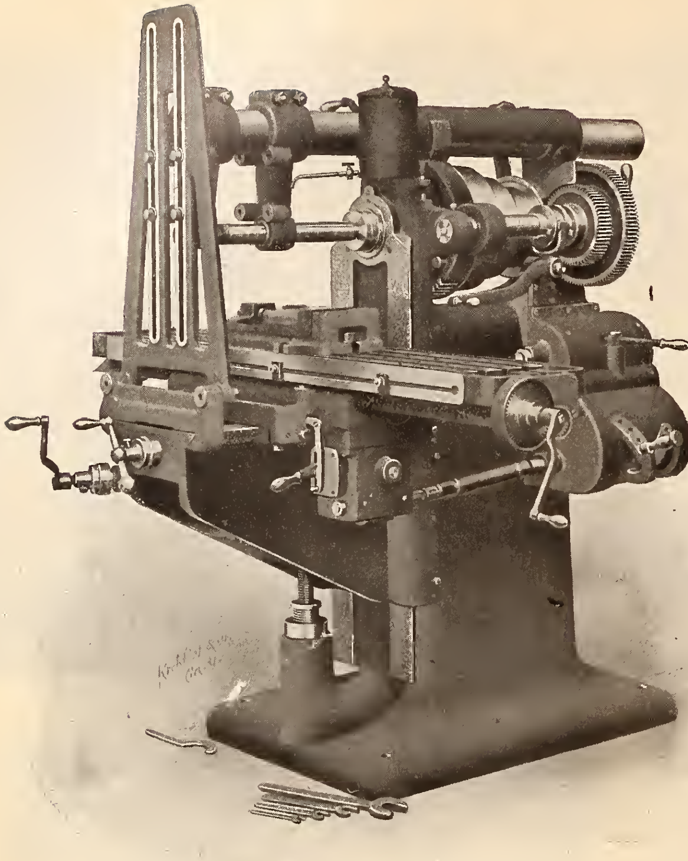


FIG. 8.—UNIVERSAL MILLING MACHINE.

Fig. 2. The variations in design are not now so numerous as they were in New England in that gun and pistol-making period when America was sowing the seeds of the interchangeable system in foreign armories, and nearly every nation was a purchaser of American arms or American tools, or both. A tool of this period of the lathe type manufactured at Worcester, Mass., had both head and tail stocks with set over motions, a vertical feed for vise and work like an inverted radial drill feed, and a dividing disc with ratchet gear also applying to the vise. Of such a machine we would exclaim: What a weak-legged little tool to carry such a millinery of mechanical head-gear! No such design would be possible now. A vast improvement has been made in solidity both of framing, and of the bearings of all sliding and swiveling parts.

Milling speeds range in the neighborhood of 30 to 40 feet per minute peripheral for steel and cast iron (except hard shots) 45 feet for wrought iron, 80 feet for brass, depths of cut varying from 1-32 inch in hard steel to 2½ inches in soft cast iron. A Newton internally-lubricated mill cut ⅜ inch depth 9 inches feed, 50 feet per minute peripheral speed, each tooth taking off 1-100 inch chip. Wherever arrangements can be made for milling the economy of time over single tool cuts as in planing is very great. The Ingersoll Company show a practical illustration of a rose mill finishing a recess in the periphery of a circular casting one-third faster than it would be done on a lathe. Such work requires a turning head or table. For work in repetition it secures duplication of recess with elimination of possible error on the part of the workman.

The prince of milling machines, and the *piece de resistance* of every tool room is the universal. It was designed long ago, but has been steadily improved in solidity and in minor details of convenience. Its essential utility becomes ever greater as machine work passes from jobbing to manufacturing, what has been defined by another as "the revolution in machine shop practice."

About twenty-five years ago (June 21, 1879) the Scientific American contained a picture of a universal milling machine presented as an improved English design, and taken from "Engineering," the well-known London publication. It looked familiar to me, and on close comparison I found it to be substantially the same machine as designed by F. W. Howe, superintendent of the Robbins & Lawrence shops (now Jones & Lamson shops) of Windsor, Vermont, at least fifty years ago. It had come back like an echo after an exportation dating back a quarter of a century. In 1855 eight of these machines were shipped by Robbins & Lawrence to the Enfield Armory and Royal Carriage and Laboratory Department of the British Government. They had the index head called universal pivoted on slide in the front of the machine and the vertical central feed through swivelling table. Later the Brown & Sharpe Company of Providence made their improved machine a household word in American shops.

The universal built by the R. K. Le Blond Machine Tool Company of Cincinnati is shown in Fig. 8, and embodies quite a number of excellent and ingenious features. In point of rigidity for heavy work the jointing of the table swivel, and the feed through its center presents the

FIG. 9.—UNIVERSAL HEAD FOR SPIRALS.

weakest point in the universal machine. This can be guarded only by liberal proportions and large carefully scraped bearings. The ordinary universal head does not provide for cutting spirals over 50 degrees angle but the Le Blond Company make a new type of universal head shown in Fig. 9 available for use at any angle as the

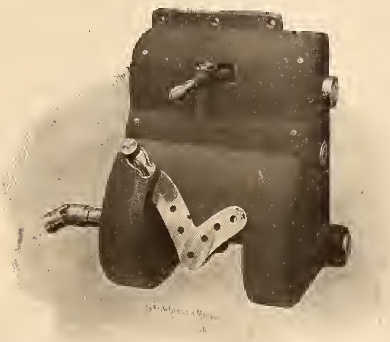


FIG. 10.—GEAR BOX FOR CHANGING FEEDS.

cutter can be swung through 210 degrees. This can be applied to plain as well as universal machines.

Other notable features are the friction-clutched double back gears, and the gear box drive. The gear box is coming to be considered essential to all types of up-to-date machine tools requiring numerous and frequent changes of feed. It requires less thought in the shop, and so far should be considered as a device which does some of the machinist's thinking for him. He does not have to figure out change gears, and sort and shift loose pieces.

In details of gear boxes there are as many possible designs as in fire-arms locks. Imaginatively the requirement is precisely the same as would be involved in shifting loose gears and bringing them into engagement with other gears on other shafts. This can be done by rotation of arms carrying some of the gears, coupled with sliding movements. Many forms of clutch are also used in effecting these combinations, and while the translation and engagement of cones and nests of gears presents an interesting rather than a specially difficult problem of machine dedsign, the net result is that this thinking once for all eliminates the need of solving a gear problem by the machinist leaving him to deal simply with the lever and pinholes of such a box exterior as shown in Fig. 10 in which there can be no interference, double-meshing, or other possibility of error. The Le Blond is an admirable tool, but there is evidence enough in the machine tool product of many other American builders that brains are being put into new model machines to save time and thought in the shop.

The increased suburban traffic on the Delaware, Lackawanna & Western R. R. has necessitated a larger equipment of modern passenger coaches, and the first consignment of ten cars is now being received. Instead of the three steps usual in such suburban cars the new rolling stock will have four steps. Is is thought that this feature will not only prove a convenience to those who travel on suburban lines, but will also facilitate the rapid loading and unloading of cars, thereby saving time. Another interesting feature of their construction is the introduction of acetylene gas for lighting. The officers of the railroad say: "This gas has been found so far superior as an illuminant that it is probable all surburban coaches of this road will be so equipped in future. For passengers desiring to read their papers on the way home good light is an important factor, and in deciding upon acetylene gas we claim that we are providing the best illuminant available. Exhaustive tests have demonstrated the practicability of the gas, and the tanks in which it is carried are constructed in such a way that it is impossible for them to explode."

Communication

To the Editor of the Railway Master Mechanic:

We have read with interest the article in your last number by Mr. Fitch, page 51, on "Railway Shop Tools." While same is not very much detailed, yet there are two points which might be misunderstood. First, the machine illustrated of our make was a double throat, but we build them single throat also. Second, on page 55, just below figure 9, you state that it is "strange that no builder has adopted the box section." We presume that this refers to the frame and if so we state that we use the box section altogether and have never used anything else.

Cincinnati Punch & Shear Company.

The Railway Storekeepers

A gathering of railway storekeepers met at the Auditorium Hotel, in Chicago, on Feb. 16, and organized what is to be known as the Railway Store Keepers' Association. It has for its object the "exchange of ideas as to the betterment in methods of handling, caring for, and use of materials and supplies, in connection with the operation of railways, by discussion, investigation, and reports of experience of its members, and to provide an organization through which the members may agree on such joint action as may be required to attain the greatest efficiency in the methods of handling, distributing and caring for material." The members elected the following as its officers to serve during the year ensuing from the first regular annual meeting, which will be held in Chicago within the next three months: President, J. P. Murphy; first vice-president, N. M. Rice; second vice-president, W. Josselyn; treasurer, J. M. Taylor; members of executive c mmittee, J. C. Morris, Theron Higby and John Burke.

Power Required to Drive Machine Tools

THE extent to which electrical drive is being applied to machine tools in railroad shops, renders available data regarding the amount of power necessary to drive the various machine tools driven by individual motors, very essential to those contemplating new installations or making provision for changes from belt drive to individual motor drive. The following data has been collected by one of the principal manufacturers of electrical apparatus and the figures presented are interesting and worthy of careful consideration. In general it may be said that the size of the motor required to drive any tool must be determined largely by the conditions under which it is to be operated and while these tables are representative of the experience of an individual establishment their significance is readily appreciated.

In large boring mills it has been found that the maximum power is required of the motor when the tool is started from rest to get up to full speed, it being the greatest when starting on the point of direct drive.

BORING MILLS DIRECT DRIVEN.

Size.	Diameter of Work Inches.	Number of Tools Cutting.	Size of Cuts Inches.		Time in seconds required for 1 revolution of table.	Cutting speed in feet per Minute.	Material.	Horse power required to drive machine.
51 inch	47.0	2	1/16 x 1/4	1/16 x 1/4	30	24.6	C. I.	2.7
51 "	25.7	2	1/32 x 3/8	1/32 x 3/8	16	25.2	S.	2.0
5 feet	34.0	2	1/16 x 1/4	1/16 x 3/8	25	21.4	S.	4.8
5 "	28.0	1	1/16 x 1/4		25	17.6	C. I.	2.9
6 "	8.0	1	1/16 x 1/8		6	20.9	C. I.	2.0
6 "	59.0	2	1/16 x 7/16	1/16 x 3/8	48	19.3	S.	6.5
6 "	32.5	1	1/16 x 1/4		3	170.0	Copper and Mica	9.6
6 "	57.3	2	1/16 x 1/4	1/16 x 1/2	33	27.3	C. I.	4.7
7 "	60.0	2	1/16 x 1/4	1/16 x 1/4	30	31.4	C. I.	2.9
7 "	53.0	2	1/16 x 1/4	1/16 x 3/8	46	18.1	S.	6.6
8 "	85.5	2	1/16 x 3/16	1/16 x 1/4	53	25.3	C. I.	3.0
8 "	30.0	1	3/64 x 3/8		25	18.8	S.	3.3
8 "	40.0	2	1/64 x 1/4	1/16 x 1/8	29	21.7	S.	4.4
8 "	84.5	2	1/16 x 3/16	1/16 x 1/8	38	34.9	C. I.	3.6
8 "	54.0	1	1/32 x 3/8		24	35.3	C. I.	3.7
10 "	70.0	2	1/16 x 1/4	1/16 x 3/8	43	25.5	C. I.	3.4
12 "	12.5	1	1/32 x 1/32		11	17.9	C. I.	6.5
12 "	96.0	2	1/16 x 3/8	1/16 x 3/8	47	32.1	C. I.	3.4
12 "	84.0	2	1/16 x 1/4	1/16 x 3/8	57	23.1	S.	4.5
12 "	123.0	2	1/16 x 1/2	1/16 x 5/8	101	19.1	S.	7.2
10-16 "	73.0	2	1/16 x 3/8	1/16 x 1/4	32	35.8	C. I.	4.3
10-16 "	84.0	2	1/32 x 5/8	1/32 x 5/8	66	20.0	S.	4.8
14 "	98.0	2	1/32 x 3/8	1/32 x 3/8	80	19.4	S.	4.2
14 "	21.5	1	3/32 x 5/16		17	19.9	C. I.	2.4
14-20 "	172.0	2	1/16 x 1/2	1/16 x 1/4	114	23.7	C. I.	2.4
14-20 "	132.0	2	1/16 x 1/4	1/16 x 3/8	103	20.1	S.	5.0
25 "	220.0	2	1/8 x 3/8	1/8 x 3/8	150	23.0	C. I.	4.8
25 "	109.0	2	1/16 x 1/4	1/16 x 1/4	67	25.5	S.	4.8

PLANERS.

Size.	Drive.	Number of Tools cutting.	Size of cut in inches.	Cutting speed in feet per minute.	Material.	Ratio of cutting speed to return speed.	H. P. to Drive.			
							Cutting stroke.	Reversing to return.	Return stroke.	Reversing to cut.
36 inch	Belted	2	3/64x1/2 3/64x1/4	29.1	S.	1:3	7.0	10.3	7.6	7.1
60 "	Belted	2	Heavy rough cut	18.0	C. I.	1:3	7.0	18.3	4.9	9.2
84 "	Belted		Running light	18.2		1:3	2.4	19.7	4.8	17.8
120 "	Direct Driven	2	3/16x1/2 3/16x1/2	18.0	C. I.	1:3	11.3	23.8	4.4	11.9
120 "	Direct Driven		Running light	18.0		1:3	3.6	24.4	4.2	11.7
120 "	Belted	1	3/16x5/16	16.0	C. I.	1:3	6.6	32.6	5.6	20.3
120 "	Belted		Running light	18.0		1:3	3.1	34.7	4.9	20.0
120 "	Belted		Running light	18.7		1:4	3.6	17.2	6.9	5.8

SLOTTERS.

12 inch	Direct Driven	1	1/16 x 1/4	12.0	C. I.	1:1½	1.8	1.6	1.4	1.5
12 "	Direct Driven	1	1/16 x 3/8	12.5	C. I.	1:1½	1.0	1.1		.8
12 "	Direct Driven	1	1/32 x 3/8	13.5	S.	1:1½	1.7	1.8	1.5	1.6
18 "	Direct Driven	1	1/16 x 1/4	10.0	C. I.	1:4	1.2	2.3	.7	.7
18 "	Direct Driven	1	1/16 x 3/4	7.25	M. I.	1:4	1.1	1.1	.4	
24 "	Direct Driven	1	1/16 x 1/4	20.0	S.	1:1½	3.5	1.1	.9	1.0
60 "	Belted	1	1/8 x 1⅛		C. I.	1:2¾	7.2	21.1	12.0	9.1
48 "	Portable Belted	1	1/16 x 3/8		S.	1:1½	4.4	5.3	4.6	5.0
48 "	Port. Dir. Drive	1	1/16 x 3/8	21	C. I.	1:3	4.75	8.8	2.7	2.7
48 "	Port. Dir. Drive		Light	21		1:3	1.3	8.8	2.7	2.7

MISCELLANEOUS.

MISCELLANEOUS.	H. P. to Drive.
7 ft. Radial Drill. Belted. Drilling cast iron with 3 in. drill	2.5
8 ft. Radial Drill. Direct Driven. Drilling cast iron with 3 in. drill	2.1
36 in. Drill. Belted. Drilling ⅞ in. hole in tool steel	1.3
30 in. Drill. Belted (with tapping attachment). Drilling 1 in. hole in laminated iron	1.4
26 in. Drill. Belted. Drilling ⅞ in. hole in tool steel	1.3
Sand Sifter. Direct Driven	1.2
200 lb. Compact Hammer. Belted:	
To start hammer	11.3
Striking 245 blows per minute	7.9
72 in. Lathe. Direct Driven. Cutting cast iron 1-16 in. x 3-8 in. (cut) with cutting speed of 36.4 ft. per minute. Diameter of work 37 ins.	3.6
Air Compressor. Direct Driven. Pumping against 80 lb. pressure	15.3
Milling Machine. Belted. Cutter 3½ ins. wide x 2½ ins. diameter. Cutting tool steel 3½ ins x ⅛ in. cut with fastest feed	1.2
Cold Saw. Direct Driven. Cutting heavy steel T rail. Feed ½ in. per minute	2.3
42 in. Rotary Planer. Direct Driven. Cutting cast iron with speed of 39.7 ft. per minute. Feed 2¼ ins. per minute. Cut ½ in. x 18 ins.	8.6
Portable Key Seater. Belted. Cutting cast iron 1-32 in. x 1 in. cut:	
Cutting stroke	2.0
Return stroke	1.5

February Meeting of the Western Railway Club

The regular monthly meeting of the Western Railway Club was held Tuesday afternoon, Feb. 16. Mr. Geo. P. Nichols of Chicago read a paper on "Square Roundhouses." Rectangular engine houses are used everywhere in Europe, while the circular form is universal in this country. The nearest approach to the square form in this country are the new engine houses of the St. Louis Terminal Railroad Association at East St. Louis and St. Louis, where transfer tables are used between rectangular buildings similar to ordinary erecting shops. Mr. Nichols showed by drawings and figures that the actual area required for circular houses is considerably larger than for square construction. The disadvantages of circular form are especially great in winter, when snow and ice impede the entrance to the building and make it almost impossible to keep it warm. Mr. Nichols' plan provides two parallel rows of stalls with a transfer table between them, the whole being roofed over. Where the character of the repairs made at the roundhouse makes it worth while, a traveling crane may be erected over the transfer table. One disadvantage is that the engines cannot be turned in the roundhouse. This may be met by providing a turntable or a Y outside or by putting in a turntable under the transfer table, a design which Mr. Nichols is now working on. In the discussion there was pretty general agreement that the rectangular shape possesses many advantages and is worthy of consideration in planning new engine houses.

The second paper was by Mr. A. Bement on "The Influence of Brain Power on Dividends." The object of the paper was to suggest the importance to railway companies of having "a new and special kind of worker, which the author would designate as a professional student, who, in the service of corporations would devote his efforts to the study in his own field, of existing methods for the purpose of their own improvement, and to the discovery of new opportunities. Such man, or men, should not be burdened with any routine duties at all, but be free to carry on the work without interruption or hindrance, and instead of working under the direction of some particular official, it should be rather with the cooperation and assistance of all."

The speaker mentioned some examples of the importance of careful study and investigation and the saving effected thereby. The discussion seemed to show agreement with the speaker's position in the abstract, but was rather indeterminate as to the possibility or practicability of anything being done. There was also some mention of the desirability of the services of consulting engineers or mechanical experts.

The third paper was by Master Mechanic D. R. MacBain of the Michigan Central on "The Lubrication of

Locomotive Valves and Cylinders." Mr. MacBain's long and practical experience gives added weight and interest to his paper. We quote very briefly from his paper the following:

"Fifteen or twenty years ago when the maximum steam pressure was about 140 pounds the question of valve and cylinder lubrication was not so much heard of, the low steam pressure and perhaps a little better class of cast iron used in cylinders and valves, made the matter of proper lubrication a simple one. * * * *

"A long experience as a road foreman of engines and a most careful effort on the part of the writer to bring about the promised results, has failed to convince him that the oil can be delivered to the steam chest under 'any and all conditions.' On the contrary, I am perfectly satisfied that on long runs * * * * either one or the other of two things must be done, ease the throttle off frequently so that steam chest pressure will fall much below that of the boiler or run with a longer cut off and a throttle opening that will keep steam chest pressure down enough below the lubricator through the oil pipe to the steam chest all the time when the engine is working. The long cut off and short throttle has become the most acceptable method among enginemen and it is safe to say that this fact is responsible in a large degree for the increase in fuel consumption that has been pretty much universal."

Simple Freight Locomotive N. Y. C. & H. R. R. R.

THE simple consolidation freight locomotives recently placed in service by the New York Central & Hudson River Railroad and built by the Schenectady Works of the American Locomotive Company, are among the heaviest engines built for fast freight service. They are designed to operate under 200 pounds steam pressure and burn bituminous coal. With their large drivers and free steaming capacity their construction is such that they might be used successfully in heavy passenger service should emergency require the transportation department to make such a demand. To aid circulation around the firebox the water space at mud ring is made 4½ inches wide and is an evidence of the current tendency towards provision of ample space in this particular. The frames are strong and well braced, as shown by the detail view, Fig. 2. The casting at the front end which performs the double function of brace and center pin guide for the truck, and the casting forming the horizontal brace above the second axle, also supporting the transmission bar hangers, are light, yet well ribbed and strong.

Expressed by the usual formula, these engines are capable of exerting a maximum tractive effort of 45,600 lbs.

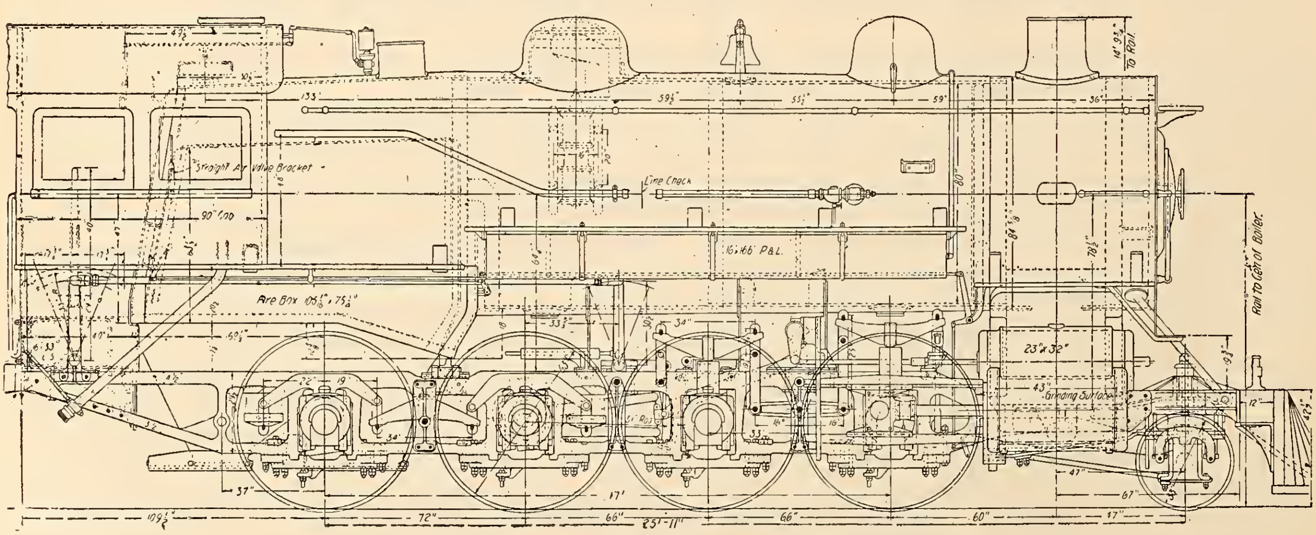


Fig. 1.—New York Central Consolidation Locomotive—General Side Elevation.

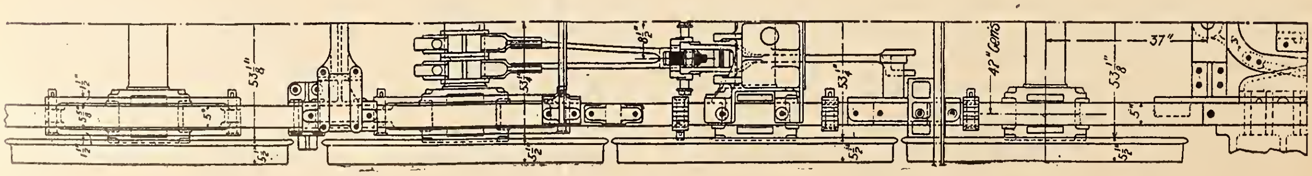


Fig. 2.—New York Central Consolidation Locomotive—Details of Frame.

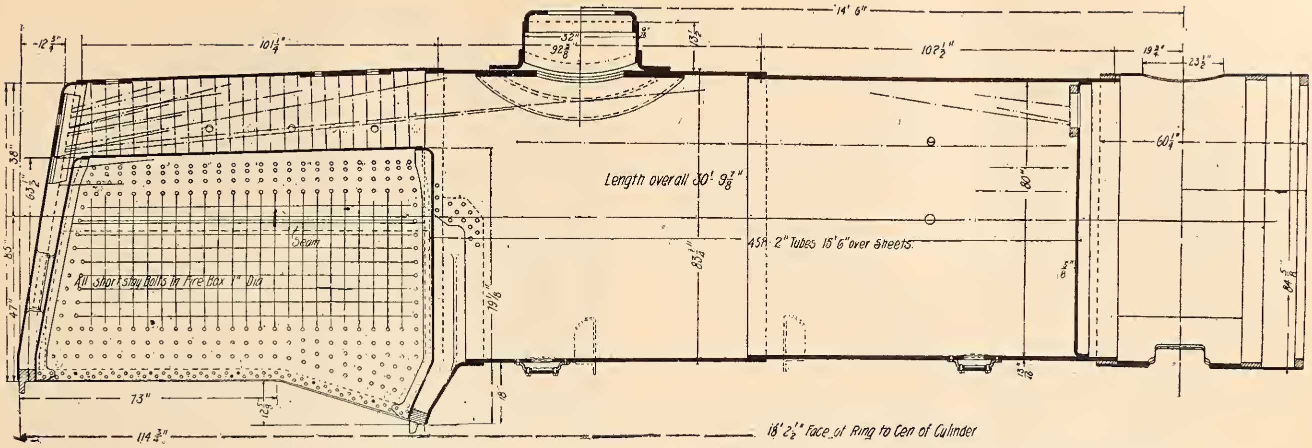


Fig. 3.—New York Central Consolidation Locomotive—Longitudinal Section of Boiler.

The ratio of weight on drivers to tractive effort is 4.37; the ratio of tractive effort to total heating is 11.5, and the ratio of total heating surface to grate area is 6.91.

Further details of interest are presented by the following table:

General Dimensions.

Fuel	Bituminous coal.
Weight in working order	219,000 lbs.
Weight on truck	19,600 lbs.
Weight engine and tender in working order	355,450 lbs.
Wheel base, driving	17 ft.
Wheel base, rigid	17 ft.
Wheel base, total	25 ft. 11 ins.
Wheel base, total, engine and tender	60 ft. 6½ ins.

Cylinders.

Diameter of cylinders	23 ins.
Stroke of piston	32 ins.
Horizontal thickness of piston	6½ ins. and 7 ins.
Diameter of piston rod	4 ins.
Kind of piston packing	Cast iron.
Kind of piston rod packing	U. S. metallic with Gibbs vibrant cup.

Valves.

Kind of slide valves	Piston.
Greatest travel of slide valves	6 ins.
Outside lap of slide valves	1 in.
Inside lap of slide valves	0 in. line and line.
Lead of valves in full gear	Line and line at front ¼-in. lead at ¼ cut-off.
Kind of valve stem packing	U. S. metallic.
Transmission bar	With.

Wheels, Etc.

Number of driving wheels	Eight.
Diameter of driving wheels outside of tire	63 ins.
Material of driving wheel, centers	Cast steel.
Thickness of tire	3½ ins.
Tire held by	Shrinkage.
Driving box material	Cast steel.
Diameter and length of driving journals	9½ ins. and 10 ins. dia. x 12 ins.
Diameter and length of main crank pin journals	(Main side 7¾ ins. x 5¼ ins.) 7 ins. dia. x 7 ins.

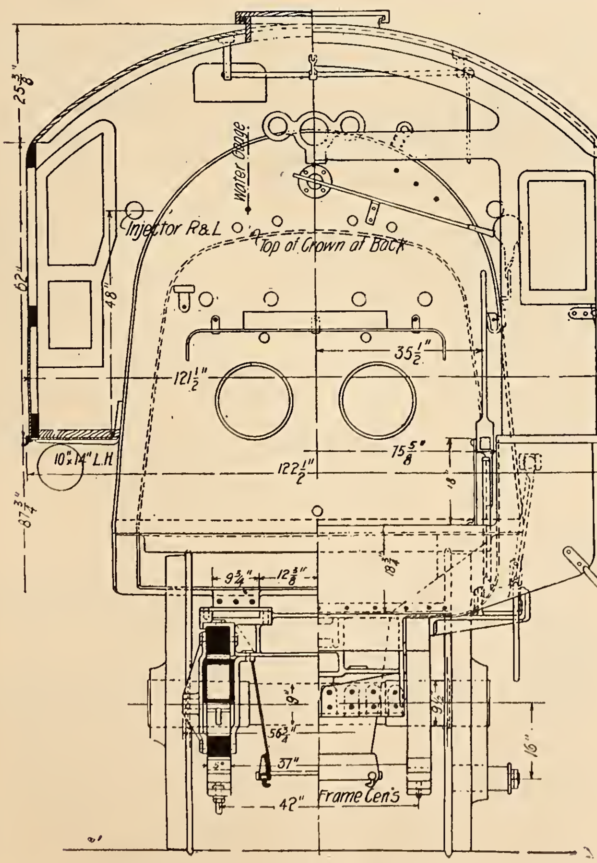


Fig. 4.—New York Central Consolidation Locomotive—Rear Elevation and Sections.

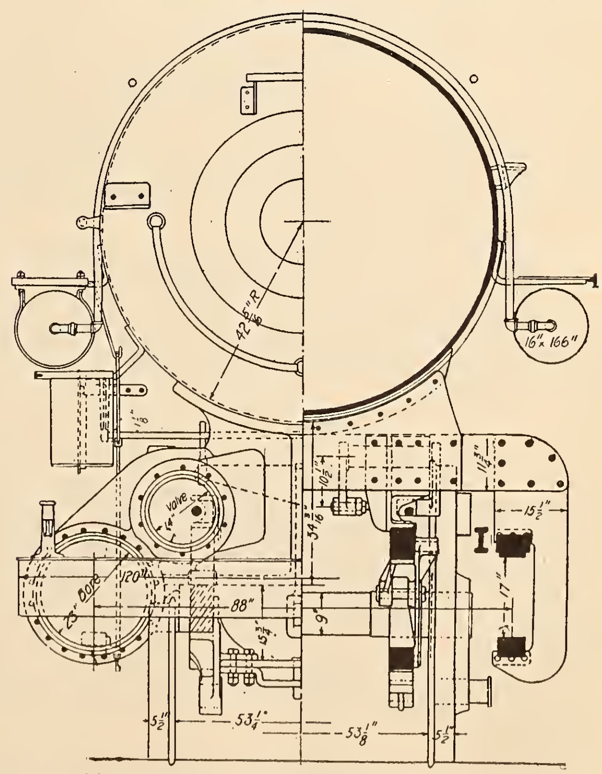


Fig. 5.—New York Central Consolidation Locomotive—Sectional and End View of Boiler.

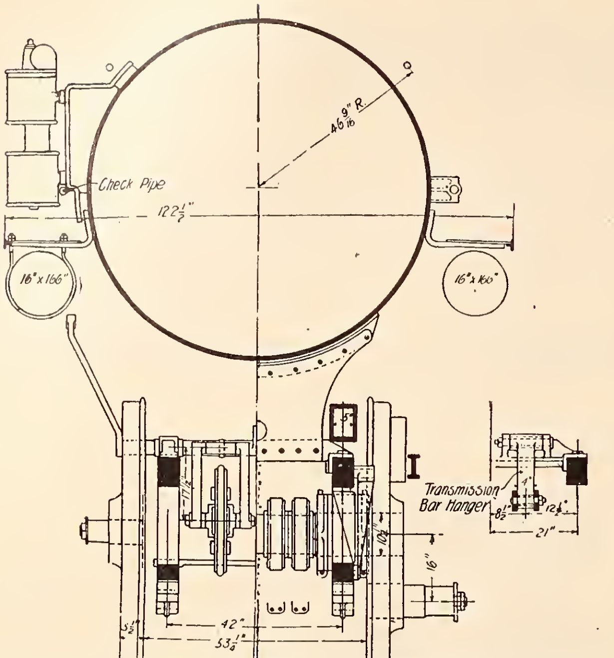


Fig. 6.—New York Central Consolidation Locomotive—Sectional View of Boiler Shell and Frame.

Diameter and length of side rod crank pin journals...... ....(Inter. 5½ ins. x 5 ins.) (F. 5 ins. x 4 ins.) B. 5 ins. dia. x 4¼ ins.
Section of rods ....Main, 1; Side, 1.
Engine truck kind, 2-wheel, C. S. frame, swing center bearings pedestals ....Wrought iron.
Engine truck journals ....6¼ ins. dia. x 10 ins.
Diameter of engine truck wheels ....33 ins.
Kind of engine truck wheels ....Krupp No. 3, Cast iron spoke center 3⅛-in. tire.

Boiler.

Style ....Straight top radial stay.
Outside diameter of first ring ....Inside, 80 ins.
Working pressure ....200 lbs.
Material of barrel and outside of fire box ....Worth.
Thickness of plates in barrel and outside of fire box..... ....13-16-in., 9-16-in., 1-in., ¾-in., ⅝-in.
Horizontal seams ....Butt joint sextuple riveted.
Circumferential seams ....Double riveted.
Fire box, length ....105 1-16 ins.
Fire box, width ....75¼ ins.
Fire box, depth ....Front, 79⅛ ins.; back, 63½ ins.
Fire box, material ....Carbon.
Fire box plates, thickness .... Sides, ⅜-in.; back, ⅜-in.; crown, ⅜-in.; tube sheet, 9-16 in.
Fire box ....Water space, 4½-in. and 5½-in.; front, 4½-in. and 6½-in.; sides, 4½-in. and 6½-in.
Fire box, crown staying ....Radial.
Fire box, stay bolts..............Taylor iron 1-in. dia. W. S.
Tubes, material and gage. Worth charcoal iron No. 11 B. W. G.
Tubes, number ....458.

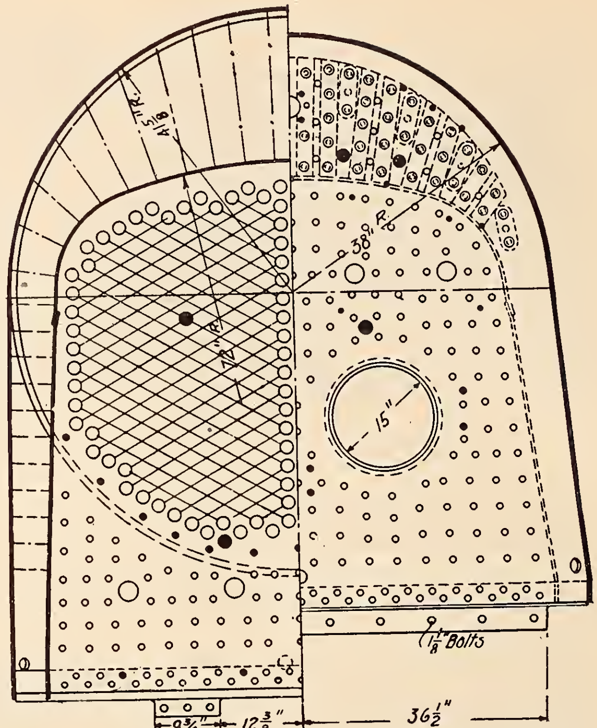


Fig. 7.—New York Central Consolidation Locomotive—Sectional Views of Firebox.

Tubes, diameter ....2 ins.
Tubes, length over tube sheets ....15 ft. 6 ins.
Fire brick, supported on ....Water tubes.
Heating surface, tubes ....3,693.3 sq. ft.
Heating surface, water tubes ....26.15 sq. ft.
Heating surface, fire box ....182.5 sq. ft.
Heating surface, total ....3,901.95 sq. ft.
Grate surface ....56.43 sq. ft.
Grate, style ....Rocking N. Y. C. Std.
Ash pan, style ....Sectional hopper.
Exhaust pipes ....Single N. Y. C. Std.
Exhaust nozzles ....6¼-in. and 6½-in. dia.
Smoke stack, inside diameter ....20 ins.
Smoke stack, top above rail ....14 ft. 9¾ ins.
Boiler supplied by ....Nathan Monitor Injector No. 11.

Tender.

Style ....Water bottom.
Weight, empty ....54,100 lbs.
Wheels, number ....Eight.
Wheels, diameter ....33 ins.
Journals, diameter and length ....5½ ins. dia. x 10 ins.
Wheel base ....20 ft. 6 ins.
Tender frame ....10-in. steel channels.
Tender trucks ....2 and 4-wheel, Cen. bear., Fox press steel frames and bolsters.
Water capacity ....7,000 U. S. gals.
Coal capacity ....12 tons.
Brake: Westinghouse, American combined on all drives operated by air 9½-in. pump; L. side; signal schedule West. J.; 2 main reservoirs 16 ins. x 166 ins.

Personal

Mr. H. W. Arnold, general foreman of the Atchison, Topeka & Santa Fe shops at Newton, Kas., has resigned.

Mr. R. J. Farrell has been appointed master mechanic of the Illinois Southern, with headquarters at Sparta, Ill.

Mr. W. S. Galloway has been appointed master mechanic of the Baltimore & Ohio Railroad at Grafton, W. Va.

Mr. George Dickson, master mechanic of the St. Louis, Iron Mountain & Southern at Baring Cross, Ark., has resigned.

Mr. W. J. Wilcox, master mechanic of the Mexican Central, has been transferred from Monterey to Chihuahua, Mex.

Mr. A. H. Pyle has been appointed roundhouse foreman of the Chicago, Rock Island & Pacific at Armourdale, Kan.

Mr. A. A. Campbell has been appointed master mechanic of the Kansas City Southern, with headquarters at Shreveport, La.

Mr. W. S. Granby has been appointed master mechanic of the Atchison, Topeka & Santa Fe, with headquarters at Arkansas City, Kan.

Mr. I. P. Bowman has been appointed acting general foreman of the Wabash shops at Montpelier, O., to succeed Mr. B. F. Luke.

Mr. Thomas Paxton has been appointed master mechanic of the St. Louis, Iron Mountain & Southern, with headquarters at Baring Cross, Ark.

Mr. D. J. Mullen has been appointed master mechanic of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Mount Carmel, Ill.

Mr. J. G. Snedeker, heretofore acting division superintendent, has been appointed division superintendent of the Missouri Pacific at Jefferson City, Mo.

Mr. J. N. Sanburn, heretofore master mechanic of the Texas Southern, has been appointed superintendent of motive power with headquarters at Marshall, Tex.

Mr. J. P. Yergy has been appointed general car inspector of the Buffalo & Allegheny division of the Pennsylvania Railroad, with headquarters at Buffalo, N. Y.

Mr. James Connors has been appointed district master mechanic of the southern district of the Chicago, Milwaukee & St. Paul, with office at Dubuque, Ia. Effective February 1, 1904.

Mr. H. C. Shields, late division foreman of motive power and equipment of the Lackawanna at Bangor, Pa., has been made master mechanic of the Lehigh & New England at Pen Argyl, Pa.

Mr. H. W. Ridgway, formerly superintendent of motive power and machinery of the El Paso & Northeastern, has been appointed master mechanic of the Mexican Central at the City of Mexico.

Mr. W. F. Buck, who until recently was master mechanic of the Northern Pacific at Missoula, Mont., has been appointed master mechanic of the Santa Fe Coast Lines, with office at Needles, Cal.

Mr. David Patterson has been appointed general foreman of the locomotive department of the C. & C. B. Iowa division of the Chicago, Milwaukee & St. Paul, with office at Marion, Ia. Effective February 1, 1904.

Mr. D. J. Malone, division master mechanic of the Oregon Short Line at Pocatello, Idaho, has been appointed division master mechanic at Salt Lake City, and Mr. W. J. Tollerton has been appointed division master mechanic at Pocatello.

Mr. Mortimer E. Cooley, professor of mechanical engineering at the University of Michigan, has been appointed dean of the engineering department, succeeding the late Charles E. Greene, who founded the engineering school at Ann Arbor.

Mr. William Cross, heretofore engineer of tests of the Canadian Pacific, has been appointed assistant to Second Vice-President Whyte, with headquarters at Winnipeg, Man., and will have charge of mechanical matters west of Fort William, Ont.

Mr. H. H. Vaughan has resigned as assistant superintendent of motive power of the Lake Shore and Michigan Southern to accept the position of superintendent of rolling stock of the Canadian Pacific, with headquarters at Montreal, Que.

Mr. Joseph Parkes, one of the oldest employes of the Pennsylvania Railroad, has just been retired to the pension roll from his position as road foreman of engines of the Tyrone division. Mr. Parkes had been in active service since May, 1851.

Mr. T. J. Cutler, master mechanic of the Northern Pacific at Fargo, N. D., has been transferred to the Rocky Mountain Division, with headquarters at Missoula, Mont., and Mr. J. E. O'Brien has been appointed master mechanic at Fargo, N. D.

Mr. G. L. Wall, who has been assistant engineer of motive power of the Pennsylvania Lines at Fort Wayne, Ind., has been appointed director of tests, in charge of the operation of the locomotive testing plant at the Louisiana Purchase Exposition.

Mr. J. J. Reid, heretofore mechanical inspector of the Northern Pacific, has been appointed general master mechanic of the Louisville & Nashville, with headquarters at Louisville, Ky. His jurisdiction will extend over all divisions, and he will have supervision of all shops.

Mr. J. A. Pfeffer, who has been gang foreman in the machine shops of the Santa Fe at Topeka, Kan., has been promoted to the position of general foreman of shops at Winslow, Ariz. Mr. Joseph Aigner, a machinist who has been employed at Topeka, succeeds Mr. Pfeffer as gang foreman.

Mr. A. W. Wheatley, superintendent of shops of the Northern Pacific at Brainerd, Minn., has been appointed assistant superintendent of motive power of that road, with headquarters at St. Paul, Minn., and Mr. J. N. Anderson, heretofore general foreman, has been appointed superintendent of shops at Brainerd.

Mr. Charles S. Hall has been appointed master mechanic of the C. & P. Division of the Boston & Maine, and Mr. Chester H. Larimer has been appointed air brake inspector, with general supervision of such matters in the motive power department. Mr. Walter S. Brazier has been appointed traveling engineer for the west section of the Fitchburg division.

Mr. J. L. Driscoll has been appointed master mechanic of the Alabama Great Southern, with headquarters at Birmingham, Ala., vice Mr. V. B. Lang, resigned. Mr. W. H. Dooley, heretofore general foreman at Somerset, Ky., has been transferred to Chattanooga, succeeding Mr. Driscoll, and Mr. Dennis Brown has been appointed general foreman at Somerset, Ky., succeeding Mr. Dooley.

Effective March 1, 1904, the present duties of Mr. W. P. Colton, advertising agent of the Delaware, Lackawanna & Western Railroad, will be extended to include the industrial department, with title of industrial and advertising agent. Mr. Colton will report to the general passenger agent for the advertising department and to the vice-president for the industrial department.

Mr. C. F. Giles, master mechanic of the Louisville & Nashville at Louisville, Ky., has been appointed assistant superintendent of machinery of that road, with headquarters at Louisville. Mr. W. L. Tracey, heretofore assistant master mechanic, will succeed Mr. Giles as master mechanic, Mr. Tracey being succeeded by Mr. J. G. Clifford. Mr. J. J. Sullivan, master mechanic at New Decatur, Ala., has been appointed master mechanic at Decatur, succeeding Mr. Beckert, resigned.

Armstrong Tool Holders

In view of the great convenience and economy of the modern tool holder of approved construction and design it is natural that economy should demand the adoption of such devices instead of continuing the solid forged tool which necessarily requires more steel than that which is actually used as a cutter. That the disadvantage of the previously existing condition of affairs was fully realized by machinists themselves is amply evidenced by the fact that during the past half century many different forms of tool holders have been devised by practical machinists and all aiming to remedy the defects, inconvenience and waste of the old system of forged tools. While many of these tool holders were used successfully for years by the inventors, or in the works where they were first made, they never displaced the forged tool to any extent, or attained any degree of success commercially. While some were superior to others, many of them embodied the objection of having been devised for special cases and were made in but a few small sizes.

With the increasing recognition of the fact that it was possible to maintain speeds and feeds previously unheard of by means of tools made from so-called air-hardening or self-hardening steel came a large increase in the use of that class of steel for lathe and planer tools. At the same time came a great increase in the percentage of waste incidental to the use of forged tools. The self-hardening steel was more expensive than water-tempered tool steel. The increased amount invested in the steel was a big item for the purchasing agent

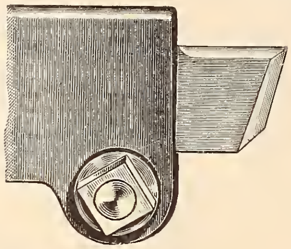


FIG. 1.

or manager to figure over, and the "stub end," when the tool grew too short for further use, represented a great deal more money than it formerly did.

With these several points in view the practical value of and the economy possible from tools of the type here illustrated are readily appreciated. Fig. 1 represents a side tool, which when arranged with a straight shank is especially designed for use on the planer.

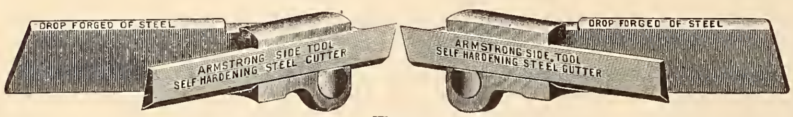


FIG. 2.

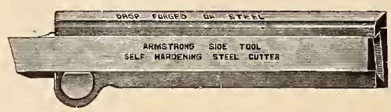


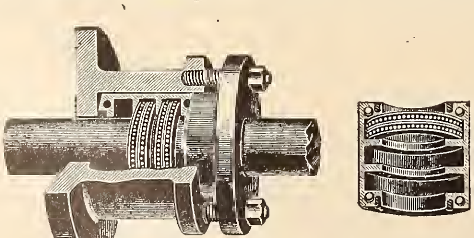
FIG. 3.

The cutters are made of self-hardening steel and are of the proper size and design to withstand the heavy strains to which a tool of this kind is subjected; they are held close up to the end and can be used up very short. The holder is drop forged of steel and is case hardened.

Fig. 2 illustrates the arrangement for right and left hand side tools and Fig. 3 shows another view of a straight shank side tool.

The Holmes Metallic Packing

The annoyance caused by steam leaks naturally directs the attention of steam engine users to a type of packing which will remove this objection and which, at the same time, will not score and scratch the rod and wear it out of round. The Holmes patent improved metallic piston rod and valve packing is not a new metallic packing, but is now marketed by those who intend to provide a first-class packing, which will overcome difficulties heretofore encountered with



Patent No. 318,400.

fibrous packing. This packing is in use on marine, stationary and locomotive engines, and has been pronounced by many to be very satisfactory and effectual. It is made of the same material as the piston rings and cylinder of an engine, and the manufacturers claim that its life will therefore be exceptionally long.

This packing does not cut or score the rod and when the engine is inactive, it will not blister or rust the rod or stem. If the rod is in good condition at the time the packing is applied, it will remain so and will not have to be turned when the engine is repaired. It can be placed in the stuffing box without disconnecting the rod, requiring very little time for the operation. It is easily removed from the box and taken apart when necessary. It works equally well on all classes of piston rods, valve stems, rotary valve stems, stop cocks, air pumps or compressors. It is steam and air tight without the use of any soft or fibrous packing. On rotary rods or valve stems the packing will not wear the rods or stems, as it hugs the rods and partakes of their motion.

By an examination of the accompanying illustration it will be seen that the packing is contained in a metal case made in halves, which case is made to fit the stuffing box. The case is securely screwed together and then pushed to the bottom of the stuffing box. A joint make of lead (this metal having been decided upon as giving best results), at the bottom of the stuffing box. A joint made of lead (this metal a packing which the makers of this device guarantee to last five years, and which they claim is good for ten years' service without repair.

In applying this packing the following should be observed: The straight cut ring should go towards the steam, and the angular cut ring towards the crank, and small dowell pin on the angular cut ring should go in between joints of straight cut rings, and so on for the three sets of rings; after the rings are on the rod, cover them with cylinder oil, and put some in the case, then screw them together and put in the box, making a joint of small lead pipe between gland and case and bottom of case and stuffing box, and have lead ring fill the inside of stuffing box tight.

Steam Turbine Installed in Paint Plant

A new Westinghouse-Parsons steam turbine of 400 kilowatts capacity has just been installed in the Sherwin-Williams Co.'s plant at Cleveland, Ohio, and is now furnishing power to all departments.

This new turbine, which marks the highest development in engine construction, is the first of its type to be put into use in the city of Cleveland; is the 54th manufactured on the continent; and is understood to be the first ever placed in the power house of any paint plant anywhere.

The installation of the turbine engine will illustrate the Sherwin-Williams Co.'s policy of being always in the van in every department of their business. And their success in paint manufacturing is largely due to this principle of maintaining the most modern and efficient equipment.

The Parsons turbine, which was invented by an English engineer and which has doubtless proven the most practical of all, is what is known as the parallel flow class. The steam enters at one end, passes along parallel to the shaft, and discharges at the other end. There are rings of small blades on the wheel alternating with rings on the inside of the casing, and the steam passing between the curved blades being deflected, first one way and then the other, produces a reaction which causes the wheel to rotate. There are 31,000 of these small blades in one turbine. The steam enters the turbine at 150 pounds pressure through a 5-inch pipe, and is discharged through a 20-inch pipe into a vacuum that is maintained by apparatus which condenses all of the exhaust steam into water.

The principal advantages of steam turbines are their high economy in the use of steam, their great simplicity, the small cost of maintenance, and the small amount of floor space which they require.

Solid Draft Rigging

The Solid Draft Rigging and Equipment Company of Terre Haute, Ind., has issued a booklet descriptive of their solid draft rigging which has been for several years in use on a number of railroads. The manufacturers say that the draft rigging has passed the experimental stage and has proved to be a decided success.

The manufacturers say the following in regard to it: "The spring bearing is of solid metal, adapted to be rigidly mounted on the center sills of engine tenders, freight cars and coaches, having horizontal and vertical flanges faced for connecting it to sills with bolts or rivets, eliminating all extra attachments, such as draft timbers, draft irons, draft plates, lug irons, check plate, lug straps, sill straps, lug and strap bolts, coupler yokes and slip pins, differing from all other draft rigging in having an immovable spring bearing, permanently set between draw sills with twenty-four one-inch rivets or bolts, applied vertically and horizontally through sills, eliminating all possiblities of chafing, splitting or spreading of sills, having socket spring seat members at each end of bearing followers and springs mounted on pull rods, slideable, extending through follower plates, springs and spring bearings, with nut adjustment at back end of rods, for taking up all slack that might accumulate from time to time, obliterating all lost motion that is so destructible to all draft riggings, having straps slideably engaged in slot ways at top and bottom of spring bearings."

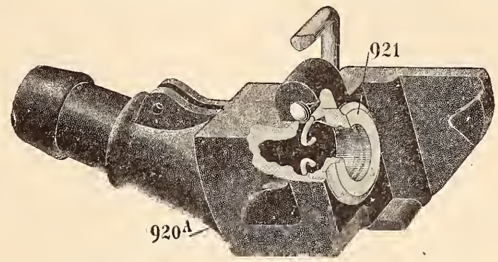
Theo. Audel & Company

Theo. Audel & Company have just issued specimen pages and a new catalogue descriptive of "Rogers Drawing and Design" which will be sent free to readers of the Railway Master Mechanic on request to the office of Theo. Audel & Company, 63 Fifth Ave., New York City. The publishers' announcement we quote as follows, as giving some information regarding this interesting work:

"It is with pleasure we submit for careful examination these specimen pages of Rogers' Drawing and Design, showing as they do, the plan and scope of a work which has long been needed. It is hardly necessary for the publishers to say aught of the primary importance of a thorough knowledge of drawing and design except that this volume is arranged for a comprehensive, self-instruction course for both shop and drawing room. The work is divided into three parts, embracing twelve divisions or general subjects. Part one relates to linear drawing and ends with page 202. Part two relates to machine design and ends with page 408. Part three is devoted to mathematical and useful tables and data, the use of drawing instruments and a most copious cross index. The table of contents, printed on the opposite page, will convey an idea of the orderly and truly scientific arrangement of the subjects as they progress from 'Abbreviations and Conventional Signs' to the 'Logarithmetic Table' and explanation of its use—the latter division occupying no less than 27 pages. A representative portion of the index is also printed. The entire work contains 506 pages, illustrated by over 600 cuts and diagrams, very many of them full page drawings; the book is printed on the same fine grade of paper as are these specimen pages; it measures 8½ x 10½ inches and weighs over 3 lbs.; the binding is in black vellum cloth with gold edges and titles; the volume is made to open freely and is in every way a most complete up-to-date book both in contents and as a specimen of high standard book making. The price of this valuable and most practical book is three dollars, delivered free of post or express to any part of the world."

Car Heating and Lighting

The Safety Car Heating & Lighting Co. has recently issued a pocket folder map of the United States showing the location of the Pintsch gas plants and the railroads securing gas in the various states. The continued rapid growth of the system is thus shown graphically. Among the new plants



STRAIGHT PORT STEAM COUPLER.

shown are those at Philadelphia, Pittsburg, Altoona and Harrisburg, which are a part of the seven which the company is building to take care of the supply of the Pennsylvania Rd. system, under their adoption of its as standard.

The company equipped 2209 cars with this lighting system in the United States, in 1903. This was the "banner year" so far, but orders now in hand indicate that it will be equalled or probably surpassed by the year 1904. The 2,209 cars are included in the annual report of progress made by the Julius Pintsch Co. of Berlin, Germany, which is as follows:

PROGRESS IN THE USE OF THE PINTSCH GAS LIGHTING SYSTEM TO DECEMBER 31, 1903.

	Cars.	Locomotives.	Gas Works.	Buoys & Beacons.
Germany	45,200	5,583	75	130
Denmark	45	.....	3	21
England	21,100	.....	87	280
France	7,500	.....	30	250
Holland	3,700	5	10	90
Italy	1,570	.....	5	20
Switzerland	410	2	1	...
Austria	5,525	.....	10	5
Russia	4,000	132	13	20
Sweden	750	53	4	2
Servia	220	.....	1	...
Turkey	120	.....	...	...
Bulgaria	98	.....	1	...
Egypt	150	.....	3	70
Canada	450	.....	2	195
Brazil	825	31	2	45
Argentine	1,150	.....	10	5
Chili	50	.....	2	...
Australia	3,000	.....	13	40
India	10,500	.....	16	...
United States	22,243	.....	80	198
Japan	150	.....	2	20
China	...	.....	1	25
Mexico	125	.....	1	...
Total	128,881	5,806	372	1,426

The Safety Car Heating & Lighting Co. also furnished its heating equipment for 2,964 cars in 1903. Its attention to the proper working and care of its apparatus is indicated by a vest pocket book which it has just issued, entitled "Directions for Management, and Catechism of Steam Heating Apparatus on Trains." This has been prepared with the greatest care, as the result of long study of practical conditions, and is intended to aid in the thorough instruction of trainmen. The directions relate to the management of the steam, making up trains, regulation of temperature, and changing of engines. The catechism covers description of apparatus, operation and care of same, and responsibility of employees.

There is an examination sheet, for rating the proficiency of those examined, and it is suggested that instructions and examinations may be given in the air brake instruction car, or in the shops if the car is not available. If this practice is generally adopted by the railroads, as it certainly will be, great good will result not only to the railroads, but to the traveling public.

The company's latest style of steam coupler is shown in our illustration. It was devised to meet the demand for a 2-inch steam train line instead of the 1½ in. It is called the Safety Straight Port Coupler No. 920A. The gasket (921) bears directly on the body and is held in position by a spring ring. The gasket is for 1½ in. or 1¼ in. port as desired, and is easily renewed when necessary. A large demand for this coupler indicates that it meets the demand successfully.

Notes of the Month

On March 1, 1904, the Cincinnati office, J. S. Patterson, resident manager, of the Galena-Signal Oil Company will be removed to suite 115 Ingalls Building, Fourth and Vine streets, where they will be pleased to have their friends call.

Mr. H. A. Norton, of the "Norton Jacks," sailed on the steamship Canopic January 30th for a four-months' trip to the Mediterranean and Egypt. Mr. Norton on this trip will combine business with pleasure.

The Wabash Railway has issued a special circular calling attention to the advantages offered by their road to those attending the exposition at St. Louis. Included in the circular is a map of the fair grounds and illustrations of many of the buildings, also a map of the business district of the city.

The Washburn Company, of Minneapolis, have issued a very complete catalogue illustrating and describing in detail their couplers. There is also included a description of the "Washburn Expansible Draft Bar", from which we quote in part. Further information will be gladly furnished by the Washburn Company: "This attachment includes several new and important features. In the Washburn rigging the expansible box is fitted between the draft timbers, and bolts passed through the whole, making a solid base of resistance for the draft springs to act on. To make the attachment still stronger each timber is itself bolted to the box. The expansible feature of the box allows it to be fitted to any car by placing the suitable expanding strips between the two portions of the box before placing the same between the timbers and by using wider followers."

At a meeting of the Engineers' Club of Philadelphia, held Feb. 6th, Mr. John M. Hartman explained the cause of black smoke and quoted from a report on the use of the Perfection burner on the New York Central R. R. locomotives, giving the methods of firing on a test trip. On this trip, when fresh coal was added, about 95 per cent of the smoke went off a light grey No. 2 color scale. Another test on the same railroad showed a saving of 12 per cent in fuel. Mr. Hartman then proceeded to take up some of the types of mechanical stokers, illustrating by means of slides their construction and operation and the details of furnace construction. In this connection he quoted from a report on the use of mechanical stokers in Pittsburg and Cleveland. The report showed the stokers to be effective in securing combustion without black smoke. In Cleveland there has been a marked difference in the atmosphere in the past four years. Notwithstanding the doubling of manufactories the atmosphere is only half as dark as it was.

A special train of seventeen solid cars, known as the "Texas Special," loaded with the Sherwin-Williams paints and varnishes, ran from Cleveland, O., to Fort Worth, Tex., February 4-13th. The run was made to Chicago over the Baltimore & Ohio road; at Chicago the train was taken over the Rock Island Railway and delivered to the Santa Fe line at Kansas City, which scheduled it through to Fort Worth. Only daylight runs were made. Short stops were made at all stations and the train had right of way the whole trip. The special was broken up at Fort Worth and the shipment distributed among retail handlers of the Sherwin-Williams Company's paints in the "Lone Star" state. It is understood that the Texas Special was the largest shipment of paints and varnishes ever made. Special representatives of the big paint concern and of the railway companies over whose lines the trip was made accompanied the train through to its destination. The shipment was given wide publication. Posters announcing its arrival were placed in all the stations en route; extensive newspaper space was used, and the train itself was covered with banners explaining the nature of the shipment.

The Martin Car Heating Co. has been recently organized, with offices at 1611 Fisher Bldg., Chicago. Mr. C. W. Martin, who is widely and favorably known by all interested in the subject of car heating, is general manager of the company. They will manufacture under the "Martin" and other patents, apparatus for heating by steam from the locomotive. Direct steam, hot water, locomotive equipments; large size interchangeable steam couplers, improved steam traps, car heating valves, all styles, and also hot water heaters for steam and electric cars, highest development of car heating apparatus.

"Koonshine"

The successful and satisfactory cleansing of interior and exterior woodwork, and also that of the metal work of railway carriages, is a question that is always of interest to the car departments of railroads. There are a large number of compounds used for this purpose, but the desired effect, that of restoring to the painted or polished surface the same lustre and gloss it originally enjoyed, has apparently been the unsolvable problem. Mr. Charles E. Koons, of St. Louis, has however, placed upon the market a compound which he claims produces the desired effect, namely, that of not only removing from painted or polished woodwork, interior or exterior, and metal surfaces such as lamps, brass and silver trimmings, bronze, metal decorations of coaches, all dirt or grease, but it also has the property of restoring to such surfaces the original lustre and polish. This compound is called Koonshine and is intended particularly for use on railway carriages. Where its merits have been tested on the painted exterior of coaches, soiled with the grime from coal smke and dust, the results have been all that could be desired; the compound has cleaned and polished such woodwork to a high degree, giving the woodwork the appearance of a new coat of paint. The same results have been obtained from its use on the highly polished woodwork of the interior of coaches where varnish has been used to give the piano finish, the compound cleaning and polishing at the same time.

Koonshine is quickly and easily applied, a cloth saturated with the oil being used to apply it. The surface is then wiped off and polished with a soft cloth. The product is manufactured by the St. Louis Surfacer Co., St. Louis.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

Advisory Committee Meeting

The advisory committee of the M. C. & L. P. Association met Feb. 20th in Hotel Lincoln, Pittsburg, Pa. The meeting was called to order at 10 a. m. by Chairman J. H. Kahler. All members of the committee were present—J. H. Kahler, Erie R. R., Meadville, Pa.; J. W. Houser, Cumberland Valley R. R., Chambersburg, Pa.; D. A. Little, Penn. R. R., Altoona, Pa.; W. O. Quest, P. & L. E. R. R., McKees Rocks, Pa.; J. A. Gohen, C. C. C. & St. L. Ry., Indianapolis, Ind.; Robert McKeon, secretary, Kent, O.

The following visiting members were present: J. P. Stroud, Allegheny Valley R. R., Verona, Pa.; John Gearhart, Penn. R. R., Altoona, Pa.; Geo. Heinz, Pitts. Con. Traction Co., Charrick, Pa.; D. W. Smith, Pitts., Ft. Wayne & Chi. Ry., Allegheny, Pa.; B. F. Wynn, Penn. R. R., Pitcain, Pa.; A. R. Lynch, P. C. C. & St. L. Ry., Dennison, O.; Robert Shove, L. S. & M. S. R. R., Collinwood, O.; T. J. Rodabaugh, Pitts., Ft. Wayne & Chi. Ry., Ft. Wayne, Ind.; J. F. Lanfersick, P. C. C. & St. L. Ry., Columbus, O., and W. S. Burton, foreman car department L. S. & M. S. R. R., Collinwood, O.

The following program was arranged for the next annual meeting:

1. Report of committee on tests.
2. What improvement have we made in the painting of steel cars in the past year?
3. What is the best material and treatment for locomotive front ends?
4. What is the best construction of sand blast and method of operating same in preparing metal for painting?
5. Which is the best method for removing cracked varnish on the interior of passenger cars?
6. Passenger car roofs—treatment and attention of same.
7. Paint shop records and accounts.
8. What causes the bulging of putty in the nail holes of new work?
9. Essay—The treatment of an ideal passenger car from a painter's view.

The following resolution was presented by D. A. Little:

Whereas, A great many protests are being made regarding the meeting of the association at Atlantic City because of the inability of members procuring transportation east of Pittsburg; and,

Whereas, Many of the members in the eastern section are desirous of visiting the Louisiana Purchase Exposition at St. Louis, from which they will be debarred if we meet at Atlantic City; and,

Whereas, A request was made to the advisory committee to take some action in the matter; therefore, be it

Resolved, That a postal ballot be taken from every member of the association indicating his preference for Indianapolis or Atlantic City.

In the event of Indianapolis being designated members east of that point can get transportation to St. Louis as readily as Indianapolis and those west can stop en route. This resolution was seconded by W. O. Quest and was unanimously adopted. The chairman instructed Secretary McKeon to procure the ballot as an early date and publish the result in the Master Mechanic.

J. H. Kahler, Chairman.
Robert McKeon, Secy.

The death of Edmund Murphy, for thirty-two years assistant foreman of the Penna. R. R. locomotive paint shop at Altoona, Pa., occurred at his home in Altoona, Jan. 19th. Four years ago Mr. Murphy was retired on a pension; and for some time after this he was employed in the paint department of the Pressed Steel Car Co., Allegheny, Pa. Deceased was 77 years old and is survived by his wife and a married daughter.

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*The Essentials of a Modern Paint Shop**

BY W. O. QUEST, MASTER PAINTER, P. & L. E. R. R. CO.

Continued from page 70.

Mr. G. N. Dow: I would like to ask whether Mr. Quest's paper is founded on ideals or on experience.

President: It is founded on experience. And in discussing the paper, I want to say that Mr. Quest has come here prepared to answer questions, and he will be disappointed if you do not extract all the information from him. The paper is now open for discussion.

Mr. Quest: I would like to say that I have had shop ideals all my trade-working life, and I am just now entering on the realization of one of those ideals, for I believe we are having a first-class paint shop coming on at the Lake Erie works at McKees Rocks.

President: Mr. Stratton, will you give us your experience on the subject?

Mr. George W. Stratton: In reading this paper, which was forwarded to us before the meeting, and in listening to it tonight, one is led to believe that it is ideal; that if we could have such conditions as it expresses we could do splendid work. But I presume Mr. Stratton has had experience similar to many others who have done their painting on the run, so to speak. For instance, a car or locomotive may be required to be done in a week, no matter what kind of a week—and the painting has to be done as the machine moves along. I have found that that is very much the way with locomotive painting, so that some of the finer processes are pretty much eliminated, such as striping and two coats of varnish, and all those refinements which we have enjoyed in the past. It is within my recollection that when a locomotive was repaired—and it did not make much difference how much time was taken—when it was done it went into the hands of the painters and they began to put on their multitudinous colors, fillers and stripes, etc., and when they got a good surface, the boss would sit down and paint pictures upon the large wheel covers that used to come between the main and back drivers. And I remember seeing, in war times, a beautiful locomotive with a picture of Point of Rocks in Virginia, and Harper's Ferry, on opposite wheel covers, and the panels of the cab beautifully decorated. And when the locomotive was done, which was not a matter of very definite time, it would go out and be a thing of beauty. Nowadays, when a locomotive has to go into the shop and be repaired and turned out again in two weeks, you have to step down from that high estate.

But with the engines nowadays, my experience being more with engines, no matter what kind of a finish you get, it does not show long. The "wiper" we used to have is a rare member of the railroad fraternity. And when the engine is ready to come into the shop again, it is pretty well covered with something very foreign to paint.

In regard to this equipment you speak of, the sand blast

*A paper read before the Pittsburg Railway Club. Mr. Quest's paper was published in the February issue and discussion of the paper is published in this issue.

and washing with acids, etc., it seems to me they are fast passing away. I remember when we used sand stones and emery stones, etc., and the best we could do in endeavoring to remove the blue and brown oxide from the steel plates was of little account. But when we began to use paints that experience taught us would stick, these methods were not necessary. And in the experience at Altoona shops, when we were using these paint eradicators, of all tenders going into the shop, 90 per cent of the cisterns would have to be completely scraped, and the cracked and blistered paint taken off by thorough cleaning and scraping. At the present time not five per cent of the tenders require scraping because of any cracking or blistering.

In regard to the modern paint shop, I believe that we would all like to have it arranged so that we would get only northern light, and then having a sort of saw-totoh roof and no direct light it would be ideal. I have known where sunlight coming into a window and striking a cistern would blister it; also where a blast of hot air from an over-heated heating system would blister the paint—and the man who happened to work just where the air struck would suffer from the hot blast. But this matter of filler and surfacer, with which I presume all of us have had a great deal of experience, has so developed that with us there is less than five per cent of the tenders that come in that require the cistern to be scraped.

Lead is one of the best materials to put on and will last without cracking when we do not have the opportunity of putting on much varnish. We used to think two or more coats of varnish would protect the paint, but now we find that the paint will stick with one coat of varnish—glad to get that on without having water or smoke spoil it.

Mr. Quest: Did I understand Mr. Stratton to say that the sand blast was not efficient in eradicating old paint, rust or scale, and that the idea is a past method for the purpose of cleaning iron and steel plate? In reply to the gentleman, I would like to submit for your inspection the following work brought with me for the occasion.

Here is a piece of steel plate, with a 12-inch square of it cleaned by hand with broken emery in four minutes, here is another plate of the same size and condition cleaned by the sand blast in 30 seconds; here is also a large piece of old tank iron with years of old paint accumulation on it, from a square foot of which we have thoroughly removed all paint, flash, scale and rust in 55 seconds, leaving an ideal surface to receive paint.

Mr. Stratton: Probably I should not have said that it would not do it; what I meant to say is that there is no use in doing it. Probably it is within the recollection of some of you that when we used to sharpen files with a sand blast, holding the files between two tubes, it did not leave the teeth as good as originally, but it sharpened the file. That is, if you would hold it between the sand blasts and let it cut a sufficient length of time, it would sharpen the teeth, and if you would hold it there long enough, it would bore a hole clear through the file. The same is the case in engraving a design on glass. If you turn the sand blast on any metal it will cut it away, and it will remove anything that is on it. But what I say is, that it is labor lost. If we get on the right materials, they will stick and not crack nor blister, and not need scraping off after a year or more of service. I just intended to say that there is no need now of such preliminary preparations for painting.

President Turner: Mr. Dow, you have recently moved into one of the largest and one of the best paint shops in the country. Will you say what is to prevent reaching the ideal conditions as represented by Mr. Quest?

Mr. G. N. Dow: I think Mr. Quest is on the right track. I think he has the right idea of an ideal shop, and if carried out that way he will have one of the best shops in the United States or in the world. His view of heating the shop is superior to the way we heat ours. I think the heat should come from the ground up. Ours is just the reverse it is from the eaves down. I think Mr. Quest is right and you will get better results the way he indicates. And I do not know that I could criticise Mr. Quest on shop lay-out in any way, shape or manner. Of course, others do not know where he got his ideas. I think he got them from our shop. (Laughter.)

Mr. R. V. Wright: Mr. Quest has presented such an able paper and is doubtless so well prepared to back it up that inexperienced in such matters as I am, I would hesitate to criticise anything he says. However, the request was made that we ask any questions we liked in order to draw Mr. Quest out. It is stated on page 5 that the paint shop should be as near the car shop as possible. Now I have always been led to believe that of all the shop buildings fire is more liable to originate in the paint shop than in any of the others, and also that the car shops are liable to take fire without much provocation. It seems to me that this should be modified and instead of saying the paint shop should be placed as near as possible to the car shop; say it should be as near as possible and yet be at such a distance that there will be no langer of fire.

On the same page it is said that the shop should be large ger equipment. This would indicate that the entire passenger enough to accommodate monthly ten per cent of the passenequipment would have to be painted each year. I would like to ask if it is absolutely necessary to revarnish the entire passenger equipment each year.

On the matter of light we are told that the side windows should come as low as 36 inches from the floor. In a shop which is laid out longitudinally the only cars which would benefit by this construction would be those on the tracks nearest the windows, and you would probably get a better light than you need on these cars, whereas the cars along the middle tracks would get no more light than otherwise. It would appear that 36 inches is unnecessarily low.

Concerning the sand blast cleaning. There would seem to be no doubt from what Mr. Quest has shown us that the sand blast machine is a labor-saving device and that a considerable saving can be made by its use. In order to bring out this point more fully I should like to ask whether in a surface cleaned by sand blast and covered with paint, the paint will not endure longer than on one cleaned by hand. It would seem to me that the life of the paint ought to be increased at least fifty per cent.

Mr. Quest: In reply to the gentleman's first question, as to why I want the paint shop and car building shop close together. I stated pretty plainly that it is on account of the distance in traveling to and from; that the arrangement was a matter of convenience, also of economy.

I do not think the matter of greater fire risk should be seriously considered. Of course it is true, that as a rule all authorities, also insurance people, usually blame all paint shop fires, either on carelessness or on spontaneous combustion, on account of the inflammable nature of materials handled in the business.

As to the 36-inch high window sills, it seems to me that the low window will radiate a lower and more uniform light on the center lines of work, regardless of position. It is true, you have only got the skylight for middle lines of shopped cars. The gentleman may be right on the high window sill, but in my mind it is a matter of doubt. Now, as to sand blast cleaning question, I will say the sand blast leaves the iron and steel surface in a perfect condition for working upon, and that so far as the life of the paint is concerned you can guarantee just twice as much service durability as you can where the surface is not scaled off with the sand blast. If you critically examine the hurried worked turned out of the contract shops, where they pay no attention whatever to scale cleaning, you can readily see the difference in a few months time.

Mr. G. W. Stratton: I hope I may not be considered too wordy in this business, but years ago the painting and scaling of paint was a very serious trouble. As I stated, probably 95 per cent of all the tenders that came in to be painted required the paint to be removed and the painting started from the metal up. Our method for getting rid of the paint was, to fill the cistern with steam, which would heat the metal to such an extent that with a chisel—which was usually a file sharpened to a chisel edge—one could peel the paint off easily, making quite a quick operation. When repainted, it would look very nice in the beginning, but after a while it would crack, and that led us to use the sand blast, and that sort of scouring seemed to improve the surface of the steel or iron. But, as I said, improved methods and materials in this day rendered sand blasts and scraping unnecessary to remove the paint that is on the cistern, in 95 per cent of cases. When cisterns have been scored in places the damaged places can be easily filled with a surfacer and when smoothed up and a few of the finishing coats put on, will look well again. But I think no amount of scouring will make a plate last without cracking, through a period of five or six years.

President: It is the rule over the country to revarnish cars once a year. Cars are taken in because they have lost their lustre, and if not revarnished the body color will suffer. Can anything be done in the way of improved shop facilities or better materials to make these cars last 18 months instead of 12?

Mr. Quest: That would be rather a hard question to answer under present shop conditions. If you could go back to the old times when we used to keep a car in the shop two or three months and use a varnish that would take three days to dry, you might get an 18 or 20 months' average. But to put on what we call an eight-hour free of dirt varnish, you can hardly expect that to last over a year. I suppose it is within the recollection of Mr. Stratton when it took a great deal longer to paint a locomotive than now. Up in Altoona under his administration I remember distinctly when they were surfaced and rubbed out and then taken "up the hill" and brought back after being thoroughly tested before they were finished.

Mr. Stratton: That is right. Time was not an object then.

Mr. Quest: If you have a wearing varnish that will dry slowly you must have more oil in it and less gum. According to varnish makers lore, the more oil the more elasticity, and the more elasticity the longer it will wear. I believe the usual coach and engine wearing varnish of to-day is expected to set free of dust in eight hours or less, which as a rule is very brilliant, also reasonably durable.

Mr. G. N. Dow: I think the car can be kept up with the present varnish by giving it a thorough cleaning once every three months with a good emulsion cleaner. I know it has been proved on several railroads where this practice is in force that a car can be used eighteen months between varnishing. We have had cars run eighteen months and look as well as some cars that were only out eight or ten that have not been cleaned.

Mr. F. H. Stark: I believe that this is a very able paper, and from one not a Painter it would come with very poor grace to do much criticising, or to even ask questions, but there is the question, however, of utilizing the painter force in the summer months on freight cars. Usually the artists in the Coach Shop object to painting freight cars. The force of coach washers might be used to paint freight cars, but there is a certain percentage of coach shop help that could hardly be used on that work. Of course there is a certain amount of baggage and mail equipment that could be run through in the excursion season, and in that way keep the paint shop employed a part of the time. If they would allow us to take cabooses in, and paint and varnish them we could keep the shop busy a great deal longer.

On the question of heat I believe Mr. Quest is on the right road. I was with a road at one time where we had a system of heating with hot air coming down from some twelve or fifteen feet from the floor. It stirred up dust, and did more or less damage. At another place we had steam heat, and it was near the floor and it gave very good satisfaction, and we found that a concrete floor was far better than a wooden floor. The wooden floor absorbed moisture, and kept the room damp, and we found that varnish would dry nearly a day quicker on the concrete floor.

On the question of the sand blast, I think we have good evidence. I remember when we used to plaster the tank with lime and work down the surface with pumice stone, and it was a very laborious and long process; while the sand blast does it better in a very short time.

Mr. Quest: We are cleaning tanks in 6½ and 7 hours in the Lake Erie locomotive painting department. In answer to Mr. Stark on the working force question, I do not think the artists of the shop would object, if they knew they had to lie idle for two or three months otherwise; I think that matter could be managed by employing the skilled labor on the stencilling on of lettering, etc., which could be done on a fair piece price basis, even though you had your shop running on day work the balance of the year.

As for having the heat coming down in shop from ten or twelve feet up, it reminds me of an incident related by an esteemed fellow associate at a recent car Painters' Convention, where the matter of shop heating and ventilating was under general discussion, who in speaking, referred to his experience while in the cold northern country, which was to the effect that one day as they were trying to keep the shop warm, in came an Irishman. He looked around and could not see any stove, though he felt the cold draft, and he asked one of the employes of the shop where he could get warm. He said: "Just stand where you are, it is all right. The heat is coming out from up there. That is all the heat we have." He says: "Who got that thing up?" "Why, that is a scientific heating arrangement." "It is, is it? Well, I wish you would call that Mr. Scientific fellow up and ask him why it is my fur cap won't keep my feet warm." (Laughter.)

Mr. G. N. Dow: I would like to state that the Lake Shore is taking to the policy of examining cars that have been out a year. We send a man out and give him the numbers of the cars that have been out twelve months and he examines those cars and reports to the office whether they should be shopped or not, or whether they are good for one or three months' longer service. It takes a man about a week to examine cars on the list.

Mr. Quest: Do you use a painter for that business?

Mr. Dow: He is a car man, but is familiar with paints. A painter is not the right man to send. And oftentimes he finds other defects that require a car to be shopped other than need of varnish.

Mr. G. E. Carson: We are following that system at the present time and we find on one of our divisions that it is out of the question to keep cars in service longer than six months.

Mr. Quest: You refer to the cars recently shopped off the Youghiogheny division, which were brought in and emulsion cleaned, on account of varnished surface being almost entirely obscured by dirt, grease and smoke.

Mr. G. W. Stratton: On the Pennsylvania at one time, there was quite a complaint of varnish not doing well, but it was only an occasional car that was bad. ("I would state that it is the practice of the Pennsylvania to apportion shops to different varnish makers.") Well, we had to look up the samples of varnish, and in the mechanical laboratory they were examined to see how much good copal they might have in them, and the varnishes generally were found to be good. Then a person started out to see what kind of soap they used in washing their cars, and we found that the soap that was used at the points where the cars deteriorated faster, contained quite au amount of uncombiued alkali, while the soap used where the varnish lasted better was fully combined or saponified. That led to the making of specifications for soap that there should be less than one-half of one per cent of uncombined alkali in the soap. Aud, also a core was taken out of the soap an inch in diameter and two inches long, which had to support a given weight a given length of time, which would prove whether it contained too much water.

Mr. J. D. McIlwain: Do not climatic conditions have a great deal to do with the life of paint?

Mr. Quest: It is generally conceded that climatic conditions do have a great deal to do with it. The material you use here in this section, in all probability would not be fit to use in Arizona, nor would it last long down along the coast, or in the extreme hot and cold sections of our country. I remember distinctly a few years ago we had a series of panel tests, which were gotten up in one section and then sent out all over the country, centrally, East, West, North and South for exposure. At the expiration of two years these panels were called in and examined at a railway car painters' convention, where it was discovered that where the paint did well in some sections, it went all to pieces in other sections, showing conclusively that climatic iufluence has something to do in the wearing of paint and varnish.

Mr. McIlwain: In clearing with sand blast, after this cleaning is done, or the scraping or burning off, which takes the longest to complete the tender ready for service afterwards?

Mr. Quest: The sand blast is decidedly the quickest and cheapest cleaning method, but after the cleaning there is practically uo difference. We usually require ten days' time for a new painted locomotive, but also have a five-day system on the more hurried new work.

Notes and Comments

Mr. A. J. Winchell, formerly with the American Car and Foundry Co., has been appointed Foreman Painter of the St. Louis Car Co., at St. Louis.

Pending the appointment of Foreman Painter at the Lima, Ohio, shops of the Lake Erie & Western R. R., vice Geo. Paulus resigned, Mr. O. S. Diling is acting foreman, we are informed.

Mr. C. I. Eagle, Foreman Painter, has severed his conuection with the Delaware, Lackawanna & Western at the Scranton shop on the staff of Mra. B. E. Miller, Master Painter, and has accepted service with the Wabash Ry. at the Decatur, Ill., shops, for the present. His address will be care Wabash Ry. Shops, Decatur, Ill.

We learn that during the last week in January the paint and upholstery shops of the Delaware & Hudson railroad, at Green Island, Troy, N. Y., were destroyed by fire, together with thirteen cars, aggregating a loss of some $80,000. It is rumored that the shops will not be rebuilt. Mr. A. Bush was Foreman Painter at this point. The cause of the fire is not given.

A special from Scranton, Pa., to the Philadelphia North American, under date of Feb. 16th, says: "The D., L. & W. Railroad's paint shop on South Washington avenue was destroyed by fire today, together with a dining car, six vestibule passenger cars, oue milk car and eight freight cars. Two passenger cars outside the shop were damaged. Loss nearly $100,000. Three workmen, Patrick Walsh, Wm. Easterbrook and John Tschow, were badly burned. The fire was caused by a workman who was burning paint from an old car with a gasoline torch." The above must be our esteemed associate, Ben. E. Miller's shop. Mr. Easterbrook is assistant foreman painter, we are informed.

The sympathy of the many friends of Mr. Augustus Dowdell, of Valentine & Co., will go out to him in his great bereavement. Mrs. Dowdell died Feb. 11th, the funeral occurring at the home in Philadelphia, Monday, the 15th. She was ill but a week, having contracted a cold which developed into pneumonia while nursing her sick son. She was a direct descendaut of Nicholas Van Dusen, who was a pioneer ship builder in that city on the Delaware river, whose yard embraced the land whereon was the elm tree under which William Penn made his treaty with the Indians; also of Col. John Hewson, renowed for bravery and patriotism in revolutionary days, and was a woman of inestimable worth and beloved by all who knew her.

We note in the Boston Globe, Feb. 12, that Mr. and Mrs. R. T. Beazley observed their golden wedding the previous evening at 25 Rutland Square, and clip the following paragraph from the account: "As residents of Waterville, Me., their former home, Mr. and Mrs. Beazley were well and favorably known. Mr. Beazley was for 15 years master car painter of the Maine Central railroad and was one of the first ten who met and organized the Master Car Painters' Association of America. Mr. Beazley is a veteran of the civil war, a member of the Masonic fraternity, and a Knight Templar."

We believe in more recent days Mr. Beazley had been employed by the Boston, Revere Beach & Lynn narrow gauge road. We had lost track of him. It was some thirty years ago that he was with the Maine Central.

The latest and most wonderful heat producer invented for developing high temperatures is called thermit. Don't breathe while we say that it is an "aluminothermic" compound—that is to say, formed by the combination of oxygen and aluminum. The immense heat generated by this combination is utilized in welding great bodies "while you wait," without the necessity of taking them apart and carting them to the fouudry. For instance, the great German ocean liner Sevilla recently broke her stern post at sea. It was easily welded in the dry dock by the use of thermit, whereas formerly the after part of the ship would have been taken to pieces and the welding then done. Thermit is one of the wonders of the age. It will save untold expense to steamship and railway companies, and will weld anything short of a broken heart.—Recent editorial, Boston Globe.

It is too often the case as men grow old, that their ambition aud enterprise diminish, and it is a pleasant surprise to see the reverse of this occasionally. In Warner Bailey's office, at Concord, N. H., yesterday, Feb. 18, we noticed a number of fine panel pictures he had painted in spare hours, lately, that would grace any man's parlor mantel. Always a fine scroll and ornamental painter he has of late, being around seventy years of age, taken up picture painting for his own amusement. "Guess if I had started at this 50 years ago I might have been quite a success," said he. Concord is the birthplace of the "old home week" idea, so he has tastily decorated some shingles, being planed for the purpose, with clover blossoms and a sketch of "the old house at home," and otherwise suitably inscribed as souvenirs, on which is the following suggestive lines:

"To gaze once more on old-time scenes,
Well I recall my boyhood days,
When mother used the shingle."

Established 1878.

RAILWAY MASTER MECHANIC

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A MOVE in the right direction which has come to our notice is in the systematic attention to the proper care of locomotive boilers, both in the roundhouse and on the road. A certain line which we have in mind some time ago began a careful investigation of the effect produced on boilers by the care exerted in and around the roundhouse. They obtained such satisfactory results that the management was encouraged to further their efforts by a close scrutiny of boilers on the road. Progress in the proper care of the boilers was begun by improving washouts at the several roundhouses, and when found necessary to cool a boiler for any purpose, all possible time was insisted upon to permit it to cool down slowly. With these reforms in view a special man was appointed to look after this work and follow it closely. Results were so satisfactory that he now holds classes in the several roundhouses, giving instructions on the care of boilers in the same manner that various roads provide for instruction on air brake matters. His work has been so carefully administered and his subject so thoroughly analyzed and systematized that he can now satisfactorily handle a large number of men each day.

The work at terminals has been supplemented by similar attention to boiler performance on the road. The plan includes the education of the enginemen in the most judicious use of the blower, fire, fire door and injector. Here, too, no little success is being attained. The road foremen are called together at intervals, when they are given subjects to think over and points are suggested for their observation and for the guidance of the enginemen. From the resultant discussions and inquiries many interesting features about boilers are brought out, suggesting ideas which can be followed to the betterment of past practice. When any favorable information is in this manner acquired, the practice involved is closely followed, with a view of obtaining the best possible results.

IN line with the continued consideration of locomotive boilers wherein much attention has been given to the matter of circulation and the provision of free water spacing, little or nothing appears to have been said regarding the effect resulting from the shape of the water leg, or rather the angle on which it is arranged. Where the sheets forming the water leg are arranged on a decided slope the tendency is for the steam leaving the firebox side sheet to rise vertically until it encounters the outside, or wagon top, sheet, following the same until it reaches the upper portion of the boiler, the result being a continued upper current throughout the entire portion of the water legs tending to induce an upward current of entering water and impeding any flow in a horizontal direction, or parllel with the mud ring. If, on the other hand, the leg is vertical, or nearly so, the steam rising from some portions of the side sheet is free to rise unimpeded until it reaches the wider portion of the boiler above the level of the crown sheet, and steam rising from the lower portion of the side sheet does not encounter the outside sheet until it arrives nearly at the top of the leg. With this condition an opportunity is provided for water to flow unobstructed from the belly of the boiler and from the front water leg to the lower portion of the side and back spaces without meeting a strong current to induce it upward until the water is converted into steam by the heat encountered, when other water will flow in to take the place of that evaporated. The same assumption applies as well to the back water leg and appears as an argument against the continued design of back heads with a decided forward rake.

While discussing these ideas with mechanical men, the plan was suggested of tapering the water leg, in the horizontal plane, making the side members of the mud ring, say, 7 or 8 inches wide at the throat, tapering to 3 inches at the back. This would permit a free flow of water entering the legs and assist circulation around the firebox. While such a design might appear as a "freak" idea on first sight, it is not impractical. The taper form would not destroy any more cab room and a slight advantage would be gained in throwing a portion of the boiler weight further forward.

IN our last issue we mentioned a gathering of railroad storekeepers in Chicago, the outcome of which is the organization of the "Railway Storekeepers' Association." This is a move in the right direction and one that should receive the hearty co-operation of all railroad companies throughout the country. It is only within the last few years that the stores department has been afforded the prominence which it deserves, and which its usefulness justifies. The title "general storekeeper" is a comparatively new one to many roads, and it is particularly commendable that these men should organize almost at once for an interchange of ideas among the stores department of the several railroads, and institute an association by which the members may consider and agree upon the most efficient methods of handling and distributing supplies, and contribute to a practical and intelligent administration of the department. The membership will consist of all officers whose duty it may be to purchase, disburse or direct the disbursement of material for railways.

The discussion and investigation of the most economical and practical methods of providing, distributing and accounting for material and supplies, presents a wide field. By a careful consideration of the experience of the several members, and by a free exchange of ideas it is possible to arrive at conclusions by which supplies may be so safeguarded as to contribute to a more satisfactory balance sheet. As railroads are dependent almost as much upon relative savings as upon traffic to produce dividends, it naturally follows that a thoroughly organized and efficiently administered department accounting for the proper use and disposition of stores and supplies will make itself felt by the effect upon revenues.

The storekeeper's department differs very materially from the other departments in the multitude and variety of the material which comes under its jurisdiction. The storekeeper's duties consist not in the careful handling of a few large things, but rather in the detailed watchfulness of the many small things which individually considered amount to very little, but in the aggregate constitute a material factor. Not only is there the new material to be taken care of, but second hand material and even scrap. Through this department is sifted what might be termed the refuse of the railways, and here again the strict attention to detail, and to the little things, count in a very great saving to the company. It is not always the question what to save but what to save it for and how to use to best advantage.

It is with peculiar interest that the Railway Master Mechanic refers to this organization, inasmuch as we have presented in recent issues communications from several general storekeepers which, though bearing more directly upon the disposition of scrap, refer in general to the stores department. Of particular significance with regard to the benefit derived from an exchange of ideas and the value of a well-organized and administered stores department, are the words of Mr. W. R. Ormsby, general storekeeper of the Southern Pacific Railway, on page 58 of our February issue.

MR. SAMUEL HIGGINS.
GENERAL MANAGER OF THE NEW YORK, NEW HAVEN & HARTFORD RY.

Mr. Higgins entered railroad service in 1881 with the New York, Lake Erie & Western, serving successively as machinist apprentice, machinist, assistant foreman, and general foreman in the Susquehanna shop. He was for two years assistant engineer of the motive power department, division master mechanic from 1887 to 1892, and assistant superintendent of motive power to Feb. 1st, 1894, when he was appointed superintendent of motive power of the Lehigh Valley. On April 1st, 1901, he became superintendent of motive power and machinery of the Union Paeific, accepting the appointment of mechanical superintendent of the Southern Railway, June, 1902, which position he now leaves for his recent appointment on the N. Y., N. H. & H. Railway. It is with no little pride that the RAILWAY MASTER MECHANIC announces the appointment of a man trained in the motive power department to fill the position of General Manager.

IT is to be regretted that the able paper by Prof. W. F. M. Goss concerning the technical graduate and the machinery department of railroads was presented before so few railway mechanical officials as were assembled at the March meeting of the Western Railway Club when the paper was discussed. But a single motive power officer entered into the discussion, while a large majority of those before whom the paper was read were supply men. This suggests the opinion that the roads are no longer interested in training technical men in the practical side of the machinery department, or that so much has already been presented on this subject that the representatives no longer care to discuss it.

Far from making a plea that a "bed of roses" be provided for the graduate, Prof. Goss urged that some opportunity of promotion should be held out to the young man who spends several years in actual contact with the practical details of the motive power department. While in the shop the treatment of the graduate is that of a workman and there he familiarizes himself with methods of doing work as well as with the character of the men employed, developing a foundation for his own ability in a manner which it is impossible to acquire elsewhere. Inasmuch as other fields offer an attractive future for the technical graduate, but a limited number enter railroad motive power work, and if the roads desire this number increased it is only logical that an ambitious man should be given to understand that there is a goal ahead of him which will induce him to put forth his best efforts.

On another page of this issue we present Prof. Goss' paper in abstract.

Electric Wiring of Machine Tools

By O. W. Bodler

THE introduction of the motor drive for the machine shop has brought forward the problem of wiring machine tools. Very little attention is usually given to this part of the installation, with the result that wires are continually torn down and in the way.

The aim of this article is to show the way of determining the size of the wire, and some neat and compact forms of wiring, without regard to whether any one of the two, three or four wire systems is the best.

The number of amperes per horse power depends upon the voltage used. As 746 watts are equal to one horse power, this can easily be determined by dividing 746 by the voltage.

The size of the wire for direct current is easily determined by the formula—

$$c\ m = \frac{2 \times l \times k \times a}{v}$$

c m = circular mills.
l = length of wire.
k = constant = 10.8.
A = amperes.
v = drop of voltage in volts.

The nearest commercial size to the c. m. thus found should then be used, care being taken that the amperes per wire thus found is not greater than that allowed by the National Board of Fire Underwriters. A copy of their table is given herewith. Also no wire should be used less than a No. 14.

TABLE OF CARRYING CAPACITY OF WIRES

B. & S. G.	Table A. Rubber-Cov'r'd Wires. Amperes.	Table B. Weatherproof Wires. Amperes.	Circular Mills.
18	3	5	1,624
16	6	8	2,583
14	12	16	4,107
12	17	23	6,530
10	24	32	10,380
8	33	46	16,510
6	46	65	26,250
5	54	77	33,100
4	65	92	41,740
3	76	110	52,630
2	90	131	66,370
1	107	156	83,690
0	127	185	105,500
00	150	220	133,100
000	177	262	167,800
0000	210	312	211,600

The above formula has been thoroughly tested in service and found to be accurate. The usual drop of voltage allowable is 5 per cent from the switch board to the average distance of the machines.

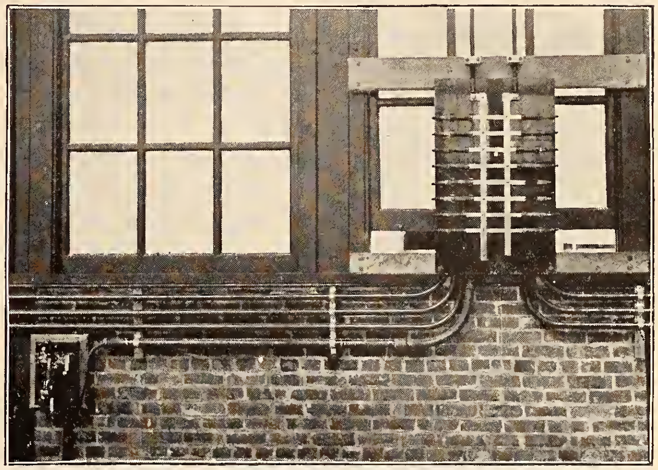


Fig. 1—Showing Tablet Board with Wires Run in Loricated Pipes.

There are two ways of distributing the current for the machines. One is the tree system and the other the tablet board system. These are graphically illustrated in Figures 4 and 5.

With the tree system the wires come from the switchboard and are tapped off for every machine. The wire has to be fused whenever the size changes, or where a wire is tapped in. When there are only a few motors, this works out very well, but when there are a large number of motors it makes a very complicated arrangement. It is usually the practice to have the heavy feeders in the roof trusses and if a fuse burns out it is hard to replace it.

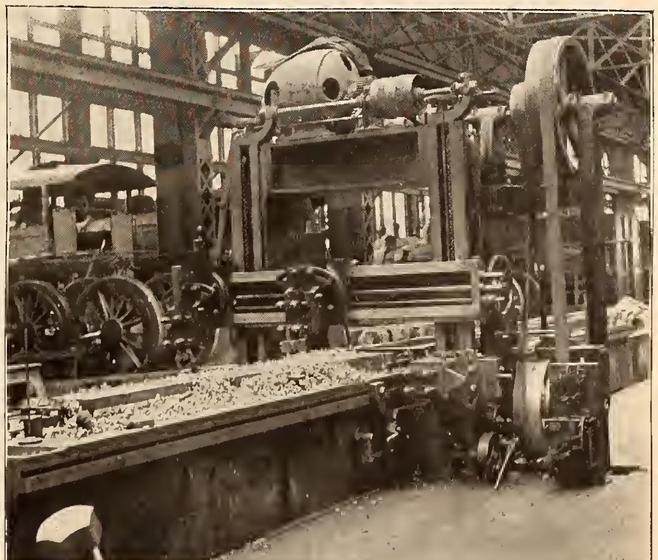


Fig. 2—Pond Frame Planer Direct Connected to a 20 H. P. Constant Speed Crocker-Wheeler Motor.

In the tablet board system, which is by far the better system, the feeders from the swichboard run to a distribution board located at about the electrical center of gravity. From this, smaller feeders run to tablet boards, which are located so as to get a convenient number of machines, preferably not less than four. From the tablet board the wires run directly to the machines. The distribution and tablet board are equipped with fuses, which makes them very convenient to get at.

With the tablet board system one gets practically the same voltage for all the motors. Besides this it simplifies the wiring and is but very little, if any, more expensive than the tree system.

When machines are far apart, good results can be obtained by using a combination of the two systems. In this case the feeders are run to a distribution board and from there follow the tree system.

For variable speed machines, as lathes, planers, etc., a load factor of 30 per cent can be allowed on the main feeders. The size of the wires from the tablet board to the distribution board is determineod by taking the maximum capacity of the largest motor and half the capacity of the sum of the rest. The size of the feeders for the distribution board is determined by taking 30 per cent of the total capacity of the motors on the board. Blowers and machines running constantly under full load should be carried back to the switchboard for their full capacity.

In running wires in the shops they should always be placed out of the way of everything. A very good arrangement is to run them in loricated pipe along the walls, posts, or under the floor. All the wiring around machines should be in loricated pipe for protection. All

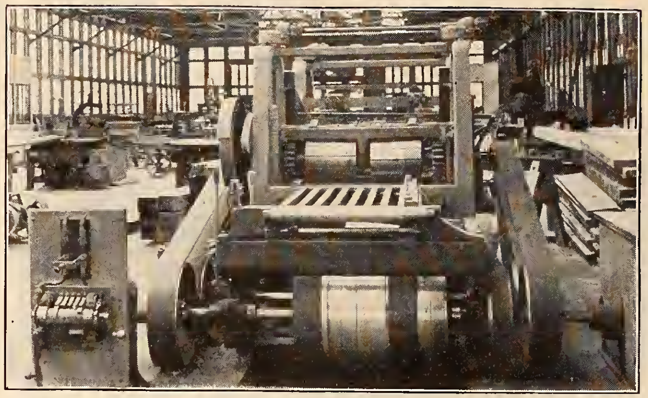


Fig. 3—Four Side Timber Dresser Direct Connected to 15 H. P. Constant Speed Crocker-Wheeler Motor.

the wires for one machine can be carried in one pipe by using rubber covered wire.

This same system of tablet board wiring can be applied to lighting. Where machines equipped with direct connected motors are under cranes, the light can be taken off of the power circuit. This has given very good results in service.

Fig. 1 is an illustration of a tablet board where all the wires are run in loricated pipe. On the left it shows a pipe passing below the floor for a machine. In this case the circuit breaker for the machine is placed on the wall.

When small lighting wires are run in the countershaft supports of machines, they should be placed in moulding

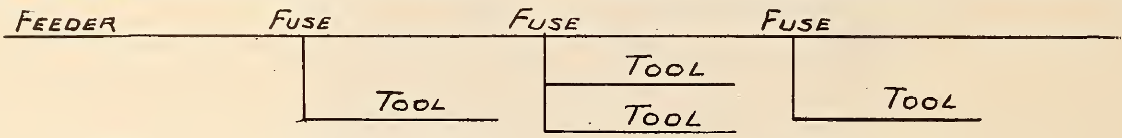


Fig. 4—Tree System of Distributing Electric Wires to Motor Driven Machine Tools.

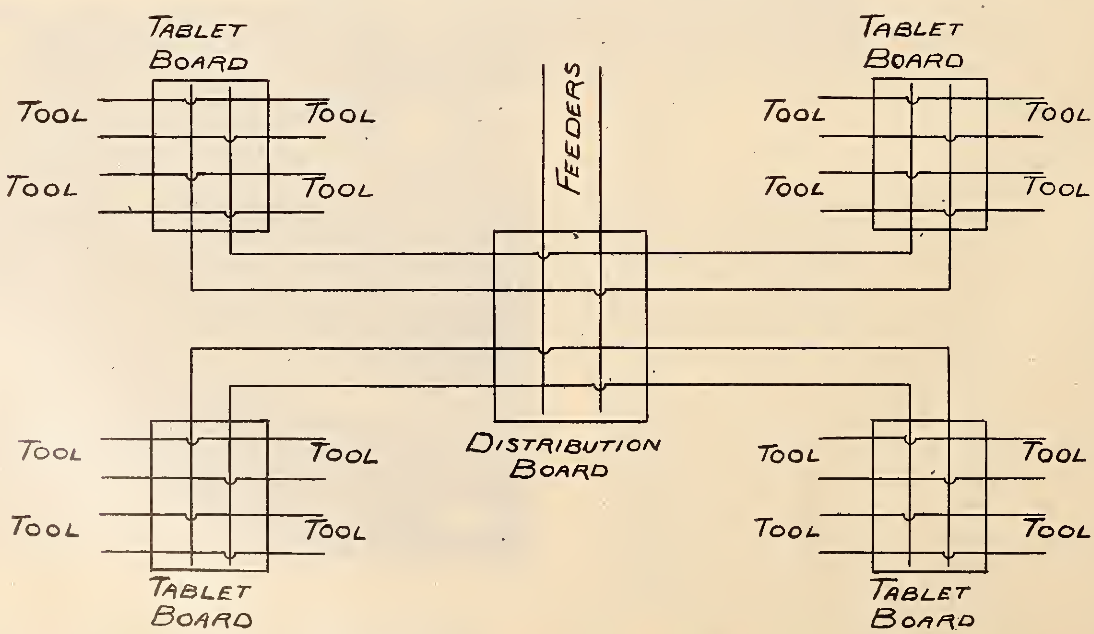


Fig. 5—Tablet Board System of Distributing Electric Wires to Motor Driven Machine Tools.

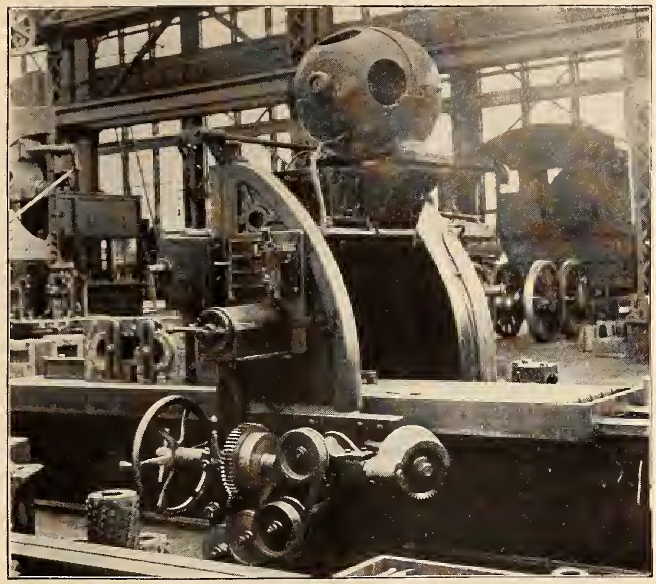


Fig. 6—Newton Plane Milling Machine Direct Connected to a 20 H. P. Multiple Voltage Crocker-Wheeler Motor.

to insure against oilers and repair men tearing them down.

Heavy feeders should always be equipped with turnbuckles and strain insulators, when making turn to take up the slack.

The starter and switches of individual drive machines should always be placed at least as convenient for the operator as a belt shifter. On lathes this can be placed on the tool carriage, but on machines where this is impossible they should be placed on brackets on the floor convenient for the operator.

Circuit breakers on machines are a great safety to the motor and machine, besides saving a large number of fuses.

Fig. 6 is a No. 4 Newton plane milling machine direct connected to a 20 horse-power multiple voltage Crocker-Wheeler motor. The feed wire comes up from under the floor in a pipe to the left of the controller to the switch. From the switch the wire passes into the controller, which is connected with the resistance and motor on top of the machine. The circuit breaker being connected in the armature circuit.

Fig. 7 is a No. 2 Lenox rotary bevel shear direct connected to a 10 horse-power multiple voltage Crocker-Wheeler motor. In this case the wire is placed in moulding on the wall and then passes under the floor in pipe to the controller. The switch is placed on the back of the controller and the resistance and circuit breaker on the wall. This also shows the application of an electric light on the power circuit.

Fig. 3 is a four side timber dresser direct connected to a 50 horse-power constant speed Crocker-Wheeler motor. The motor is on the right of the machine while the switch and starter are on a bracket on the left. The wire is run in pipe from the tablet board to the machine.

Fig. 2 is a 54 inch by 54 inch by 32 foot Pond frame planer direct connected to a 20 horse-power constant speed Crocker-Wheeler motor. The motor is located on top of the machine and the switch and starter are on a bracket on the floor convenient for the operator. The wire is all run under the floor in pipes.

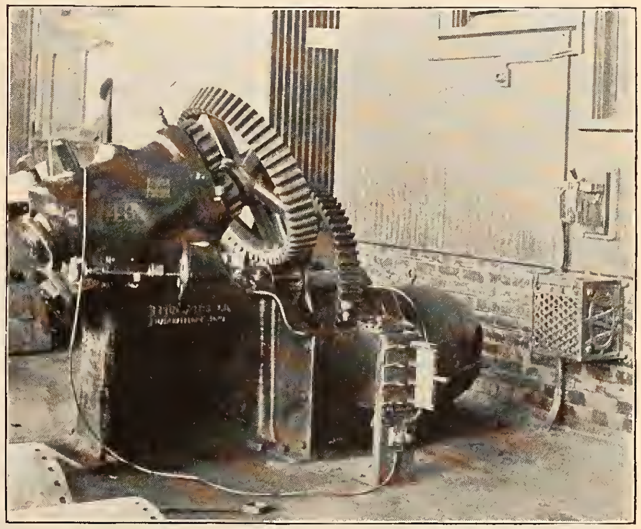


Fig. 7—Lennox Rotary Bevel Shear Direct Connected to 10 H. P. Multiple Voltage Crocker-Wheeler Motor.

Air-Brake Hose Testing Apparatus--N. & W. Ry.

In view of the expense to which the Norfolk & Western Railway has been placed in supplying air brake hose, devices for thoroughly testing this material have been designed by the motive power department, and it is found by careful testing that the efficiency of the material may be thoroughly determined before being placed in service. The illustrations which we present herewith show the device for the bursting test to the right of Fig. 1 and the apparatus for the buckling test to the left of the same figure. Another view of the buckling test machine is shown by Fig. 2. The latter machine is devised to reproduce, as far as possible, the vibration or buckling to which hose is subjected on the road. It is operated by a pulley driven by a belt from a counter shaft above. On the shaft of this pulley is a crank for giving motion to a vibrating arm. The illustrations show very clearly the manner in which the hose is attached at one end to a point on the table connected with the air supply pipe, and on the other end to a vibrating arm. In order to save time in placing and removing the hose, unions are so arranged that the hose may be held securely by a lever clamp. A constant pressure of air is maintained in the hose by using a standard Westinghouse signal line reducing valve, and it is found that the best results are obtained by fifteen pounds pressure. In the union between the reducing valve and the hose is a copper diaphragm in which is located a small hole of about one one-hundredth of an inch in diameter. This is provided to reduce the flow of air into the hose so that when the hose is sufficiently worn by the buckling action to allow the escape of air it cannot be supplied fast enough to maintain pressure therein. In order to announce a break and consequent leak in the hose, a whistle is attached to the end of the vibrating arm, as shown in the illustrations, and connected to the upper end of the hose. Air is maintained in the hose and kept from leaking through to the whistle by a plain bevel seat valve, which is held closed by pressure of the air. On the opposite side is a spring to unseat the valve, which is set at 12 pounds. When a leak occurs in the hose and the pressure is reduced below 12 pounds, the valve unseats, permitting air to pass to the whistle, announcing the leak. An ordinary cyclometer is arranged on the frame supporting the machine, and is operated by the crank engaging the lugs thereon, so that the number of vibrations are counted automatically. The hose is usually given about 120 vibrations per minute, and while no specifications have been prepared in this direction, the hose should stand about 75,000 vibrations, or bucklings, before failing.

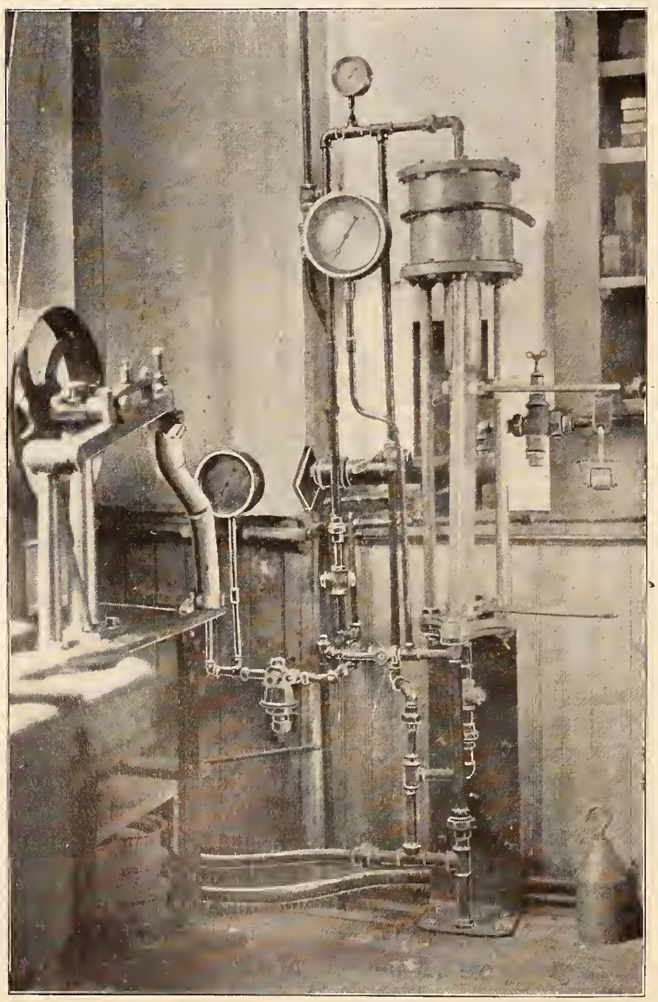


FIG. 1—HOSE TESTING APPARATUS—N. & W. RY.

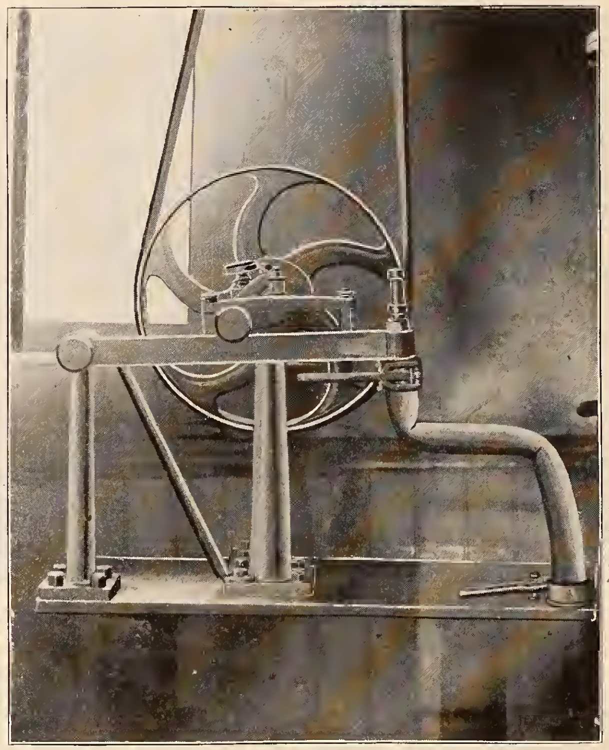


FIG. 2—HOSE TESTING APPARATUS—N. & W. RY.

The apparatus for the bursting test consists of a frame for supporting the hose and pipe connections and a differential piston for supplying the necessary pressure. The position of the hose is shown in the illustration and the manner in which it is clamped is also indicated. In making the test water is admitted from below to fill the hose and small cylinder. The valve is then closed and air admitted to the top of the upper and larger cylinder, forcing the piston down and supplying a pressure to the hose. The diameter of the smaller piston in this instance is 2¾ inches, and the larger, or air cylinder, is 8 inches in diameter. The Master Car Builders' Association requires that a test hose must stand for ten minutes a pressure of 500 pounds before bursting.

Besides the appliances here described the road has simple tests for friction and stretching, as required by the M. C. B. Association. In presenting these illustrations and description we acknowledge the courtesy of Mr. W. H. Lewis, superintendent of motive power of the Norfolk and Western Railway, and Mr. W. W. Lemen, engineer of tests

It was suggested at the March meeting of the Western Railway Club that in view of the increasing necessity of the adoption of steel as the timber supply diminishes, the Master Car Builders' Association might well begin the investigation of the most practical forms to be adopted in steel car construction, in order to be prepared to meet the exigencies which must necessarily arise in coping with the future economical repairs of cars of this type.

New Shops of the Terminal Railroad Association of St. Louis at East St. Louis, Ill.

THE old shops of the Terminal Railroad Association of St. Louis, located on 16th street, near the Union Station, having been outgrown by the mechanical department and having become totally inadequate to maintain the motive power equipment, this company has constructed a new shop for the repair of locomotives and the maintenance of the few cars owned by them, just north of East St. Louis, Ill. In addition to this plant the company is erecting three new square engine houses and a modern coaling station to be located on the site of the old plant. These engine houses will maintain 58 engines and facilities will be provided for light locomotive repairs. Much interest is being attached to this small plant on the St. Louis side of the river because of the adoption of square houses instead of the round house heretofore usually built. The three houses are served by two transfer tables, and inasmuch as most engines housed here will be used in switching service, and the few passenger engines receiving light repairs will be turned on the Y's at the Union Station, the feature of providing a turntable or Y for turning the engines does not enter, and, therefore, the space which would perforce be occupied by this feature is eliminated.

The general lay-out of the new plant near East St. Louis is shown by Fig. 4, and a bird's eye view of the shop buildings is presented by Fig. 1. The shops were planned by Mr. Daniel Breck, general superintendent, with the assistance of the engineering department, and most of the work was done under contract. The buildings were constructed by Purdy & Henderson, of Chicago, and most of the electrical apparatus for power transmission provided by Westinghouse, Church, Kerr & Co., of New York City. The machine tools were installed by the mechanical department of the railroad.

The manufacturers of individual installations will be presented later as the several features are taken up in detail. While the buildings are plain as regards exterior appearance and there is nothing especially new or unusually peculiar about their construction, they are well put together and serviceable. An unfortunate feature of the land on which the shop is built was its low, uneven and swampy condition, requiring much filling and necessitating deep foundations. In some instances a fill of 12 feet was necessary. None of the foundations are placed on piles except the foundation for the stack.

Fig. 2—Exterior View of Locomotive and Machine Shop—Terminal R. R. of St. L.

The principal building is occupied by the locomotive and machine shop. It is built of brick supported by a structure of steel resting on stone foundations, and is 329 ft. 7 in. long by 122 ft. 10 in. wide. It is interesting to observe the thorough manner in which the building is lighted by day, a large expanse of the

Fig. 1—Bird's Eye View of Plant—Terminal R. R. of St. L.

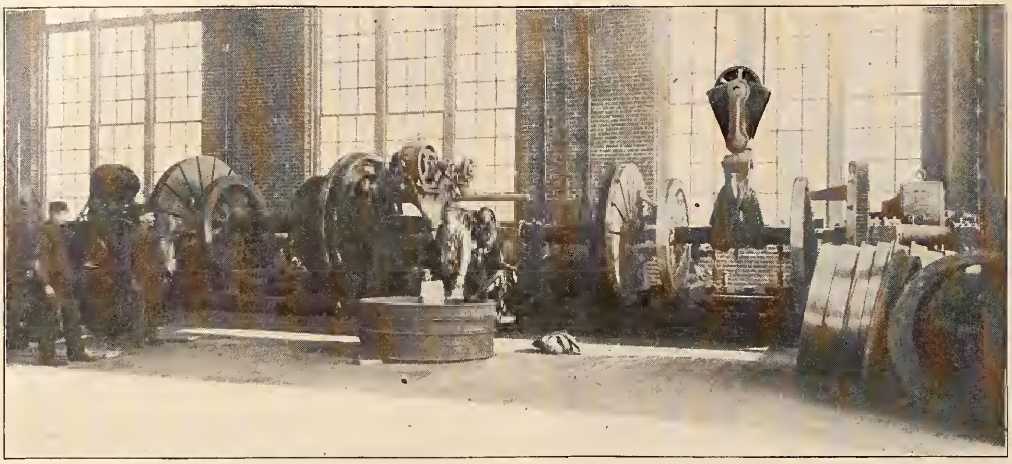


Fig. 3—Niles Wheel Lathes in Locomotive and Machine Shop, Served by Traveling Crane—Terminal R. R. of St. L.

wall being given over to glass window lights. The main floor is divided into two bays, the west side being arranged with transverse pits for the erecting floor, and the east bay for machine tools. Over the machine side is a balcony extending the entire length of the main portion of the building in which are located the tin shop, pattern shop, air brake room, hot-air ventilating system and wash rooms. At one end of this building, and separated from the main portion by a brick wall extending to the roof, is a smaller structure, 122 ft. 10 in. x 77 ft. 10 in., for the blacksmith shop. The north end of the machine side within a space bounded by the wall of the blacksmith shop on the north and the third row of columns on the south, and separated by a short wall extending from the floor to the under side of the balcony, is a department given over to boiler shop machines, and an imaginary line running north from the center row of columns supporting the balcony to the north wall of the blacksmith shop, provides a space given over to boiler work, including the flue working machines, etc.

There are nine pits on the erecting floor, seven of which are used for general repairing, and the last two at the north end are devoted to tank and boiler repair work, being in close proximity to the boiler tools. The erecting floor is served by a Niles electric crane of 80 tons capacity, having in addition two hoists of 20 tons capacity and one of 10 tons capacity

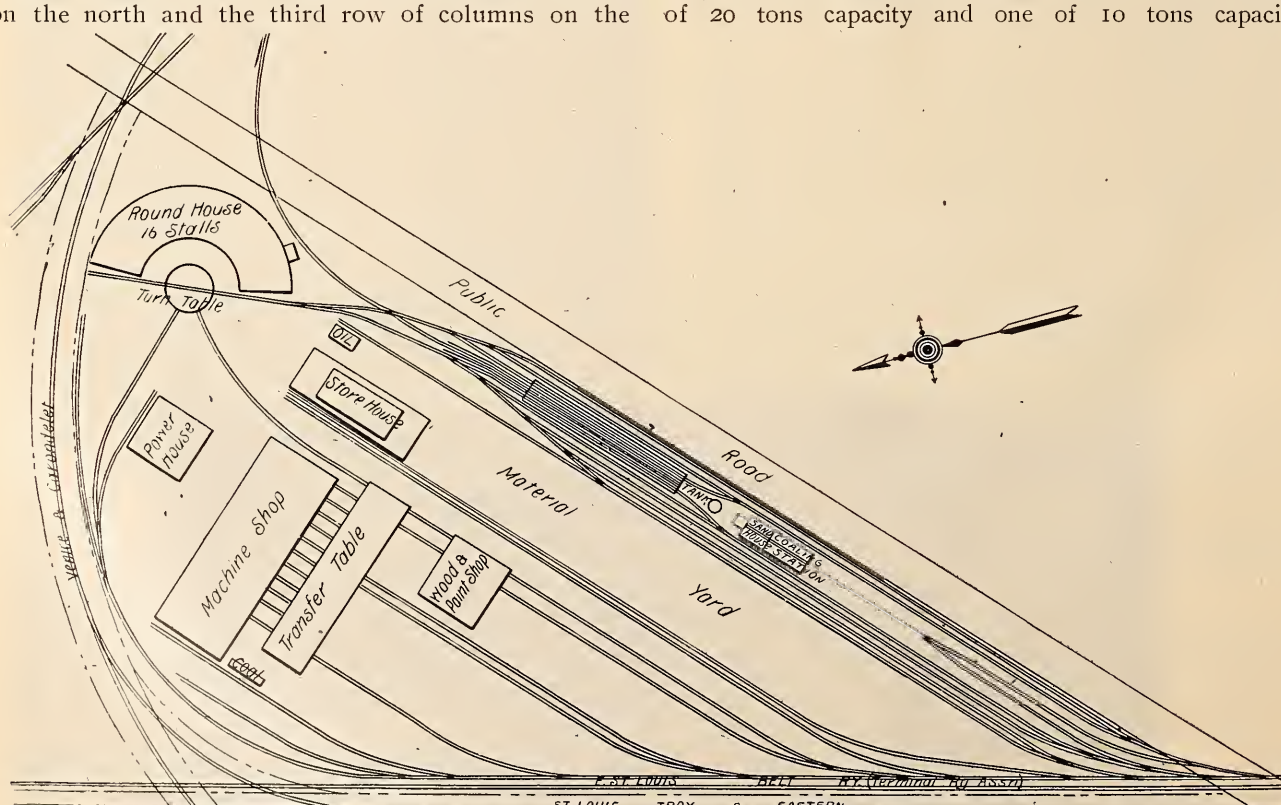


Fig. 4—General Lay-Out of Plant—Terminal R. R. of St. L.

for handling lighter parts. It is interesting to notice that sufficient space is provided back of the engines so that the driving wheels of each locomotive may be placed on the pit which it occupies, and at the same time leave ample space for the transportation of material between the back of the pits and the center line of the shop. The rails extend back to within a few feet of the crane girder columns. In connection with each locomotive pit are four jack block pits, so arranged that when required to jack up an engine it will not be necessary to rest the jack block on the cement floor. When the jack pits are not in use they are covered by planking, which is readily removable.

In arranging for the disposition of machine tools care was taken to so place the heavier tools that they may be served by the large traveling crane. For this purpose the wheel lathes and large boring mill were placed along the south wall of the erecting side. Other tools for heavy work were placed on the machine side

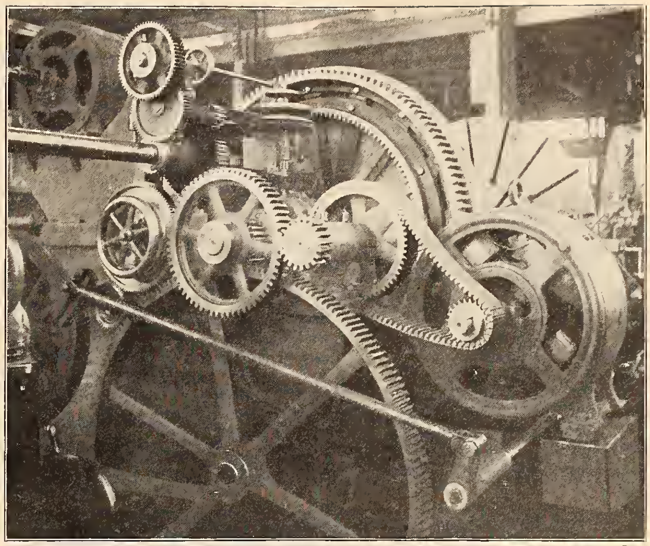


Fig. 5—Showing Motor Connection to 79-in. Wheel Lathe—Terminal R. R. of St. L.

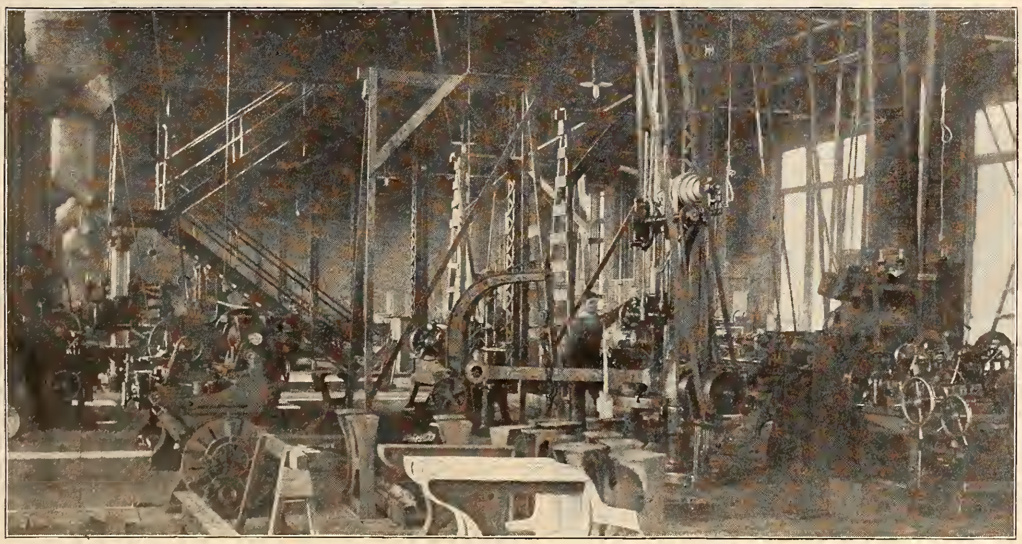


Fig. 6—View in Machine Side of Locomotive and Machine Shop—Terminal R. R. of St. L.

near the row of columns which divide the shop into the two bays. In this manner the crane may be used to place work near the machine, from which position it can be handled by air hoists. In these latter mentioned are the two planers, which are so located that

Fig. 7—Showing Distribution of Hot Air Discharge Pipes in Locomotive and Machine Shop—Terminal R. R. of St. L.

their beds may extend into the space covered by the crane, and work may be placed there by the traveler. All wheel work is done in the south end of the building, the southeast corner being arranged with the machines for car wheel work, and at this end of the building a through track extends, on which the wheels are placed when finished, to be transported to the storage yard. Near this track the bolt and nut machines are located, so that bolts and nuts may be conveniently transported on trucks from the blacksmith and store houses respectively, and may be as readily delivered when threaded. The floor of the machine side and that portion of the erecting floor given over to the machines above mentioned is of wood, while the floor of the erecting side is of cement. The floor of the blacksmith shop is of the usual tamped cinder.

Most of the machine tools are individually driven by electric motors, but a number of them under the balcony are belt driven. It is interesting to observe

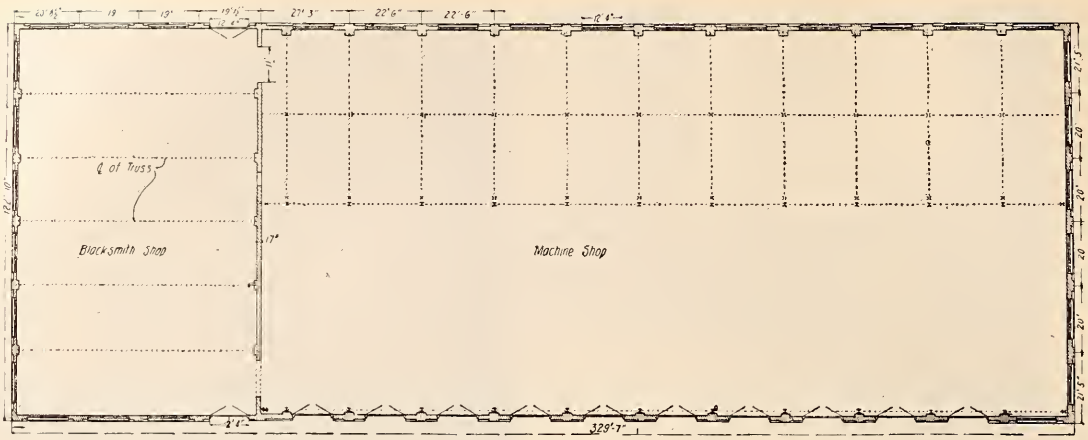


FIG. 8—PLAN OF LOCOMOTIVE AND MACHINE SHOP—TERMINAL R. R. OF ST. L.

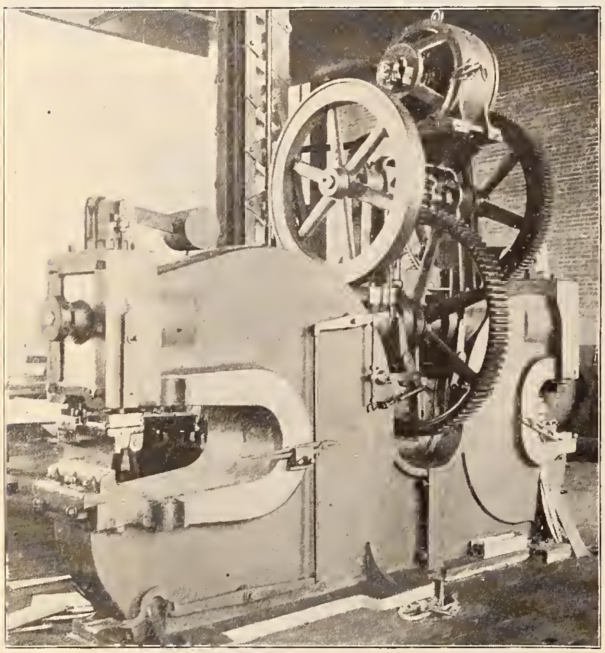


FIG. 9—LONG & ALSTATTER PUNCH AND SHEAR, DRIVEN BY A 10 H. P. WESTINGHOUSE MOTOR—TERMINAL R. R. OF ST. L.

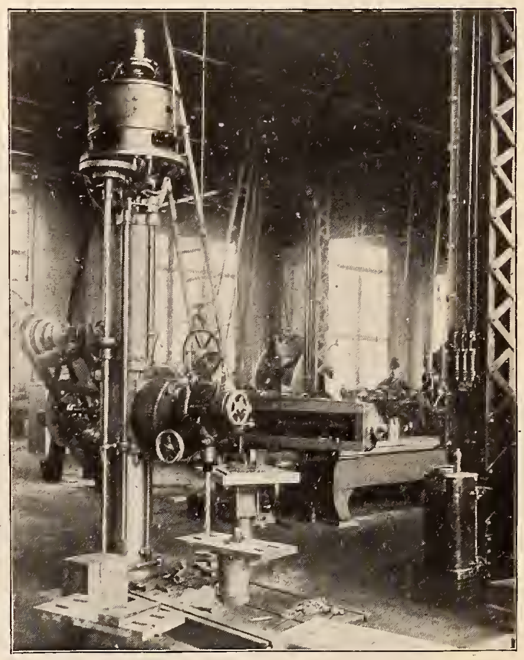


FIG. 10—NILES RADIAL DRILL DIRECT CONNECTED TO 6 H. P. WESTINGHOUSE MOTOR—TERMINAL R. R. OF ST. L.

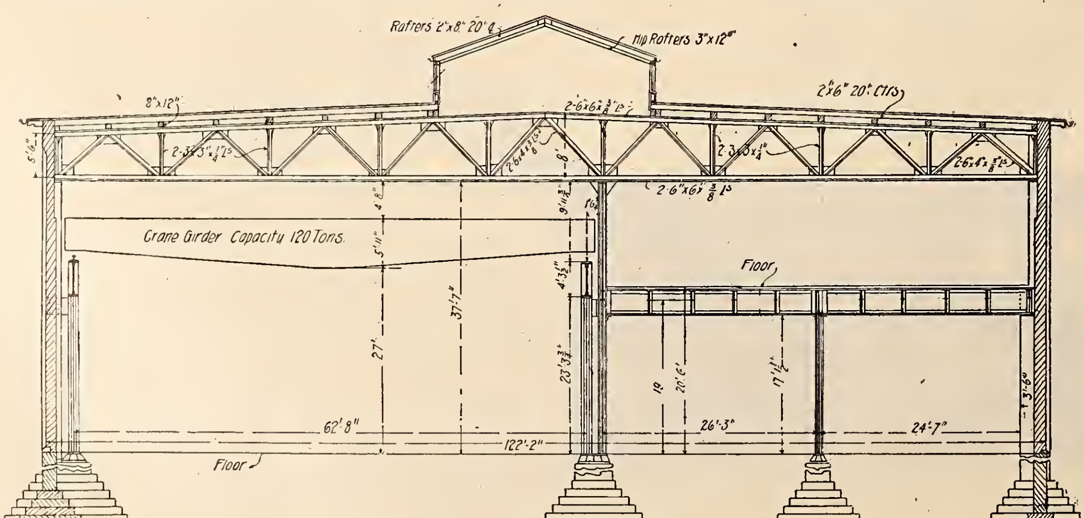


FIG. 11—CROSS SECTION OF LOCOMOTIVE AND MACHINE SHOP—TERMINAL R. R. OF ST. L.

that the 79-in. wheel lathe is supplied with three motors, one for operating the face plates, while the other two are in use in connection with the quartering device. The 54-in. planer is provided with a 20 H. P. motor for driving the table, while the cross rail is operated by a 4 H. P. motor. The motor for driving the line shaft is located on the floor of the balcony. A traveling air hoist is arranged to run parallel with the length of the building, serving the heavier machines near the western border of the machine bay.

Special interest attaches to the lavatory and wash rooms provided for the men. As above mentioned, these facilities are located on the balcony, and arranged in two tiers, and being within the buildings are kept well warmed and ventilated, and provide against the necessity of the men going out of doors. These rooms are well equipped with urinals, closets, 157 individual lockers, and 90 basins. The basins are supplied with both hot and cold water, and are arranged in double rows between the lockers, and so far as space permits the lockers are arranged along the walls; the remainder are arranged in double rows through the rooms. For the sake of ventilation and to provide against the likelihood of fire the lockers are made of expanded metal. In addition to these facilities are four shower baths for the use of the men.

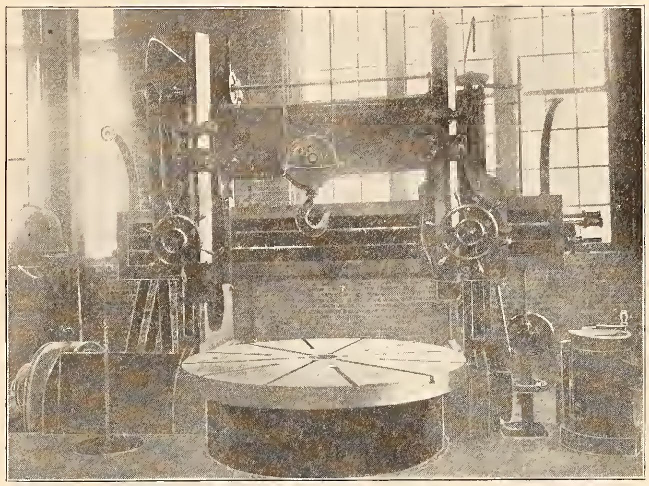


Fig. 12—84-inch Niles Boring Mill Driven by a 22 H. P. Westinghouse Motor—Terminal R. R. of St. L.

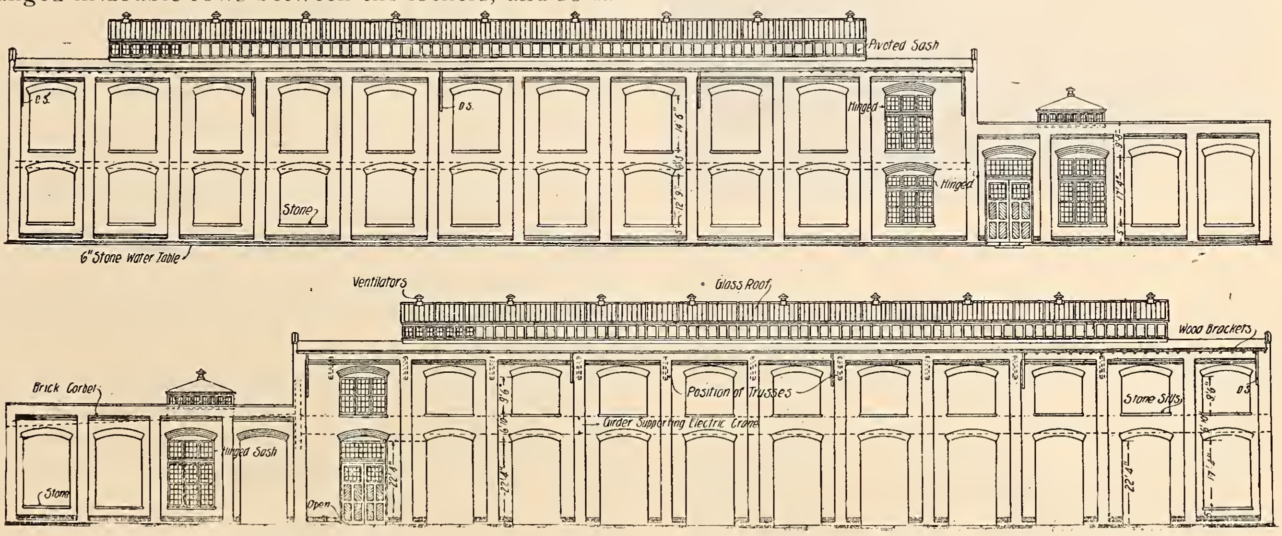


Fig. 13—Side Elevations of Locomotive and Machine Shop—Terminal R. R. of St. L.

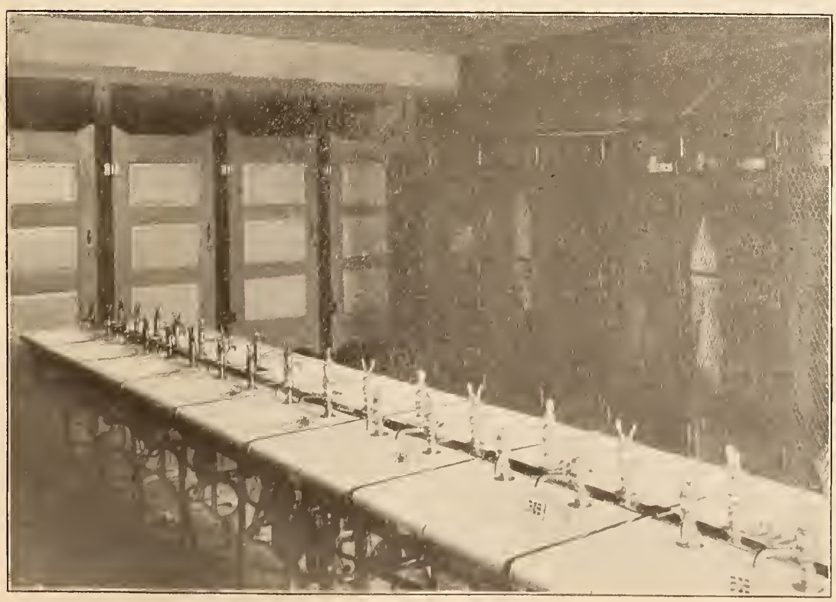


Fig. 14—View Showing Interior of Lavatory and Wash Room—Terminal R. R. of St. L.

In connecion with the lighting of the shop it should be mentioned that ample head room is provided between the main floor of the machine side and the bottom of the balcony, this distance being 17 ft. 1½ ins. The crane girders are supported by a double row of individual columns, the distance from the floor to bottom of the girder being 23 ft. 3¾ ins., and the distance from the bottom of the girder to bottom of rail 4 ft. 1-32 in. The building is heated by the Sturtevant system. Steam coils, fan and operating engine are located in the balcony as heretofore mentioned, and hot air is delivered by galvanized iron ducts terminating in the center row of columns in a line a few feet below the balcony, as shown by Fig. 7. The equipment in the locomotive and machine shop include the following:

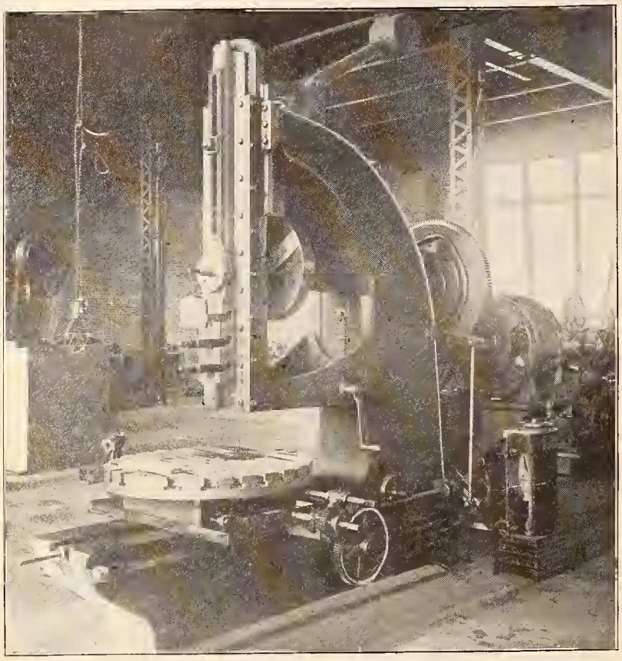


Fig. 15—Niles 16-in. Slotter Driven by 7 H. P. Westinghouse Motor—Terminal R. R. of St. L.

Machines.	Motor Horse Power.	Speed of Motor.	Maker.
69-in. wheel lathe........	13-26	300-1200	Niles
79-in. wheel lathe.......	(2)-3-6*	400-1600	"
	13-26†	300-1200	
84-in. boring mill	13-22	300-1200	"
Driving wheel press.......	5	.950	
Axle lathe	10-20	375-1500	"
Car wheel press...........	5	1040	"
Pipe machine	3	1050	D.Saunders'Son
Car wheel borer..........	Belt driven		Niles
(3) Acme bolt machines..	Belt driven		"
Turret lathe	Belt driven		Pratt&Whitney
Turret lathe	1¼	300-1200	Jones&Lamson
24-in. lathe	1½	300-1200	Niles
28-in. lathe	3½	1200-1600	Pond
36-in. lathe	5-10	400-1600	"
26-in. lathe	Belt driven		Hill-Clarke
2 18-in. lathes...........	1½		Niles
16-in. lathe	1½		"
Radial drill	3-6	400-600	Niles
26-in. traveling head shaper	5-10	300-1200	Bement-Niles
24-in. shaper	2-4	300-1200	Cin. Shaper Co.
37-in. boring mill.........	5-10	400-600	Niles
16-in. slotter	3½-7	325-1300	"
Horizontal boring bar.....	3.6	400-1600	"
36-in. planer (10-ft. bed)..	8¼	1125	Pond
54-in. planer (14-ft. bed)..	20‡	850	"
	4§	600	
IN BOILER DEPARTMENT.			
Punch and shear...........	10	850	Long&Alstatter
12-ft. boiler sheet rolls.....	26	650	Niles
Flue welder			Hartz
Flue cleaner			
Flue cutter			
IN BLACKSMITH DEPARTMENT.			
2½-in. bulldozer			Ajax
Shear			Fk. Kneeland
2500-lb. steam hammer....			Niles
Bradley hammer			
9 Buffalo forges (down draft)			
20 horse-power motor for supplying draft		630	
15 horse-power motor for driving line shaft.......		1150	
MISCELLANEOUS.			
60 horse-power motor for line shaft in wood shop		630	
5 H. P. motor for line shaft in pattern room...		1150	
20 H. P. motor for main line shaft in machine shop		830	
35 Y. P. reversible motor for driving transfer table		280	

*Quartering device. †Face plate. ‡Driving table. §Raising cross rail.

The further features of interest will be presented in our next issue.

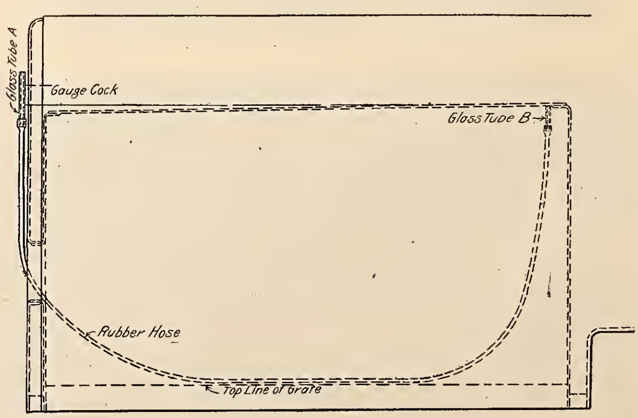
A Device for Locating Gauge Cocks

THE mechanical department of the Chesapeake & Ohio railroad has originated a practical and simple device for locating gauge cocks in locomotive boilers. The appliance is merely an application of the hydrostatic level. The parts used in this connection consist of a piece of rubber hose about twenty feet long and one-half inch in diameter, the hose having metallic wrapping to prevent kinking preferably. In each end of the hose a piece of glass tube, as large as possible, is inserted. The arrangement is shown in the accompanying line drawing.

The glass should be arranged securely and made water tight; their ends should be ground a little unevenly, in order that when the end is placed against the crown sheet it will permit water to leak out between the end of the tube and the sheet. Reference to the drawing will show the application of this device and the directions for its use are as follows:

The tube B should be held against the highest point of the crown sheet, and the tube A at the other end of the hose, should be held about where the gauge cocks are to be located. Water should be poured into tube A until the hose is entirely filled and runs out of tube B. By holding the tubes and hose perfectly still, the level of the water in tube A will show the height of the top of tube B, and therefore the location of the highest point of the crown sheet. The water level in tube A is the height of the under side of the crown sheet, and to this position must be added the thickness of the sheet.

The practice of this road is to locate the lowest cock for engines carrying 180 lbs. of steam and over, 4½ inches above the highest point of the crown sheet, and the vertical distance between centers of the gauge



Hydraulic Level for Locating Gauge Cocks—C. & O. R. R.

cocks is 3 inches. For locomotives carrying less than 180 lbs., the location of the gauge cock, above the highest point of the crown sheet, is 3 inches, and the vertical distance between centers 2½ inches.

Before taking level for gauge cocks, it should be observed that the engine is perfectly level, or as near so as it is possible to arrange it; and it is further necessary to notice that the tube B is at the highest point of the crown sheet, and that it is entirely filled with water. Before taking the level in tube A, no part of the hose should be permitted to be higher than the bottom of tube B, and no kinks or sudden bends should be allowed to form in any part of the hose.

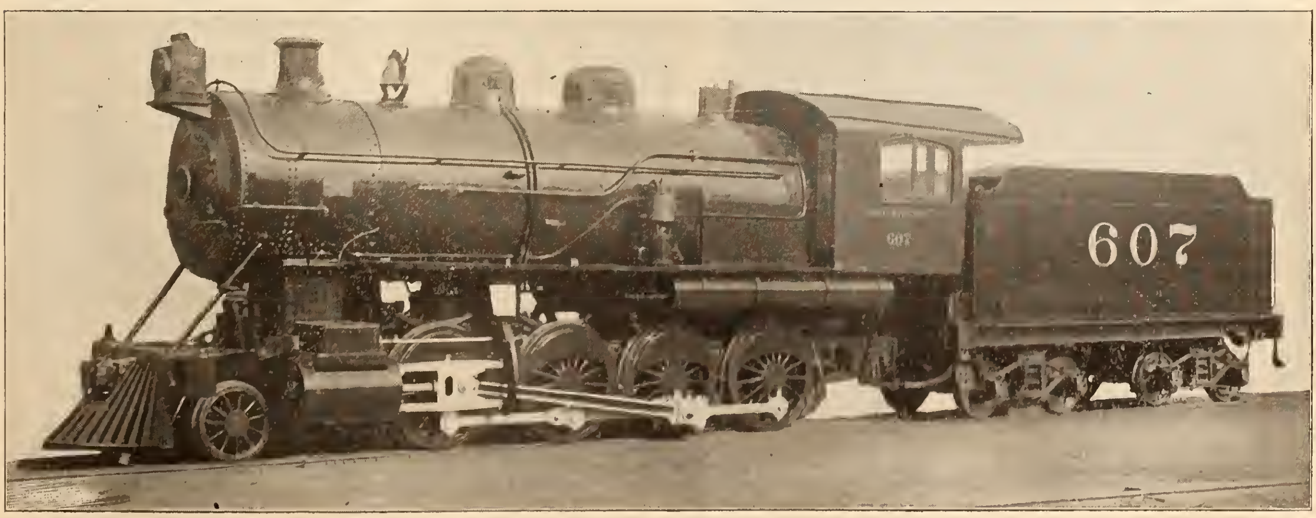
In this connection it is interesting to observe that the practice of the C. & O. is to renew soft plugs in the crown sheet every thirty days. It has been found that the plugs deteriorate after having been in place for a greater length of time and become coated with a hard scale resulting from sulphur in the coal. These conditions so depreciate the value of the plugs for the purpose for which they are applied that if not frequently renewed they will be of little use in saving the crown sheet.

In presenting this sketch we are indebted to Mr. F. H. Walsh, superintendent of motive power, and Mr. J. J. Ewing, mechanical engineer.

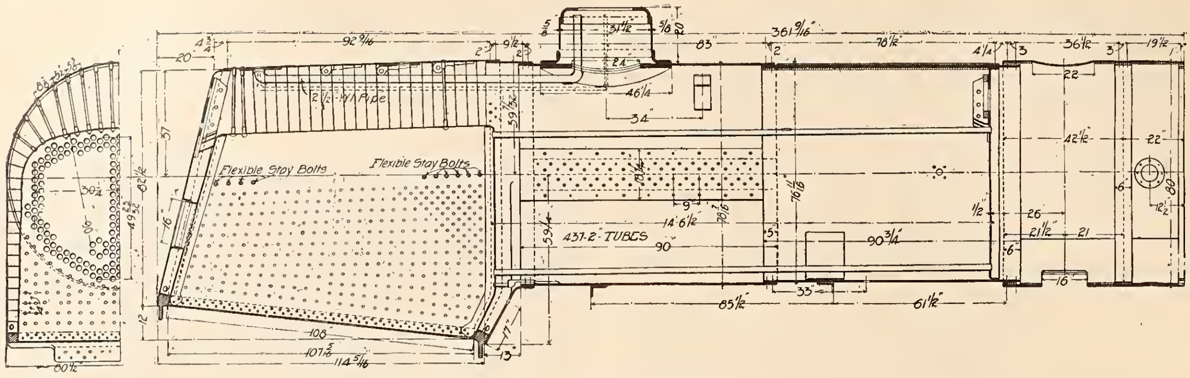
Freight Locomotive--Southern Railway

PRESENTED herewith are illustrations of the principal features and general dimensions of one of a number of large 2-8-0 freight locomotives recently placed in service by the Southern Railway, which were built at the Richmond Works of the American Locomotive Company. The locomotives are designed to operate under 200 pounds of steam; the firebox is of the modified wide type for burning bituminous coal and in this connection it is observed that the water legs are nearly vertical, a point in design concerning which a discussion is presented in our editorial columns of this issue; the cylinders are 22 inches in diameter by 30 inches stroke; the valves are the Richardson balanced slide, and the driving wheels are 56 inches in diameter. The driving boxes and centers of main driving wheels are cast steel. The boiler is fed by two Hancock injectors, No. 11, one located on each side of the firebox. The general dimensions applied to the usual formula for tractive effort show the locomotive capable of developing a starting power of 44,000 lbs. The weight on drivers is 173,700 lbs., the total heating surface is 3,517 sq. ft. and the grate area is 52.9 sq. ft. Comparing these figures, the ratio of adhesive weight to tractive effort 3.94; ratio of tractive effort to total heating surface 12.5 and total heating surface divided by grate area is 66.4. One cylinder full of steam at boiler pressure weighs 2.923 lbs. and the ratio of total heating surface to this figure is 1,203.

General Dimensions.	
Weight in working order	195,036 lbs.
Weight on drivers	173,700 lbs.
Weight, engine and tender, in working order	320,256 lbs.
Wheel base, driving	16 ft.
Whel base, total	24 ft. 3½ ins.
Wheel base, total, engine and tender	55 ft. 1 in.
Cylinders.	
Diameter and stroke	22 by 30 ins.
Horizontal thickness of piston	6½ ins.
Diameter of piston rod	4 ins.
Size of steam ports	1⅜ by 19 ins.
Size of exhaust ports	3 by 19 ins.
Size of bridges	1¼ ins.
Valves.	
Greatest travel of slide valves	5½ ins.
Outside lap of slide valves	1 in.
Inside lap of silde valves	0 in.
Lead of valves in full gear	0 in.
Wheels.	
Diameter of driving wheels outside of tire	56 ins.
Thickness of tire	3 ins.
Diameter and length of driving journals	9 and 10 by 12 ins.
Diameter and length of main crank pin journals	7½ by 6½ ins.
Diameter and length of side rod crank pin journals	8 by 5 ins.
Engine truck journals	Diameter, 5½ by 10 ins.
Diameter of engine truck wheels	33 ins.
Boiler.	
Style	Straight top, wide firebox.
Outside diameter of first ring	76 11-16 ins.
Working pressure	200 lbs.
Thickness of plates in barrel and outside of firebox	9-16, 11-16, ⅞ and 27-32 in.
Horizontal seams	Butt joint, sextuple riveted
Circumferential seams	Lap joint, double riveted.
Firebox, length	107⅛ ins.
Firebox, width	71¾ ins.
Firebox, depth	Front, 74½ ins.; back, 59½ ins.
Firebox, material	Carbon steel.



Freight Locomotive—Southern Railway.

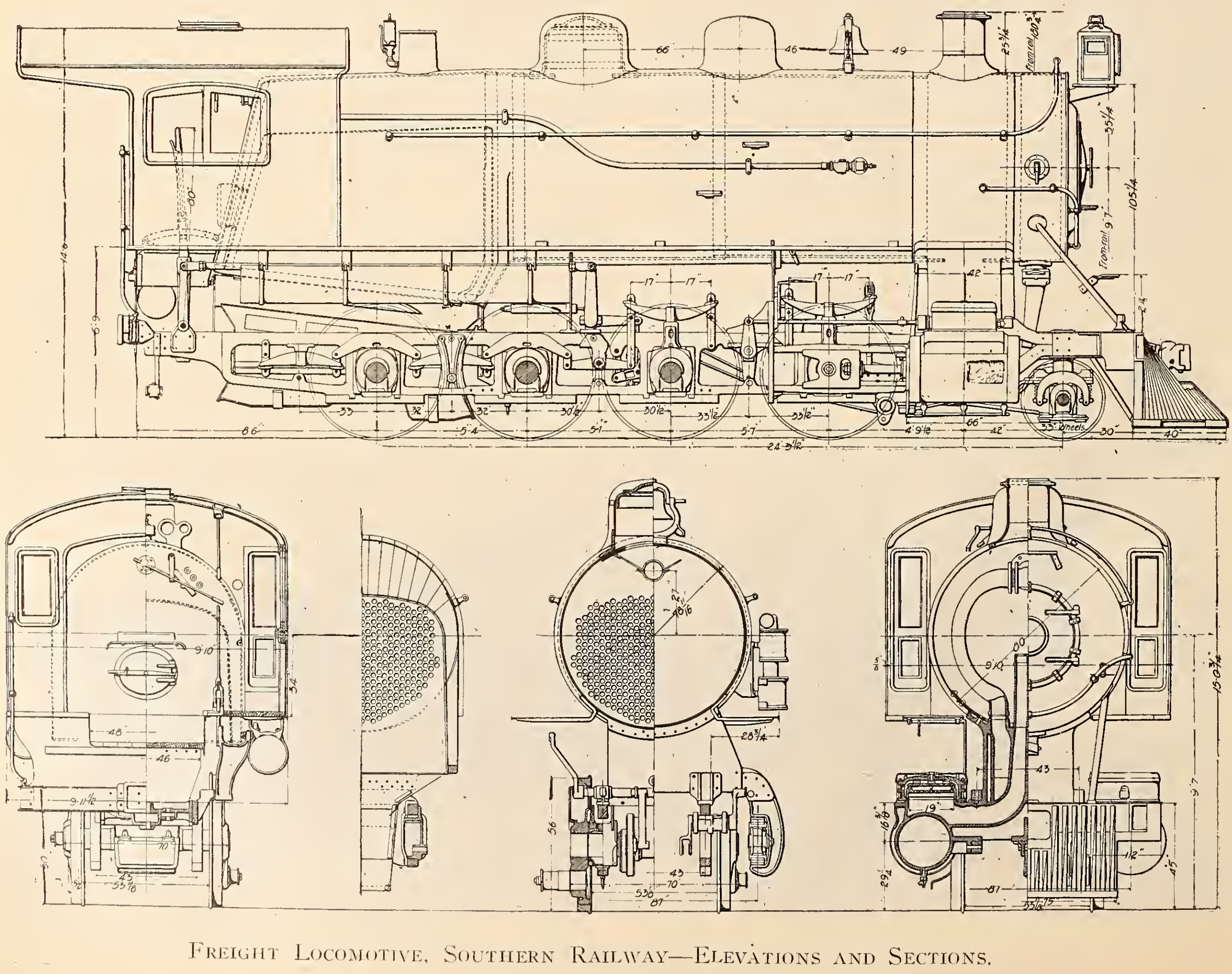


Freight Locomotive, Southern Railway—Sectional Elevation of Boiler and Half Section of Fire Box.

Firebox, plates ....Thickness, ⅜ in.; tube sheet, ½ in.
Firebox, water space......4-in. front, 3½-in. sides, 3½-in. back.
Firebox, crown staying ....Radial, 1⅛-in. diameter.
Firebox, staybolts ....1-in. diameter.
Tubes, material and gauge......Charcoal iron, No. 11, B. W. G.
Tubes, number 437
Tubes, diameter ....2 ins. O. D.
Tubes, length over tube sheets ....14 ft. 6½ ins.
Heating surface, tubes ....3,374 sq. ft.
Heating surface, firebox ....143 sq. ft.
Heating surface, total ....3,517 sq. ft.
Grate surface ....52.9 sq. ft.
Exhaust pipes ....Double.
Exhaust nozzles ....3¾, 4 and 4¼ ins.
Smokestack, inside diameter ....17 ins.
Smokestack, top above rail ....15 ft. ¾ in.

Tender.

Style ....Steel channel frame.
Weight, empty ....50,650 lbs.
Journals, diameter and length ....5 by 9 ins.
Wheel base ....18 ft. 4 ins.
Tender trucks..........Arch bar type, with cast steel bolster.
Water capacity ....6,000 U. S. gals.
Coal capacity ....12.5 tons.
Westinghouse brake on all wheels, National hollow brake beams.



Freight Locomotive, Southern Railway—Elevations and Sections.

The Distribution of Scrap

Communication.

To the Editor of The Railway Master Mechanic:

The articles of Messrs. J. P. Murphy and W. R. Ormsby, General Storekeepers respectively of the L. S. & M. S. R. R. and Southern Pacific Co., relative to the taking care of railroad scrap, have been read with no little degree of interest. Mr. Omsby's article, dealing with conditions on the Coast so radically at variance with conditions existing in this section where we are readily accessible to the market, cannot fail to be of especial interest to all readers.

Relative to Mr. Murphy's article. There are no roads around this section of the country that the writer knows of that do not handle scrap in practically the same manner as he outlines. Some roads pay more and others less attention to these details. In the first class this road may be included, as especial care and attention is given to the handling of scrap so that the best results may be obtained. Classified bins of ample proportions are provided for the comfortable handling of material except under most abnormal conditions, and the facilities for sorting a mixed car and putting different kinds of scrap in their proper bins very conveniently arranged. One feature that should receive careful attention and consideration is the usable material that comes mixed in with scrap; for this purpose we have a large bin where the material is classified and when a quantity sufficient has accumulated is taken to the different departments where it can be used. This feature alone has been found to cover a large share of the expense involved in having skilled mechanics and laborers whose only work is the sorting, loading and unloading of scrap material. The above does not, of course, include copper, brass and other valuable scrap, which we insist on outside points packing securely in boxes and barrels, and is kept under lock and key in the storeroom. The repair track daily turns over to the storeroom all scrap brass, etc., accumulated that day. At the latter part of the month this material is carefully loaded by classes in barrels and shipped away, as there is an ever ready market only too glad to get it.

Have no idea that anything contained herein advances any ideas that well regulated roads have not formulated years ago and had in practice a corresponding length of time. The interchange of ideas between General Storekeepers cannot fail to be productive of the greatest good to all concerned, and it was with extreme regret that it was found necessary to give up being present at the initial meeting in Chicago last month, it will not happen again very soon.

No little credit should be given Mr. Murphy, and other gentlemen, for their efforts in getting the organization started and making possible the "Railway Storekeepers' Association," which we all trust will result in something of which individually and collectively we may all be proud.

Hope our brother on the far-off Pacific slope will soon favor us with another communication relative to methods pursued on his line.

The province of the Store Department contains so many elements of good for railroad service that one feels like going on indefinitely, but having already trespassed on your valuable space too much will desist. Hoping to see many contributions in your interesting journal from other sources. Very truly yours,

D. E. Moodie,
General Storekeeper and Accountant,
Wisconsin Central Railway.

A Gauge for Setting Crank Pins

A DEVICE for quickly setting the crank-pins of locomotive driving wheels and for the accurate location of keyways has been designed and patented by Mr. Wm. A. Nunnally, a machinist in the Richmond shop of the Chesapeake & Ohio Railway. Mr. Nunnally has been engaged for several years in work on driving wheels, and appreciating the value of a device by which much time could be saved in this respect, he has taken advantage of his opportunity in perfecting this appliance. It consists principally of a skeleton body, whose sides or edges are parallel, and an extension skeleton, a portion of which is provided with two parallel straight edges, which is arranged to be adjusted according to the several lengths of locomotive cranks. The apparatus is so arranged with lugs and forms as to be applied to a driving wheel when it is on the axle and when the crank-pin is in place, before either axle or crank-pin is applied, or when one or the other is in place. Fig. 2 shows the construction of the device, and Fig. 1 shows the same in place upon a

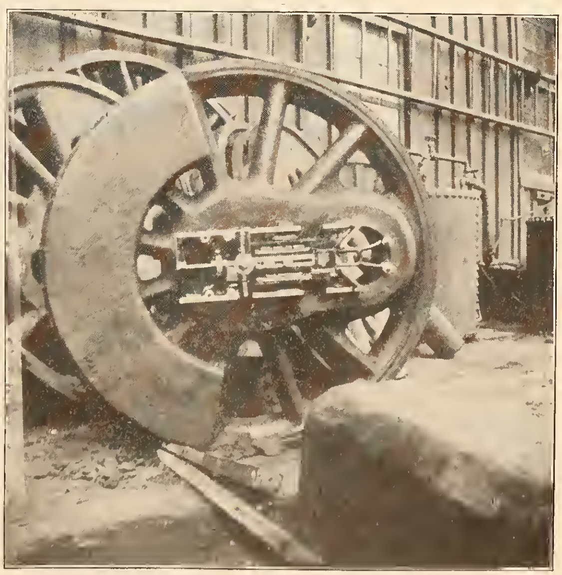


Fig. 1—Gauge for Setting Crank Pins, in Position on Locomotive Driving Wheel.

driving wheel. It is readily seen that the device is easily and quickly adjustable, and that by scribing lines according to the parallel sides it is a very simple matter to locate a straight line through the centers of the holes or through the centers of the axle and the crank-pin by which the key seat may be accurately located. As well as using this appliance for laying off new work, it may be

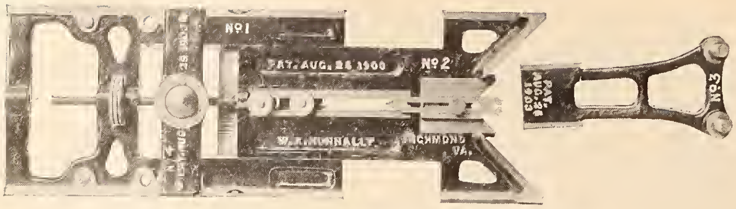


Fig. 2—Gauge for Setting Crank Pins.

as readily used for testing drivers which already have been put in place.

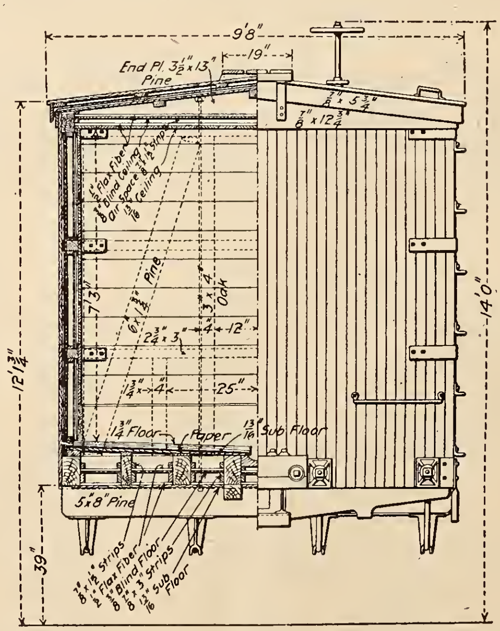
The parts shown in Fig. 2 may be designated for convenience as Nos. 1, 2 and 3, according to the figures shown thereon. Consideing first the main body No. 1 and the adjustable portion No. 2, the portion No. 3 will be temporarily disregarded. So arranged the device is applicable to a wheel on the axle and with crank-pin in place. Under such circumstance the taper lug on the cross piece, No. 4, will fit in the center in the end of the axle, and the faces at the end of extension, No. 2, will rest against the periphery of the crank-pin or crank-pin collar. Should the wheel be removed from the axle, lugs on the side of the casting opposite to that shown, will bear against the wall of the axle hole, while the faces bear against the crank-pin, as in the previous instance. The screw and thumb nut for adjusting the extension and the thumb nuts for clamping same in position are clearly visible. Applying now the portion No. 3, the machine appears as in Fig. 2, which further shows another condition under which it is applied. In this instance the wheel is free from the axle and the crank-pin not yet applied, lugs of the main body bearing against the wall of the axle hole and lugs of the extension bearing against the wall of the crank-pin hole. With the axle in position and no crank-pin, the taper lug above mentioned would engage the axle center.

As hereinbefore presented the machine appears as a ready, quick and serviceable device for locating key seats on new wheel centers and for trying the same when wheel, axle and crank-pin have been located, as well as in making renewals in the event of accident. Further than this, the machine is serviceable in comparing key seats of wheels on the opposite ends of the same axle in order to determine whether or not the wheels are truly quartered, or arranged at 90 degrees with each other, and for this purpose three levels are included, one on each of the two parallel sides or straight edges and one on the end piece, at right angles to the sides. In order to make this observation the quartering machine is applied as above indicated and the wheel is rotated until the center of the axle and the center of the crank-pin are in the same horizontal line, this fact being indicated by the bubble in the upper level being centered. The wheel is then carefully blocked so that its slightest movement is impossible, when the machine is changed to the wheel on the opposite end of the axle and there applied as before. If the wheels are properly quartered, the crank will be in a vertical position as indicated by the bubble in the level on the transverse piece being centered.

This device is now in use at the Richmond shop of the Chesapeake and Ohio Railway where it is considered a valuable time saver and perfectly reliable.

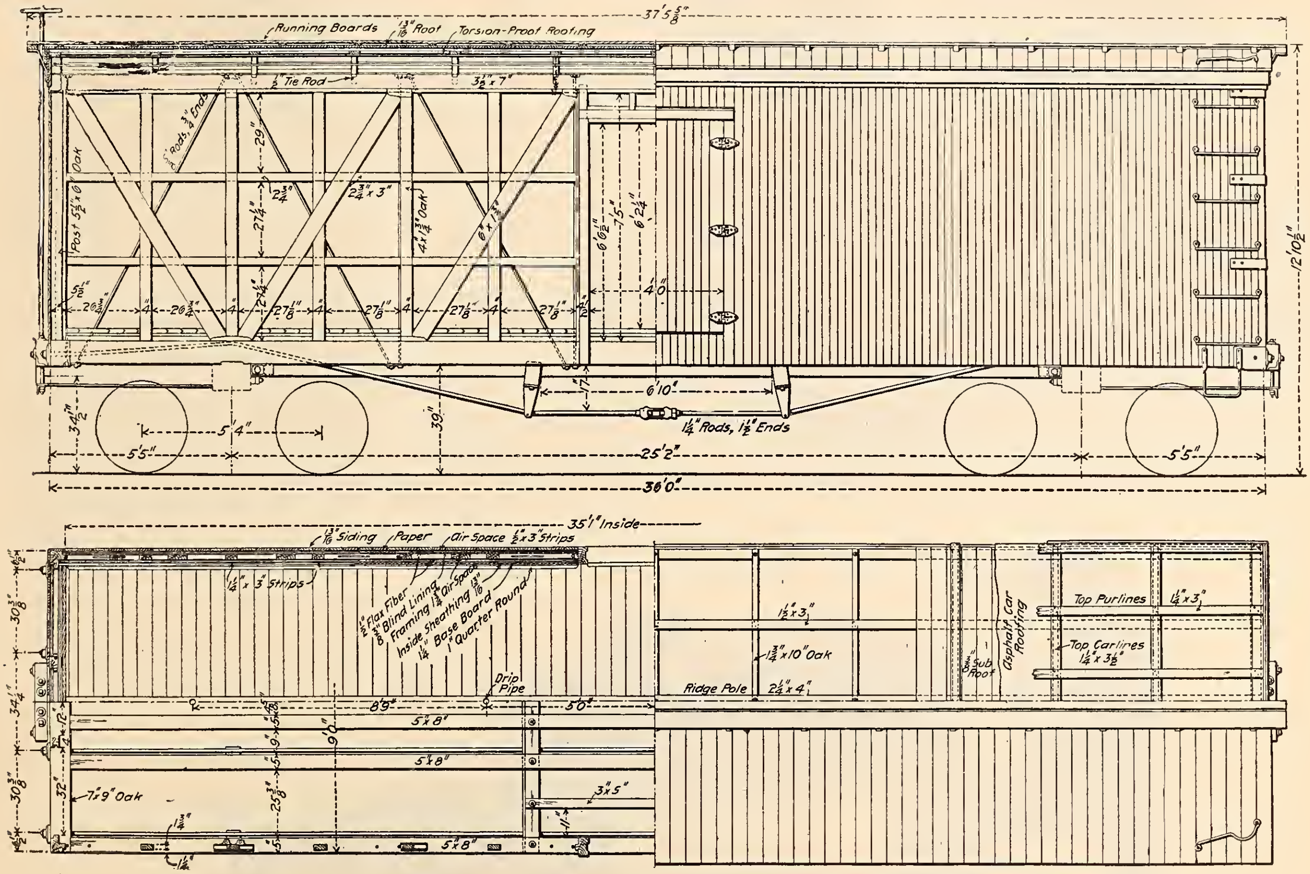
New Cars for the Milwaukee Refrigerating Transit Company

The accompanying line drawings illustrate the design by which 340 refrigerator cars are being built by the Pullman Company for the Milwaukee Refrigerator Transit Company. They are for special service and to be used in transporting beer for Pabst Brewing Company, of Milwaukee, Wis. The cars have a capacity of 60,000 lbs.; they are 36 ft. long over end sills and 9 ft. wide over side sile. The underframing and superstructure are of wood and the interior is carefully lined. A gutter is arranged along the center line of the floor and the section on each side is arranged on an incline leading towards the same. The floor is of 1¾-in. plank separated by a lining of paper from the sub-floor 13-16 in. thick. The inside clear height is 7 ft. 3 in. and height from rail to running board is 12 ft. 10½ ins. The draft sills are 8-in. 23-lb. I beam bolted to the center sills by four 1-in. bolts passing through the upper flange in close proximity to the web. The sills at each end abut the body bolster and are tied thereto by two 1½-in. strap bolts, each riveted to the web of the I beam with five ¾-in. rivets arranged one above the other on 3¾ in.



60,000 lbs. Capacity Car for the Milwaukee Refrigerating Transit Company—Partial End Elevation and Section.

centers. The tie bolts pass through specially cored holes in the bolster, and are secured with double nuts and cotters. To take care of buffing strains two 4-in. by 5-in. wooden sub sills extend between the body bolsters to which they are rigidly attached by corner irons. Dayton twin spring gear is specified. The cars have cast steel body and truck bolsters, furnished by the American Steel Foundries, and are mounted on Barber trucks. They are roofed with asphalt torsion proof car roofs manufactured by F. W. Bird & Son, and the interior lining includes Neponset insulating paper manufactured by the same firm.



60,000 lbs. Capacity Car for the Milwaukee Refrigerating Transit Company—Plan and Elevation.

Railroad Shop Tools

By Charles H. Fitch

XII.

REQUIREMENTS and ideas of planing machines were ambitious from the first. Some of the very first planers built between 1830 and 1840 were big tools for any period. A Chelmsford, Mass., firm building cane-crushing machinery for sugar mills constructed a planer to take work 42 in. x 42 in. by 22 ft. travel. The table traverse was effected by a link belt or chain with the usual dog on the table reversing a belt, whose suffering was audible. Both vertical and horizontal feeds were automatic. This, the first tool of its kind in New England, was as large as is now found in some locomotive repair shops and larger than the largest planer in the 12th St. shops of the Allis-Chalmers Company, Chicago, as late as 1900. It should be said, however, that the locomotive shops of trunk line divisions, such shops as Oelwein, have usually a 60 in. x 60 in. planer with 26 or 30 ft. travel, seconded by a 36 in. x 36 in. planer, while the Betts Company, of Wilmington, have just completed a planer to take work 122 in. x 122 in. with 36 ft. travel, which is hardly extraordinary, as other makers list and build 120 in. x 120 in. machines. The new Collinwood shops' largest planer is a 54 in. x 54 in. Pond special for locomotive frames, having 32 ft. travel and using a 20 H. P. motor. Their remaining planer equipment comprises a 42 in. x 42 in. x 12 ft. Gray, a 42 in. x 42 in. x 10 ft. Niles, a 38 in. x 38 in. x 10 ft. Niles, a 36 in. x 36 in. x 10 ft. Pond, a Dietrich & Harvey open-side taking a 10 H. P. motor, and an old Richards 20 in. x 50 in. open-side. The planer is a more distinctively railroad shop tool than the milling machine, and even the latter takes the planer type, as shown in Figure 2, a four-head machine by the Ingersoll Company, of Rockford, Ill. These are called milling machines, but they are made in open-side and other styles like the planer, and might well be called planing machines with milling heads, and classed with numerous other devices for quickening the work of planers.

Mr. E. C. Lewis, of the Niles-Bement-Pond Company, summarizes the present state of the art in planers for locomotive shops, as compared with the condition of 20 years ago: "A 60 in. frame planing machine used to be considered the proper size, but they are now built 84 in. x 84 in. to plane 36 ft. long, very heavy and with steel driving gears throughout. We have an order for one to have eight cutting tools in operation at once, speed 30 ft. per minute. There will be three tools in each of the heads on cross rail and one in each side head. Of the three tools, two are for roughing and one for finishing." This machine will be driven by a 50 H. P. motor. Its lines of construction are shown in Figure 1, a 72 in. x 72 in. machine, motor driven, for planing locomotive cylinders.

Most significant is the increase of power applied in these machines. There are 60 in. x 60 in. planers driven by 5 H. P motors, but some of the latest use 20 or 30 H. P., and here is an 84 in. x 84 in. using 50 H. P. A 60 in. x 60 in. with a speed of 21 ft. per minute cutting, 74 ft. per minute making a ½ in. x 1-16 in. cut on steel casting, took 10 H. P. per cut, 16 H. P. for reverse and 14 H. P. for return. The driving pulley for return served as a 1,500 lb. fly wheel very much as shown in the picture. This means of assisting to overcome the inertia of the platen and work upon it originated before the coming in of electrical drive. At the shop of the Sullivan Machinery Company, Chicago, is a very large planer installed by Milan C. Bullock about 1890 and provided at his suggestion with a fly wheel for return drive pulley to serve the purposes of high speed quick return. About ten years later electrical drive was applied, the motor being simply put upon the fly wheel shaft.

Despite the progress made in milling machinery it is not for a moment to be supposed that the planer will be displaced in its peculiar sphere. It is popularly supposed to have some disadvantages to be overcome by invention, but these become significant only

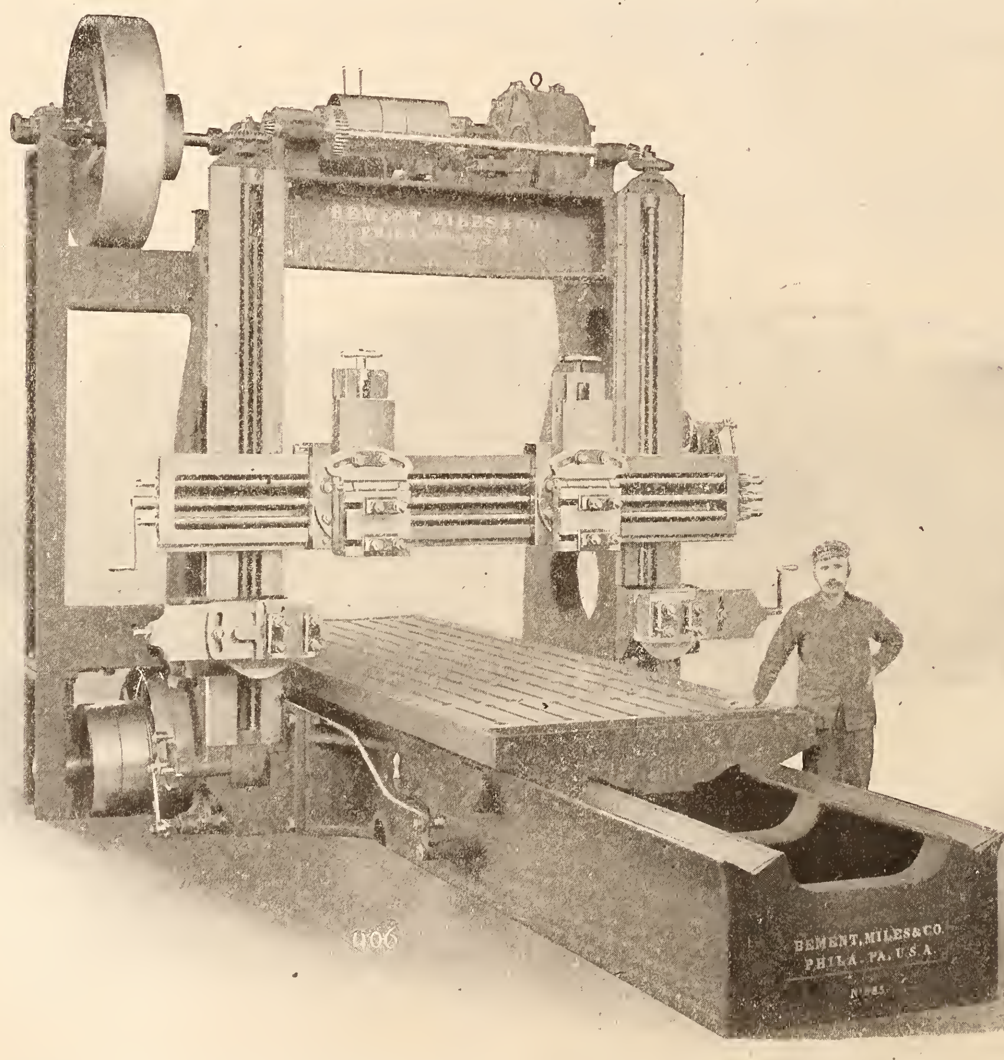


FIG. 1—72-IN. MOTOR DRIVEN CYLINDER PLANING MACHINE—MANUFACTURED BY BEMENT, MILES & COMPANY, PHILADELPHIA, PA.

when an effort is made to enlarge its sphere. This sphere is that of a jobbing tool on large work. Its platen moves slowly, but it is a movement very effective for getting work done. On repetitious work it may be quickened by use of milling cutters, but large work is not usually reptitious.

Still effective progress has been made in developing the capacity of the planer and increasing its convenience.

We will not dwell at length upon the details of this familiar tool. Apart from the small and exceptional crank planers the driving of the platen is accomplished by straight or helical rack and gearing driven and reversed by tight and loose pulleys with belt shifters worked by lugs on the platen. There is a great deal of pretty and ingenious design in the belt shifting mechanism, so arranged that there is no lapping in the on and off functions. Two belts are commonly used and larger pulleys for the return, which is desirable, reducing the amount of gearing under the platen. Whether the countershafting is lengthwise or crosswise of the platen is merely a matter of gearing. Much has been said of the former practice for saving shop room, but, after all, is it always desirable to save shop room? I do not like a shop crowded with machines, and there is no particular economy in skimping light and space in a shop.

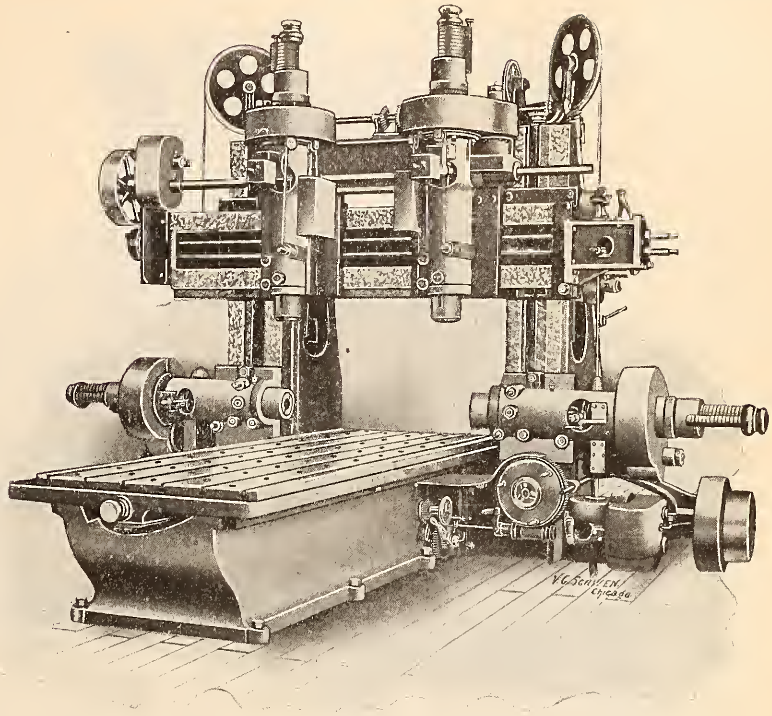


Fig. 2—Four Head Milling Machine—Manufactured by Ingersoll Milling Machine Company, Rockford, Ill.

The feed motion is either taken from the belt shifting levers in a very obvious way, or more usually is taken from the gearing under the platen in a way which does not appear so plain to the casual observer, because the gearing which drives it is out of sight and the engaging and releasing devices, springs, leather discs, etc., whose moving power is overcome by stops at each reversal, are not so placed that their action can be followed. The feeds work by racks and sectors operating splined and screw shafts with clutch, clamp or nut engagements, and worm and bevel gearing permitting the feeding of the tool post through a swiveling head. All these movements are carried in the cross bar to the saddle on which the head swivels, and are automatic, with provision for hand feeding. The tool post apron also swivels. The cross bar is lifted and lowered by hand or power feed in a very obvious way; details of gibbing of slides and minor variations in design we need not here enter upon. In the matter of feeds certain movements are generic and belong to similar functions on tools of all types, and this is really the best relation in which to study them.

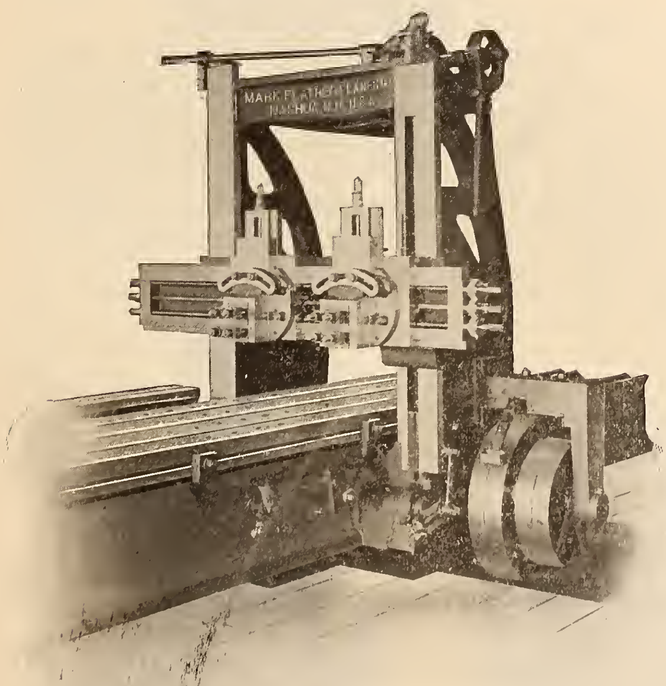


Fig. 3—Standard Planer with Open-Side Attachment—Front View as a Standard Planer—Manufactured by Flather Planer Co., Nashua, N. H.

Many efforts attended with some measure of success have been made to specialize and enlarge the usefulness of the planer. Most important are those which develop its speed and power. I have seen devices in the nature of double-acting tools planing both ways. These worked all right mechanically, but involved enough trouble and rigging up to prevent their use

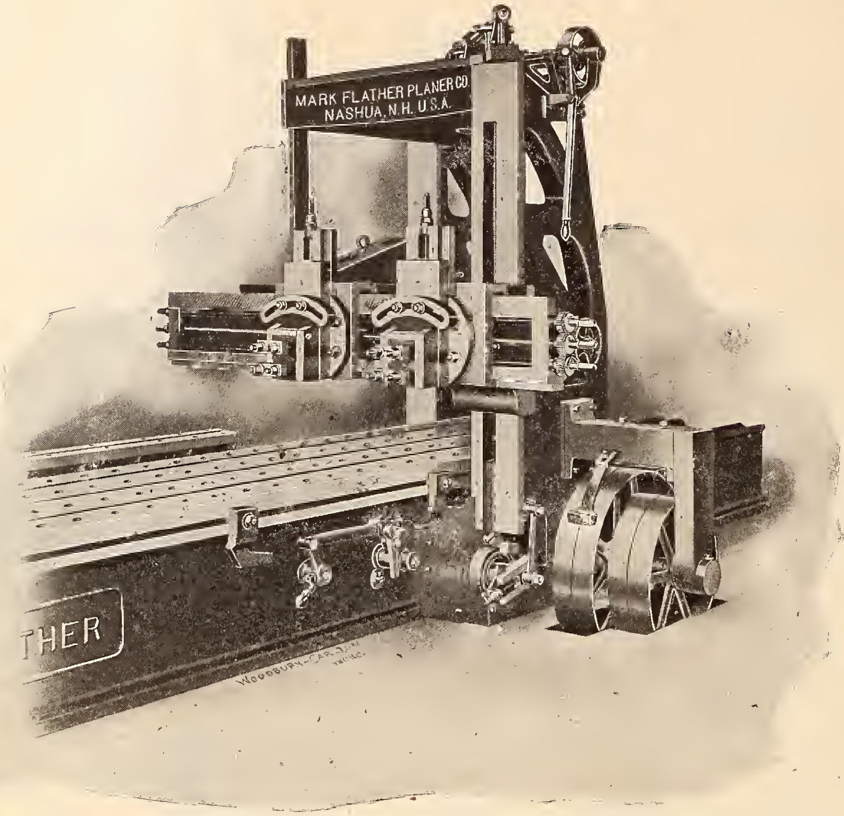


FIG. 4—STANDARD PLANER WITH OPEN-SIDE ATTACHMENT—FRONT VIEW AS OPEN-SIDE PLANER—MANUFACTURED BY FLATHER PLANER CO., NASHUA, N. H.

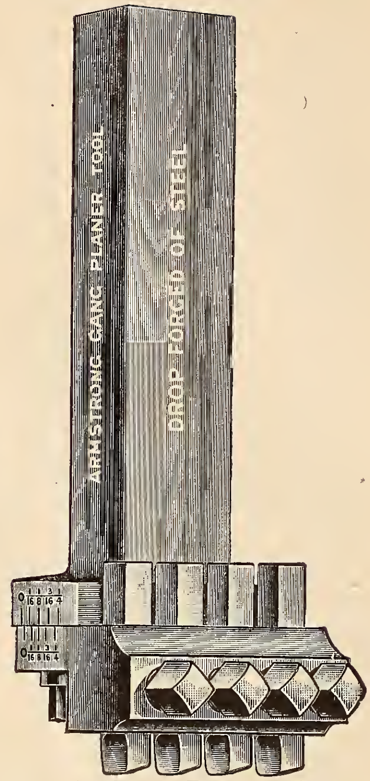


FIG. 6—GANG PLANER TOOL—MANUFACTURED BY ARMSTRONG BROS. TOOL COMPANY, CHICAGO.

from spreading although in theory they saved a large percentage of time.

Since the inertia of the platen and its load is the obstacle to high speed planing it has of course occurred to many to apply planing motion to the lightest tool instead of to the heavy work. In special cases this is highly successful as in the boiler plate edge planers in common use in locomotive shops and ship yards. In these machines two or three tools upon a light tool carriage are caused to travel to and fro upon ways 12 or 15 feet long by means of a feed screw. The Bement machine of this type bevels plates for caulking by the Connery system at the rate of three plates an hour, equal to the hand work of a force of fifteen men with hammers and chisels.

The railroad shop does not call for light machinery to trim about a heavy casting, but for heavy machinery to finish light parts with absolute accuracy. Such a machine is shown in Figure 5, a duplex connecting rod planer by the Woodward & Powell Co., of Worcester, Mass. Speed of work is obtained by duplex tool heads on double housings, one pair of which is movable. This machine has eight heads.

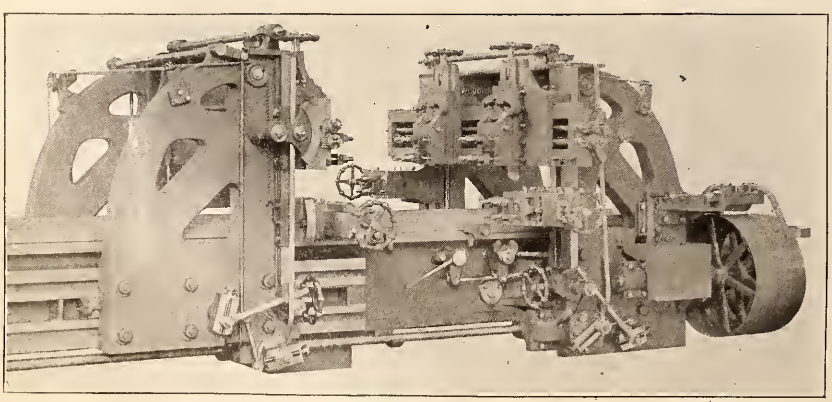


FIG. 5—LOCOMOTIVE CONNECTING ROD PLANER—MANUFACTURED BY WOODWARD & POWELL PLANER CO., WORCESTER, MASS.

FIG. 7—ARMSTRONG PLANER JACK—MANUFACTURED BY ARMSTRONG BROS. TOOL COMPANY, CHICAGO.

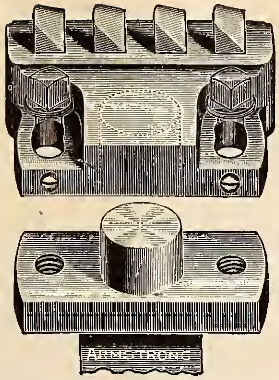


Fig. 8—Construction of the Armstrong Gang Planer Tool.

A machine tool now found in many large railroad shops is the open-side planer. In 1880, only two or three such tools had been built. The design shown in Figs. 3 and 4 is that of the Flather Planer Co., Nashua, N. H. It can be used as an open-side with one housing set back, or the bracket can be removed and the housings set opposite, converting the machine into a regular planer.

The most effective way to improve the planer is to provide it with convenient appliances for setting work, and to use multiple or gang tools to the limit of its pulling capacity, giving the machine heavier proportions and gearing. Small planers of the G. S. Gray, Whitcomb, Flather and other makes are built with

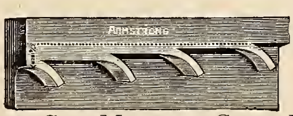


Fig. 9—Plan of Cut Made by Gang Planer Tool.

deep beds and have a stocky and substantial look which make beds of the shallow type with legs look comparatively shaky, but no doubt further advances in solidity remain to be made even upon the meritorious tools now on the market.

The Armstrong Bros. Tool Co. of Chicago have their planer tools in use in most railroad shops. The single tools are really adjustable holders of "high speed" steel cutters available both for convenience and economy. Figures 6 and 8 show the construction and operation of the gang or multiple planer tool. It might to some appear self-evident that a gain would be made by using a gang tool such as the Armstrong

Fig. 11—The Armstrong Planer Tool.

and it often seems to be the case, a saving of half the time being claimed in some instances. In other cases railroad master mechanics and foremen report only a much smaller gain. Much depends on the skin and character of metal planed. Against the work of making a deep cut is offset the work of ploughing out four lines of cleavage against one, and a shallow cut through a hard skin may be a tougher job than a deep cut that gets under the skin.

Fig. 11 shows the construction of the Armstrong

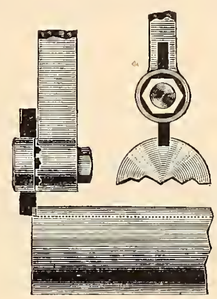


Fig. 12—The Armstrong Planer Tool Cutting a Keyway.

planer tool which, equipped with an assortment of properly ground cutters, will effectively equal a complete set of forged planer tools. Fig. 10 illustrates one of these tools at work in close corners, giving a good general idea of clearance obtained. It shows also a few of the angles at which the cutter can be set. A job similar to the one shown could be finished with one of these tools without shifting the position of the work on the bed. Fig. 12 shows the planer tool cutting a keyway with the cutter reversed and the tool turned around, thus throwing the cutting point behind center of tool and practically working as a "goose-neck" tool.

Setting heavy work on the planer is a great time killer, and this loss of time is much reduced by leveling jacks such as made by Binsse of Newark, the

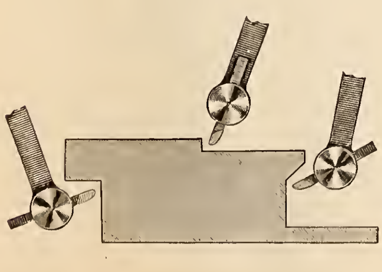


Fig. 10—Armstrong Planer Tool at Work in Close Corners.

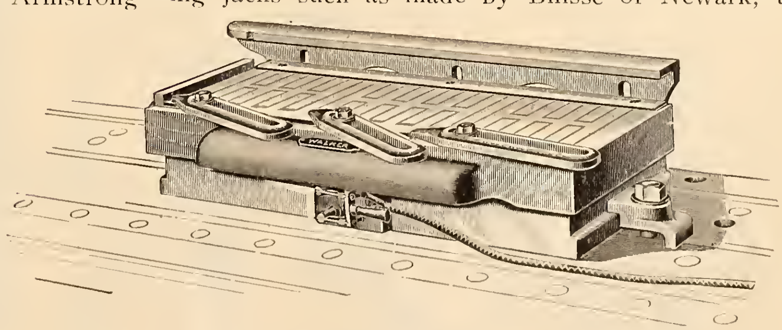


Fig. 13—A Magnetic Chuck for Holding Work on a Planer Table.

Armstrongs of Chicago, and perhaps others. Fig. 7 shows one of these time-saving jacks.

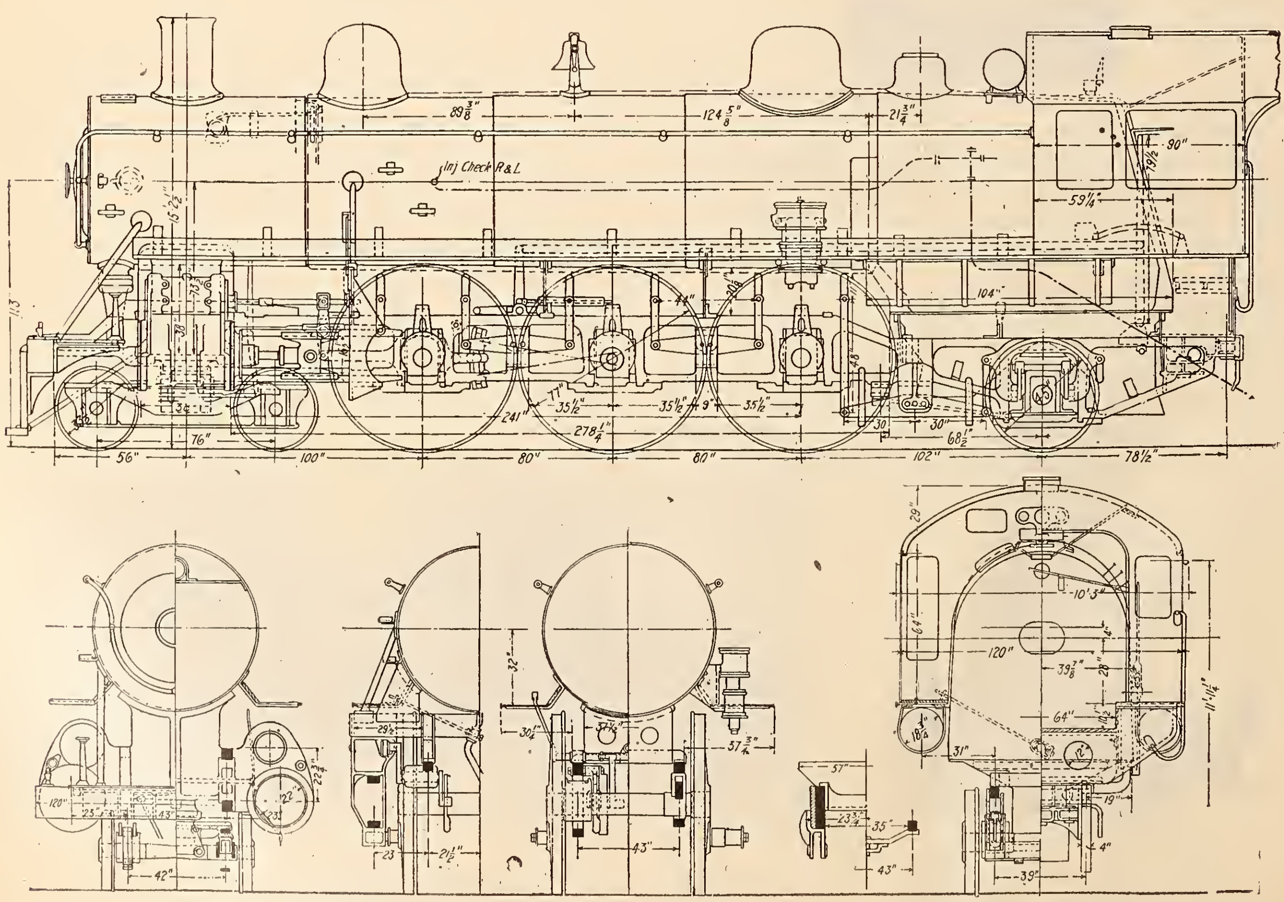
Magnetic tools and devices are in some small use in connection with planers. Little can be said about them now, but there is no telling what the future may bring forth.

Figure 13 shows a magnetic chuck for holding work on a planer table. It requires a direct current to charge the magnetizing coil in the chuck. The largest planer chuck listed has a holding face of 36 in. x 7¼ in. and is listed (probably subject to discount) at $175. Several hundred chucks are in use holding keys, gibs, straps, etc., and while the holding down of a side rod by these means may be only a matter of detail, we have not heard of any such application.

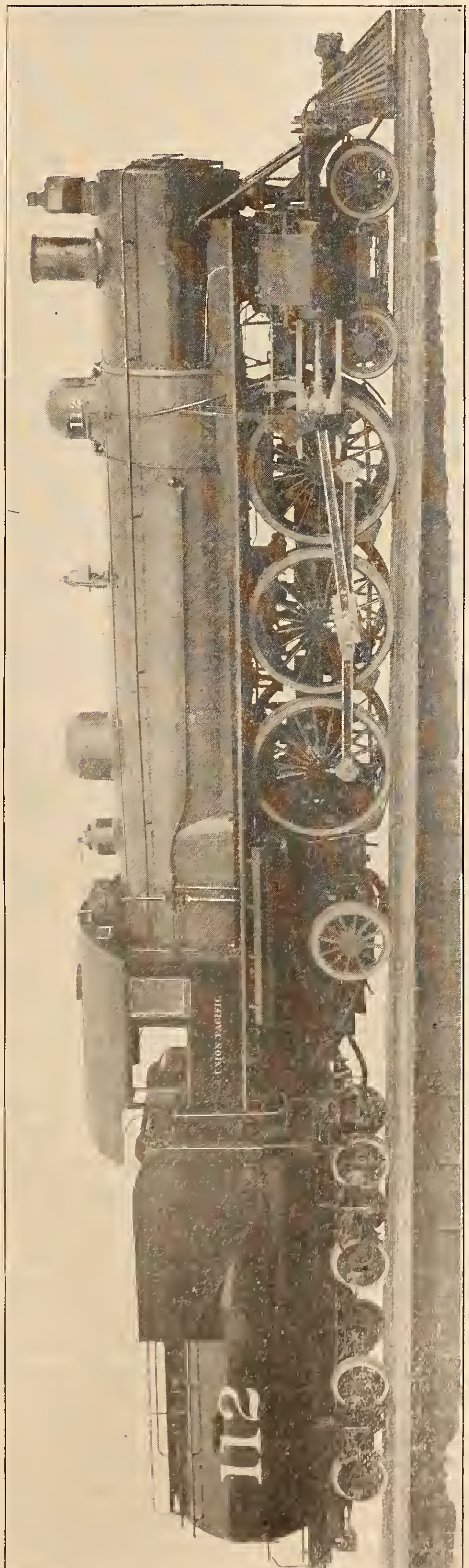
With reference to the magnetic clutch in some experimental use upon planers, Mr. James K. Cullen of the Niles-Bement-Pond Company, says that at present the cost almost bars the use of this appliance, and that there is some trouble with residual magnetism, but he believes that this difficulty will be effectually overcome. Satisfactory operation of planers with the magnetic clutch has been obtained and it is thought that the cost can be reduced, and the clutch made to serve a good purpose in getting variable speeds and high return velocities with a simple and reliable type of mechanism.

Passenger Locomotive, Union Pacific Railway.

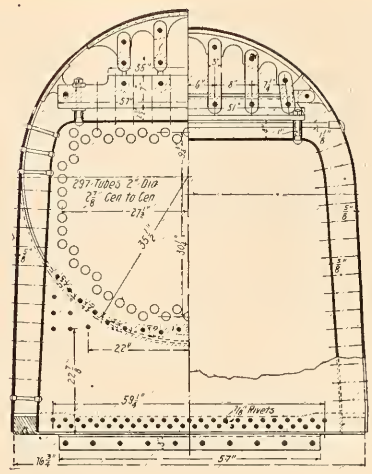
THE Union Pacific Railway has in service a type of 4-6-2 passenger locomotive, recently built by the Baldwin Locomotive Works for the heavy travel on that line. The cylinders are 22 by 28 inches, boiler pressure 200 lbs., outside diameter of driving wheels 77 inches, and the valves are of the piston type. The forward truck is equipped with simple swing hangers, while the trailing truck has a radius bar and is equalized with the rear pair of drivers, from which the equalization extends continuously through to the front pair of drivers; the trailing wheels have a three-point pin fulcrum, which gives an opportunity to arrange the loading of drivers within the limits required, making it more or less to suit conditions. The guide yoke is of composite character. The transverse portion is of hammered steel while the ends supporting the guides are of cast steel. The casting is ribbed and of hooded section with ample strength to resist the forces to which the guides are subjected. The engine is



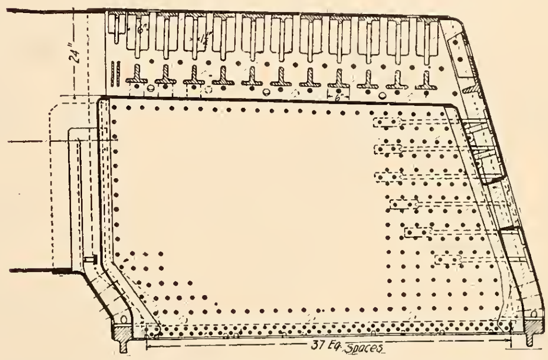
Passenger Locomotive for the Union Pacific Railway—Elevations and Sections.



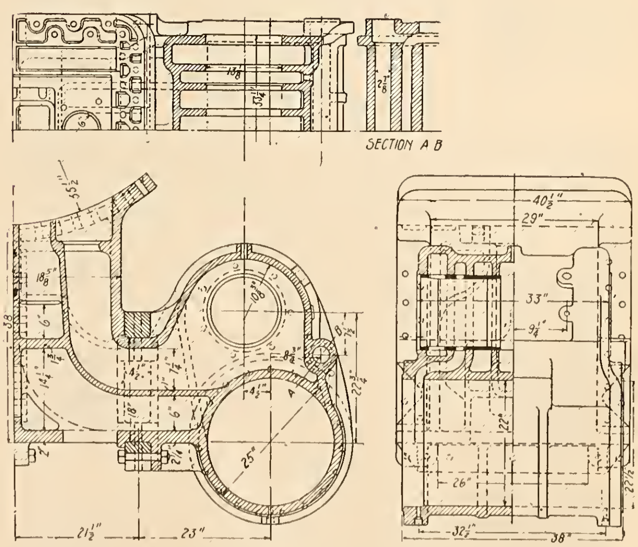
PASSENGER LOCOMOTIVE FOR THE UNION PACIFIC RAILWAY.



PASSENGER LOCOMOTIVE FOR THE UNION PACIFIC RAILWAY—CROSS SECTION OF FIREBOX.



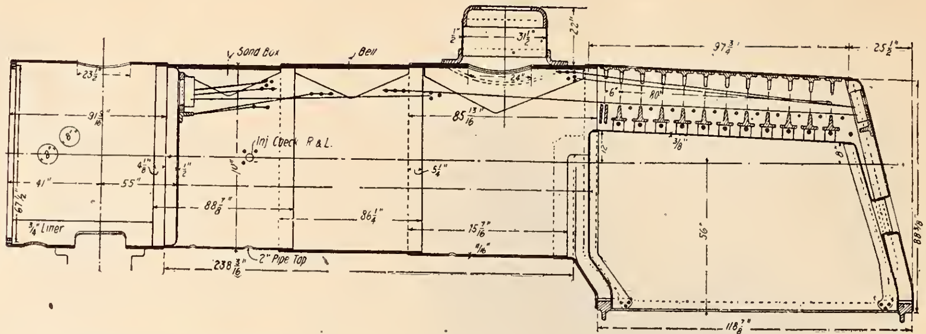
PASSENGER LOCOMOTIVE FOR THE UNION PACIFIC RAILWAY—LONGITUDINAL SECTION OF FIREBOX.



PASSENGER LOCOMOTIVE FOR THE UNION PACIFIC RAILWAY—CYLINDER.

capable of a maximum tractive effort of 29,900 lbs. and the ratio of adhesive weight to tractive effort is 4.7. The tender is of the Vanderbilt design, having a tank capacity of 7,000 gallons. The principal features of design are presented by the following table:

Gage	4 ft. 8½ ins.
Cylinder	22x28 ins.
Valve	piston.
Boiler.	
Type	straight.
Material	steel.
Diameter	70 ins.
Thickness of sheets	~~11 ins.~~
Working Pressure	200 lbs.
Fuel	soft coal.
Staying	Crown bars.
Firebox.	
Material	steel.
Length	108 ins.
Width	66 ins.
Depth front	68 ins.
Depth back	64 ins.
Thickness of sheets, sides	⅜-in.
Thickness of sheets, back	⅜-in.
Thickness of sheets, crown	⅜-in.
Thickness of sheets, tube	½-in.
Water Space.	
Front	5 ins.
Sides	5 ins.
Back	5 ins.
Tubes.	
Material	iron.
Wire gage	0.125 M.M.
Number	245
Diameter	2¼ ins.
Length	20 ft.
Heating Surfaces.	
Fire Box	179 sq. ft.
Tubes	2,874 sq. ft.
Total	3,053 sq. ft.
Grate area	49.5 sq. ft.
Driving Wheels.	
Diam. of outside	77 ins.
Diam. of inside	70 ins.
Journals, main	10x12 ins.
Journals, others	9x12 ins.
Engine Truck Wheels.	
Front, Diam.	33½ ins.
Journals	6x10 ins.
Back, Diam.	45 ins.
Journals	8x12 ins.
Wheel Base.	
Driving	13 ft. 4 ins.
Rigid	13 ft. 4 ins.
Total Engine	33 ft. 4 ins.
Total Engine and Tender	62 ft. 8¾ ins.
Weight.	
On Driving Wheels	141,290 lbs.
On Truck, front	37,330 lbs.
On Truck, back	43,900 lbs.
Total Engine	222,520 lbs.
Total Engine and Tender, about	353,000 lbs.
Tender.	
Wheels, number	Eight.
Wheels, Diameter	33½ ins.
Journals	5½x10 ins.
Tank Capacity	7,000 gals.
Service	Passenger.



PASSENGER LOCOMOTIVE FOR THE UNION PACIFIC RAILWAY—SECTIONAL ELEVATION OF BOILER.

COMMUNICATIONS

Railroad Shop Tools

Editor, Railway Master Mechanic:

Referring to your edition of March, 1904, page 92, we quote the following:

"In such large shops, two purpose machines will not be wanted, but in a small shop they serve a valuable purpose."

This refers to the Farwell milling machine in combination with our planer. Our experience has been just the reverse. These milling machines in combination with a planer are used in many of the best equipped machine shops in the United States.

In one shop in Pennsylvania there are eighteen in operation and are turning out from 100 to 200 tons of the same casting per day. This plant tried some of the best designed special milling machines and adopted the planer with our milling attachment to do the work.

There is a plant in New York state operating two of our milling machines in a duplex form and when the first set was in successful operation, they purchased a new planer and purchased another duplex Farwell milling machine for this new planer.

The Watervliet Arsenal, Watervliet, N. Y., have purpurchased four of our milling heads.

Our understanding is that in large machine shops they make a great many of the same piece. It then would be to their advantage to purchase milling cutters and mill the work in place of planing it. This work has been reduced to one-sixth of the time that it took to plane it.

The advantage of having a milling machine in combination with a planer is, that the combined cost of the planer and milling attachment will not be as great as an exclusive milling machine of the same capacity. You would then be able to do vertical, horizontal and angular milling, also vertical and horizontal boring. You could also at all times use the planer without any delay.

One does not hesitate to use a lathe, both for chucking work and for arbor work. The milling machine in combination with a planer is just as important as a three or four jaw chuck with a lathe. If there is a disadvantage in milling on a planer, we have not yet found it out.

There is a prejudice against combined tools, but we do not consider our milling attachment to be classed in that way for it is just as necessary to a planer as the regular tool holder is to it.

Respectfully yours,

The Adams Company,

Dubuque, Ia.

Eugene Adams, Pres.

Editor, Railway Master Mechanic:

Referring briefly to sundry criticisms, it is true that a box or cored section of frame is used by Cincinnati Punch & Shear Co., as it is also by Long & Alstatter, a firm among the earliest and Geo. Whiting of Chicago, one of the latest in the field of punch and shear manufacture. But an I-beam section is also used, and where this is cored to a double II the outside flanges are still retained. My view is that the material in these outside flanges would do more good if put into the box. Even the C. P. & S. Co. retain a vestige of these flanges in their patterns, but are quite right in saying that their frame is really a strong box, and the flanges are shallow being retained as a matter of fashion or ornamentation.

On milling machines I showed the original Lincoln and the later fixed spindle type illustrated by a Becker-Brainard machine, but though these are much used in smaller interchangeable mechanism, it is a fact of singular interest that they have as yet made little head in the manufacture of the largest distinctive interchangeable—part machine—the locomotive.

The ingenious and valuable two-purpose machine of the Adams Co. was described as a type of "miller" which would yet be used in the smaller shops much as the McCabe double spindle lathe is useful in such shops. As it is, the smaller railway shops outside of tool room practice have little use for milling machines, and the larger are putting in milling machines that may, if needs be, be converted into planers, but as a matter of usage these are likely to be used for one purpose only.

C. H. Fitch.

The Technical Graduate and the Machinery Department of Railways.

By Professor W. F. M. Goss.

Abstract of paper presented at March meeting of Western Railway Club.

THE technical graduate of the better schools of engineering is not, as many people have supposed, a boy, but a man. He may approach thirty years in age, and is never less than twenty. The average graduate has good health, a good frame, and some muscle. As a day laborer he should be able to earn his wage. Moreover, he has had a limited amount of actual shop experience either before entering college or during his summer vacation, or both before college and during his summer vacation.

The technical graduate in his knowledge of science and technology has a broad foundation upon which to build a life's work as an engineer. He is something of a scholar and is sufficiently trained in intellectual processes as to be able to deal with facts as he finds them. In many cases he has earned much of the money which he has spent as a student, and as a rule, he is always ready to work.

I have no wish to imply that the technical graduate knows all that he ought to know, or that his character is always perfect. In common with other men, he has faults. But no one should be judged by his faults. I am asking no favor in behalf of the technical graduate when I seek to have him measured by the standards which are applied to other men.

The absorption each year by the various industries of the country of 2,500 or more trained young men is a matter of no small significance. It requires no argument to show that these men include in their number many who will later have a prominent part in advancing the engineering practice of our country, and, hence, their distribution is a matter of some importance. If, for example, it were shown that some one industry receives and retains in its service a much larger share of these technical graduates than another having similar needs, it would be expected that its operations would in the long run become the more efficient, and, similarly, it would appear that an industry receiving less than its share must in the end suffer through lack of technical ability. In view of these facts it is of interest to inquire whether the motive power and car departments of railroads are getting and retaining their share of the technical graduates?

An examination of the pay rolls of railroad companies will show that the number of technical graduates of the apprentice grade in the motive power and car departments is not only relatively small, but actually so. On most western roads the number is less than one to each one thousand men employed, while many roads of considerable size have no technical men in training. Considerations, briefly stated, constitute strong testimony favorable to the contention that railroads are not getting their share of the technical graduates for their motive power departments.

It can be shown that it is only on the larger systems that any considerable amount of expert work is asked or expected of the motive power department. Such work when necessary in the design of equipment or in framing the specifications governing its construction, is in many cases offered by the supply houses and accepted by the railroad companies. When unusual improvements are to be made, outside expert help is called in. Upon many roads the motive power and car department makes no real pretense at being a technical department; it merely represents one phase of operation. In so far as the condition described applies, the fact must be recognized that the motive power department under these conditions presents no large field for the technical graduate. His place is rather with the railway supply houses, which are in effect the engineering bureaus of the railroads.

It will be well to remember that just at present roads are enjoying the services of thousands of men who, by virtue of unusual qualities of character, have risen from the ranks of the mechanic to high positions of responsibility in the railroad service. But the process by which these men have been trained is likely to be less productive in the future than it has been in the past. The aspiring youth of thirty or forty years ago, who then turned to the shop for his training, would unquestionably have attended a technical school had the advantages of the modern institute then been open to him. The corresponding man of today is in most cases to be found in college. Moreover, the conditions existing in the shop a generation ago were more favorable to the development of men than those which exist in the modern shop, while the demands which are to be made upon the official of the future are likely to be made more exacting than those which are made upon the official of today. All this leads inevitably to the conclusion that no motive power department should fail to have its group of technical graduates in training for its future work.

One other condition which is sometimes urged as a reason for not employing technical graduates is the difficulty which some roads allege to have in finding work for them after they have finished their special apprenticeship. It has been said by the superintendents of motive power of several roads that they had college men who had finished their probationary period, but no vacant offices to put them into. Obviously, so far as it may be a real difficulty, it constitutes an objection to the employment of considerable numbers of technical graduates. But is the difficulty real? If the technical graduate is a good man, there should be profitable work ahead. If he is not a good man, he should not have been tolerated through his special apprenticeship. Think of it! Here stands the superintendent of motive power at the head of a corps of several thousand men. He is responsible not only for its present efficiency, but for its development for future service as well. Down beside him is the college graduate who has served his time—one graduate and a thousand and perhaps fifteen hundred men who are not graduates. I am sure that no superintendent of motive power in this presence will wait for a vacancy before using the full strength of this young man. In looking over his organization, however well he may have done his work, he will see weak spots which ought not to be there; faults which may arise from the failure of a man, from the yielding of defective or of insufficient material, from a lack of a definite understanding of related facts, and having found the thinnest and least defensible spot in his whole organization, he will put his young man into it, perhaps merely as a multiplication table, to a foreman whose practical training makes him valuable, but whose figures are bad, perhaps as an inspector of material, or as a student of failures in materials, but whatever the task, he will feel sure that if he chooses well, the young man will earn his salary, and will at the same time be in training for the larger responsibility when it comes.

The technical graduate who enters upon a special apprenticeship, by so doing announces that he intends to work for an official position on the road; and the company in accepting him, agrees to so train him that he may be worthy of such a position. In view of this compact, the special apprentice accepts a low wage, and the railway company undertakes to vary his task, notwithstanding the fact that such a course limits for a time the usefulness of the apprentice. On a very few large railway systems the course for special apprenticeships has been worked out with care. Students in such courses are handled with intelligence and consideration, with the result that they are satisfied, while the road accomplishes its full purpose in training men for its service. Most roads, however, undertake to receive special apprentices with no adequate understanding of their responsibility in the matter. It often happens that injustice is done the special apprentice and that in the end the road fails in its efforts to make him a means of strenthening its organization. Moreover, the unhappy experiences of those who have been through the mill, or have attempted its passage, have had their influence on the undergraduate, with the result that it is now more difficult than formerly to interest graduates in a special apprenticeship. Such a condition is unnatural. It is unmerited by the technical graduate, and is, I am sure, contrary to the real interest and desire of the management of our railroads.

In view of this, I venture to outline some of the defects which, as they seem to me, sometimes appear in the administration of the special apprenticeship, and in some cases to suggest a possible remedy.

One defect is the low wage paid the special apprentice. He has depended upon other throughout his school and college course and has long looked forward to the time when he can begin to take care of himself. He is willing to deny himself many things; he will be content with rough clothes and scant fare, but except in rare cases he must have self-support. This is not given him, as a special apprentice, and the opportunities of such an apprenticeship are, therefore, sealed against most graduates. It is only the man of means, or the man who is not very sensitive concerning the sacrifices which are being made for him at home, who can enter such a course. In effect, therefore, the railroad deliberately closes its doors to the rank and file of the graduates in mechanical engineering.

Some roads have fallen into the habit of receiving technical graduates, ranking them as special apprentices, and of then undertaking to see how valuable they can be made to the road, without much regard for the rights of the graduate. By this arrangement it is possible to secure a man for twelve or fourteen cents an hour, who can run a lathe, make a drawing, summarize statistics, conduct an experimental investigation, inspect material, report on defective equipment, test a locomotive, figure the bracing for a boiler, outline a scheme for motor-driving in an existing shop, install motors, or interview a division superintendent in behalf of his chief. When a road keeps such a man busy under the hardest sort of conditions, perhaps transferring him to a roundhouse or division shop remote from the center of the road's activity, when he has no contact with men who can aid him and few opportunities to observe processes which can instruct, the attitude of the road toward him is lacking in that element of fairness which is essential to permanent success. An organization in which such things are possible is obviously not ready for a special apprenticeship. It needs more than other roads, perhaps, the technical graduate, but it has no right to accept him as a special apprentice. It ought rather to take its technical graduates as it takes other men, not for the purpose of training them, but for getting service from them, and having them, they should pay them what they earn. I am glad to say that there are some roads which are now following this latter plan.

I am sure that no one will accuse me of desiring simple ease for the technical graduate. *My plea is not that their task be light, but that they be given such reasonable opportunity as will make their position attractive to the average man.* In urging this plea I assume that I am serving the railroad companies quite as much as the technical graduate.

Personal

Mr. William Rourk has been appointed car foreman of the Michigan Central at Chicago.

Mr. J. Dewey has been appointed acting master mechanic of the Erie Railway at Galion, O.

Mr. T. J. Cole has been appointed acting master mechanic of the Erie Railway at Meadville, Pa.

Mr. W. H. Fetner has been appointed master mechanic of the Central of Georgia at Macon, Ga.

Mr. John T. Downs has been appointed car foreman of the Michigan Central at Jackson, Mich.

Mr. T. H. Ogden has been appointed master mechanic of the Mexican Central at Monterey, Mex.

Mr. John G. Witt has resigned as general foreman of the Northern Pacific shops at Spokane, Wash.

Mr. William Cunningham has been appointed car foreman of the Michigan Central at Detroit Station.

Mr. G. Bruchlacher has resigned as master mechanic of the Mexican Railway at Apizaco, Mexico.

Mr. A. G. Else, foreman of the Grand Trunk Railway at St. Thomas, Ont., recently died at the age of 61.

Mr. Theodore W. Dow has been appointed general air brake inspector of the Erie, with office at Meadville, Pa.

Mr. T. Rumney, heretofore master mechanic of the Erie at Meadville, Pa., has been transferred to Jersey City, N. J.

Mr. A. H. Gairns has been appointed master mechanic of the Chicago, Rock Island & Pacific Railway at Trenton, Mo.

Mr. J. H. Stubbs has been appointed master mechanic of the Chicago, Rock Island & Pacific Railway at Fairbury, Neb.

Mr. W. H. Wilson, formerly master mechanic of the Erie at Dunmore, Pa., has been transferred to Susquehanna, Pa.

Mr. Owen Owen, master mechanic of the Denver, Northwestern & Pacific, died at his home in Denver on February 20th.

Mr. F. O. Bunnell has been appointed engineer of tests of the Chicago, Rock Island & Pacific, with headquarters at Chicago.

Mr. George W. Smith, assistant superintendent of machinery, and master mechanic of the Burnside shops of the Illinois Central, has been appointed superintendent of motive power of the Chicago & Eastern Illinois, with headquarters at Danville, Ill.

Mr. J. G. Riley, master mechanic of the western division of the Michigan Central, died at his home in Chicago on Feb. 21st.

Mr. H. C. Shields has been appointed master mechanic of the Lehigh & New England, with headquarters at Pen Argyl, Pa.

Mr. J. G. Sullivan has been appointed inspector of train service on the Southern Pacific Railway, with headquarters at San Francisco, Cal.

Mr. W. S. Ganby has been appointed master mechanic of the Atchison, Topeka & Santa Fe Railway, with headquarters at Arkansas City, Kan.

Mr. Harvey Shoemaker, heretofore general foreman of the Delaware, Lackawanna & Western, has been appointed master mechanic at Scranton, Pa.

Mr. W. E. Chester, master mechanic of the Central of Georgia at Macon, Ga., has been appointed general master mechanic, with office at Savannah, Ga.

Mr. Frederick J. Roberts, assistant superintendent of motive power and machinery of the National of Mexico, is at present acting master mechanic.

It is stated that Mr. T. A. Puncheon, master mechanic of the National of Mexico at the Santiago shops, has resigned and returned to the United States.

The headquarters of Mr. W. C. Hayes, assistant mechanical superintendent of the Erie, have been removed from Meadville, Pa., to No. 21 Cortlandt street, New York.

Mr. S. W. Taylor, superintendent of shops of the Chicago, Rock Island & Pacific Railway at Cedar Rapids, Ia., has also been appointed master mechanic at that point.

Mr. H. J. Martin, until recently general foreman of the Santa Fe shops at Winslow, Ariz., has been appointed general foreman of the Santa Fe shops at Newton, Kas.

Mr. C. Graham, division master mechanic of the Philadelphia & Reading at Philadelphia, Pa., has been transferred to Reading, Pa., as master mechanic of the Reading and Lebanon branches.

The jurisdiction of Mr. E. R. Webb, division master mechanic of the Michigan Central at Michigan City, Ind., has been extended over all locomotive department affairs in the Chicago district.

Mr. W. S. Haines has been appointed master mechanic of the Jefferson and Wyoming divisions of the Erie and the New York, Susquehanna & Western, with headquarters at Dunmore, Pa.

Mr. Burton P. Flory, mechanical engineer of the Lehigh Valley at South Bethlehem, Pa., has been appointed mechanical engineer of the Central of New Jersey, with headquarters at Jersey City, N. J.

Mr. W. Cross, who has been appointed assistant to the second vice-president of the Canadian Pacific, will have general supervision of mechanical matters on western lines, with office at Winnipeg, Man.

Mr. Christian G. Steffe, general road foreman of the Philadelphia & Reading at Reading, Pa., has retired at the age of seventy years after having served the Reading Company continuously for 52 years.

Mr. R. F. Kilpatrick, master mechanic of the Delaware, Lackawanna & Western at Scranton, Pa., has been appointed superintendent of motive power and equipment of that road, with headquarters at Scranton.

The position of assistant superintendent of rolling stock of the Canadian Pacific at Winnipeg, Man., held by Mr. J. H. Manning, has been abolished and Mr. Manning will be assigned to other duties. The car department of this road, formerly under the superintendent of rolling stock, has been separated and the master car builder will report direct to the vice-president.

Mr. George H. Hatz has been appointed master mechanic of the Chicago & Alton, with headquarters at Bloomington, Ill. Mr. Hatz has heretofore been general foreman of the Illinois Central at Burnside, Ill.

Mr. F. N. Hibbits, heretofore assistant superintendent of motive power and machinery of the Union Pacific, has been appointed consulting mechanical engineer of the Southern Railway System, effective March 15th.

Mr. George H. Taylor has been appointed mechanical foreman of the Quebec Southern, with office at Sorel, P. Q. Mr. Taylor will have charge of the motive power, rolling stock and machinery of the company.

Mr. Henry Hardie, general foreman of the Louisville & Nashville shops at Corbin, Ky., has been appointed master mechanic of the Knoxville branch and Cumberland Valley division, with headquarters at Corbin.

Mr. George W. Wildin, for three years mechanical engineer of the Central of New Jersey, has been appointed assistant mechanical superintendent of the Erie, with headquarters at Meadville, Pa. Effective March 1st.

The jurisdiction of Mr. R. N. Durborrow, superintendent of motive power of the Pennsylvania, has been extended to include the Philadelphia, Baltimore & Washington, the New York division, and all territory about Phiadelphia.

In a recent issue we stated in error that Mr. T. J. Clark had been appointed master mechanic of the Spokane Falls & Northern Railway at Spokane. Mr. Clark is master mechanic of the Spokane Division of the Great Northern at Spokane.

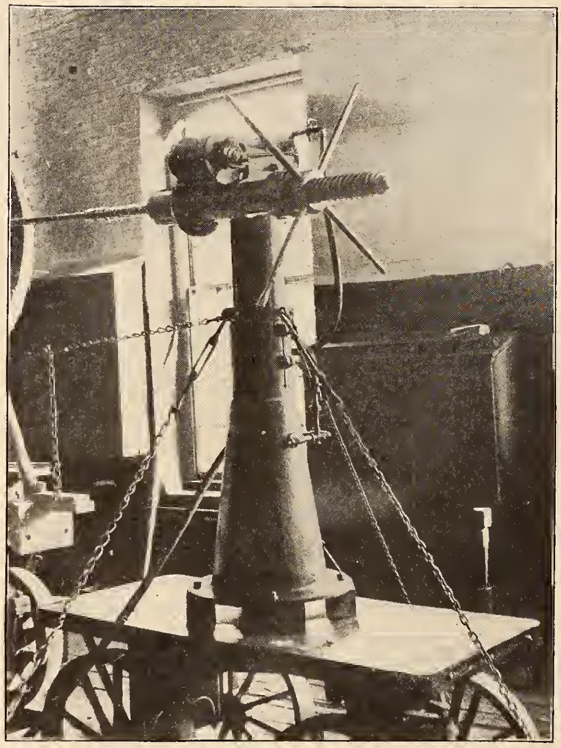
Mr. T. S. Lloyd has resigned as superintendent of motive power and equipment of the Delaware, Lackawanna & Western to accept the position of general superintendent of motive power of the Chicago, Rock Island & Pacific, with headquarters at Chicago.

Mr. J. J. Reid, who was recently appointed general master mechanic of the Louisville & Nashville, at Louisville, Ky., was formerly mechanical inspector of the Northern Pacific. In his new position Mr. Reid will have supervision over all shops of the Louisville & Nashville.

The position of superintendent of car shops of the Delaware, Lackawanna & Western Railroad, at Scranton, Pa., has been abolished and Mr. R. F. McKenna has been appointed master car builder, with headquarters at Scranton, reporting to the superintendent of motive power and equipment. He will have general supervision of all car department work on this system, and charge of such other matters of the car department as may be assigned to him by the superintendent of motive power and equipment.

The Ruth Flue Machine

The Ruth flue machine, for cutting out and rolling in boiler flues, is particularly adapted to locomotive boiler work, and is also useful about a shop where practical portable power is of value. The power is derived from powerful double cylinder air engine reversible locomotive design, mounted upon a telescopic piston, the whole being mounted on a substantial truck easily and speedily handled, and transferred from place to place and put in action wherever there may be an air line. Any air pressure from 20 to 100 or more pounds will successfully operate the engine, as the supply is governed by throttle valve. To the revolving shaft is attached the flue cutter, the universal joint allowing the cutter



The Ruth Flue Machine.

to be inserted into every flue. When cutter is inserted in flue, turn on air and feed by hand rapidly. Time to cut flue, ten seconds, more or less, according to material of flue. The flues are cut sharp and clean, having practically no burr.

In rolling or expanding flue, a thimble stops the cutter when flues are sufficiently expanded, thus preserving the round hole in flue sheet, and disposing of oblong holes in same, which often occurs from expanding with hand tool, and which is cause of many leaky flues. The dimensions of the machine are as follows:

Height of platform	36 ins.
Height over all with piston down	72 ins.
Raise of piston	42 ins.
Lateral feed of screw	20 ins.
Diameter of feed wheel	36 ins.
Diameter of feed screw	3¼ ins.
Quadruple screw lead	4 ins.
Angle of elevation about	45 deg.

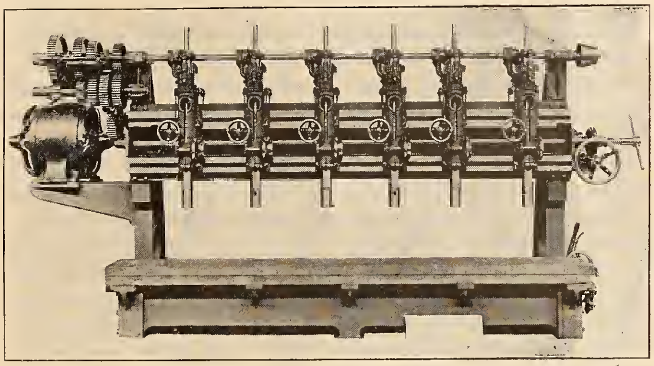
Ball bearing thrust, rawhide and steel gearing, all wearing parts case hardened, weight about 1,400 lbs.

This device is marketed by W. W. Worthington & Co., 114 Liberty street, New York city.

Six Spindle Gang Drill

The use of a gang drill with several spindles for drilling arch bars and other pieces which are to be duplicated and require several holes to be drilled in each piece, saves much time and labor. This fact is evinced by the extent to which railroad companies and car manufacturers are installing such machines. A machine for this class of work is illustrated by the photo-engraving presented herewith and the following specifications appear of no little interest: Maximum distance, spindles to table, 18 in.; minimum, 6 in. Traverse of spindles, 12 in. Maximum distance between spindle centers, 8 in. or 10 in. Distance, center to center outside spindles, 9 ft. 10 in. Diameter of spindle, 2 in. Distance between housings, 11 ft Floor space, 13 ft. 6 in. x 4 ft. Height, 7 ft. 10 in. Weight, 13,500 lbs.

The heads are movable laterally upon the rail. Each spindle is counterbalanced and has independent vertical adjustment, for varying lengths of drills. They are driven by



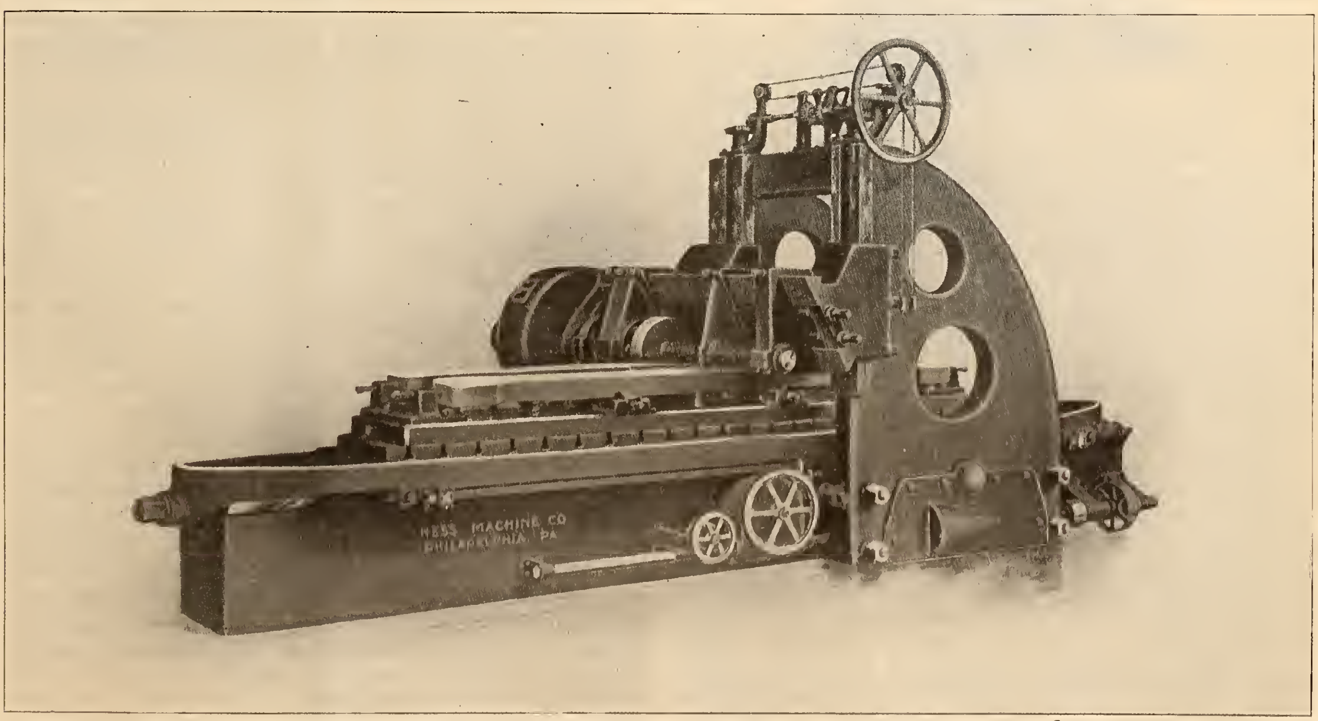
Six Spindle Gang Drill.

gearing from the top shaft, and controlled by clutches, which are actuated by a handle, placed in front of each head within easy grasp of the operator. This machine has hand and power feed. It has a quick approach and return movement, operated by a lever, by which all the drills can be instantly lowered to, or raised from, the work together. The feed motion is universal, but any of the spindles can be disconnected at will, making any portion of them independent of the others. Three changes of feed are provided, and change gears can be supplied to give any required feed. The tables have both a lateral and transverse movement. The lateral movement is by a hand wheel and screw. The wheel is graduated and provided with a stop. Each graduation of the wheel represents a table movement of 1-16 inch; one revolution of the wheel, a table movement of ½ inch. It also has a transverse movement of 8 inches, by means of a lever and gearing. By this arrangement holes can be accurately spaced. This machine can be supplied with an automatic trip and stop motion for determining the depth of drilled holes. It is designed for all around work and will drill holes up to 2 in. in diameter. There are four changes of speed obtained mechanically, as shown by the gears on the end of the machine and the motor has a fifty per cent variation of speed by means of varying the resistance in the field windings.

The machine is built by the Prentice Bros. Company, Worcester, Mass.

The Hess Milling Machine

The usefulness of the milling machine in the railroad shop is rapidly increasing, and this class of machine tool is making itself felt to a greater extent. Among its earliest adaptation in railroad shop practice the milling machine was used in machining locomotive side rods and in present practice large machines of this type are acquiring the general outlines of planing machines, so that they are to some extent entering into direct competition with heavy planers. A machine of this type is illustrated by the accompanying half-tone engraving, which is manufactured by the Hess Machine Company, Philadelphia, Pa. The capacity of the machine includes rods 10 ft. 6 ins. long between centers, and it has established an enviable record of one rod every two hours in performing its regular every day work, milling the rod over sides, edges and heads. Cuts in steel of 42 ins. width and ⅜ in. in depth at a feed rate of 4 ins. per minute, are guaranteed by the manufacturers. Such a cut is equivalent to removing 63 ins. or 18 pounds of steel per minute in chips. Heretofore it has been almost impossible to produce truly flat surfaces where the depth of stock or width of cut on the same piece varies between wide limits. Such conditions have usually been accompanied by a dropping in of the cutters, producing uneven work, but in view of the extreme rigidity of the machine very gratifying results have



The Hess Milling Machine.

been accomplished in this direction, so that in many cases it is not unusual to dispense with finishing cuts altogether, thereby materially reducing the time expended on a given job.

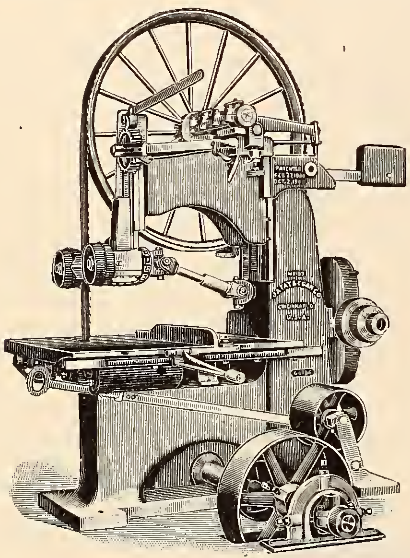
The machines have been operated so successfully, and the capacity of the machine in daily service has so proven its ability and power in turning out work, that the Hess Machine Company is desirous of quoting time on the basis of sketches submitted to them.

New No. 109 Automatic Band Rip Saw.

The machine here represented will, without doubt, prove of considerable interest to those who have ripping to do. The makers claim it will surpass in quality and amount of work any other of this class they may now be using. It is original in every respect, and has just been built, and is powerful in all parts. The makers were the first to introduce a machine of this character, and since being placed on the market has proved a revelation to all those who have used it.

It was patented February 27, 1900, and October 2, 1900.

It is designed especially for heavy work, and is particu-



Automatic Band and Rip Saw.

larly recommended to the car builder and other woodworkers who have stock that requires heavy framing.

It is safe to operate, a very small kerf is removed, wide or thick material easily ripped, little power is required, work always accomplished easily and rapidly, table always at standard height, rolls are close together, allowing short pieces to be easily fed; adjustment of fences and rolls quickly made, and there is a great saving in time each day in making the various adjustments. It is admirably adapted to reducing large timbers to smaller dimensions, ripping wide lumber into strips of varying widths, resawing from the side of a timber, and other light work.

The straining device, which controls the upper wheel and the path of the saw blade on the face of the wheels, is new and very sensitive, and is covered by letters patent. No matter what the vibrations are the strain takes up the slack in the blade instantly, thus adding wonderfully to the perfect working of the machine, and of lengthening the life of the saw blades.

The lower wheel is solid, lessening the circulation of dust, and giving itself increased momentum so that its speed governs the upper wheel and prevents it from overrunning the lower.

The machine has three feeds, and powerfully-driven feed rolls in and above the table; and by a single movement of a lever convenient to operator, the machine can be instantly changed to a hand feed rip saw, or instantly stop the feed.

Further particulars can be obtained from the makers, J. A. Fay & Egan Company, of No. 145 to 166 W. Front street, Cincinnati, O., who will also send their new catalogue of woodworking machinery free to those desiring it.

Technical Publications.

American Compound Locomotives. By Fred H. Colvin. This book is a practical treatise devoted entirely to the compound locomotive found in American practice. It considers the compound feature solely, presenting the principle of compounding, describing the expansion of steam in the several cylinders, the duties of the respective parts necessary in changing back and forth between simple and compound, instructions by which to keep going in case of accident and suggestions to be observed in properly handling the compound, in each case explaining why these features should be observed. The first chapter is devoted to a brief history of compound locomotives and gives the years in which several types were brought out. This is followed by an explanation of the theory or principles on which compound locomotives are constructed, after which the several different systems of compounding found in American practice today are described. The book is principally descriptive and the features presented are generously illustrated. Derry-Collard Company, New York. Price $1.50.

Electrical Engineering, a course of lectures adapted to the needs of non-electrical engineers, by Henry H. Norris, assistant professor of electrical engineering Cornell University. The distribution of electrical energy and the application of electrical apparatus have assumed such important features in all engineering work that a certain familiarity with electrical principles has become essential, if not absolutely necessary, to all classes of engineers. In view of such requirements a pamphlet has been prepared by Prof. Norris, embodying a general outline upon which to base a complete set of notes as an assistance in studying electrical problems from the operating standpoint. This outline has been prepared primarily for the guidance of students of engineering. However its suggestions are equally applicable to those whose engineering experience dates back for some years, but whose opportunities for familiarizing themselves with electrical machinery or apparatus have been limited, as for instance in the mechanical department of railroads. It is of course not so complete as a text book and not as valuable to the engineer for that reason, but to those who have some knowledge and have access to literature on the subject it is of no little value. The outline gives roughly the form and order of a lecture course planned to cover the essential features of electrical engineering for the purposes of the mechanical or the civil engineer. The subject is one which cannot, at present, be covered by a text book on account of the rapid development along all lines of the application of electrical machinery for engineering purposes. All engineers must meet electrical problems and they must be able to apply to these a judicial skill, in order to select properly the electrical machinery or apparatus which is needed and to apply it in such a manner as to bring about the most satisfactory results. For this reason the course consists in the study of electrical problems from the operating standpoint, including only such introductory matter as is essential to a proper understanding of the subject as a whole. Published by the Stephens Publishing Company, Ithaca, N. Y. Price 50 cents.

The Earning Power of Railroads, by Floyd W. Mundy. This work treats in the most simple manner of the earning power of railroads, and deals but little with those features alike most essential to investors—the traffic resources and the financial and physical condition. Several chapters are devoted to each of the elements which go to make up a railroad's annual report, embodying the several classifications of expenses under the most prominent heads and discusses in some detail the ratio which operating expenses bear to gross earnings, the fixed changes, the relation of earning power to stock outstanding, as well as the relation of guarantees to surplus available for dividends. In addition to this, important statistics are presented, showing the income account of one hundred and twelve railroads, the statements of the roads represented being considered as a single system and so arranged that trustworthy comparisons can be made respecting the earning power of the different roads. The tables presented in this connection summarize the annual report of each of the roads represented and present comparisons of mileage operated, gross earnings and surplus, through a series of years. A valuable compilation for purposes of reference by investors and others interested in the securities of railroads, embraces a statement of earnings, operating expenses, net earnings, etc., which are all reduced to a mileage basis for the last report at hand from each of the roads covering, as a rule, the fiscal year ending June 30, 1903. Issued by James H. Oliphant & Co., 20 Broad St., New York City.

Notes of the Month

The Pullman company are building 340 36-foot cars for the Milwaukee Refrigerator Transit Company, with all modern improvements, including Neponset insulating paper and asphalt torsion proof car roofs, manufactured by F. W. Bird & Son, East Walpole, Mass.

Special interest attaches to the March number of Graphite, which is published by the Joseph Dixon Crucible Company, inasmuch as this number is devoted to Dixon's silica graphite paint, and illustrations of a number of steel structures are presented showing the kinds of buildings upon which this material is used to advantage.

An illustrated placard lately issued by John F. Allen, 370-372 Gerard avenue, New York city, will be found of interest by all users of riveting machines. It presents some facts regarding the results accomplished by the "Allen" portable pneumatic riveter that are worthy the noting. Copies, we are informed, will be mailed free upon application.

Mr. G. P. Altenberg, manager of the foreign department of J. A. Fay & Egan Company, manufacturers of woodworking machinery, is on his way to Europe. He shall first visit England a few weeks, and then tour the Continent. He expects to be several months abroad. Letters to him will arrive, if addressed, Mr. G. P. Altenberg, No. 31 Boulevard Haussmann, Paris, France.

On March 3rd Mr. Henry R. Dalton, Jr., was elected president of the Bausch Machine Tool Company, vice Mr. W. H. Bausch, resigned. Taking effect March 21st, Mr. C. J. Wetsel was elected treasurer of the same concern to fill the vacancy caused by the resignation of Mr. David Hunt, Jr. Any communications to this establishment should be addressed to the Bausch Machine Tool Company, Springfield, Mass.

The Gold Car Heating & Lighting Company have moved their offices to the Whitehall Building, 17 Battery Place, New York city. This company have recently made an arrangement with Mr. Thomas A. Edison, by which agreement they are given the exclusive sale in the United States of the Edison storage battery for car lighting purposes. As their business has grown to a very large extent, and as they are now about to introduce their new system of railway car lighting, they found it necessary to secure more commodious quarters. Both the Chicago branch and the New York office have been moved to this building so that all communications should be addressed to the company at New York.

Among recent orders received by Hicks Locomotive & Car Works are: From Waterloo & Cedar Falls Rapid Transit Co., two locomotives; Butterfield Lumber Co., one engine; Arizona Southern Ry., one 55-ton consolidation; Midland Valley railroad, four passenger coaches, two combination cars and two baggage cars; Waterloo & Cedar Falls Rapid Transit Ry., two coaches and one combination car; Copper Range railroad, four coaches and two combination cars; Louisiana & Northwest railroad, one coach, in addition to those previously reported.

It is well known that a flexible staybolt which will always remain flexible, which will not corrode rigid, which will allow movement in every direction, which can be readily examined, and which will be as strong as the tensile value of the iron in the bolt, would practically eliminate one of the large costs of locomotive maintenance. The Flannery Bolt Company, 339 Fifth avenue, Pittsburg, Pa., are distributing a descriptive pamphlet, in which they introduce a flexible staybolt that they claim is inexpensive, durable, thoroughly practical, and not affected by scale, as well as embodying the above mentioned features.

The Henry Roever Company, Chester, Pa., are manufacturing a cleaner that is used by the largest railroads of the country. A thorough cleaner and varnish feeder gives the highest possible lustre, which retains its appearance; it preserves the varnish and makes old coaches look like new. In connection with a mention of this material it is interesting to note that the buildings and plant of this establishment have been made up-to-date in every respect. Thorough facilities for shipping are maintained, including side tracks into the grounds of the plant, and a dock on the Delaware river, where steamers can land to receive merchandise. With these modern facilities, together with their improved formulae, the company is turning out a good cleaner, which produces results speaking for itself. The company also makes a Modoc powdered soap for shop use which is found very efficient.

The Thos. H. Dallett Company, Philadelphia, Pa., wishes to say to the trade that, in view of the fact that several manufacturers of pneumatic tools are seemingly conducting a campaign of intimidation by endeavoring to frighten prospective purchasers into buying no apparatus but their own, under penalty of a law suit for infringement of patents, that a statement from us as to our position in the matter may be of interest. The recent decisions in the courts, which have been so widely heralded, do not apply in any way to the Dallett tools. All our products are manufactured under our own patents, do not infringe in any manner the patents of other manufacturers, and our patrons may rest assured that in buying Dallett apparatus they incur no financial risk of this nature whatever. This we are prepared to guarantee to any purchaser of our tools. If any person has been threatened with litigation because of buying, or stating that they are contemplating buying, Dallett machinery, we shall esteem it a favor to be made acquainted with the facts of the case.

Our plug drills and surfacing machines, as well as riveters and chippers, embody many novel and desirable features, in the right to use which we are fully protected by letters patent. THOS. H. DALLETT CO., Philadelphia, Pa.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

The Readville Shops of the N. Y., N. H. & H. R. R.

In company with Associate "Sam" Brown of the Roxbury shops of that company, we recently visited the mammoth new car shops of the New York, New Haven & Hartford R. R. at Readville, Mass. This is about nine miles out from the Boston Southern Terminal. As a dwelling place it is yet to be developed; but the land adjoining is an ideal spot, being on a sightly elevation, and with entrance direct to shop yard, it is especially adapted for use for the shop men, who now swarm to the local trains for their homes or boarding places along the line, there being few houses at present available. The desirable points can be seen from the illustrations herewith kindly loaned by Mr. E. E. Hubbard, Old South Building, Boston, who is developing this property with direct reference to employes. The Readville station is metropolitan in character, with its enameled brick subway leading underground to stone stairways to various tracks and local trains, while others trains on main lines leave from tracks overhead. In this respect it makes one think of the West Philadelphia station.

In the temporary absence of Mr. J. P. Young, the general foreman, his assistant, Mr. Thos. Simpson, entertained us. We were shown over the entire plant, which has about 12½ acres of the 75-acre plot roofed in. We venture the assertion that there is not a shop in the country devoted to car work alone that will compare with it in size, character and adaptation to this requirement. Evidently no pains have been spared or expense avoided to make it up to date in all its appointments and fitted with the most modern machinery. Its magnificent general storeroom, with the general offices at its head, resembles an elegant railroad freight station on a prosperous road in a large city, with its doors on the side at the receiving track where loaded box cars deliver their cargoes to the platform alongside even with their doors, where truckmen wheel them in.

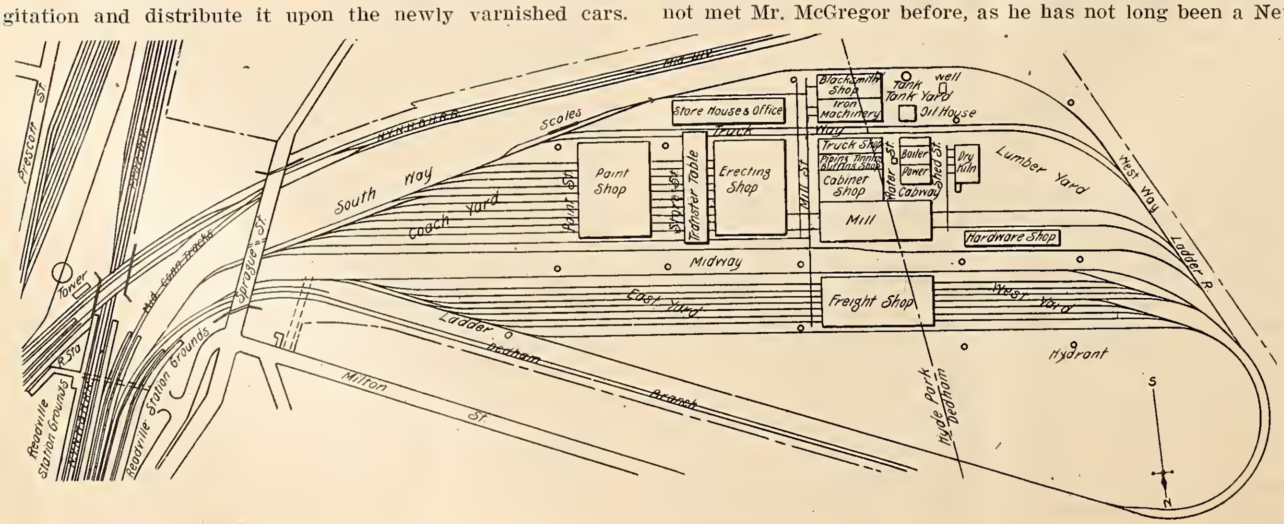
The Sturtevant system of hot air heating is installed throughout, fed by four huge boilers, with room for others that will doubtless be added in the near future, though the past extremely cold winter has tested its efficacy as a heating system. If we were to criticize the paint shop installation we should say the outlet and inlet pipes are too near the floor, as they will keep the dust of the floor in constant agitation and distribute it upon the newly varnished cars. We are of the opinion that ten to twenty feet of those pipes could be taken off that come down toward the floor without suffering any loss of heat and gaining much in the matter of cleanliness from dust. We think the air itself would distribute and diffuse the heat throughout the shop, in its belt-line-like circulation from the pipe-outlets above to the heating coils on the floor line better than the pipes are doing it and minus the dust circulation. We have seen a shop so piped that does produce satisfactory results.

The floors throughout are of granolithic, as smooth as a plastered wall, save the blacksmith and kindred shops, which are of earth. The workmen's lockers are of the well-known

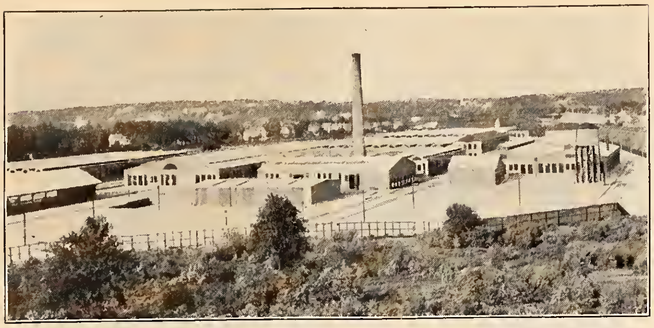
Bird's Eye View of the N. Y., N. H. & H. Railroad Car Plant, Looking West.

open wire work and the washing-up facilities and toilet rooms are of the best. Electricity furnishes abundant light and power and drives mammoth compressors for air, only one of which is in use at present.

In the course of time we ran up against Mr. Andrew McGregor, who is the presiding genius of the large paint shop, which covers 1½ acres and holds 30 passenger cars—10 cross tracks that hold three cars each, with a transfer table outside between the paint shop and coach repair shop. We had not met Mr. McGregor before, as he has not long been a New



General Layout of the N. Y., N. H. & H. Car Plant.



Bird's Eye View of the N. Y., N. H. & H. Railroad Car Plant, Looking East.

England foreman painter, having been ornamenter and succeeding Mr. Shuttleworth, sometime since at New Haven. But he at once gave evidence of being up to date, as he told us he had joined the M. C. & L. P. A. and expects to meet with them in the near future at Atlantic City. At present he employs a force of about 190 men, 19 of whom are in the freight department. Day work is the order throughout the entire plant and we are told that some 1,200 men are now employed, yet the plant is not up to its full capacity, as about 2,000 men can be employed when it becomes fully fitted and installed for the building of new cars, as well as repairing of the old. Moving in late last fall, or early winter, carpenters are still busy putting up various shop devices, fittings and fixtures. In the paint shop no permanent staging is installed as yet, but they are preparing to do so, and as there is no illuminating gas near they are handicapped with burning-off facilities, using gasoline torches; but they are preparing to install the burning-off machines with compressed air and naphtha gas formerly used with success at the New Haven shops.

Mr. McGregor has, we think, the roomiest and best stock room that we ever saw, with large tanks, holding seven barrels each, numbered from one up, the contents going by number instead of by name in work and accounts. A large, elegant varnish room for sashes, doors and other loose stuff is on the floor above, where are the end windows, also the offices of the ornamental designer and that of the foreman of the varnish room who, by the way, also has charge of all inside varnishing in the main shop below. On the same floor and adjoining the stock room is a large sink room for washing all the sashes and loose stuff, which is sent to the varnish room above on a large elevator leading to it.

In the designer's room, before described, a dark room is being fitted up where photography will be carried on as the company has need, and we hope to be favored at some time, with some views of interest and may have more to say anon.

In the view "Looking West", the first building is the paint shop; that at the left is the general offices and storehouse.

To Mr. Wm. P. Appleyard, who resigned as M. C. B. of the N. Y., N. H. & H. in January last and went with the Pullman Company at Chicago as superintendent of car repairs, doubtless much credit is due in the fitting up and installation of the Readville plant, if not in its general plan and lay-out.

The new B. F. Sturtevant Blower Works, famous throughout the country for furnishing the heating system for this and many other railroad shops, has been building a mammoth new plant nearby of nearly as much magnitude as the car shop in territory covered, but exceeds it in other respects, as its buildings are three or more stories high and will employ many more men, some 5,000 we are told. They are to move into it this month from the old place at Jamaica Plain. Taken all in all—Hyde Park with various enterprises and other nearby places—this locality is resounding to the hum of industry and must prove a great feeder to this enterprising railroad.

The D. L. & W. Shops Fire

We make the following extracts from two letters from Associate B. E. Miller, master painter D., L. & W., as to the cause of the recent fire at his shop and the results, etc., that will be of interest to our members and readers:

"I presume you have read in the papers of the ill luck which we had on the morning of the 16th inst., when our passenger car paint shop at Scranton, with a capacity of fifteen cars. took fire and was totally consumed together with its contents, nine passenger cars, including a diner. The blaze was caused by the flame of a burning-off torch coming in contact with inflammable material which was being used on the inside of a coach.

"Our office and all our records were a total loss. Our 'boneyard,' where we exposed all our tests and which occupied a conspicuous place on the west wall of the shop, suffered likewise. Among the latter was an extensive test as to the cause of the bulging of putty which I had been at work on as chairman of the committee on this subject since September last. Results were just beginning to show up and I feel about as badly over losing this as anything else. I presume we will have to begin over again, or fall back upon our colleagues on the committee, Messrs. Keil and Pitard, as I undestand they also have been making extensive tests. The experiment I had been conducting consisted of nail holes puttied under some 110 different conditions. I hope our loss will not result in postponing a final report of this committee at our next convention.

"The fire started about 10 a. m., February 16th, a bitter cold day. Some of the cabinet men were using varnish remover on the interior of a car and dropped some of the stuff on a window sill where a man was engaged in doing some burning off on the exterior. This was wrong, of course, and better judgment should have been used, yet these accidents somehow will happen with the best of precautions. The spread of the flames was almost instantaneous through the entire shop, which goes to show that probably an accumulation of dust, which might have been set off like dry powder (gathered in the rafters), together with gases of volatile materials, which had undoubtedly risen and were in suspension. The entire shop was in flames within fifteen minutes, together with all the cars therein, one dining car and eight coaches, also nine freight cars which happened to be in the shop at the time.

"It teaches but one lesson, viz: That all paint burners, or any naked flame in fact, should be barred from a paint shop under any and all conditions. That at least is what it will result in on our road in the future.

"What is your practice? Do you occasionally do small jobs of burning off in your paint shop? We have always done it in a small way and never have met with any accident before.

"We have, for the present, turned one of our carpenter shops, which holds six cars, into a paint shop and will get along in this way for awhile. Quite a difference from the one burned which held fifteen cars and which, while a frame structure and formerly used as a freight repair shop, had undergone considerable alterations at our hands until it was more or less a modern paint shop.

"The shop will not be rebuilt, as eventually all passenger car work will be done in the vicinity of Hoboken, the eastern terminal, and work on a thoroughly modern passenger car shop will be commenced there at once."

Graining on outside car sashes with the gelatine roller process should be made rather pronounced in shade when new, or it will fade in a year or two so that it is difficult to distinguish that there is any graining on the sash at all, and they will look as if painted plain. This will prove to be the case if a fine, close imitation of mahogany is made at the start; but if made rather loud and coarse in the beginning they will tone down shortly to the requisite appearance under the effect of the sun.

Varnish Removers and Fire Dangers

All successful varnish removers that we have ever seen—that is, those not containing acid or alkali to discolor the wood—are highly inflammable and should not be used where a flame or lighted match will come in contact with them, or the gases arising from their use. We know of one large road that had a fire from this cause and unwisely went to the extreme of ruling them all out of use. Fire arms may as well be ruled out of use because one is carelessly handled and is prematurely discharged and someone is hurt, and an ineffective weapon placed in its stead.

Another instance came within the writer's observation where some men were burning the paint off outside of a car and another crew was put inside with varnish remover to work directly over the window around which the man was burning. In an instant the flame from the torch caught the varnish remover that had been applied to about a square foot or two of inside finish, and but for prompt action by employes with a hose in use nearby in washing another car, a serious conflagration would have ensued, for the flames shot up and warmed up to the melting point the varnish on the wood head-lining and that caught on fire at once, and so it would have rapidly spread the entire length of the car in short order. The fire burned only half a minute, yet the veneers were started on two sections of head-lining and they had to be removed.

Another case we heard of was where a man was removing the varnish from the window sills inside a car in a dark shop and he lighted a match to see how it was working. He saw. In an instant his work was lurid with flames, but they were promptly extinguished.

These instances are quite enough to teach us that we must be careful in the use of these articles and allow no flame to be used near them. Of course paint or varnish may be removed by acid or alkali, which is not inflammable; but this is not permissible because it burns and discolors the wood and spoils it. It is up to somebody to devise a successful varnish remover that is not inflammable, and that will not injure the wood, nor the hands, nor health of the operator, and of not an offensive odor. There are some good ones on the market in some of these respects, but they are lacking in others, notably the non-inflammability.

In conversation with a chemist and expert in varnish removers, since the above was written, he says that he is experimenting with one and has practically arrived at the point of success with a non-inflammable article of this sort, but that the high price of the necessary ingredients would make it so expensive per gallon that he fears it would be debarred from use on this account. Consumers would prefer to assume some risks with ordinary care than to put out so much money for chemical combinations of a non-inflammable character. This is his view of the matter. We should like to hear from others on the subject who are experienced in it.

Where feasible it would be good policy to have a place set apart from the main shop for this work, not only on account of possible fire dangers but the odor from it which is bad enough with the best of them.

Painting Machine Designed for Service on the G. F. & S. R. R.

We present herewith an illustration of a practical painting machine which has been devised by Mr. L. B. Rhodes, master mechanic of the Georgia Southern & Florida Railway. The construction of the device is clearly shown by the photo-engraving. The painting material is carried in the vessel swung from the operator's shoulder and is connected by a flexible hose to the spraying nozzle. The nozzle is attached to the end of a pipe about seven feet long, which enables the operator to reach a large surface from a single standpoint. At the lower end of this pipe is a union for connection to the air hose applied to the yard air piping system. A valve con-

A Practical Painting Machine Designed for Service on the Georgia, Florida & Southern Ry.

trolling the flow of air through the pipe is in easy reach of the operator's hand and a second valve is applied in the paint supply connection near the nozzle. The flow of air through the nozzle induces paint to flow from the small tank carried by the operator, delivering it in a fine spray over the surface of the car, leaving a good, smooth finish. By actual time, an average size box car ran be painted in a half hour with this apparatus.

The Proposed Change of the Next Place of Meeting

President Cook Declares It Out of Order and Lets Atlantic City Stand as the Choice.

Following is a copy of President Cook's official letter to Secretary McKeon on this subject, which he has sent us for publication in this issue. A clean-cut, manly document, it speaks for itself. It is what we expected of him and we are therefore not disappointed. He could do no less and maintain the respect of our association and kindred associations for himself as the executive and the by-laws it is his duty to uphold; and we trust the majority will look at it in the same candid light in which he treats it. We believe with him that the Advisory Committee intended no deliberate infraction of these laws; but, yielding to a clamor, they consented to the action which they took; and that they honestly thought they were doing their duty and doing that which was for the best, we have no reason to doubt, and we therefore respect them accordingly, notwithstanding our feelings in the heat of the hour when the news of their action first reached us. At that time, overlooking the amendment adopted at Boston (pages 108-109 of proceedings), we concluded that this committee, in the light of existing by-laws, had no authority whatever to change the next place of meeting under any circumstances, only to suggest or recommend that which should be conducive to the welfare of the association. But we see now that executive power was given them to use under certain conditions. What were those conditions? Plainly, that if some unforeseen circumstances should transpire between the time of one convention and another that would render the meeting place chosen as impracticable because of contagious disease or a destructive conflagration or other terrible visitation, then they might choose the place which had the next highest number of votes. This they did not do, but, instead, issued a postal ballot, which the amendment above referred to does not authorize, and thus put a question before the association for reconsideration that had been decided by it by ballot and therefore could not be reconsidered.

They also erred in that they acted without that sufficient reason given in this amendment. Had that "untold circumstance" existed to "militate against the next place of meeting" which would warrant moving the meeting, they had the authority to do so by the amendment. They did not have sufficient reason to do so, and showed it by issuing the ballot—they yielded to a clamor that would have better made itself heard on the floor of the convention before the vote was taken.

Now Atlantic City will be the next meeting place, unless some "act of God," so-called, renders it impracticable. Then what? Why let the committee correspond with the officers and have another place chosen. A similar thing was done years ago when Montreal was chosen and a small pox scare caused a change to be made to Toronto.

If President Dane's suggestion at the Boston convention had been carried out instead of the resolution that was adopted this mix-up would have been avoided. What was that? It was in his opening address (page 19 of proceedings, paragraph 5) to the effect "that a council of five might be formed, consisting of the elective officers and one active member, to be given full power," etc., to do this very thing. We never heard of such a thing as the president and other officers of a society, club, or association, having no voice in important matters like this. It is the officers of both the M. C. B. and M. M. Associations that form the executive committee that appoints the next place of meeting for those bodies. If our Advisory Committee were to have the powers which they assume only a chairman would be needed at the conventions, for between them the President would seem to have no responsibility.

Personally we do not see any need of anybody but the elective officers having any power to change the meeting place when any "untold circumstance" occurs to require a change. If so, let the matter be remedied at the next convention somehow that will forever settle these differences.

PRESIDENT COOK'S LETTER.

To Mr. Robert McKeon, Sec'y M. C. & L. P. A.

Dear Sir:—In your favor of the 3d inst., you ask for my views and opinion in regard to changing the place of meeting for our 1904 convention.

I received a letter from Mr. Kahler, chairman of the Advisory Board, immediately after the meeting in Pittsburg, in which he stated what action they had taken and why. To say the least, I was greatly surprised—first, because I was not aware of any contemplated change; and, second, I did not imagine that the Advisory Board would even inadvertently ignore the by-laws of our association which they themselves helped to create. The amendment to the by-laws offered and enacted at the Boston convention (see pages 108-109) does not at this time warrant the action of the Advisory Board, as so far there is absolutely no "untold circumstance" to "militate against" the legitimate choice of a majority of the members voting at the Chicago convention.

The members of the association who are now voting for a change had an opportunity on the floor of the convention to select Indianapolis, if in their judgment that were the better choice; but they decided against it for the best of reasons, and under the circumstances should stand by their choice.

As the Advisory Board have taken action without the warrant given them by Art. XIII, Sec. 4 of the by-laws, i. e., "Should any untold circumstance militate against the place of meeting after being selected in accordance," etc., I, as President of the Master Car and Locomotive Painters' Association, feel it my duty to declare their action at the Pittsburg meeting illegal, and, at the proper time, call the convention to meet at Atlantic City. Indeed, as presiding officer I cannot do otherwise, as a vote by ballot and elections cannot be reconsidered; and it is my duty to preserve inviolate, so far as I can, the laws of our association.

That a deliberate infraction of the by-laws was intended no one believes, and I feel quite sure that the membership of the association will uphold the law and sustain the officers elected to see that they are carried out.

Yours fraternally,

Chas. A. Cook,
President M. C. & L. P. A.

Wilmington, Del., Mar. 9, 1904.

Committee Report on Locomotive Painting

Editor Railroad Paint Shop:

I promised to give you a little account of the meeting of the special committee on locomotive painting in New York, but can barely find time to do it.

Our headquarters were at the Imperial Hotel, corner 32d and Broadway; the hour, 11 a. m., Friday, March 4th. The members present were J. D. Wright, of the B. & O.; W. O. Quest, of the P. & L. E.; B. E. Miller, of the D., L. & W., and the President of the M. C. & L. P. A., who was to act as chairman of the committee at this meeting. A. P. Dane, of the B. & M., was detained by illness, and E. T. Congdon, of the N. P. Ry Co., Tacoma, Wash., was, of course, too far away to be expected. The President was the last to arrive at the hotel, which was reached just as the hands of the clock pointed to 11. His train was 30 minutes late out of Wilmington, thus losing an hour at Philadelphia by failing to connect. After hearty greetings were exchanged we adjourned to the parlor set apart for us and got down to business. About 1 p. m. we adjourned for lunch, then back again to our work, which occupied us until 7 p. m., when we concluded our labors. A report was made up from the various papers submitted by the members of the committee. Mr. Dane was made chairman of the committee just before its adjournment and requested to forward the report to the Master Mechanics' Association in time for their convention in June, 1904. There were also present, on invitation, Bro. Hosely, from the P. R. R. Meadow Shops, and Bro. Butts, of the N. Y. C. & H. R. It was a very pleasant, and we trust profitable, meeting. Mr. W. A. Polk, of the Patterson-Sargent Co., and F. E. Quest, of the Cleanola Co., were assiduous in their efforts for our comfort and pleasure.

My modesty will not permit me to refrain from adding that I think it was one of the most businesslike occasions I, or the others, ever had to do with in connection with the association.

Yours sincerely,

C. A. Cook.

Obituary

Mr. Fred C. Steele, foreman painter B. & M. shops, Lyndonville, Vt., died March 2, 1904. He had been in failing health for more than a year, having a slight shock, terminating in neurasthenia and partial paralysis. Mr. Steele was born in Springfield, Mass., March 26, 1853, and therefore had hardly reached his 51st birthday. He began his painting career in the Conn. River shops in Springfield in 1872, where he remained two years, and then went to the B. & A. shops at Allston, working there about nine years. Some years later he took charge of locomotive painting for the B. & M. at Charlestown. From there he returned to the Conn. River shop, afterward leased to B. & M., and on the death of C. E. Page he was made foreman, Jan. 24, 1884; and in July, 1900, when the Springfield shop was closed, he was transferred to Lyndonville, Vt., which position he held until his death. He joined the Master Car and Locomotive Painters' Association in '97, maintaining membership for a time, but never attended a convention. He was a Mason and an Odd Fellow, also a member of the B. & M. Relief Association.

Notes and Comments

Mr. David Lyon has severed his connection with the Lehigh Valley R. R. as foreman locomotive painter at Buffalo, N. Y., so report says.

Mr. W. H. Truman, formerly with the Southern Ry. at Chester, S. C., we are informed, has been appointed master painter of the Logan Valley division of the American Steel Railways, Altoona, Pa., the appointment being effective Mar. 14th.

Associates D. W. Smith and F. F. Fisk are on duty again. The former, located at the Allegheny shops of the P. R. R., has had a long seige with typhoid fever; the latter, at Frankfort, Ind., for the T., St. L. & W., still finds it difficult to get around on that scalded leg.

The rumor of another paint-shop fire is now confirmed—the B. & O., formerly C., L. & W., at Lorain, Ohio, which was destroyed in December last. Associate J. G. Hilpert is still holding forth at this point, however. The result is that the Zanesville, O., shops of the B. & O. take the coach work formerly done at Lorain and therefore Geo. R. Kinney, master painter at that point, is now very busy trying to make up for the loss and turn out 30 cars per month.

From a letter, under date of March 8, we make the following extract, written by Mr. B. E. Miller, master painter D., L. & W. R. R., who was one of the committee referred to. As it relates to a matter referred to the M. C. & L. P. A. by the Master Mechanics' Association, to be reported back to them at their annual meeting in June, it will be of general interest as noting progress. We hope for a report from Mr. Cook, but haven't received it yet:

"The Committee on the Best Practice as to Painting Locomotives held a meeting at the Imperial Hotel, New York, on the 4th inst., which, by the way, was a most successful one. We worked diligently and practically completed our labor. Two of the members were absent; Mr. Dane on account of sickness and Mr. Congdon, of Washington, probably found the distance too great. We had the pleasure of the company and assistance of Bros. Butts, Hosely and President Cook, who, by the way, acted as chairman and secretary of the meeting, doing the lion's share of the work."

Since receiving the above the editor of these columns has seen Mr. Dane, who had that day (Mar. 14) resumed his duties. He had a narrow escape from pneumonia. He was taken ill a day or two before the meeting and had applied for transportation, and expressed his regrets at his inability to attend.

No one who admires the artistic and beautiful should fail to visit the handsome booth of Adams & Elting Company, in the Liberal Arts Building, of the Universal Exposition. The booth will be made of the finest mahogany and quarter-sawed oak and finished in the most popular shades of the celebrated Ad-el-ite one coat dull finisher, which are so admirably adapted for finishing dining cars, offices, libraries, furniture and all woodwork. The renowned Ad-el-ite paint and varnish remover will be on exhibit there, and demonstrations of its marvelous properties will be made for those interested. Panels may be seen showing the beautiful effects that can be produced by using their mahogany fillers. Nowhere in the exposition will the elegance of simplicity be more delicately displayed. The company will be glad to have people make their headquarters at their booth and feel perfectly at home there. Their representative will be pleased to give any information that he may have, when called upon.

We clip the following obituary notice from the Official Railway Guide for March. We were associated with Mr. Phillips on the Railroad Car Journal with this department for some eight years and were shocked to learn of his sudden death. Our relations were most cordial. We found him to be square, and respect his memory accordingly. We last saw him at our Chicago convention. He was then representing the Official Guide:

It is with profound regret that we announce the death of Edward A. Phillips, general agent of the National Railway Publication Company, which occurred in New York on February 26, 1904.

Mr. Phillips was widely known among railroad men, particularly those of the mechanical departments. He was born at Wolverhampton, England, September 8, 1863, and came to America in 1888. Prior to that date he had been engaged with the Hull & Beardsley Railway Company, and had also passed several years at sea, where his ability as a sailor won for him a shipmaster's certificate, notwithstanding his youth. After coming to New York he was for a time with the firm of Thomas Cook & Sons, tourist agents, in charge of their publishing department, and in 1890 became engaged in publishing The Journal of Railroad Car Heating and Ventilating, from which was developed the following year The Railroad Car Journal, Mr. Phillips being president of the publishing company. His services with the National Railway Publication Company date from the summer of 1902.

Mr. Phillips was a writer of ability, possessed of an excellent literary style, and had an extensive knowledge of matters relating to the mechanics of railroads. He enjoyed a genuine popularity among railroad men and those engaged in industries associated with transportation interests, where his agreeable personality and sterling qualities of character never failed to win for him a high place in the esteem of those with whom he came in contact.

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AMONG the needed standards and recommended practices worthy the attention of the Master Car Builders' Association appears the desirability of establishing a standard distance between the centre of hole in fulcrum of brake beam and a straight line extending across from the face of one brake shoe to the face of the other. When a brake beam is replaced by one of a make other than that which was previously used, the brake is usually rendered inoperative unless the lengths of the rods are readjusted and it is not always possible to make these readjustments at the time and place at which the beams are changed. Any alterations in the rods, arranging them to lengths which are not standard to the car, renders more labor necessary in again adjusting the rods when the original type of beam is reapplied. While it is hardly practical to expect beams already constructed or in service to be rearranged, yet it appears worth while to provide for a standard distance for brake beams which will be constructed in future and thus eliminate the additional labor and expense which is experienced when making the changes here referred to.

TO avoid leaky tubes it is well known that every effort should be made to maintain an even temperature around the flue sheet and keep up good circulation of water within the boiler. Most damage is done to flues and flue sheet of a locomotive under steam when the throttle is closed, that is while drifting, while standing on side tracks and especially over cinder pits. Remarks relative to the use of the blower to keep up circulation and to induce a hot fire when the engine is not working have been already presented in our columns.

Another direction in which a little care will react to the advantage of the boiler is in the use of the injector on passenger locomotives. It is not an uncommon practice for an engine crew to leave the injectors working while standing around stations and to shut off the injector as the throttle is opened to start up again. When water is put into a boiler in which circulation is not kept up, cold water settles near the bottom. Opening the throttle again starts circulation, suddenly distributing this cold water throughout the boiler, producing an effect which not only tends to cause flues to leak and is hard on the firebox sheets, but further tends to knock back the steam pressure just at a time when the greatest pressure is needed to start the train.

The most practical method of handling the injector to advantage is to hold the water level while the engine is working and use the injector after shutting off steam merely to the extent necessary to avoid "howling" or the disagreeable noise of popping while around stations. When coming into a station with sufficient water in the boiler it will not be necessary to work the injectors again until after the train is started and the full pressure of steam has been raised. If it becomes necessary to work the injector either to prevent popping or to maintain the water at a safe level, the fire should be forced with the blower to induce circulation and to keep up necessary steam pressure against cold water that is being pumped into the boiler. Where water is being pumped merely to avoid popping, but one injector should be used at a time so that no more water will be put into the boiler at stations than can be used to good advantage when pulling out.

LONG flues and the wide firebox are among the instances in which modifications of locomotive design have been carried to the extreme. Rather than alleviating boiler troubles this combination of parts seems to have aggravated them. The report of the committee to the 1903 convention of the Master Mechanics' Association states that boiler troubles have increased with the added size of boilers. As the most noticeable features in larger and heavier boilers are the wide grate, long flue and smaller firebox heating surface, evidently these must have had their effect upon failures, though the effect of increased steam pressure must also be borne in mind.

Many new boilers have been recently built and placed in service embodying the features here mentioned with no more seeming reason than that they are up to date, or considered so. While this combination of parts of the locomotive boiler has been rushed into, little or no consideration appears to have been taken of the value of the respective heating surfaces. In the attempt to get free steamers and an apparently large total heating surface the tubes have been much increased in length, at the same time increasing the ratio of tube length to diameter. While adding to the tube heating surface, recognition of the firebox, the most efficient heating surface in the boiler, has been neglected so that the percentage of the heating surface in the firebox has been continually diminishing in recent years.

While it is well to attempt new departures it is at the same time more expedient to practice more or less conservatism instead of rushing into a departure which has gained the reputation of being up to date in spite of the multitude of faults which it carries with it. For this reason we are pleased to note that a design of locomotive boiler is being prepared embodying features in decided contrast to the now generally popular, wide shallow firebox and long flues.

We present the leading features of this boiler on another page of this issue and direct attention to its consideration with no further criticism here than that such careful investigation is worthy of commendation and is a needed check to present tendencies to follow customs.

THERE is an association among the apprentices in the Elkhart shops of the Lake Shore & Michigan Southern Railway inaugurated to offer advantages of instruction to its members. This appears a practical method of making their daily work interesting and not merely mechanical. It should also increase the efficiency of the apprentices and ultimately prove good business policy for the road.

The association meets once every two weeks. At the meetings lectures alternate with discussions, the meeting following the lecture being devoted to a discussion of the subject presented by the lecturer. The talks are given by foremen of the several departments, or occasionally by supply men visiting the shops. The room in which the meetings are held is provided with a blackboard to enable the speaker to illustrate his points, and examples of the subjects discussed are placed before the members whenever possible.

Further advantages are offered by a night class in mechanical drawing, which meets twice each week, and the shop management requires all apprentices to attend regularly. The class is held in the Y. M. C. A. building at Elkhart and is instructed by the shop draftsman, who receives from the road additional pay for this work. It is not the intention of the management to train each apprentice to be a competent draftsman, but rather to give him sufficient knowledge of mechanical drawing to enable him to read a blue print readily. A man who is quick to grasp the meaning of a print will plan his work and order his material while his less efficient neighbor is attempting to determine what is wanted.

MR. ALEXANDER ROBERTSON,
GENERAL MANAGER OF THE TERMINAL RAILWAY ASSOCIATION OF ST. LOUIS.

Mr. Robertson was born November 14, 1860, and entered railway service in 1885 as passenger brakeman of the Fitchburg Railroad, serving with the same road until April, 1897 as brakeman, baggagemaster, conductor, general yardmaster, station-master and trainmaster, consecutively. In 1897 he was appointed yardmaster of the Wabash railroad, and in February of the following year was appointed trainmaster. In September, 1899, he was promoted to division superintendent at Decatur, Ill., which position he resigned August 1st, 1903, to become general manager of the Western Maryland and the West Virginia Central and Pittsburg at Baltimore. Five months later, he accepted his present office of general manager of the Terminal Railroad Association of St. Louis, with jurisdiction over the transportation and motive power departments.

Additional evidence of interest on the part of the management in the welfare of apprentices is shown by the pains taken to arrange the apprentices' schedule to the best advantage. The work of each apprentice is made as broad and general as can be consistently arranged in order that his experience may not be limited to a few machines or a narrow line of work.

Touching on this subject suggests the consideration of how best to use apprentices to the advantage of the shop and yet give them the broad training necessary to make competent journeymen. If in the course of his training a boy is shifted from a machine as soon as he becomes skilled in its operation and goes as a green hand to a new machine, while a second green hand takes his place the output of both machines suffers. This reacts upon the foreman who is responsible, and therefore it is not always advisable for him to put a green hand at a machine when by so doing he will temporarily cripple his department. On the other hand, it is not fair to keep a boy at a machine an unreasonable length of time merely because he is capable of turning out certain work cheaply.

When clamoring for a change it would be consistent for the apprentices to weigh both sides of this question, and the same suggestion might apply to a master mechanic or general foreman who is over-zealous in wishing to "give the boys a show."

Judging by the list of subjects selected upon which papers will be read at the convention of the Association of Air Brake Men at Buffalo this month, the meeting should be most interesting.

New Shops of the Terminal Railroad Association of St. Louis at East St. Louis, Ill.

(Continued from page 120)

Power House.

POWER for the entire plant is derived from a single central station. While the building is not located in the actual center of the plant, it is arranged in such position as to be most convenient for the steam distribution, and the distance to any of the buildings is not so great as to affect the electrical distribution.

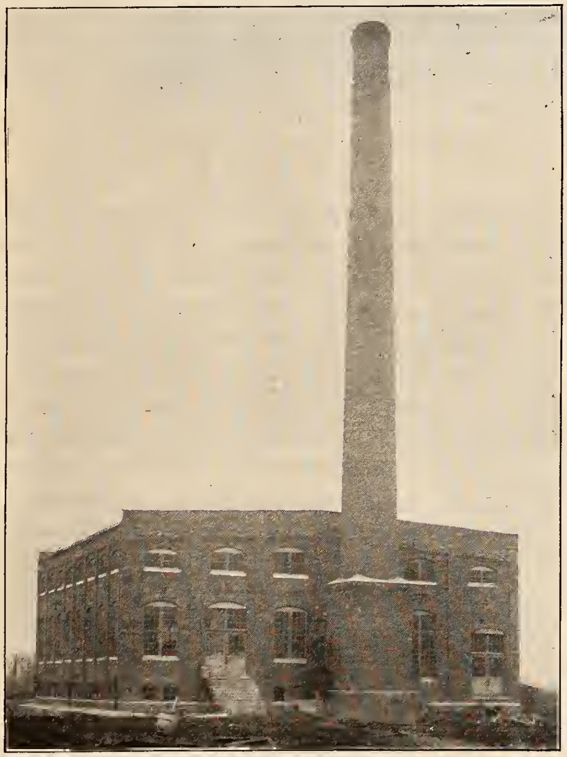


Fig. 1—Exterior View of Power House—Terminal R. R. of St. L.

Steam, air and water pipes as well as all electrical connections are led from the power house to the several buildings through brick tunnels, which provides for the convenience of readily reaching any point of the several lines in case of accident and renewal. The tunnels are of such height as to be easily traversed by workmen, and man-holes, located at several points around the yard, provide easy access thereto.

The power house is in a brick building, 98 ft. 2 in. long by 92 ft. 4 in., and is divided by a center wall into an engine room 44 ft. wide and a boiler room 49 ft. 11 in. wide. The stack is erected on a foundation of concrete supported on piles. The square base is 20 ft. across, while the circular portion is 8 ft. interior diameter at the base and 150 ft. in height. The flooring of both the boiler room and engine room is of concrete; the boiler room floor is on the ground level, while the engine room floor is four feet higher. Beneath the engine room is a basement whose flooring is 10 ft. below the floor of the engine room, and beneath the boiler room is a basement of the same depth, a section of which is 4 ft. 6 in. lower for the pump room. The boiler room is equipped with four Babcock & Wilcox boilers arranged in two batteries, each boiler being of 250 H. P., supplying a total of 1,000 H. P.

The coal supply and ash are handled automatically by an installation of the Link-Belt Machinery Company, of Chicago. Coal cars are switched to a track on the northeast side of the building and dump into a chute, which delivers coal in the basement beneath the boiler room floor; from this point it is elevated by a system of traveling buckets and delivered to the coal bunkers above the level of the top of the boilers. From the bunkers coal is led through nearly vertical chutes and delivered to the coal hoppers, from which it is automatically fed to the grates, which operate by the Roney system. Motion is given to the grates by a system of levers and gears operated by a horizontal shaft, which derives its motion from a small 5 H. P.

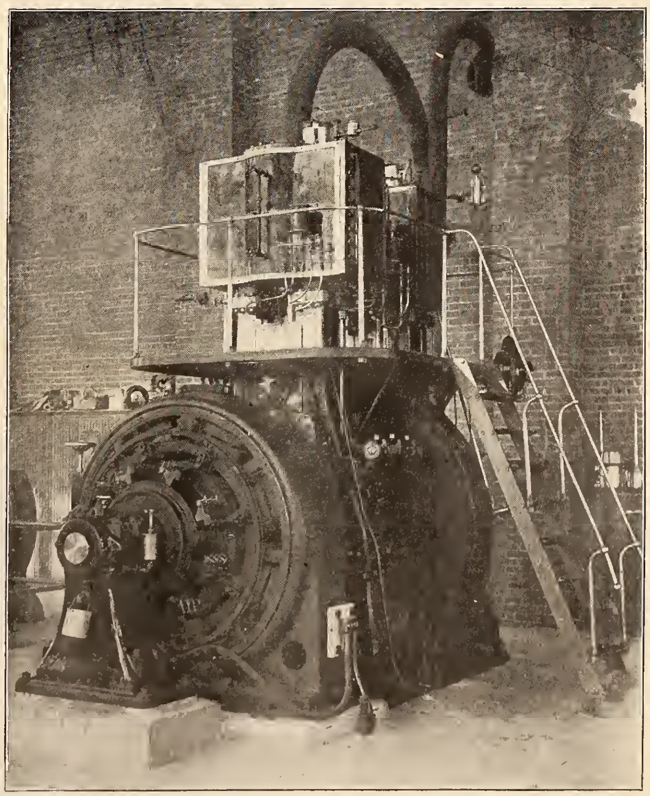


Fig. 2—One of the Generating Units—Terminal R. R. of St. L.

Westinghouse engine. Each battery is served by one shaft and one small engine. Steam engines are used in this connection instead of electric motors, in order that the grates may be operated at all times, including

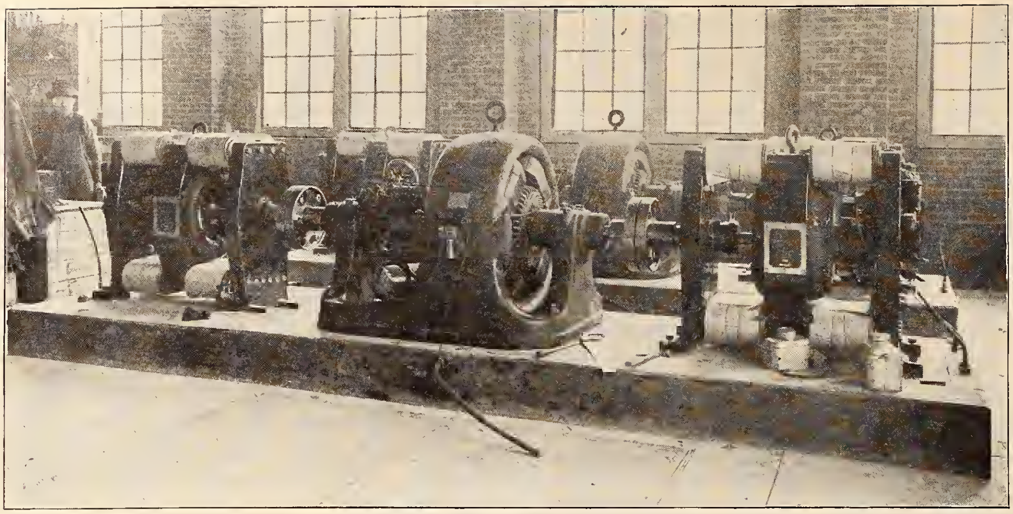


FIG. 3—FOUR WOOD ARC LIGHTING MACHINES DRIVEN BY TWO WESTINGHOUSE MOTORS—TERMINAL R. R. OF ST. L.

occasions when the generators may not be running, as, for instance, in the early morning when the plant is being started up. After feeding slowly across the grate, coal is thoroughly consumed, and is dumped periodically by hand to the ash pits beneath. Tracks are placed in the basement beneath the boiler room in such position that small hand cars may be run along in front of the ash chutes, and ash delivered thereto. By this system ash and clinkers are conveyed to a hatch in the basement floor, through which they are dumped, and then elevated to the ash hopper outside of the building immediately over the outside track. From this point they are dropped by gravity to gondola cars, by which they are transported. Provision is made for an additional battery of two boilers when further requirements demand such an installation. Further boiler room equipment includes two duplex Dean pumps 12 in. by 7 in. by 12 in., and a Cochrane feed water heater.

There are installed in the engine room three compound Erie engines manufactured by the Lake Erie Engineering Works, Buffalo, N. Y. Each engine develops 125 H. P. at 250 revolutions per minute, and is direct connected to a 125 K. W. Westinghouse generator. Power for the operation of machinery is supplied by the direct-current, three-wire system, using a

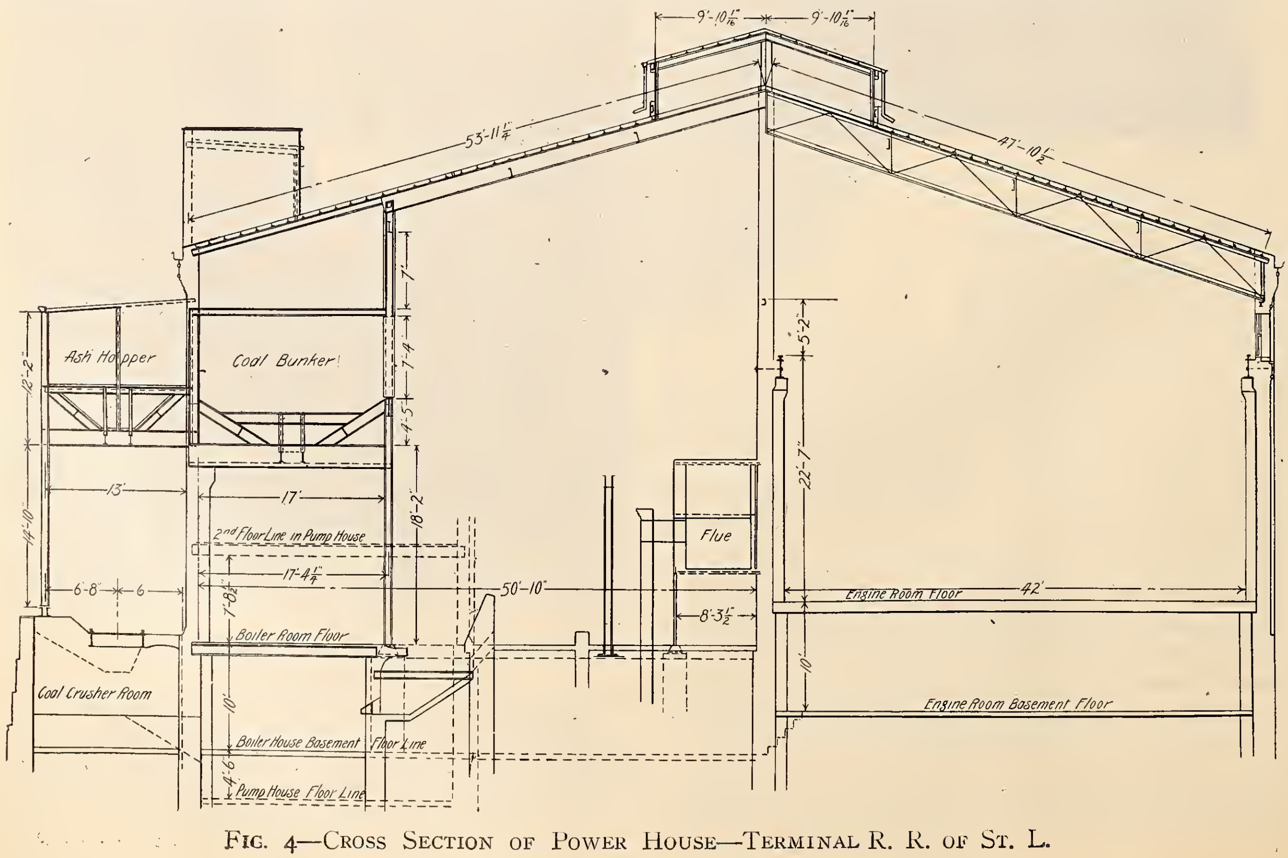


FIG. 4—CROSS SECTION OF POWER HOUSE—TERMINAL R. R. OF ST. L.

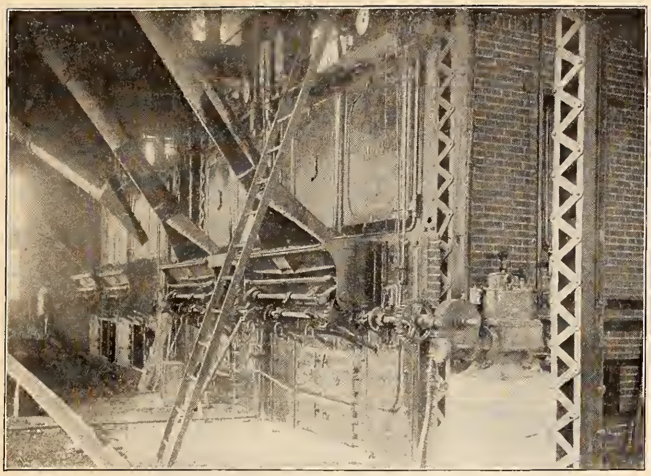


Fig. 5—Showing Attachment of Roney Stokers to Babcock & Wilcox Boilers—Terminal R. R. of St. L.

balancing set, and each unit is connected to the switchboard in the same manner, so that any one may operate the entire system, or two or three may be connected in multiple. The system is operated at 220 volts, maintaining a current of 500 amperes.

For lighting the terminal yards from Madison to the Eads bridge, an arc light system is installed, which is operated by four Wood, No. 8, arc light machines, driven by two Westinghouse motors, of 100 H. P. each, direct-connected. These machines are shown by Fig. 3.

Air for the entire plant is supplied by an Ingersoll-Sargent air compressor of 2,100 cubic feet capacity. In addition to the reservoir within the power house a second reservoir is located outside of the building, and near the chimney, to be used in case of emergency. A by-pass valve directs air to the main line, and in case of an accident to the principal reservoir the second reservoir will be connected to the compressor from which air will be delivered to the main line.

The engine room is served by a hand traveling crane of 20,000 pounds capacity built by the Northern Engineering Works, of Detroit, Mich.

Wood and Paint Shop.

On the side of the transfer table pit opposite to the locomotive and machine shop is situated a building for the wood and paint shop for repairing cars, cabs, tender frames, etc., and for painting tanks and cars. The building is of brick construction, similar to the other structures of the plant, the roof being supported by lattice girders carried by the walls. The building is divided into two shops by a center wall 13 inches thick, one of which is to be used for the wood shop and the other as a paint shop. The wood shop is 100 ft. long x 58 ft. 10 in. wide, through which extends one track, and the shop is to be supplied with woodworking machinery, and the line shaft driven by a 60 H. P. motor at 630 revolutions per minute. The paint shop is of the same length and 51 ft. 2 in. wide. Through this section extends two tracks for the storage of tanks and cars while being cleaned and repainted. The flooring of both rooms is of cement on a foundation of concrete, and the building is ventilated by two monitors with glass ends and sides, with ventilators arranged along the center lines of the roofing. Beneath a portion of the paint shop is a basement reached by a staircase located at the southeast corner of the building, for storing paint supplies, etc.

Office and Storehouse.

The storehouse and office building is the most centrally located of the plant, and a good idea of its proportions may be had by reference to the line drawing showing the first floor plan and side elevation in Fig. 11, and by the general view of the plant presented on page 115 of our April number. The building is 128 ft. long x 52 ft. 10 in. wide. A portion, 52 ft. 10 in. long,

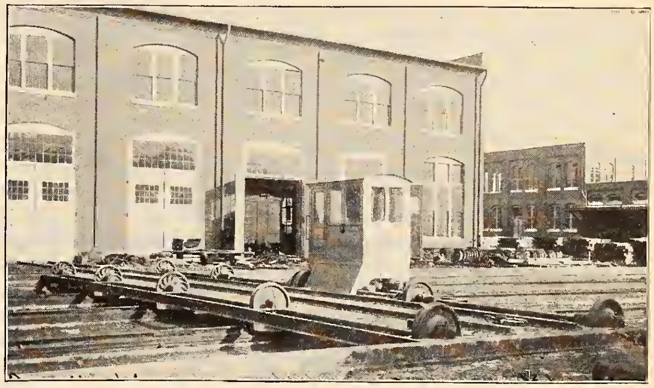


Fig. 6—Transfer Table—Terminal R. R. of St. L.

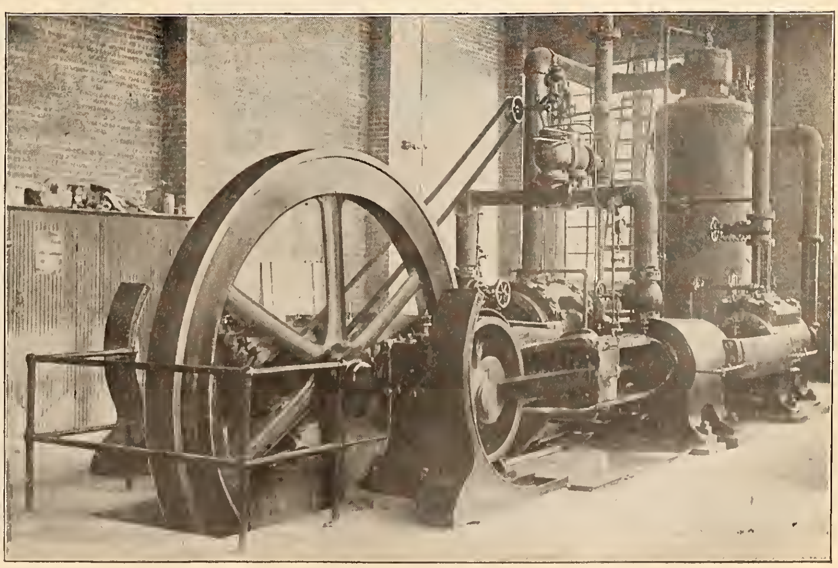


Fig. 7—Ingersoll-Sargent Air Compressor of 21,000 Cubic Feet Capacity—Terminal R. R. of St. L.

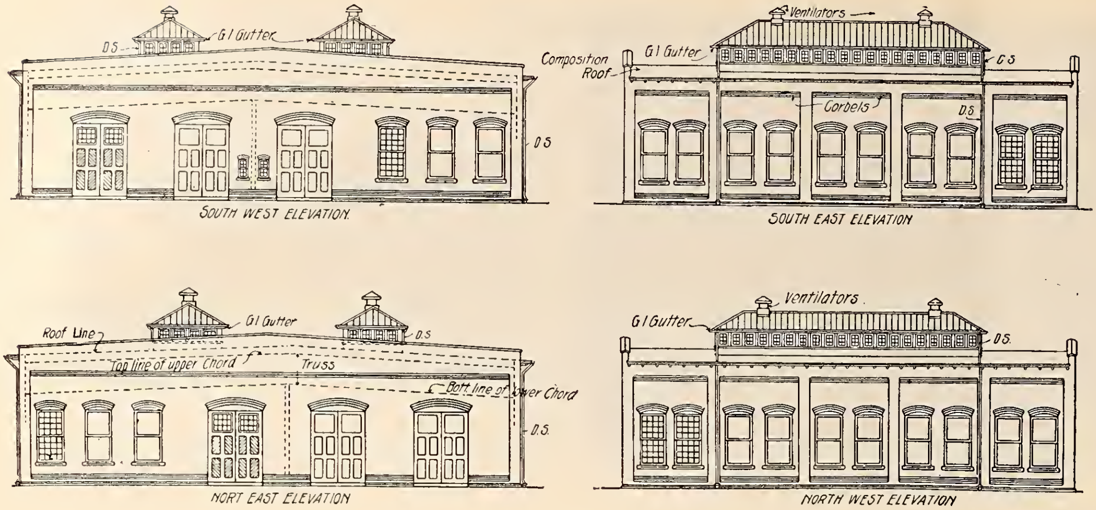


FIG. 8—ELEVATIONS OF WOOD AND PAINT SHOP—TERMINAL R. R. OF ST. L.

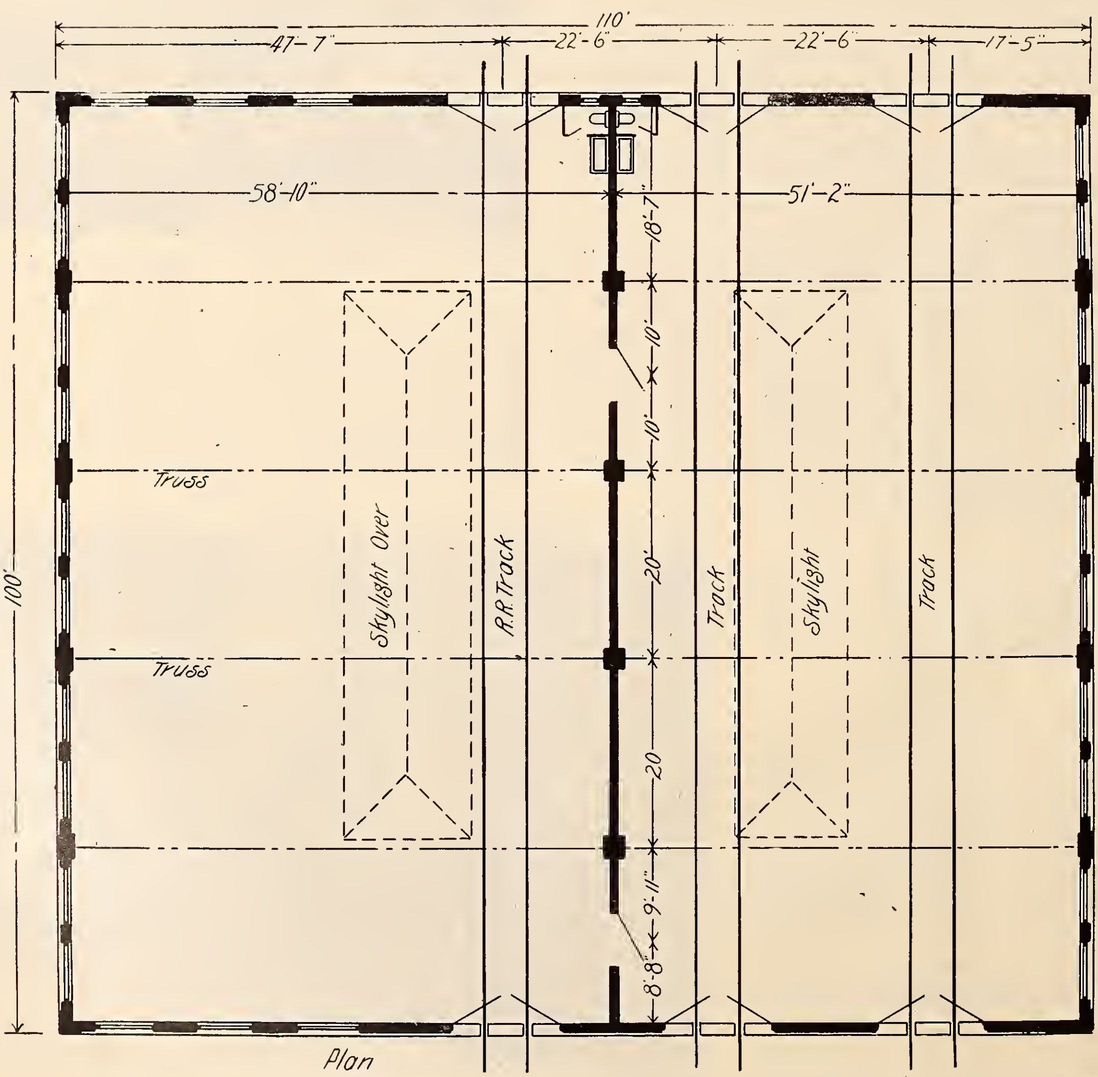


FIG. 9—PLAN OF WOOD AND PAINT SHOP—TERMINAL R. R. OF ST. L.

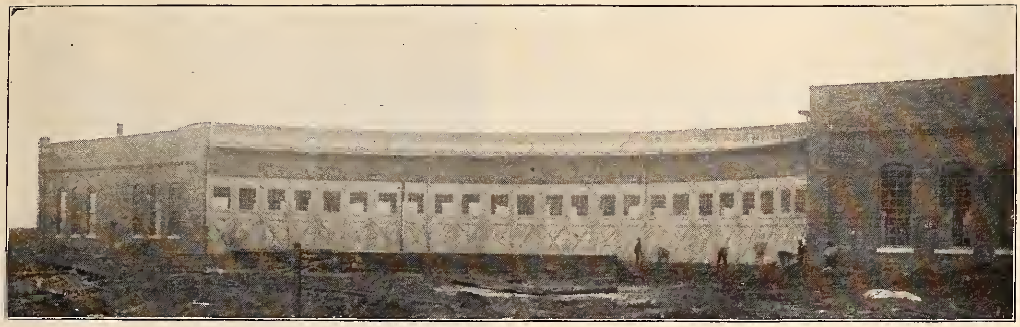


FIG. 10—VIEW OF ROUNDHOUSE LOOKING ACROSS TURN-TABLE—TERMINAL R. R. OF ST. L.

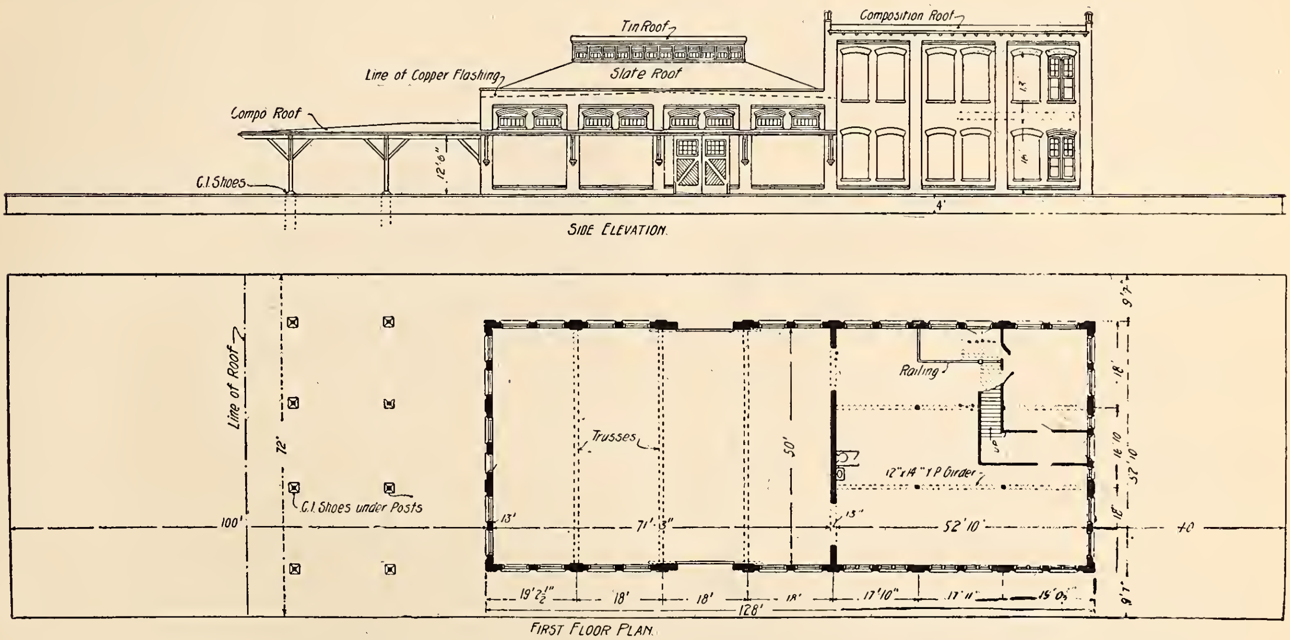
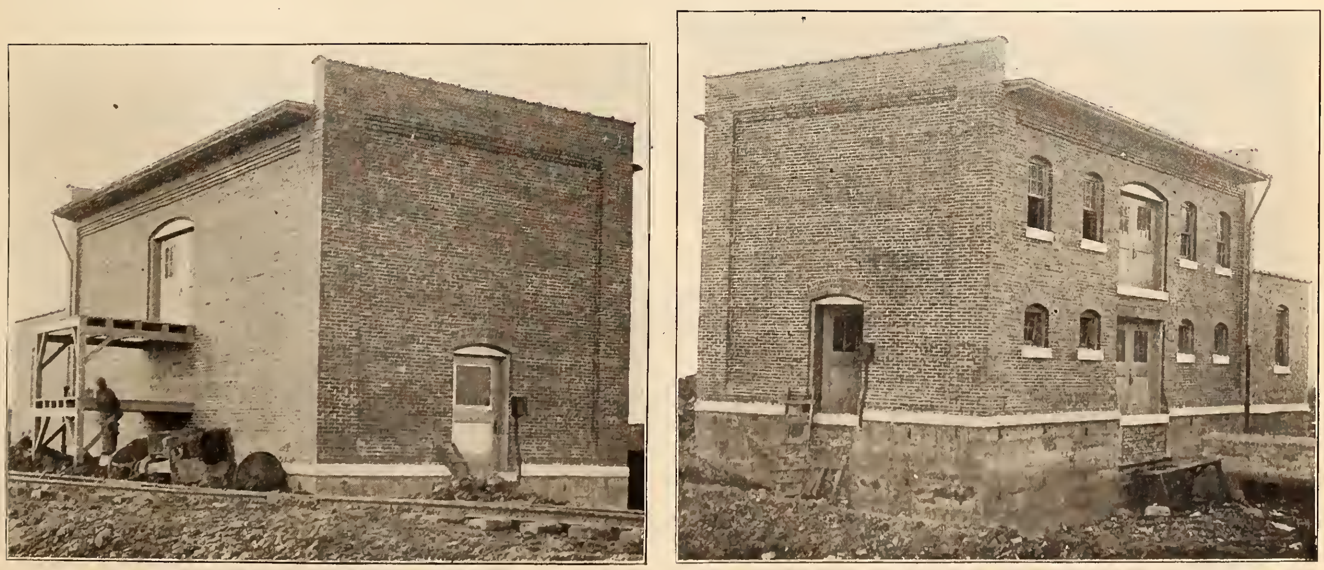


FIG. 11—PLAN AND ELEVATION OF STOREHOUSE AND OFFICE BUILDING—TERMINAL R. R. OF ST. L.



FIGS. 12 AND 13—VIEWS OF THE OIL HOUSE—TERMINAL R. R. OF ST. L.

is a two-story structure and is arranged as an office building for the storekeeper, general foreman and their respective office forces. It is well supplied with window lights, piped for water and steam and equipped with all modern conveniences. To the rear of the office is a single-story structure 71 ft. 3 in. long, which is well arranged and equipped for the storage of material and supplies. The building is surrounded by a long and wide platform to facilitate handling material to and from cars, and for storing such supplies—castings, etc.—as may be exposed to the weather. A portion of the platform immediately adjacent to the storehouse section on each side and to the rear is covered by a shed. Along the sides of the building this shed is supported by the walls, and at the rear, where the shed is much wider, it is supported by wooden columns resting on cast iron shoes. The office building is covered by a composition roof; the roofing of the storehouse is of slate, while the top covering of the ventilator over the storehouse section is tin.

Oil House.

The oil house is exceptionally interesting and well designed. It is located south of the storehouse, and an exterior view is presented by Figs. 12 and 13. It is constructed similarly to the other buildings and is 43 ft. 11 in. long by 22 ft. 4 in. wide, and two stories high. The flooring of the lower story is of 2-in. plank supported by joists, 6 in. by 12 in., upon an underflooring of concrete 6 in. thick. The concrete flooring is supported by old tie rails. The second floor is of 2-in. plank supported on wooden joists. The building is covered by a composition roof. On the south side of the oil house is a small platform arranged on a level with a car floor, and a second platform on a level with the second flooring of the house. Operating between these two platforms is an air elevator for hoisting oil drums from the car floor level to the sceond story of the building. Being thus delivered to the second floor, the drums are rolled to a pair of skids which are located on the flooring of the second story, and immediately over the large oil storage tanks which are located on a raised platform of the first floor. By means of these skids each drum may

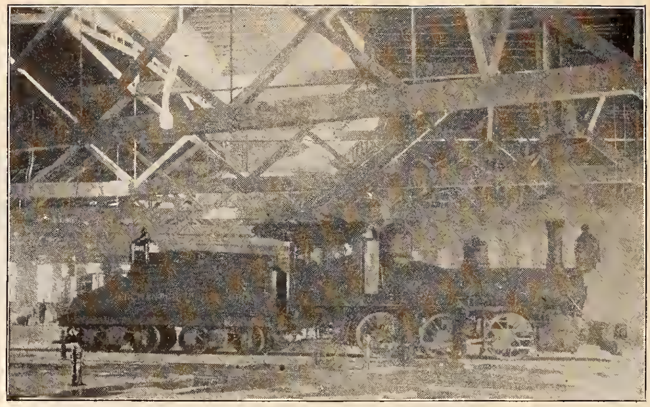


Fig. 14—View Inside of Roundhouse, Showing Roof Trusses and Monitor in Roof—Terminal R. R. of St. L.

be placed immediately over the oil tank, which it is to supply, and by opening the bung in the drum oil is fed by gravity to the tank beneath. Each oil tank is equipped with a special gage, by which the desired amount of oil may be measured, so that it may be delivered direct to the engine oil cans without the necessity of an intermediate measure.

Bales of waste are delivered to the second story by the air elevator heretofore mentioned. In the northwest corner of the building is a large chute and storage bin extending from the second to the first floor. Waste is arranged in one or two pound bundles, as desired, on the second floor and dropped into this chute, from which it may be taken as desired on the first floor. On the north side of the building is a large doorway, near which is placed a counter, and firemen applying for oil and other supplies enter through this door, receiving their material over the counter. By means of the arrangements here explained material is received on the second floor and distributed on the first floor, and the conveniences supplied provide ample room, so that the lower portion of the oil house is by no means crowded. The usual precautions are taken in providing drip pans for catching waste oil.

Round House.

The position of the roundhouse with respect to the machine shop and other buildings is shown by the general plan. The roundhouse contains 16 stalls and is served by a 70-ft. electrically driven turntable. A cross section of this building is shown by Fig. 15, an interior view by Fig. 14, and an exterior view by Fig. 10. The walls are of brick construction, while the roof trusses are of wood supported by 8 in. x 8 in. square cast iron columns, one inch thick. The distance from the base of rail to top of doors is 18 ft. 4 in. The building is observed to be particularly well lighted and well ventilated. The windows are unusually large, and a broad monitor in the roof extends almost the entire length of the house, the sides of

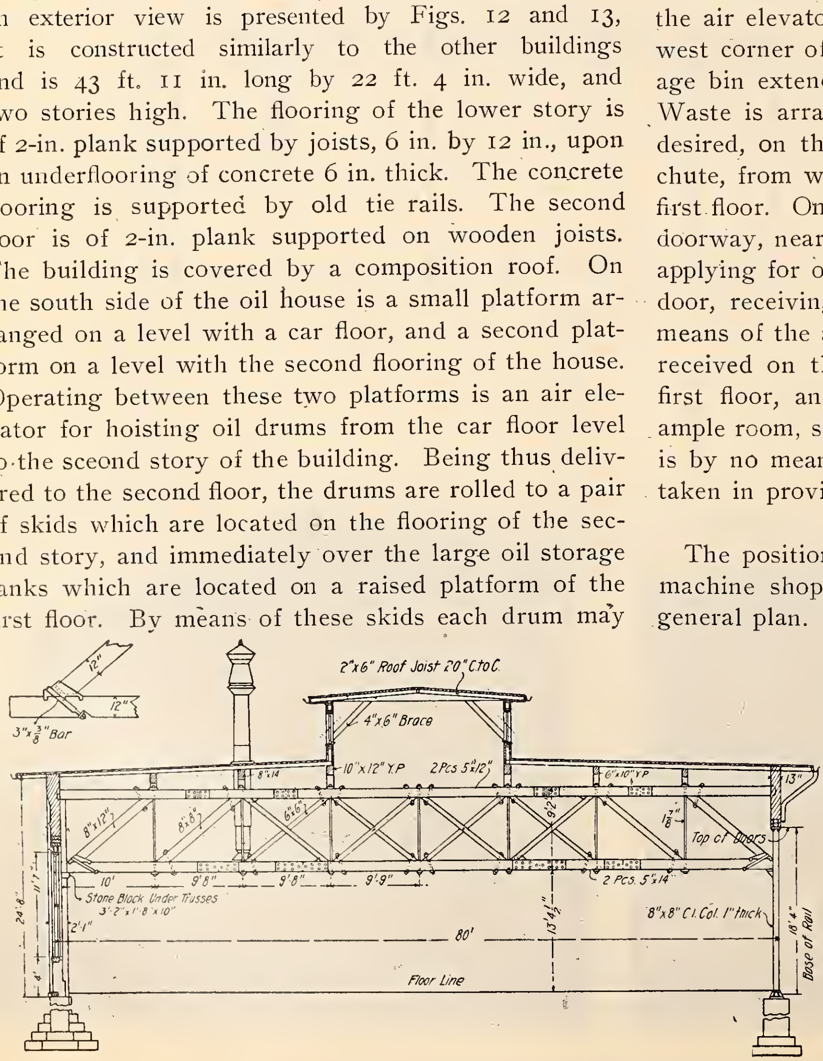


Fig. 15—Cross Section of Roundhouse—Terminal R. R. of St. L.

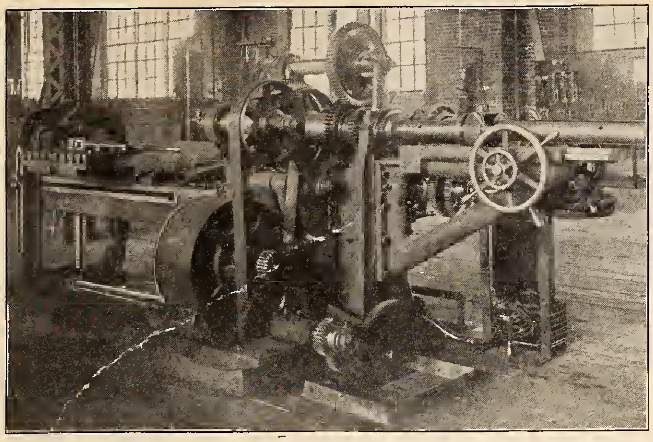


Fig. 16—Niles Horizontal Boring Bar, Motor Driven —Terminal R. R. of St. L.

which are provided with glass swinging window sashes, which are operated by chains and hand wheels along the walls. The floor of the roundhouse is cement and the sides and bottoms of the pits are lined with the same material. The bottom of the pits are concave and drain towards the turntable. The rails are supported on treated timbers 10 ins. x 12 ins. square There are two drop pits for driving wheels and two drop pits for truck wheels. The building is heated by an individual Sturdevant system located in a small "lean-to" against the exterior wall, 25 ft. 6 in. x 19 ft., and lighted at night by incandescent electric lights arranged to hang between the pits. In order that all piping may be accessible a duct extends along the inner circumference of the building between the pits and the inner wall, in which are located pipes for air, water and steam. These ducts are covered throughout with light planking, which may be readily removed. Between every alternating pair of pits branches

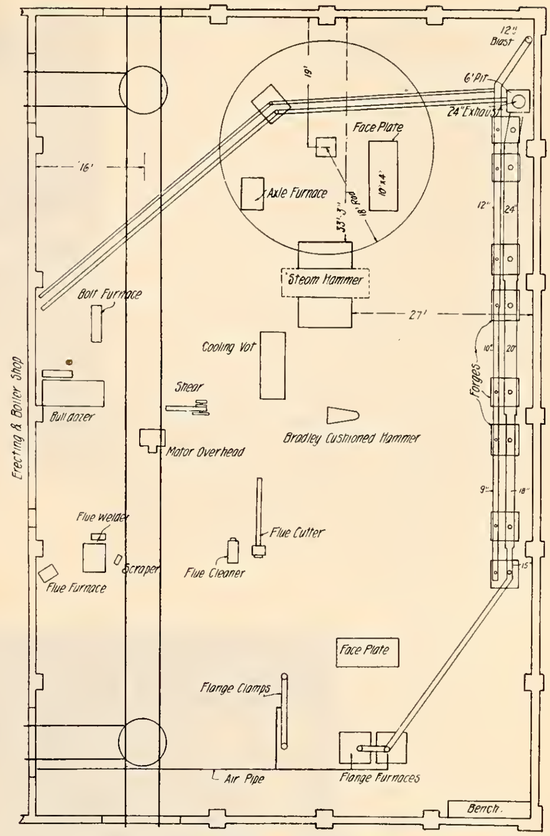


Fig. 17—Location of Tools in Blacksmith Shop—Terminal R. R. of St. L.

lead off from this duct to a point about the center of the pits for supplying air, water and steam as required.

Coaling Station.

The coaling station is located southwest of the plant and the plan of the coaling station, sand house, water tank and cinder pit is shown on the general lay-

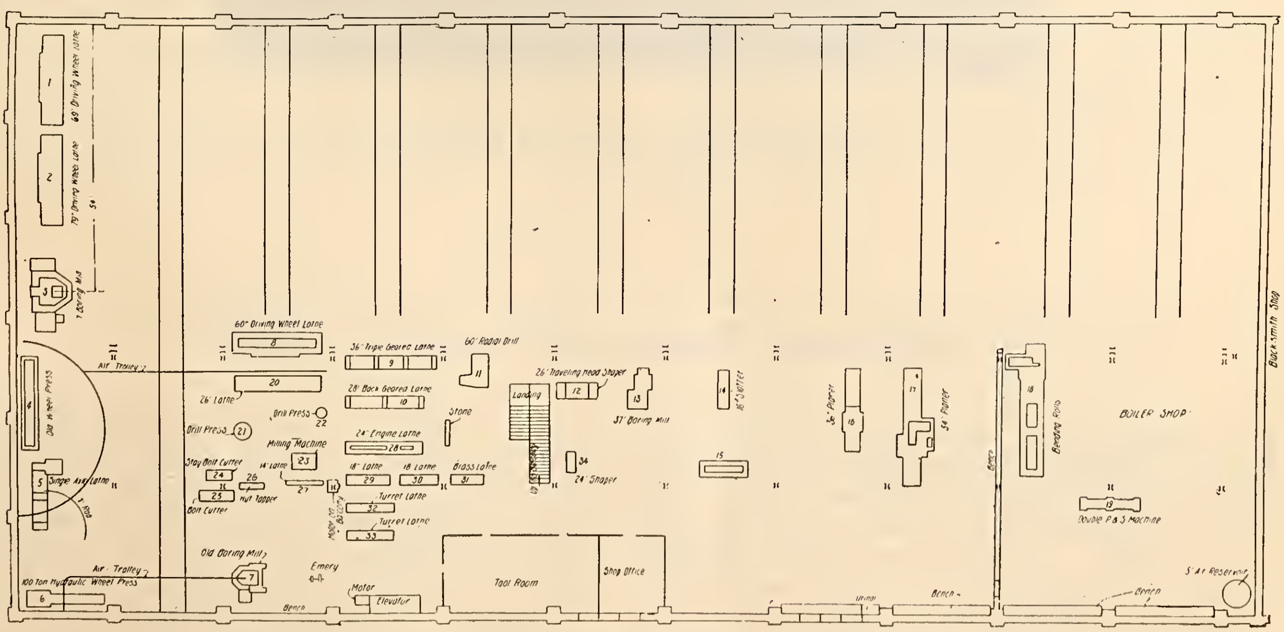


Fig. 18—Location of Tools in Machine Shop—Terminal R. R. of St. L.

out, page 116, April issue. Inasmuch as all locomotives supplied at this station are for switching service, the supply of sand is naturally very large. The coaling station and sand house are in the same building, a structure of wood, and both coal and sand are delivered from dump cars by gravity to the storage bins. Cars are elevated into the sand and coal house along an incline of about 5 to 1 by a cable and drum, which are operated with a 20 H. P. General Electric motor. East of the building the water tank is located, with spouts on two sides for supplying engines passing along either the north or south side of the coaling station. Stand pipes are so placed that water may be taken on four parallel tracks.

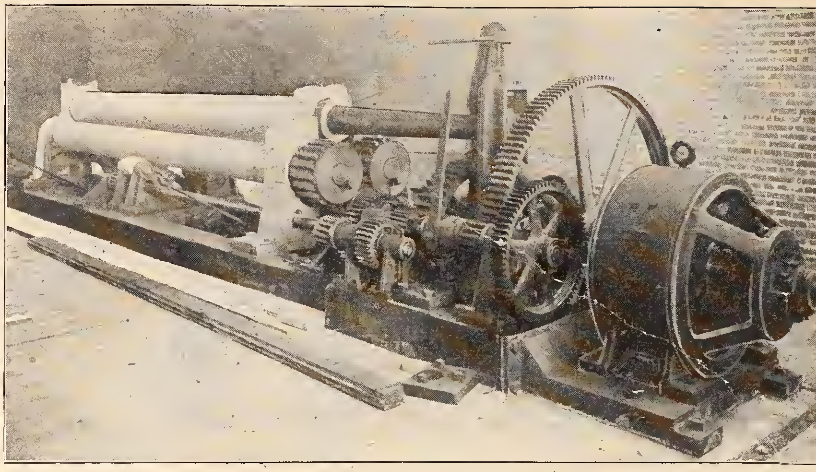


Fig. 19—Niles 12-Foot Boiler Sheet Rolls, Driven by 26 H. P. Westinghouse Motor—Terminal R. R. of St. L.

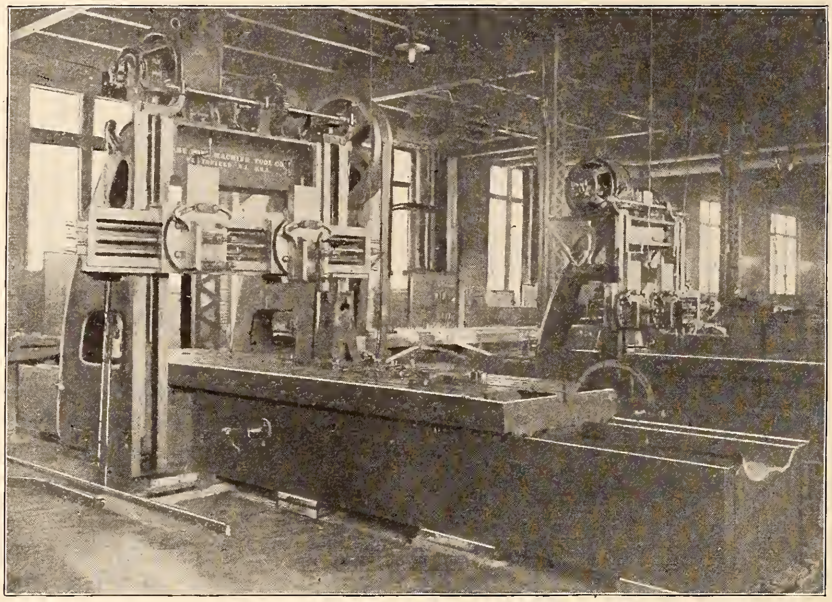


Fig. 20—Motor Driven Planers so Located as to be Served by Traveling Crane—Terminal R. R. of St. L.

An Interesting Design of Locomotive Boiler

IN striking contrast to the general run of locomotive boilers placed in service during the past few years, wherein long flues and wide, shallow fireboxes have been the prevailing custom, appears the design which is here outlined. Long flues and shallow fireboxes appear to have aggravated flue troubles, instead of alleviating them, and the accompanying type of boiler is to be used on a number of new passenger engines as an experiment. The modification embodies a number of practical features. The flues are to be 16 feet 6 inches long, from 3 to 3½ feet shorter than the tendency of present practice indicates. The bottom of the mud ring is 29 inches from the belly of the boiler, where recent tendencies have reduced this distance to about 18 inches. The slope in the throat water leg is such that the flue sheet is 16 inches forward of the inner throat sheet at mud ring. This arrangement places the flue sheet and ends of tubes at greater distance from the fire, giving a larger space in which to permit the gases to circulate and become thoroughly heated before reaching the sheet, diminishing the tendency of cold gases to rush from the fire to the tube sheet and providing something of a combustion chamber in which to assist more nearly perfect combustion before the gases enter the tubes. The mud ring at front is 4 inches. The throat water leg tapers to 6 inches, to permit water to flow toward the space around the firebox and to provide freer circulation as water rises along the flue sheet.

The grate is narrow and the forward end of the firebox is between the tires of the rear drivers. In order to secure the great depth of firebox, the rear portion of the frame is carried by a trailing truck. The interior of the firebox is 41¾ inches wide by 126 inches long, inside of mud ring, giving a grate surface of 37 square feet. The mud ring slopes forward from a height of 12 inches above frame at rear of mud ring to a distance of one inch above frame at front. The side members of the mud ring are straight, to provide against a hump in the grate, which is noticeable in many recent designs. The firebrick arch is so located that in connection with the deep firebox there is such distance between forward portion of arch and front end of grate that a fireman will not strike the arch and pile up coal against the flue sheet. The boiler is to operate under 200 pounds steam pressure, and supply cylinders 23 inches in diameter by 26 inches stroke. The diameter of boiler at front end is 73 inches, and bituminous coal is to be used as fuel. The design provides for 365 tubes, 2 inches in diameter, which, as heretofore stated, are 16 feet 6 inches long. Of a total heating surface of 3,373.77 square feet, 3,136.26 square feet are in the tubes, 18.68 square feet in the water tubes and 218.83 square feet in the firebox, and, as before stated, the grate surface is 37 square feet. A comparison of these several surfaces show the following ratios:

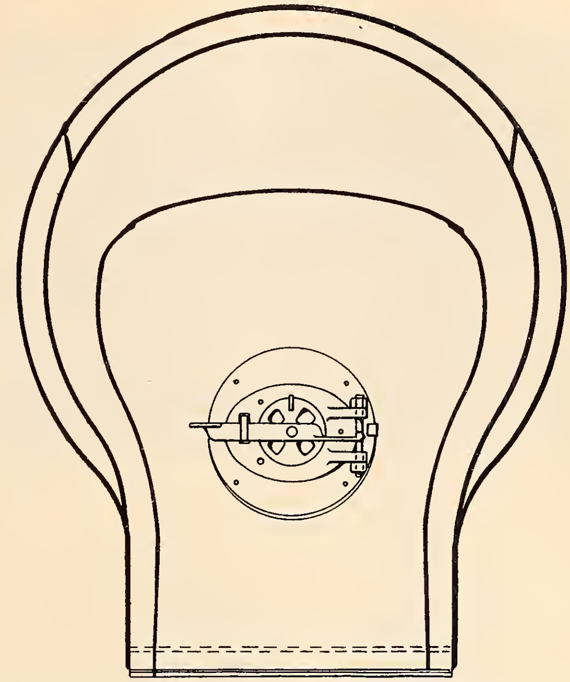
Total heating surface to grate area, 91.18.

Total heating surface to tube heating surface, 1.075.

Total heating surface to firebox heating surface, 15.42.

Tube heating surface to firebox heating surface, 14.33.

Tube heating surface to grate area, 84.76.



A Design of Locomotive Boiler With Deep, Narrow Firebox and Short Tubes—End Elevation

Firebox heating surface to grate area, 59.008.

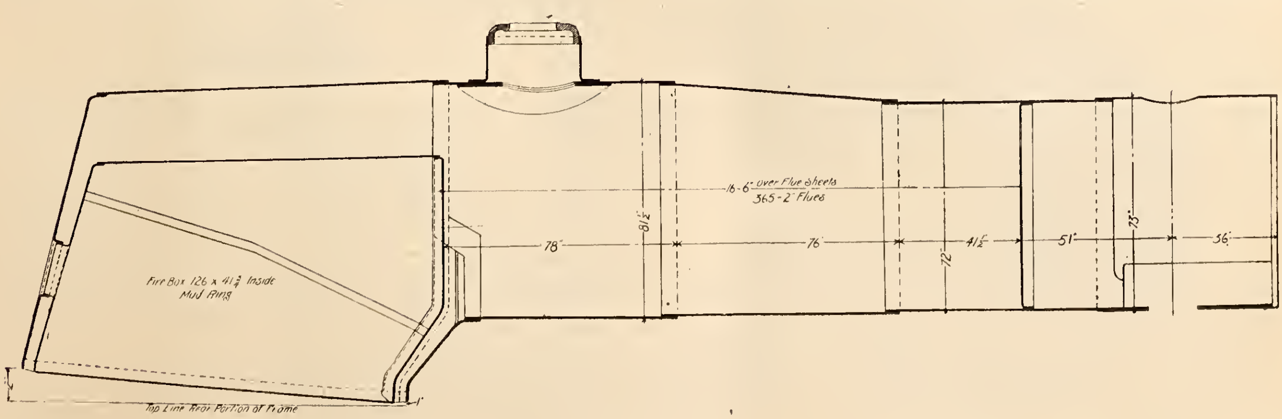
Total heating surface to volume of both cylinders, 269.9.

Grate area to volume of both cylinders, 2.96.

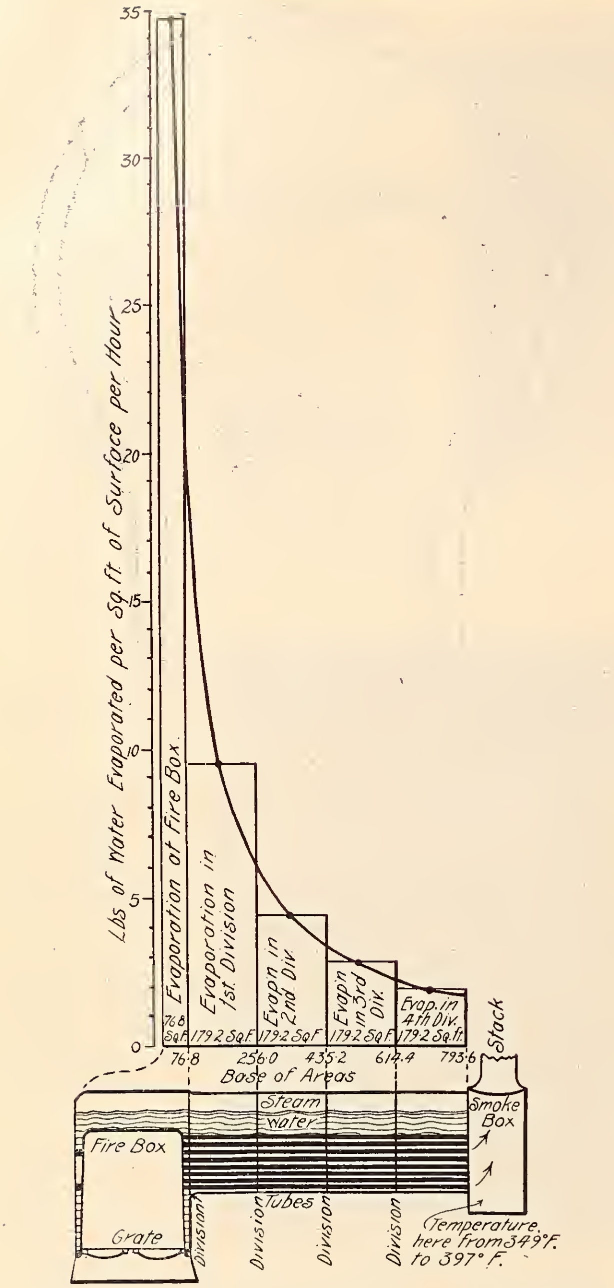
Total heating surface to weight of one cylinder full of steam at boiler pressure, 1,218.8.

As previously mentioned, this boiler is to be tried experimentally on a number of passenger engines and in the event of its securing the desired results in minimizing round house work on flues it is to be generally used on a number of engines now being contemplated by the road having this question under consideration.

In this connection it is interesting to note the graphical exposition of the distribution of heat in the various sections of a boiler as presented in Rowan's Modern Steam Boiler, which is reproduced herewith. From the results of experiments on the Northern Railway of France, this author quotes the following: "From two-fifths to one-half of the whole quantity of water was



A Design of Locomotive Boiler With Deep, Narrow Firebox and Short Tubes—Sectional Elevation.



Graphical Exposition of the Value of Heating Surfaces.

evaporated from the surface of the firebox, although this surface was less than one-tenth of the whole heating surface. Per square foot of the respective surfaces, the evaporation from the firebox section amounted to from two to three times that of the first section of tube surface."

Electric Wiring of Machine Tools

In the title of figure 3 appearing with the article on the electric wiring of machine tools, presented in our April issue, a typographical error occurred. The words "Four side timber dresser direct connected to 15 H. P. constant speed Crocker-Wheeler motor," should have read "50 H. P.," instead.

Valve Lubrication

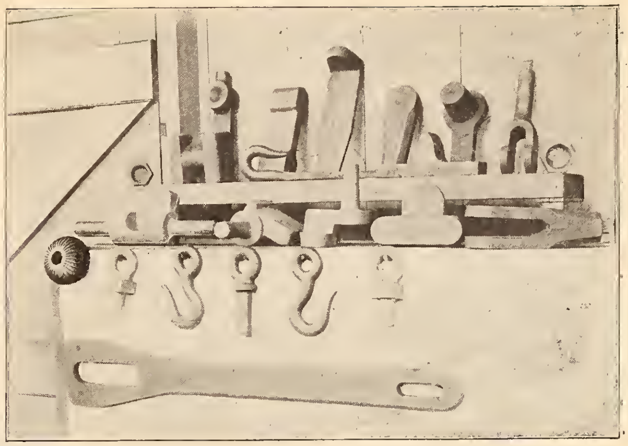
We often read about engines making records of 600 miles per pint of valve oil, but they do not say how rapidly they are wearing away their valves, seats, cylinders and motion work, or how much coal is used in overcoming the extra friction caused by poor lubrication. Take the volume of steam used in operating two 19 ins. pistons with 24 ins. stroke and a nine and one-half inch air pump on an ordinary train for 600 miles and vaporize one pint of valve oil in this, then take the small amount that actually comes in contact with the seats and walls of cylinders and it would take a microscope to find any traces of it. But the proof of a pudding is the eating thereof, and here is the record of a 17x24-inch mogul engine carrying 140 pounds pressure and having a 9½-inch air pump. Engine has soft seats and valves; type of valve, Richardson balance. Type of cylinder packing, snap rings ¾ inch square. Engine had valves and seats faced, and was put into service Feb. 7, 1893. Since that time she has run 73,237 miles in passenger service, 162,175 miles in freight service and 48,514 miles switching, making a total of 283,926 miles without having valves or seats refaced, there being less than 1-32 in. wear off of same and 1-64 in. wear in diameter to bore of cylinders, and the seats are less than 1-100 in. from true at present time and prospects are good of reaching the half million mile mark before valves or seats need refacing. This engine averages 105 miles per pint of valve oil. We have 19 ins. x 24 ins. engines carrying 180 lbs. steam pressure working in heavy freight service that compare very favorably with the above. But I imagine someone will say: "Are not valves, false seats and cylinder bushings cheaper than valve oil?" When they do, I am prepared to compare repair accounts. Too much oil is harmful same as not enough but I do not believe in making a good oil record at the expense of the fuel and repair accounts unless the gain is greater than the loss.

E. N. Wiest,
M. M. of the M. & N. E. R. R.

We believe the arguments presented by Mr. Wiest to be well taken and we hope that others will be sufficiently interested to present the results of their observations along similar lines. A comparison of repair accounts of the nature suggested will be profitable.—Editors.

Drop Forgings

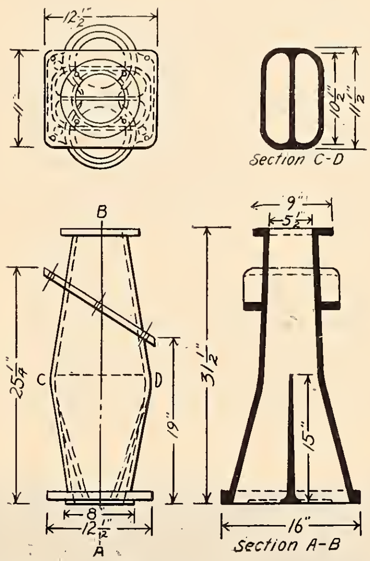
The use of die work and drop forging is followed more extensively by locomotive building establishments than is usually observed among railroad repair shops. Such work presents a wide field for economy in both time and labor and by the exercise of ingenuity on the part of those closely associated with forging work, many parts heretofore formed at no small expense may be turned out cheaply and at the expense of time which appears almost insignificant when compared with the old hand method. Several examples of pieces formed in dies under the drop hammer are shown in the accompanying illustration which is reproduced from a photograph kindly submitted by Mr. William Hunziker, foreman die sinker, of the Richmond Works, American Locomotive Company, who has given much time to this class of work and attained very successful results. The dies used in this connection are made of steel carefully machined. Brake pins are forged to size, the fit being made in the original operation, and no machining is required. Holes in sling stays are forged round or oblong, as required for the lower and upper ends. Two hundred jaws for boiler braces are turned out per day. The following are included among the forms forged: Spring hangers, spring hanger gibs, smoke box braces, sling stays, handrail columns, crank pin washers, front end door clamps, flexible stay thimbles and caps, equalizer fulcrums, spring rigging blocks, boiler swing links, link hangers, link hanger saddles, jaws of different styles, eye bolts from ½ to 2½ ins.



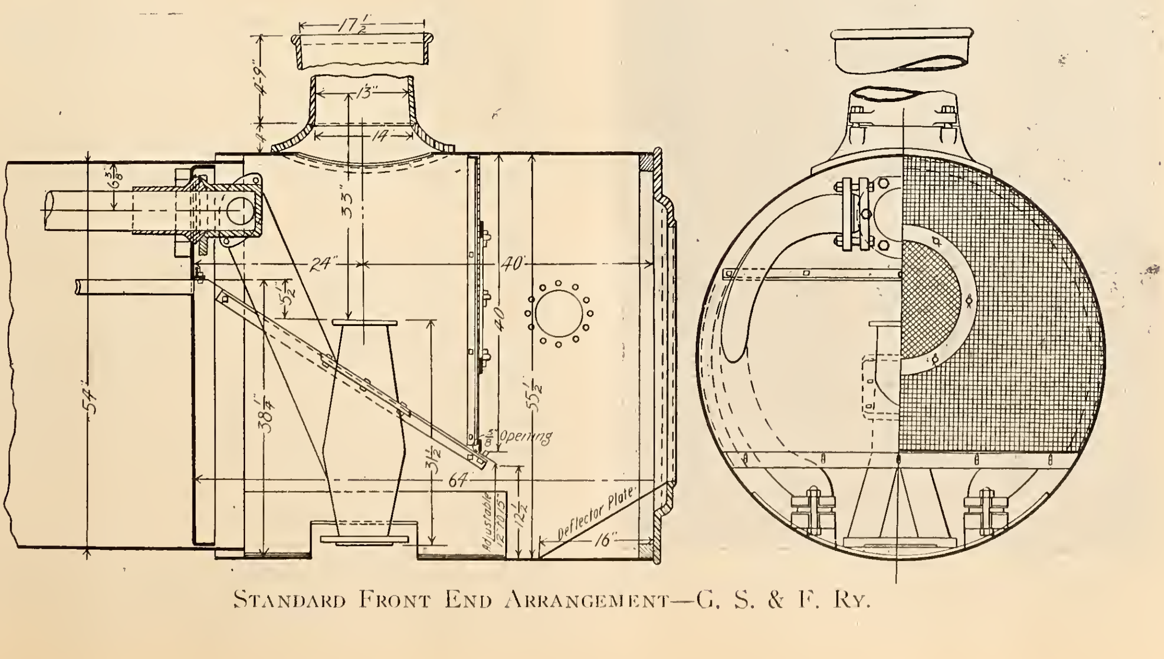
Examples of Drop Forgings.

Standard Front End Arrangement G. S. & F. Ry.

THE design of a standard front end arrangement to meet the requirements of all locomotives has been generally acceded to be impossible, and it, therefore, remains practical for each road to work out its own salvation, because of the varied conditions under which locomotives operate on different roads, and in many cases on different divisions of the same road. At the same time, a design of smoke box which has proved successful under conditions for which it was designed is always of interest, and in many cases offers some suggestion worthy of consideration. The accompanying illustrations present the design of smoke box arrangement standard on the Georgia Southern & Florida Railway, which has been kindly forwarded us by Mr. L. B. Rhodes, master mechanic. The design illustrated is the front end rigging as applied to an eight-wheel passenger engine, having cylinders 18 by 24 inches, with narrow type of deep fire box burning soft coal. While



Details of Exhaust Pipe—G. S. & F. Ry., Front End Arrangement.



Standard Front End Arrangement—G. S. & F. Ry.

this drawing has been submitted to us without comment, its design appears to be that of an arrangement which is self-cleaning with a vengeance, an idea which seems to be borne out by the fact that no provision is made for a cinder hopper. The provision of a deflector plate is a good one, not only directing the sparks towards the netting more readily, but further providing against an accumulation of cinlers in the forward part of the smoke box. Cinders so accumulated frequently become ignited, and the heat produced thereby often results in warping the metal of the box. Inasmuch as the extended front is provided, we fail to see why the netting is arranged vertically instead of being arranged at an angle so as to extend forward to the smoke arch ring. Such a provision would have increased the area of the netting materially, and one so adjusted is more readily cleaned and less liable to become clogged than one arranged vertically, as in the design shown. A noticeable feature in supporting the baffle plate is the method of attaching the same to the exhaust pipe. It has been found that where the plate is not securely attached a certain amount of motion results, causing the plate to rub against the pipe and wearing it to an extent which has proved objectionable. This objection is obviated by casting a lug on each side of the exhaust pipe, to which the plate is bolted. The method of adjusting the apron is shown by the drawing. The spark arrester used is No. 8 steel wire netting having 2½-inch mesh.

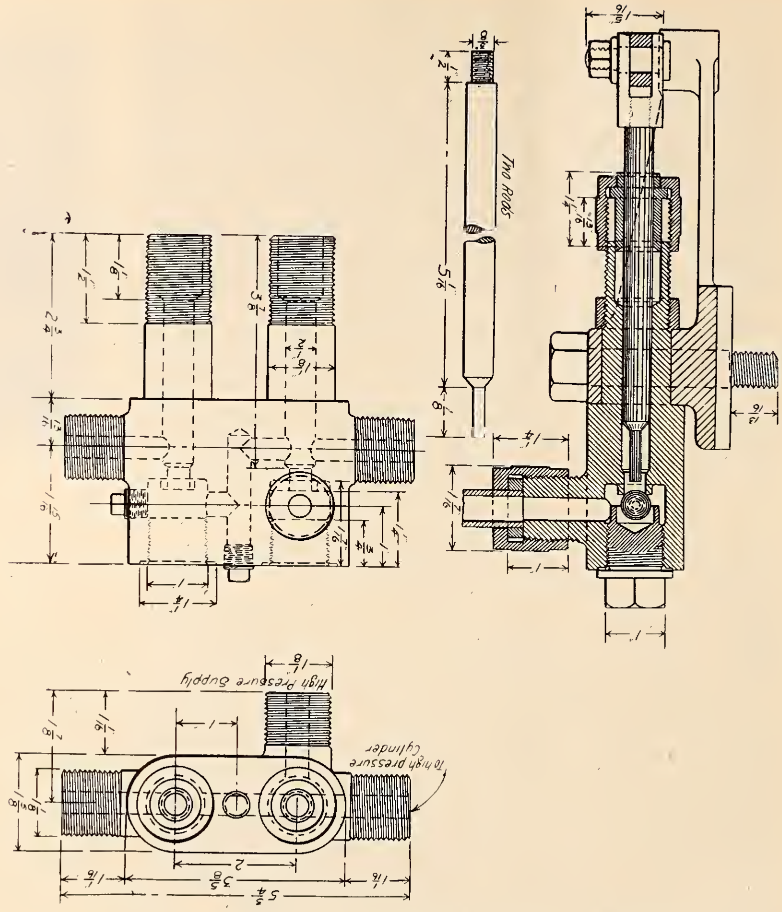


Fig. 3—Details of Controlling Valve, Hydraulic Driving Brass Press—L. S. & M. S. Ry.

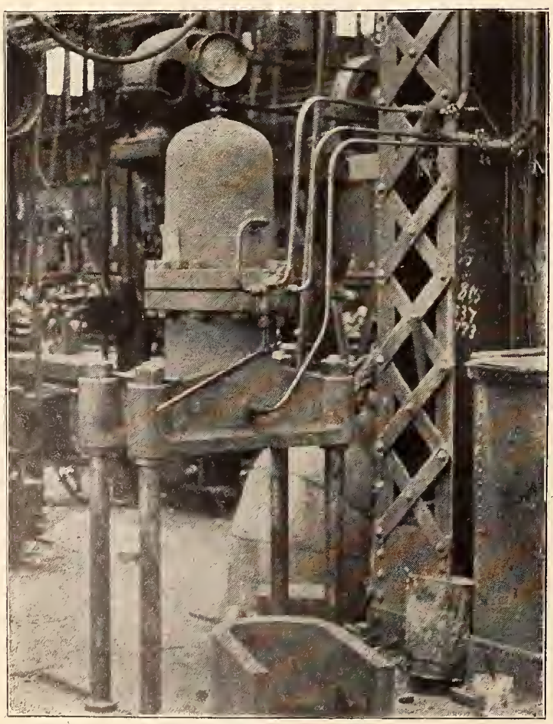


Fig. 1—Hydraulic Driving Brass Press—L. S. & M. S. Ry.

Hydraulic Driving Brass Press

AMONG the many up-to-date machines and appliances in the new Collinwood shop of the Lake Shore & Michigan Southern Railway we note an interesting hydraulic press for forcing crown brasses in and out of position in driving boxes. Another machine of similar design is used for rod brasses. A general view of this device with its connections is presented by the halftone engraving Fig. 1, an end elevation and a half section is shown by Fig. 2, and the details of the controlling valve are included in Fig. 3. The press consists practically of two vertical cylinders arranged in tandem. The upper cylinder is connected to the hydraulic pumping plant, which supplies the necessary pressure to force down the plunger and accomplish the desired work. The lower cylinder is connected to the city main, which provides sufficient pressure to again raise the plunger when pressure in the upper cylinder is released. It will be noticed that pressure of water in the lower cylinder acts against only a small shoulder in raising the plunger. For the drawing illustrating this machine we are indebted to Mr. R. B. Kendig, mechanical engineer of the L. S. & M. S. Ry.

An Ideal Electric Plant for Railroad Shops

COMMUNICATION.

Editor, Railway Master Mechanic:

I wish to bring out an item of expense incurred during the installation of electrically driven shops which is usually overlooked, namely, the expense of locating feeders for the direct current system. In the construction of a plant with which I am connected there were 69,000 pounds of copper put into feed wires, not including inside wiring of the building. This plant is operated under a 240-volt direct current system with multiple voltage control of speed for machine tools. If high tension alernating current had been used, much of the labor expended in distributing the feeders might have been dispensed with, and the cost represented by erecting the feeders would have been enough to pay for the smaller wires for alternating current as well as to meet the excess cost of the induction motors necessary with this system. This would have saved the value of the 69,000 pounds of copper.

There is no doubt but that the multiple voltage for control of speed is an excellent system in connection with machines of variable speed. At the same time, the induction motor is undoubtedly better for constant speed and load, and I believe a combination of the two systems would make an ideal general arrangement.

Such a combination of the systems can be arranged as follows: Furnish a high pressure alternating current from the power house and put a rotary converter in the machine shop to convert the alternating current into multiple voltage direct current for the machines requiring it. For operating the motors driving machines arranged in groups and for lighting, use the alternating current.

The advantages of such a system would be not only in the saving of copper and the provision of both currents for the shop, but it also appears practical for lighting freight car classification yards and depots, which may be within a radius of a mile or a slightly greater distance. Instances are common wherein small amounts of power are required for outlying points which cannot be furnished by the constant current system because of the great distance from the central power plant. In cases of this kind this combination system would meet the requirements by supplying the outlying points with alternating current.

O. W. BODLER.

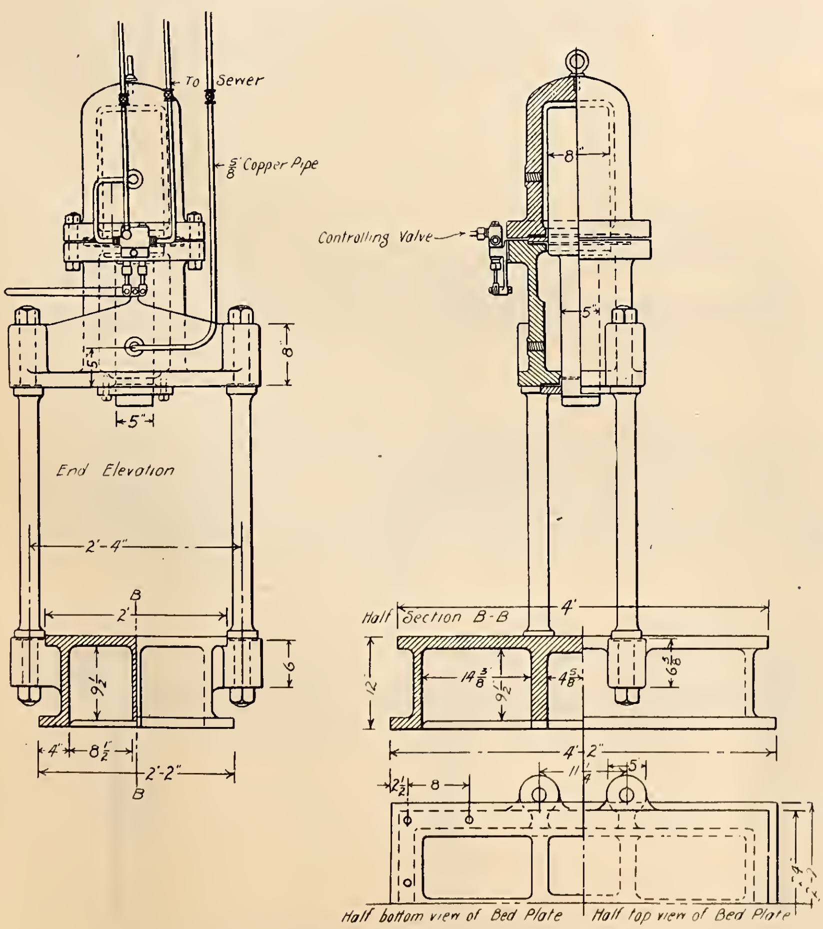


FIG. 2—END ELEVATION AND HALF SECTION OF HYDRAULIC DRIVING BRASS PRESS—L. S. & M. S. RY.

M. C. B. Drop Testing Machine

THE Master Car Builders' drop testing machine, which has for some time been in process of erection, is now completed and ready for use. By direction of the association, this machine has been installed at the laboratory of Purdue University, Lafayette, Indiana, where it will be operated under conditions similar to those prevailing in connection with the Master Car Builders' brake shoe testing machine and the Master Car Builders' air brake testing rack. The conditions are such that the machine may be used not only by committees of the Master Car Builders' Assocation, but also by individual railway companies and manufacturers as well.

The machine has been described in detail in the proceedings of the Association for 1903. The drop weighs 1,650 pounds and is so designed that supplemental pieces may be added to increase its weight to 2,000 pounds. The maximum height through which the drop may fall is 50 feet. The machine may be used in testing materials of any kind, provided that the form of the part is such as will permit it to be located under the drop. It is especially designed to test couplers, draft gears, axles, rails and bolsters.

Parties interested in making use of the machine should communicate with Prof. W. F. M. Goss, Dean of the Schools of Engineering, Purdue University, Lafayette, Indiana.

Driving Wheel Drop Table---Southern Railway

THE Southern Railway has recently constructed a useful drop table at their shop in Atlanta, Ga., for raising and lowering driving wheels, in order to save labor and eliminate the necessity of jacking engines for the removal of drivers, as the equipment of the shop does not include a traveling crane over the erecting floor. A plan view of the plant and sectional elevations are shown by Fig. 1, and a cross section by Fig. 2. The drop table operates in a pit 40 ft. 1⅞ ins. long by 10 ft. 8½ ins. wide and is raised and lowered by supporting screws. The weight of the structure is carried by bearing nuts which engage the threads of the screws. There are eight such screws, set in niches in the walls of the pit, arranged on 12 ft. 9⅝ ins. centers longitudinally and 9 ft. 6 ins. centers transversely. They are supported on foundations of stone and each screw rotates in a cast iron pedestal cap. The table is constructed of wood and each section between the rows of columns is stiffened by truss rods on which turn buckles are arranged for taking up any slack which may develop. The side and end walls are built of brick 22 inches thick and the bottom of the pit is of concrete.

The mechanism operating the table entails no comlications and is very simple. Two longitudinal shafts extend the length of the pit, each one carried in a heavy wooden box placed above the longitudinal walls. Sections of these shafts include worms which engage the worm

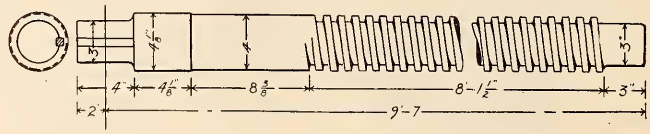


Fig. 3—Driving Wheel Drop Table, Supporting Screws.

wheels in which the several supporting screws terminate. Each shaft terminates in a bevel gear wheel which engages one of two similar wheels arranged in two pairs on a transverse shaft located over the south end wall of the pit. The gear wheels on the transverse shaft are arranged in pairs to provide for revolving the main shafts in either direction, thereby raising or lowering the table as desired. One end of the transverse shaft is supported by an outboard bearing and carries a pulley which is

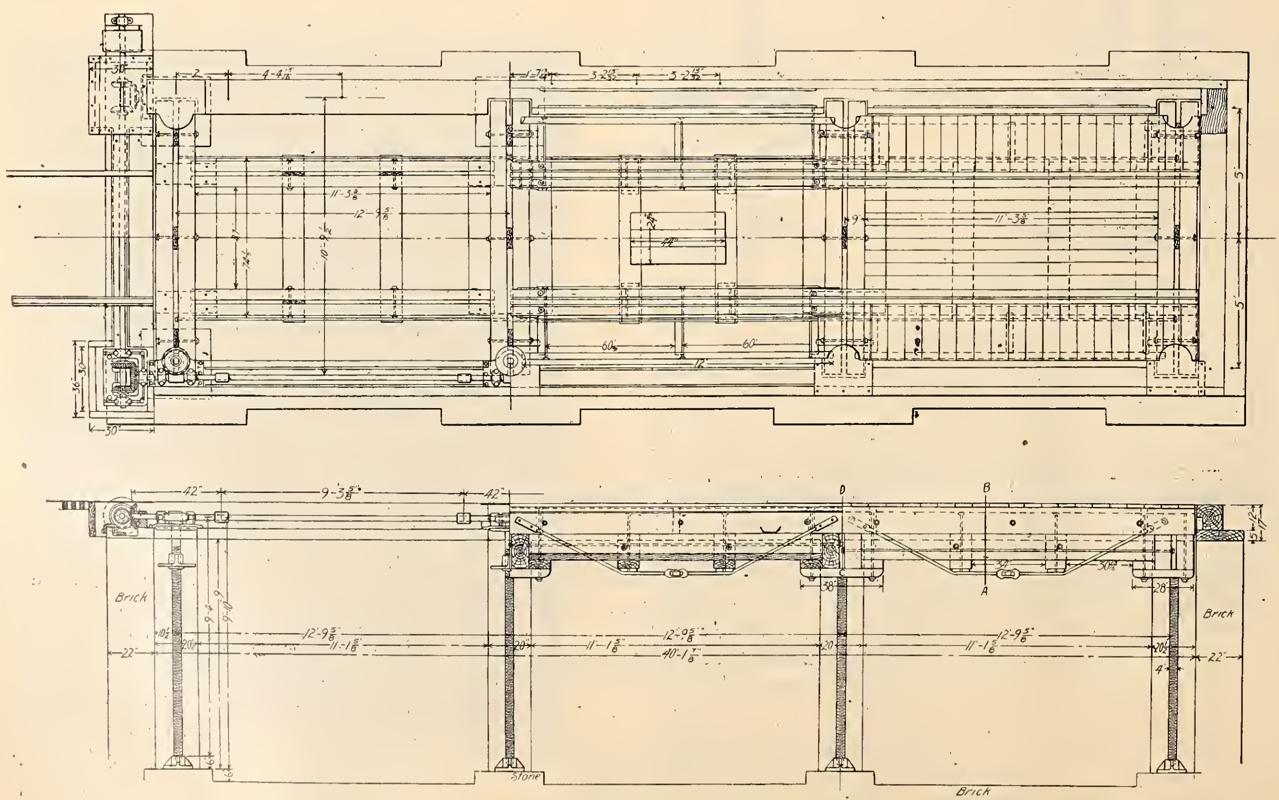


Fig. 1—Driving Wheel Drop Table, Plan View and Sectional Elevation—Southern Ry.

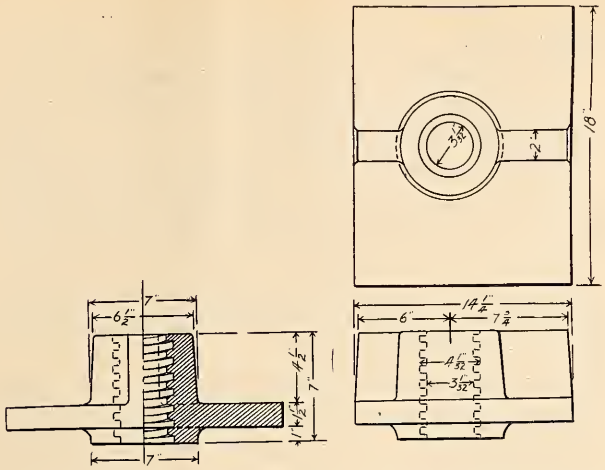


FIG. 4—DRIVING WHEEL DROP TABLE, BEARING NUTS.

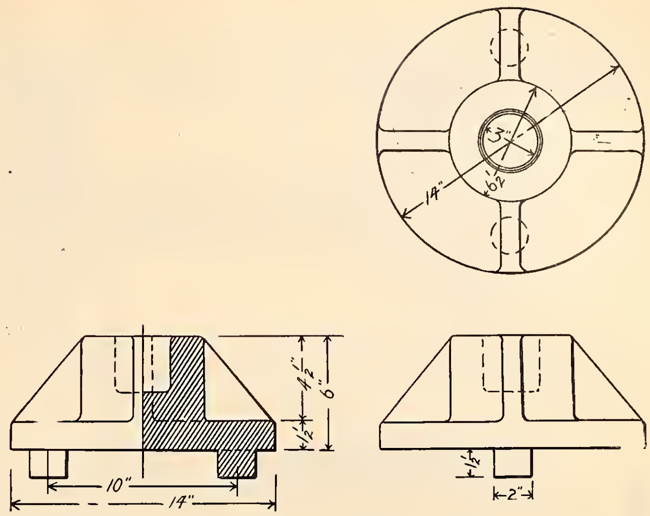


FIG. 5—CAST IRON PEDESTAL CAP FOR SUPPORTING SCREW.

connected by a belt to a countershaft above, rotating at 600 revolutions per minute. To engage either one of the sets of bevel gearing for operating and reversing the mechanism a sleeve is placed on the shaft between the bevel gears nearer the pulley and a lever pinned to this sleeve provides for the operator's control over the movement of the table.

To drop a set of drivers, a locomotive is delivered by the transfer table to the track connected with the drop table, and pushed into such position over the pit that all wheels are in the clear. Both ends are blocked up to support the weight of the engine and the table is depressed, lowering the wheels. When the table has been lowered a sufficient distance to permit the boxes to clear the pedestals, the wheels are rolled forward, lifted by an air hoist and placed on a track running the length of the building, by which they are delivered to the wheel lathes. A specially designed truck is then lowered into the pit and the table raised to its initial position when the weight of the engine is allowed to rest on the trucks. The locomotive is then returned to the transfer table and delivered to any desired erecting pit in the shop. The heaviest engine now in service on the road, and which it is probable will be placed over this pit in the near future, is a 2-8-0 freight locomotive weighing 200,000 lbs., of which 180,000 is on the drivers, and 20,000 on the truck. The wheel base of this class is 24 ft. 3½ ins. and the driving wheel base 16 ft.

In presenting the illustrations we acknowledge the courtesy of Mr. S. Higgins, late superintendent of motive power of the Southern Railway, and Mr. P. L. Raymond, general foreman of the Atlanta shops.

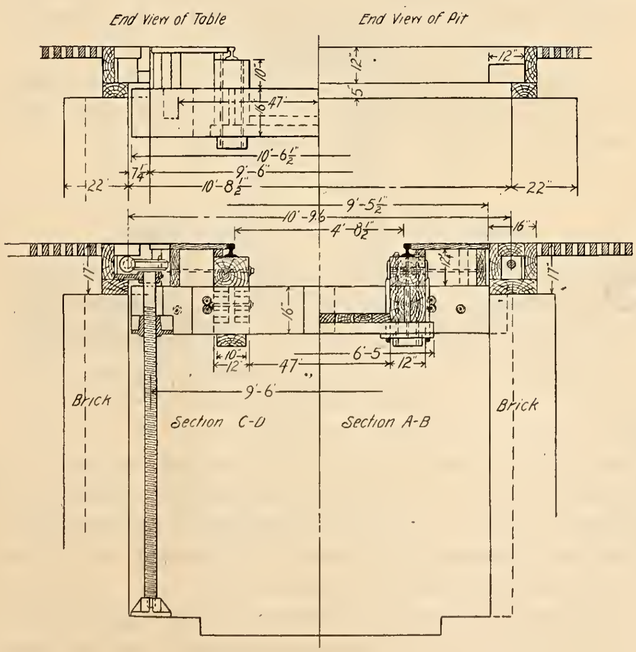


FIG. 2—DRIVING WHEEL DROP, TABLE CROSS SECTION—SOUTHERN RY.

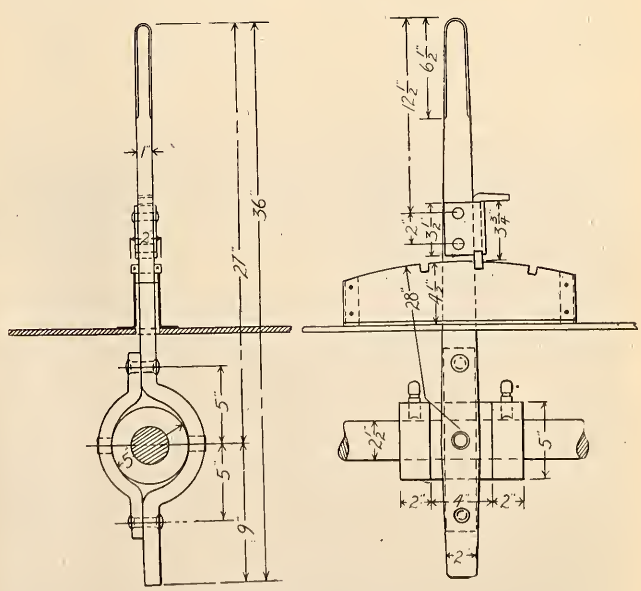


FIG. 6—DRIVING WHEEL DROP TABLE CONTROLLING LEVER.

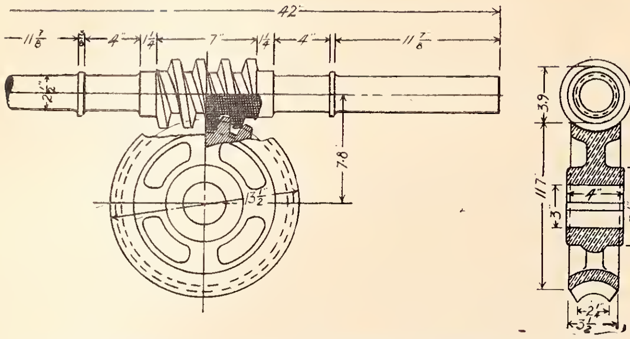


FIG. 7—WORM AND WORM WHEEL FOR OPERATING SUPPORTING SCREWS OF DRIVING WHEEL DROP TABLE.

The Care of Locomotive Boilers

IN following up the subject of the care of locomotive boilers, a set of instructions has come to our notice which we are pleased to be permitted to reproduce. A large per cent of locomotive failures are due to the boilers, a fact which makes their care of vital importance to motive power men. Realizing this, a prominent system has developed the following rules for the guidance of its men in order to promote efficiency in the proper care and handling of its boilers and we understand that since their adoption engine failures due to leaky tubes have become almost unknown.

INSTRUCTIONS TO FOREMEN, ENGINEMEN AND HOSTLERS.

1. Don't fail to examine the flues, staybolts and crown stays before engine leaves division points and to report if they are not in good condition.

2. Don't fail to keep up the fire, with the blower and fresh coal, if necessary, while putting feed water into a boiler, when not working steam.

3. Don't put more water into a boiler at stations than you can use to good advantage when pulling out.

4. Don't work both injectors at the same time when the engine is not using steam, unless it is necessary to prevent or stop popping or to protect the crown sheet.

5. Don't put a large quantity of water into a boiler at any one time, especially when there is ample time to put it in by small installments.

6. Don't reduce the steam pressure more than five (5) pounds in putting feed-water into a boiler, but shut the injector off to allow the steam pressure to raise, then start the injector again.

7. Don't open the fire door more than two (2) inches to prevent or stop popping.

8. Don't fail to bring your engine to the clinker pit track with a full glass of water and the fire in good condition.

9. Don't blow water out of a boiler when the fire is dirty, and in no case should there be more than one gage blown out at a time, without replacing the water blown out, being careful to keep up the same steam pressure.

10. Don't put water into a boiler with the injectors, while cleaning or knocking the fire, or after the fire is out.

11. Don't herd an engine with a dirty fire; the fire should be cleaned and the engine then placed on the herding track.

INSTRUCTIONS TO BOILER WASHERS.

1. Boilers cooled for any purpose should be given all the time possible to cool down.

2. When an engine has a brick arch in the firebox, not less than four hours' time should be used from the time the fire is knocked until the water is out of the boiler.

3. Blow the steam off slowly through the valve in the dome to less than ten (10) pounds pressure before cold water is forced into the boiler.

4. Connect washout hose to feed pipe with injector throttle always open, allowing water to go into the boiler until full; then open mud ring blow-off cock, allowing the water to run out as fast as it runs in. Continue this until the water coming from blow-off cock is not more than thirty (30) degrees warmer than the water entering the boiler.

5. Remove all washout plugs and thoroughly wash crown sheet first, except in case of crown bar boilers, then wash through back belly plug hole, then through front belly plug hole, or front end, and, lastly, through mud ring plug holes.

6. Fill boiler with water of a temperature within thirty (30) degrees of that used in washing.

7. When it is necessary to put water into a hot boiler before firing up, it should be put through the feed pipe with the injector throttle open the same as when cooling.

8. A change of water in the boiler should be made as per sections Nos. 2 and 3. Do not allow the water to get below the crown sheet and never let all of the water out of the boiler while changing. Proceed in this manner for thirty (30) to forty (40) minutes, leaving the water the proper height for fire. A change of water should always be made as above, when there is not time to cool and wash according to instructions.

9. Use graphite and oil on threads of washout plugs, and do not screw them too tight. A sixteen (16) inch wrench used with one hand is sufficient.

Repairs to 9 1-2 Inch Air Pumps

SUGGESTIONS in the practice of economy are always of interest and means by which savings may be made, even in repairs of small parts, never fail to be appreciated. Mr. H. F. Cunning, foreman of the air brake department, Roanoke shops of the Norfolk and Western Railway, has kindly sent us two blue prints illustrating practices in repairing 9½-inch air pumps which he has used to advantage. These are shown by Figs. 1 and 2, in which Fig. 1 represents the method of bushing reversing valve chamber and Fig. 2 method of bushing main valve bush.

A little observation will show that on most Westinghouse 9½-inch air pumps which have been in service hammer marks are evidence of the reversing valve chamber cap having been hammered to a greater or less extent by the engine men in attempting to jar the valve when it may have become stuck. The threads by which this cap is held are rather fine and the practice of hammering strips or breaks the thread and as this rough treatment is of very frequent occurrence a number of top heads have been thrown away in consequence. To obviate this loss Mr. Cunning has devised the method here shown in Fig. 1 for saving the head. The plan is to bore out the chamber to the depth of 1 11-32 inches and apply a brass bushing of the form shown by the illustration. The top portion of the bushing is threaded, to a depth of ½ inch, to fit the reversing valve chamber cap which is designated in the Westinghouse catalogue as No. 74. After the bushing is screwed into position a light cut is taken to true up the chamber for the reversing valve bush. As the latter is made large to allow repair men to turn to fit, a light cut taken through the chamber does not make any difference. The port by which the main valve chamber and the reversing valve chamber are connected and which is usually referred to in plates of the Westinghouse 9½-inch air pump as "e," is drilled after bushing is in position. This port is 5-16 of an inch in diameter, and is not included in the drawing. The outside hole through which the port is drilled is tapped out with a ⅜-inch standard tap, and plugged up. The face of the reversing valve cap is carefully scraped to seat upon the brass bushing and the reversing valve bushing. Within eight months 25 top heads have been saved by the method here described. It had heretofore been the practice to scrap these old heads, and the saving thus made can be readily appreciated. The cost of labor and material will not exceed $1.00 per head, and in consideration of the price of a new head, a saving of about $500 is effected in the number mentioned.

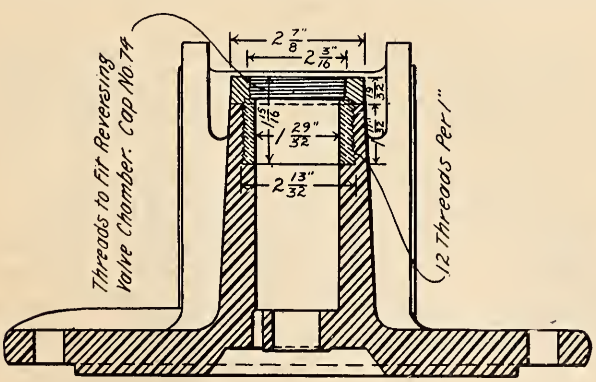


Fig. 1—Method of Bushing Reversing Valve Chamber of 9½-in. Air Pump.

The method of applying bushing to worn main valve bush is not entirely new, but is presented with the idea that it may be of interest to those air brake repair men who have not tried it, and who may have been in the habit of scrapping their old bushing. The inner bushing is made of bronze and where the main valve bush is bored out true the bronze bushing may be finished before it is applied. As the main valve bush is very thin in places after it is bored out, the bronze bushing should be carefully fitted, for if the fit is made too tight, the main bushing is liable to be cracked.

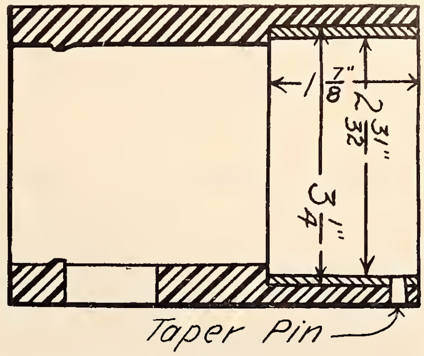
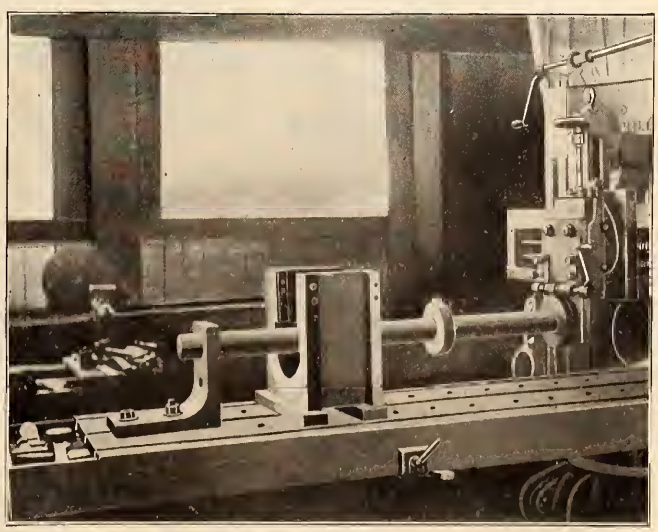


Fig. 2—Method of Bushing Main Valve Bush of 9½-in. Air Pump.

To prevent the bronze bushing from changing its position by turning and thereby blocking the port, a taper pin is put through the two bushings as shown. After the bushing is pressed into the head, it is impossible for this pin to work out. As the labor and material on each bushing will not amount to more than sixty cents, a considerable saving is effected.

A Device for Planing Crown Brass Fits

In the smaller shops, where the facility of a slotting machine is not available, it is not unusual to machine crown brass fits on a planer. The necessity of a device for accomplishing this work resulted in the design by Mr. J. S. Booth, master mechanic of the Carolina & Northwestern Railway at Chester, S. C., shown in the accompanying photo-engraving. The parts consist of a horizontal bar for carrying the tool, which is supported by the planer head at one end and at the other by a cast iron bracket which is bolted to the bed. The tool is secured



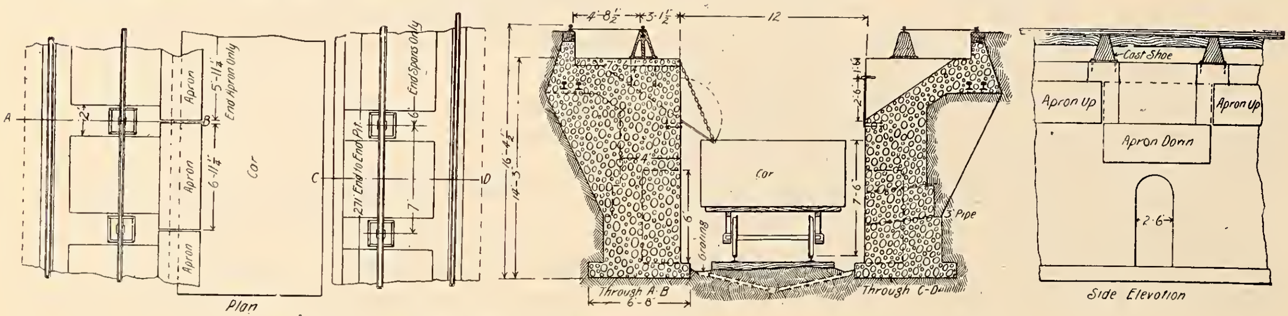
A Device for Planing Crown Brass Fits.

by a set screw, and for rigidity is backed by a cast iron collar, which in turn is held in place by a set screw. With the motion of the planer bed the bracket slides along the bar and the work is carried against the tool. The bar is rotated by a worm and gear wheel, motion being given to the former by a crank handle in the hands of the operator. The several parts may be made at small cost and are very simple. In this case the bar consists of an old piston rod from a narrow gauge engine, the worm is merely an old bolt with the ends turned down, and the teeth of the gear wheel were cut by a standard tap. To perform this job the tap was placed on the centers of a lathe and the gear wheel supported on the tool post in such manner that it might rotate. The threads of the tap turned the wheel as it was fed forward, so that an even pitch was obtained on the circumference of the wheel. The construction of the device is clearly shown in the accompanying illustration.

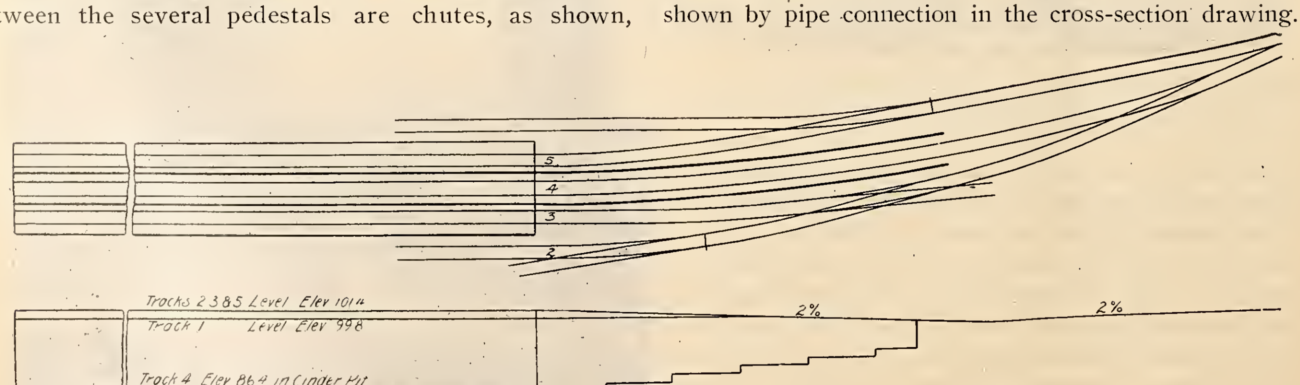
Cinder Pit at Shop of Terminal Railroad Association of St. Louis

THE design of the cinder pit at the new shops of the Terminal Railroad Association of St. Louis, located at East St. Louis, Ill., is one of the most interesting which has come to our notice. Its design is the work of the engineering department of the road.

The plan, cross-section and side elevation of the pit are shown by the illustration. Provision is made for two parallel tracks on which ash pans are dumped, and between these tracks is a depressed track on which gondola cars are run for receiving and transporting ash and cinders. The cinder pit is 271 ft. long, and throughout this length the depressed track is level, being elevated to grade beyond the pit. Each dump track is on a concrete foundation 16 ft. deep from top of rail, of a form shown by accompanying cross-section. The outer rail of each track is supported on a timber 10 in. square, which in turn rests on the concrete foundation. The inner rail of each track is supported on cast iron pedestals. Between the several pedestals are chutes, as shown, whose bottoms and walls are formed by the foundation material, and in which cinders are held by an apron which is kept closed by an automatic clutch. When the several chutes have become filled and a car has been run into the pit to receive the cinders, the aprons are freed and allowed to fall open, depositing cinders into the car. In order that the aprons may not open beyond a certain point, they are retained by a chain, which is also used to again close the chutes when they have been emptied. That portion of the foundation supporting the pedestals and between the chutes provides a surface for workmen to stand upon when cleaning ash pans. The rails are held from spreading by wrought iron tie rods. On each side of the depressed track are two niches in the walls of the pit, equally spaced from the ends, for the safety of employes who may be in the pit when a car is approaching. The bottom of the pit is convex, draining towards the sides, the side gutters being drained as shown by pipe connection in the cross-section drawing.



CINDER PIT—TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS.



Plan and Profile of Track Arrangement

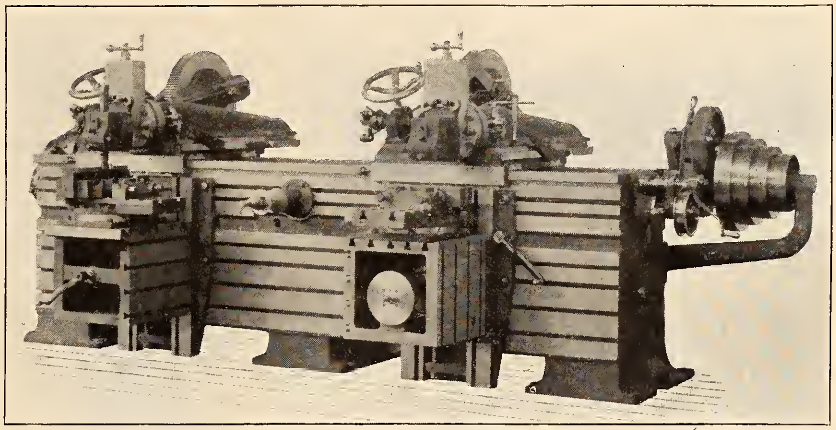
CINDER PIT—TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS.

Traverse Shaper With Pull Cut Head

THE difference between this and the ordinary type of traverse shaper is that the cutting tools are reversed, the cutting taking place during the backward motion of the ram and quick return during the forward, the operation being directly opposite to that in the usual form.

The advantage of this type is that the pressure or thrust of the tool is taken directly back against the bed of the machine, and tends to draw the table and apron more closely to the bed, rather than force them apart. This is of a decided advantage, especially when heavy cutting is being done, as is the case since the introduction of high speed steels. Then, in many cases, the work itself can be pressed directly against the bed of the machine, so that the resistance to the cutting is not altogether dependent upon the hard clamping of the work and the table. Large pieces can also be directly bolted to the bed, the tables being removed. This is of a decided advantage in certain classes of work.

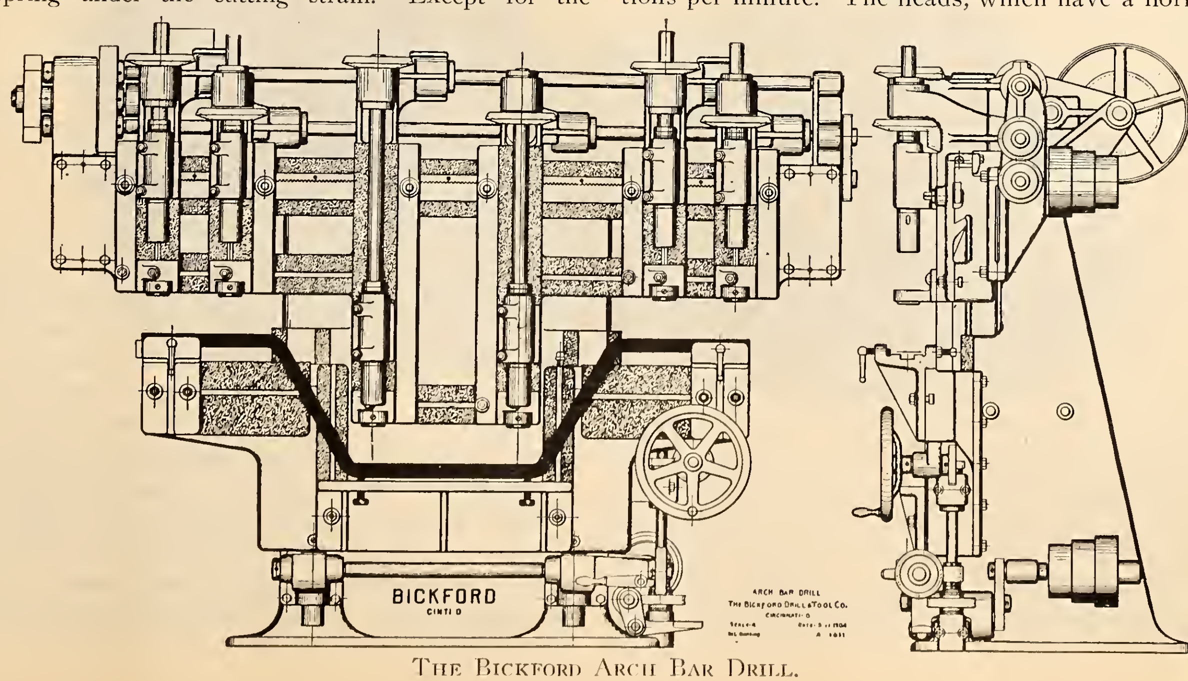
.The head is so constructed that the stress due to the cut comes directly upon solid metal contacts, and not upon threads, bolts or screw points, except in the case of the set screws for holding the tool. These screws are large in diameter, and have a long bearing. The whole construction of the head is one of great rigidity and strength, having the least possible tendency to yield or spring under the cutting strain. Except for the head, ram and such other modifications as have been deemed necessary, this traverse shaper is similar to the ordinary push cut machine heretofore and still made by the Cincinnati Shaper Company, Cincinnati, Ohio, the introducers of this tool.



Traverse Shaper with Pull Cut Head.

A New Arch-Bar Drill

AS an example of the development of machine design among machine tool manufacturers to provide for special classes of railroad work, appears a new arch bar drill here illustrated. It has been produced by the Bickford Drill & Tool Company, Cincinnati, O., and is designed for drilling with equal facility car trusses, arch bars and brake levers, ranging from a straight piece of 3 feet 6 inches between outside holes to one having a drop of 18 inches, with a length of 6 feet 8 inches between outside holes. The spindles are driven by a constant speed pulley which imparts to them through the medium of change gears, located at the left end of the machine, 8 rates of speed, ranging, in geometrical progression, from 32 to 77 revolutions per minute. The heads, which have a horizontal



The Bickford Arch Bar Drill.

rack and pinion adjustment on the rail, are fitted with individual jigs for steadying the ends of the drills. The two center drills have a vertical adjustment of 22 inches, readily adapting them to the offset of the work at hand and minimizing the reach of the outer spindles. The outer, or short, spindles have a vertical adjustment of 4½ inches. The table feeds upward and has feeds of .008, .011 and .014 ins. per revolution of drills. It is provided with quick advance and return, together with automatic trip and carries two end supports or jigs, which are adjustable horizontally and

Fig. 2—Adjustable Roughing Reamer.

which clamp the work in position holding it securely, also a center support or jig which is adjustable vertically, so as to be readily adapted to the form of work whether straight or having an offset in the center. The work is placed in the machine with the drop, or offset, down, as shown in the illustration, instead of with the offset portion towards the spindles as is sometimes done. The machine is capable of absorbing sufficient power to drill simultaneously six 2½-inch holes without causing undue wear in any of its parts. One of the chief features of this tool is its durability under continuous and severe duty. Its form of construction, practical and convenient arrangement for securing the work in position, together with the adjustable arrangement of the spindles, etc., is clearly shown in the illustration, and further features of interest are presented by the following general dimensions:

Diameter of short spindles, least section...1 15-16 in.
Diameter of long spindles, least section.......2⅛ in.
Spindles bored to fit Morse Taper..............No. 4
Vertical adjustment of short spindles......4½ inches
Vertical adjustment of long spindles........22 inches
Minimum distance between spindles 1 and 2..6 inches
Minimum distance between spindles 2 and 3..9 inches
Minimum distance between spindles 3 and 4.12 inches
Maximum distance between spindles 3 and 4.20 inches
Maximum distance between end spindles...6 ft. 8 ins.
Max. distance under spindles over end jigs..14½ ins.
Max. distance under spindles over center jig.2 ft. 8 ins.
Horizontal adjustment of end jigs..........15 inches
Vertical adjustment of center jig..........18 inches.
Maximum feed of table......................5 inches
Size of driving pulley.................20x5½ inches
Size of tight and loose pulleys.........22x5½ inches
Width of driving belt.....................6 inches
Speed of countershaft...............300 revolutions
Floor space required..........4 ft. 1 in. x 9 ft. 10 in.
Approximate weight.....................12,000 lbs.

Adjustable Reamers

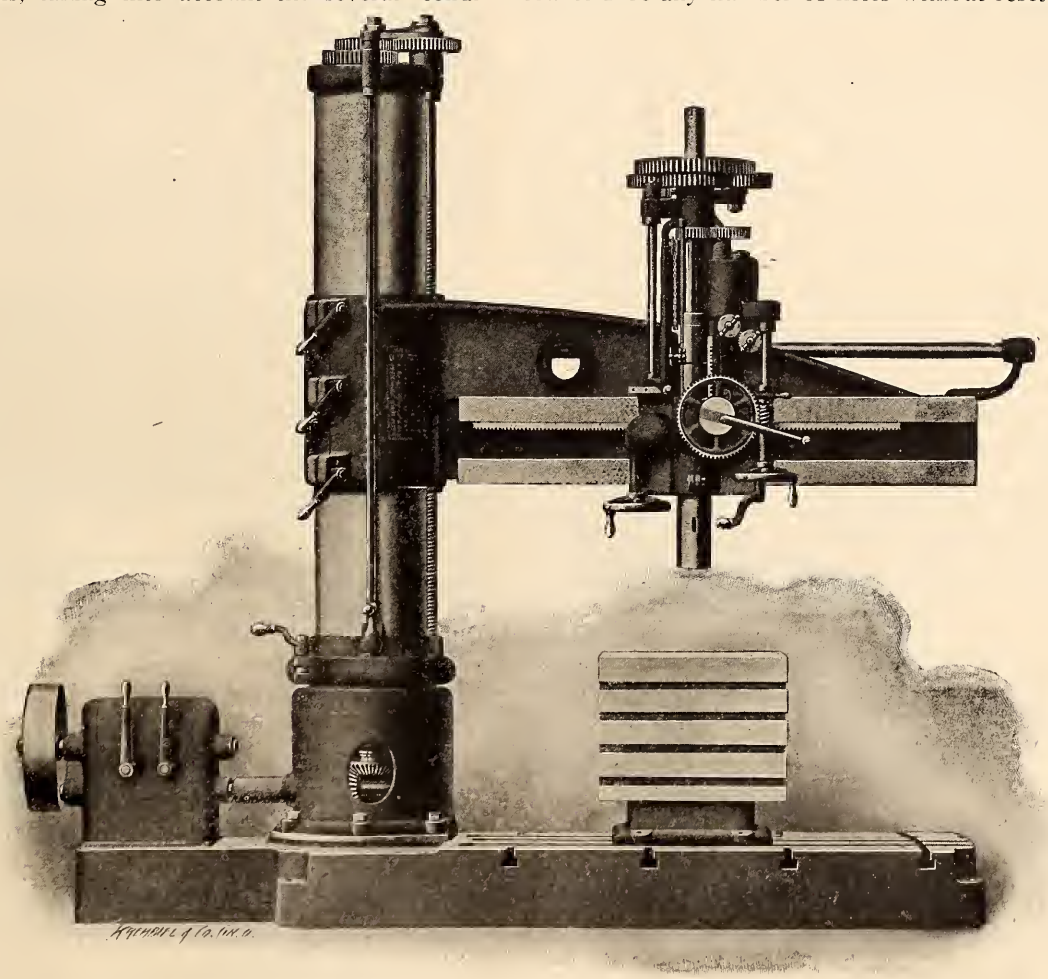
A DEPARTURE in reamer construction has been introduced by the form of tools of this class produced by Shellenbach & Radcliffe of Cincinnati, O., which are here illustrated. Two types of the adjustable reamer are made, the universal, as shown by Fig. 1. and the roughing reamer, shown by by Fig. 2. Of the former there are three styles, the shell, hand and machine reamers. Taking up these types in order, the universal reamer consists of a body of machinery steel, from 6 to 12 cutting blades, an adjusting collar which operates over a threaded surface and a locking collar which secures the adjusting collar in position when the desired adjustment has been obtained. The body of the reamer is milled to receive the blades and the bottom of each groove is tapered. The bottom surface of each blade is arranged on the same taper and desired diameters of the cutting edges are obtained by either raising of lowering the blades in the body, the tapered form causing the blades to protrude or recede according to the adjustment, which is provided for by the adjusting collar. The adjusting collar has a groove turned on its inner face to engage the tongue milled on the end of each blade. Turning the collar moves all blades simultaneously, and when the desired adjustment has been reached the locking collar is turned against the adjusting collar. The collars are operated by a spanner wrench provided with each tool. The blades are held securely in position by set screws whose bottoms engage the surface of a groove milled in one of the side faces of each blade. When it is desired to adjust the blades the set screws are given about one-quarter turn to release the blades and after they have been adjusted by the collar the set screws are again tightened up and the blades are rigid.

Fig. 1—Universal Reamer.

The roughing reamer has no universal adjustment. Its body is of machinery steel milled to receive cutters of high speed tool steel. Each blade has a groove milled near its bottom on a taper with its bottom edge. Set screws passing through the body of the reamer engage the edge of this groove securing the blade in place. It is readily seen that with the taper form of the bottom of the groove and the location of the set screws their adjustment is rigid and the blades cannot be forced out of position when in contact with the work. The heel sides of the cutters are given ample clearance. When the cutting ends of the blades become worn, adjustment is provided for by driving them forward from the shank end of the reamer. This tool is for use in connection with cored work where a considerable amount of stock is to be removed without preliminary boring. When started true this tool will ream a round hole straight through the work, even though the cored hole may not have been truly located. With such work a 2-in. reamer will remove ¾-in. of stock at one cut. The cutters are interchangeable and are made for hard and heavy service. Tools of this form are made in sizes from 1 in. to 12 ins. in diameter, those 3 ins. in diameter and over, are made in shell form.

Improved Plain Radial Drill

RADICAL changes have taken place in the past few years in the standard of construction of radial drills. In order to keep fully abreast of the changed conditions and greatly increased duties now confronting the radial drill, the American Tool Works Company of Cincinnati, have just redesigned throughout their type of radial drills, taking into account the several conditions influencing modern radial drill work. In the accompanying illustration is shown their new improved plain radial drill, which can be furnished with 4, 5, 6 or 7 ft. arms. A feature worthy of attention on this new drill is the feeding mechanism in the head, an entirely new and original construction. It provides eight distinct rates of feed to the spindle. These feeds are all obtained by the simple turning of a dial shown on the feed box, until the desired feed, indexed thereon, comes opposite a fixed pointer. This method is a simple one, as it requires no reference to index plates and subsequent handling of levers. The feeds operate through a friction, which permits a drill being crowded to its limit without strain to the feed works. A plate is provided, indicating twist drill sizes, from 1½ inch to 3½ inches inclusive, and their respective proper feeds, which, in connection with the dial index, enables the operator to secure immediately the proper feed for the twist drill he is using. This involves no guess work, saves a great deal of time, and insures the drill being used to its full capacity. Feeds can be automatically tripped at any position of spindle by adjustable trip dog and pointer, acting on the work clutch. Depth graduations are on the spindle, and all depths can be read from zero. Two or more dogs can be supplied, making it possible to counterbore any number of holes without resetting. The trip acts automatically at full depth of spindle, preventing breakage of feed mechanism. The speed box is of geared friction type, providing four changes of speed, each being instantly available by use of the two levers shown. Frictions are of patent double band type, employing very few parts in their construction, which can



Improved Plain Radial Drill.

thus be made of such large proportions as to be free from slipping under the severe cuts, and obviating the use of loose delicate parts. A motor of any type may be readily attached at any time that it may be desired to change to individual drive, connection being made through chain gear, or belt. The speed box can be easily interchanged with a cone by simply breaking a coupling connection on the lower driving shaft of the machine. The spindle has sixteen changes of speed, all immediately available without stopping the machine. This wide range of spindle speeds, combined with the exceptional driving power of the machine, renders the drill equally efficient with either ordinary or high speed twist drills. The column is of double tubular type. The outer column is practically integral with the inner column, which extends the entire height and has full bearing for outer column, at both top and bottom. This gives the equivalent of a double column, affording exceptional rigidity. The arm is of parabolic beam and tube section, giving the greatest resistance to bending and torsional strain. Its design leaves the lower line parallel with the base, and thus permits work being operated upon in close proximity to the column without the necessity of an extreme reach of spindle. The arm is raised and lowered rapidly by a double-thread coarse pitch screw hung on ball bearings, and controlled instantly by a convenient lever. The back gears are located on the head, thus bringing the greatest speed reduction direct to the spindle. They may be engaged or disengaged without shock or jar while the machine is in operation. The spindle is counter-balanced and has frictional quick advance and return. The tapping mechanism is carried on the head, between the back gears and speed box, thus giving to the friction, already very powerful, the benefit of the back gear ratio, making unusually heavy tapping operations possible and also permitting taps to be backed out at an accelerated speed. The lever for starting, stopping, or reversing the spindle is controlled at the head from the front of the machine.

Personals

Mr. H. D. Taylor, superintendent of motive power of the Lehigh Valley, has resigned.

Mr. George H. Brown has been appointed master mechanic of the St. Louis & San Francisco at Fort Smith, Ark.

Mr. E. J. Shipp has been appointed master mechanic of the Mexican Railway, with office at Apizaco, Mex.

Mr. G. W. Bynow has been appointed general foreman of the Delaware, Lackawanna & Western at Scranton, Pa.

Mr. J. R. Skinner, assistant superintendent of motive power of the Delaware & Hudson at Oneonta, N. Y., has resigned.

Mr. H. C. Chandler has been appointed general storekeeper of the Chicago Great Western, with office at Saint Paul, Minn.

Mr. I. T. Custer, chief clerk to the general storekeeper of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed general storekeeper of the Coast Lines at Albuquerque, N. M.

Mr. W. Norman Dietrich has been appointed electrical engineer of the Canadian Pacific, with office at Montreal, Que.

Mr. R. H. Barber has been appointed acting mechanical superintendent of the Santa Fe Coast Lines, with office at Los Angeles, Cal.

Mr. C. Barruzzi has been appointed master mechanic of the Hoosac Tunnel & Wilmington, with office at Readsboro.

Mr. John Cool has been appointed road foreman of engines of the New York Central & Hudson River Railroad at Syracuse, N. Y.

Mr. P. H. Connors, superintendent of the Susquehanna division of the Delaware & Hudson at Oneonta, N. Y., has resigned.

Mr. R. J. Turnbull, foreman of the Illinois Central shops at Burnside, Ill., has been appointed master mechanic at Paducah, Ky.

Mr. W. A. Meagher has been appointed master mechanic of the St. Louis, Watkins & Gulf, with headquarters at Lake Charles, La.

Mr. Wm. Miller has been appointed master mechanic of the Terminal Railroad Association of St. Louis. Effective April 1, 1904.

Mr. T. F. Barton, master mechanic of the Illinois Central at Paducah, Ky., has been appointed master mechanic of that road at Chicago.

The headquarters of Mr. Maynard Robinson, division master mechanic of the Gulf, Colorado & Santa Fe, have been removed from Beaumont to Silsbee, Tex.

The headquarters of Mr. G. A. Schmoll, superintendent of motive power of the Baltimore & Ohio, have been removed from Newark, O., to Wheeling, W. Va.

Mr. F. A. Symonds, heretofore shop foreman of the Louisiana & Arkansas, has been appointed master mechanic of that road, with headquarters at Stamps, Ark.

The office of Mr. Alfred Lovell, assistant superintendent of motive power of the Atchison, Topeka & Santa Fe, has been removed from Topeka, Kan., to Chcago.

Mr. John Pullar, foreman of the Atchison, Topeka & Santa Fe shops at Los Angeles, Cal., has been appointed master mechanic of the Mexican International at Durango, Mex.

Mr. J. F. Roberts, heretofore road foreman of engines of the National Railroad of Mexico, has been appointed master mechanic of that road, with office at the City of Mexico.

Mr. R. E. McCarty has been appointed assistant road foreman of engines of the Pittsburg division of the Southwest system of the Pennsylvania Lines, with office at Carnegie, Pa.

Mr. M. R. Coutant, heretofore division master mechanic of the Erie at Susquehanna, Pa., has been appointed master mechanic of the Ulster & Delaware, with office at Rondout, N. Y.

Mr. William Wright has been appointed superintendent of motive power of the Chicago, Rock Island & Pacific, with headquarters at East Moline, Ill. Mr. Wright was formerly with the Vandalia Line.

Mr. J. A. Pool, general foreman of shops of the Seaboard Air Line at Americus, Ga., has been appointed master mechanic of the Fourth and Fifth divisions, with headquarters at Savannah, Ga.

Mr. H. A. Bowen, who has for some time been master mechanic of the Cold Blast Transportation Company, Chicago, has resigned.

Mr. M. H. McGlasson has been appointed master mechanic of the Midland Valley Railroad, with headquarters at Hartford, Ark., to succeed Mr. E. L. Moon.

Mr. J. J. Shaw, master mechanic of the Denver, Enid & Gulf, at Enid, Oklahoma, has resigned, to take effect May 1st. The office has been abolished and the duties are assumed by the general superintendent.

Mr. E. B. Gilbert, heretofore master mechanic of the Bessemer & Lake Erie, has been appointed superintendent of motive power in charge of maintenance and equipment, and the former office has been abolished.

Mr. Eugene McKann has been appointed acting general foreman of the Wabash Railroad at Delray, Mich., to succeed Mr. J. M. Barnes. Mr. McKann has heretofore been general foreman at Peru, Ind.

Mr. A. Stewart, heretofore general master mechanic of the Southern Railway at Birmingham, Ala., has been appointed mechanical superintendent of that road, with headquarters at Washington, D. C., effective April 1, 1904.

Mr. W. H. Hudson, master mechanic of the Southern Railway at Atlanta, Ga., has been appointed general master mechanic of the western district of that system, with office at Birmingham, Ala., effective on April 5.

The jurisdiction of Mr. W. C. Ennis, master mechanic of the Pennsylvania Division of the Delaware & Hudson Railroad, has been extended over the Susquehanna Division, with headquarters at Oneonta. Effective March 23, 1904.

Mr. T. N. Gilmore, heretofore master mechanic of the Terminal Railroad Association of St. Louis, has been appointed assistant to the general superintendent of motive power of the Rock Island, with headquarters at Chicago.

Mr. H. L. McLow, heretofore division master mechanic of the El Paso & Northeastern at Santa Rosa, Tex., has been appointed assistant superintendent of motive power of that road, with headquarters at Alamogordo, N. M.

Mr. G. R. Joughins has resigned as mechanical superintendent of the Coast Lines of the Atchison, Topeka & Santa Fe at Los Angeles, Cal., to accept the position as mechanical superintendent of the Intercolonial Railway of Canada at Moncton, N. B.

Mr. W. S. Morris has resigned as mechanical superintendent of the Erie, and Mr. George W. Wildin, recently appointed assistant mechanical superintendent, has been appointed acting mechanical superintendent, with headquarters at Meadville, Pa.

Mr. S. M. Dolan, master mechanic of the Southern at Selma, Ala., has been transferred to Atlanta, Ga., to succeed Mr. W. H. Hudson, who has been promoted. Mr. N. N. Boyden, heretofore foreman of locomotive repairs, has been appointed master mechanic at Selma, Ala.

Mr. J. R. Slack, superintendent of motive power of the Delaware & Hudson at Albany, N. Y., has been appointed assistant to the general superintendent, and has been succeeded by Mr. J. H. Manning, heretofore second assistant superintendent of rolling stock of the Canadian Pacific.

Mr. H. H. Vaughan having resigned as assistant superintendent of motive power of the Lake Shore & Michigan Southern to go to the Canadian Pacific at Montreal, the office has been abolished. Mr. R. B. Kendig, chief draughtsman, has been appointed mechanical engineer, with headquarters at Cleveland, O.

Mr. J. E. Mechling, assistant master mechanic of the Pennsylvania lines, with headquarters at Twenty-eighth street, Pittsburg, has been appointed to the position of master mechanic of the Vandalia system, with headquarters at Terre Haute, Ind., to succeed Mr. F. F. Hildreth, resigned.

Mr. S. L. Bean has been appointed mechanical superintendent of the Santa Fe coast lines, with headquarters at Los Angeles, Calif., to succeed Mr. J. R. Joughins, resigned. Mr. Bean has been master mechanic of the Santa Fe at Albuquerque, N. M., for about a year, previous to which time he was master mechanic on the Northern Pacific.

Mr. H. W. Arnold, who resigned as general foreman of the Santa Fe shops at Newton, Kan., in February, has gone to Raton, N. M., where he will have charge of the Santa Fe shops at that point. Mr. Charles Wincheck, who recently resigned as master mechanic of the Mexican Central, has been appointed general foreman of the Santa Fe shops at Needles, Cal.

Mr. J. W. Oplinger has been appointed mechanical inspector of the Atlantic Coast Line, with headquarters at Wilmington, N. C. Mr. Oplinger will report to and receive instructions from Mr. R. E. Smith, assistant to the general manager. He will confer with the superintendents of motive power and the master mechanics in reference to mechanical details. Mr. Oplinger has heretofore been master mechanic of the company at South Rocky Mount, N. C.

Mr. A. E. Mitchell has resigned as superintendent of motive power of the Northern Pacific, effective on May 1, to accept the position of superintendent of motive power of the Lehigh Valley, with headquarters at South Bethlehem, Pa. Mr. Mitchell has been with the Northern Pacific since August 15, 1902, previous to which date he was for less than a year assistant superintendent motive power of the Chicago, Milwaukee & St. Paul. He was formerly for many years superintendent motive power of the Erie.

Robert Sample Miller, until recently associate professor of machine design of Purdue University, died on March 27, 1904, at Lafayette, Ind., at the age of 28 years. Professor Miller was a graduate student of Purdue University, having finished his course in 1897. After his graduation he was appointed assistant in mechanical engineering, a year and a half later he was made assistant professor of machine design, and in 1901 was promoted to the position of associate professor of machine design, which position he held until near the close of his life. In the summer of 1902 he was given leave of absence, on account of ill health, and went to Colorado. He was somewhat benefited by this change, and accepted an appointment as professor of mechanical engineering in the University of Colorado, at Colorado Springs. He was, however, obliged to give up this position within a very short time, on account of illness. He afterward returned to Lafayette, where he died within a few weeks.

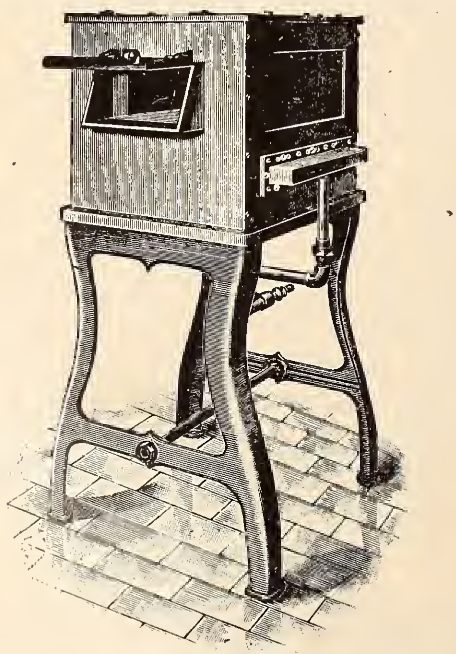
Technical Publications

Suplee's Mechanical Engineer's Reference Book.—This book is devoted principally to the presentation of tables, formulas, and reference data for mechanical engineers. Its strongest features are in the portions relating to machine design and to such information as will render it useful in the drawing room and in the designing room, rendering it available in furnishing a record of general principles as well as of detailed method. Only those formulas which are most generally applicable have been presented thus relieving the user of the necessity of selecting from a mass of contradictory information. In view of the fact that the metric system has been under active discussion of late, a number of the tables have been presented in both British and metric units, so that those engineers who are desirous of using the latter system may do so. Among these tables may be mentioned the metric steam table, which renders it convenient for steam computation to be made in the metric system. The work as a whole is subdivided under the following headings: Mathematics, Mechanics, Materials of Engineering, Strength of Materials, Machine Design, Heat, Air, Water, Fuel, Steam, Steam Boilers, Steam Engines, Internal Combustion Motors, Cost of Power, and Works Management. A feature of convenience is the provision of thumb indexes to facilitate the immediate location of the several subdivisions concerning the subjects treated. Published by J. B. Lippincott Company, Philadelphia. Price $5.00.

THE 1904 AIR BRAKE CATECHISM BY C. B. CONGER.—The twenty-second edition of Mr. Conger's air brake catechsim is now appearing under the above title. The work has been thoroughly revised and brought up to date. It embodies the latest types of both the Westinghouse and New York air brake systems and has been approved by officers of both companies. The text is well illustrated by line drawings of the several parts of the air system. In addition to the general descriptive matter, an interesting feature to those preparing for promotion is the list of air brake examination questions. The book is strongly bound and is of convenient size to be carried in the pocket. Published by Derry-Collard Company, New York City. Price $1.00.

Hardening and Annealing Furnace

The accompanying illustration represents the hardening and annealing gas furnace, No. 4, manufactured by the C. B. Manchester Gas Furnace Company, of Providence, R. I. Furnaces of this type are designed to heat a square or oblong



HARDENING AND ANNEALING FURNACE.

piece of any desired dimensions evenly throughout, to any required degree from cherry red to white heat, and to maintain the required temperature steadily. They will do the work of Muffle furnaces perfectly, except where the absolute seclusion of the work from the products of combustion is necessary. They are used for heating cutters, dies, reamers, shears and knife blades, saws, and for annealing all kinds of work of steel, iron, brass and other metals. The floor space occupied by this furnace is 24 by 30 ins.; its heating space is 10 by 18 ins. and the door opening is 10 by 6 ins. It uses 125 ft. of gas per hour.

New Type of Canvas Diaphragm

It is a fact, though perhaps unnoticed by those not directly connected with the transformation, that no part of a vestibule passenger car has undergone so complete a change in the matter of general practice as the diaphragm. Within the past three years the canvas diaphragm has displaced those made of rubber on fully 95 per cent of the railroads in the United States, and at the largest car building plant in the country only two cars have been equipped with rubber diaphragms during the past year. In that short space of time the rubber diaphragm has been almost univer-

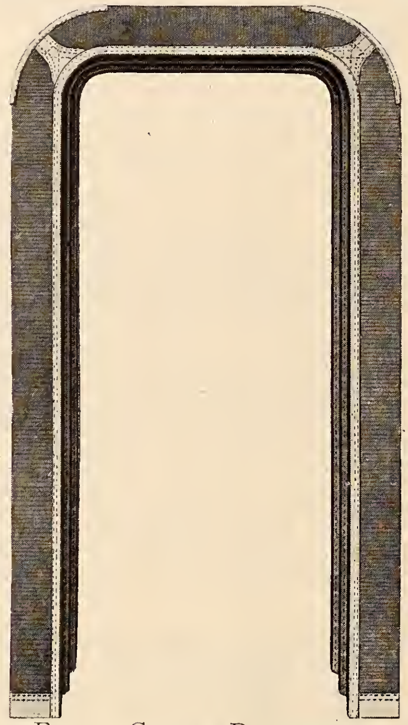


FIG. 1—CLIMAX DIAPHRAGM.

sally supplanted by a diaphragm made of canvas belting. There is nothing strikingly new about diaphragms made of belting, as the first full sized sectional model prepared for Mr. Sessions, the inventor of the Pullman vestibule, was made of belting riveted together and the second was of rubber belting cemented together. The latter form was adopted by Mr. Sessions, and was for many years universally used until owing to competitive activity the quality deteriorated until the average life of rubber diaphragms was reduced to two and one-half years. About the same time the Wagner vestibules were equipped with canvas sewed diaphragms, many of the original being still in service on the Northern Pacific Road.

Several roads began about 15 years ago to substitute canvas sewed diaphragms, among them being the Northern Pacific, Atchison, Topeka & Santa Fe, Rock Island, Chicago, Milwaukee & St. Paul and Chicago & Northwestern. Later on several others followed, but it was not until January, 1901, that a canvas diaphragm was commercially made. The reduced first cost being one-half and the durability several times as great, this form found ready sale, but about a year later, owing

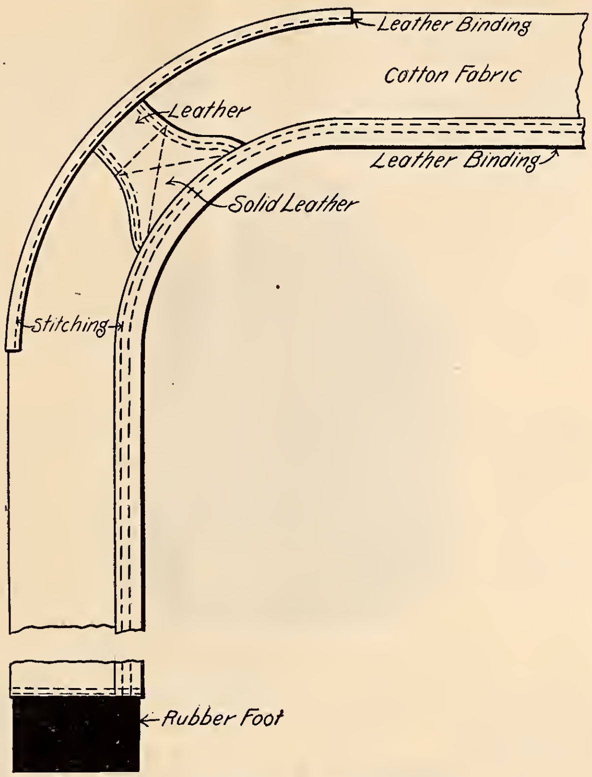
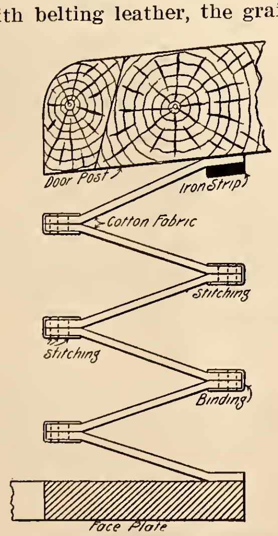


FIG. 2—PULLMAN DIAPHRAGM.

to complaints, the riveted form was abandoned by the members of the manufacturing firm, and a sewed diaphragm substituted. This proved very popular and the sales of the riveted diaphragm dropped from about 500 in May, 1902, to 36 in December, of the same year, while in the same period of time the sales of the sewed type increased from 30 to 895.

This sewed form met the requirements very well in some respects, but car builders soon found that a stronger corner could be produced to hold up the crown or top and prevent sagging; a more substantial binding could be used capable of resisting wear and the elements, and an adjustable foot or bottom used which could be cut off without the material unraveling and preventing danger of burning.

To meet these requirements the "Climax" diaphragm has been put on the market by the same firm which originally and for several years later exclusively supplied diaphragms to the Pullman Company. The "Climax" is ordinarily bound with belting leather, the grain being used for the inside and



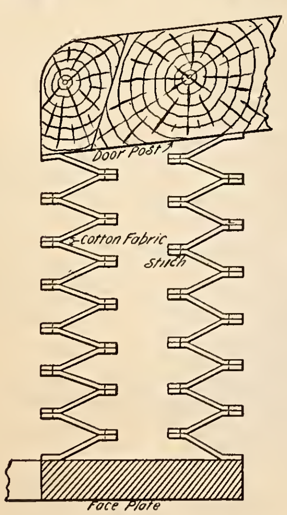


FIG. 3—CROSS SECTION OF THE PULLMAN DIAPHRAGM.
FIG. 4—CROSS SECTION OF THE GOULD DIAPHRAGM.

the split—which is capable of being more thoroughly water the weatherproofed—is used on the outside. Where especially requested rawhide or other binding can be used.

The corners of the "Climax" are constructed on mechanical lines so as to form a keystone at the top and thus prevent sagging. The corner is made by inserting a solid leather fillet, triangular in shape as shown in figure 2. This is the thickness of the belting, so that it prevents cutting away any material at the corners and allows the inside of the belting to form a perfect retangular joint. The upright and longitudinal sections are then securely "tied" by two heavy locked stitches practically parallel. Then when the heavy binding is applied the sections are absolutely "framed" in as will appear from the illustrations. To prevent errors due to shrinkage or variations in car heights, and to furnish a durable wearing part where the diaphragm rubs against the lower buffer plates and at the same time allow

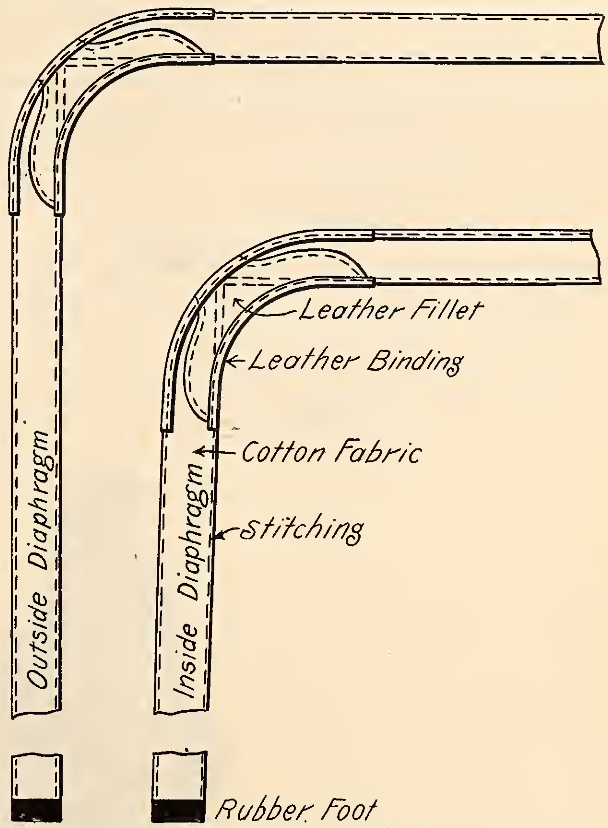


FIG. 5—THE GOULD DIAPHRAGM.

the bottom to be trimmed to a proper fit and to prevent the material from unravelling, feet of rubber packing are used.

The "Climax" is treble sewed throughout, with a locked stitch of eight strand Irish linen thread. One seam is sewed through the edges of the belting before the binding is applied and thus absolutely protected from the weather, and two more seams spaced about a quarter of an inch apart through the binding. The complete diaphragm presents a thoroughly substantial and mechanical appearance.

The corner construction of the Gould is similar to the Pullman type, differing only in dimensions and number of folds or leaves.

The "Climax" is made to conform to all types, including Pullman, Gould, American Car & Foundry and Buhoup vestibules.

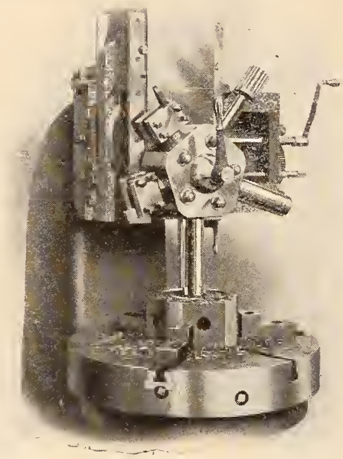
In all other types the same relative points of betterment are retained, as will appear from the illustrations.

Where rivets are asked for on the Pullman type they are supplied at no extra cost, but one of the three seams is omitted to make room for the insertion of the rivets.

Patents fully covering the essential features of the above diaphragm have been allowed by the United States patent office, and, remarkable as it may appear, there was not a single citation as to infringement. The "Climax" is manufactured by W. H. Salisbury & Co., No. 109 Madison street, Chicago, where they have established a complete factory, and the department is under the management of Mr. Fred F. Bennett, well known in connection with the manufacture and sale of canvas diaphragms. Mr. Warren M. Salisbury, the head of that firm, prepared the models for Mr. Sessions' diaphragm, referred to above, and supplied the first diaphragm ever applied to a passenger car.

Thirty-Four Inch Vertical Boring and Turning Mill

The accompanying half-tone engravings illustrate a 34-inch vertical boring and turning mill built by the Colburn Machine Tool Company, Franklin, Pa., and the set of tools in finishing turret used in its operation. The capacity of this mill is 34 inches in diameter. It will take 14 inches under cross rail and 22 inches under the turret. It has 16 changes of speed, varying from 2⅜ to 68⅜ revolutions per minute. The feeds are positive, gear driven, both vertical and horizontal, and provided with adjustable automatic stops. The chuck is of extra heavy design, and all parts are very strong. The scroll is made from a steel forging, and the chuck is both universal and independent. The jaws are fitted in T slots, planed in supplementary steel slides which can be adjusted separately by an independent screw underneath. The driving cone shaft is placed parallel with the cross rail and the machine may be located under a traveling crane and belted back to the countershaft, leaving a clear space overhead for crane service. The driving gear is of cast iron and made fast to the chuck, so that there is no twisting strain on the spindle. It is driven by a 3 pitch steel pinion through a powerful train of gears. The ratio of the constant train is 7½ to 1, and the ratio of back gears is 45 to 1. The 16 changes are graded to give a perfect goemetrical progression. The spindle is 6 inches in diameter and runs on a bronze shoulder ring.



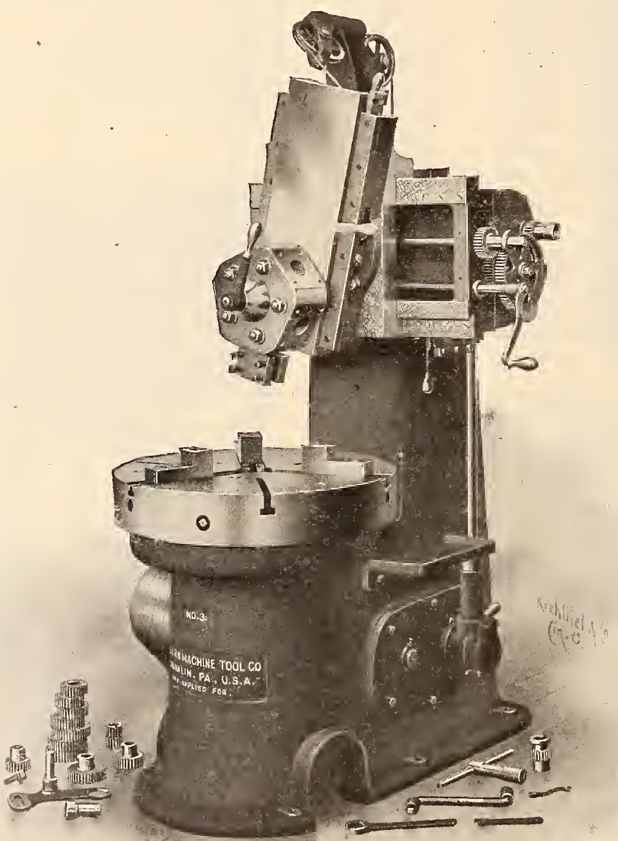
Set of Tools Finishing Turret.

The vertical slide has a travel of 18 inches either by hand or power, and is carried on a swivel saddle attached to the cross slide by four bolts, working in a circular T slot. When the power feed is used, an adjustable automatic stop regulates the length of travel as desired. A graduated scale 18 inches long is attached to the turret slide cap, parallel with rail within easy reach of operator, and without having to use a wrench.

The turret is 10 inches in diameter, five-sided ,and has a hole in each side bored to fit tool shanks, 2¼ inches in diameter. Each side measures 5⅝ inches long by 5⅜ inches high and has four ⅝-inch tapped holes for clamping special tools to turret. The turret has a clamp lever, which remains in a vertical position when released. The lock bolt is of hardened tool steel ground perfectly true, and works in a hardened tool steel index ring also accurately ground.

A micrometer dial is furnished to set over collar on cross feed screw, which proves a great convenience in providing a fine adjustment for depth of cut.

The thread cutting attachment may be quickly applied and the turret slide. The latter has an adjustable pointer which moves over the scale indicating at all times the travel of the turret slide. A counterbalance weight suspended within the column and connected to the turret slide makes it easy run-



34-in. Vertical Boring and Turning Mill.

ning. The turret slide can be swiveled to any angle up to 30 degrees either side of the perpendicular. This operation is unique and is accomplished by simply turning the crank on the vertical feed shaft, first having locked the weight cable by means of the clamp on the sheave wheel bracket on top of the machine, and loosening the clamping bolts on the swivel.

The cross slide has a travel of 15½ inches, either by hand or power. It is equipped with adjustable automatic stops for tripping feed, as well as means for clamping slide to cross remain permanently attached to the machine without interfering with its regular operation. It consists of an arm having a fixed stud forming a bearing for change gears. This is attached to the side of the feed gear case, so as to bring the change gear in mesh with the proper gear in the train.

The Cleveland Pressed Steel Carline

The use of steel in car construction is increasing rapidly, and a new company known as the Cleveland Car Specialty Company, of Cleveland, Ohio, has recently been organized to place on the market some pressed steel car specialties.

The Cleveland City Forge & Iron Company has just installed a complete plant of the latest types of heavy hydraulic and pneumatic machinery for the work of the Cleveland Car Specialty Company, and the first article ready for the market is the pressed steel carline. This carline is manufactured under the Haskell and Maltby patents now owned by the Specialty Company. There are now over 75,000 of them in service and they are constantly growing in favor.

The pressed steel carline is light in weight, pleasing in appearance, and very strong, being about 2½ times the strength of the same weight of rolled commercial shapes. The use of seven carlines per car (a reduction of practically 50 per cent over wooden carlines), at the same time gives greater strength and rigidity to the roof, and permits a saving in weight of from 250 to 300 pounds per car. The height at eaves with the pressed steel carline is from 2 to 4 ins. less, with same inside dimension, or the cubic capacity may be increased. The cubic capacity of the A. R. A. standard car is 2,448 cubic feet, while the same car with Cleveland Pressed Steel Carline has 2,537 cubic feet.

A 38 ft. car recently built, equipped with seven steel carlines was tested with a load of 15,000 pounds on the running board. This only caused a deflection of ⅜ in. in the carline, without any permanent set in the carline when the load was removed.

The pressed steel carline passes over the side plates, having lips turned down over outside of plates, to which carlines are securely fastened by half inch bolts which binds side plates together, making spreading of sides impossible. The steel carlines do not stretch, cannot shrink and are always the same distance apart, this in connection with the purlines and ridge pole securely bolted to carlines results in a rigid and substantial construction that proves a sure cure for leaky roofs.

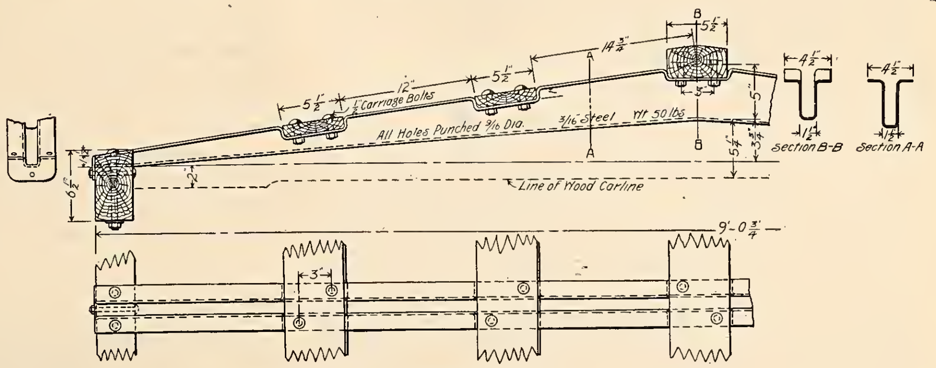
The steel carlines are indestructible, and in cases of total destruction of a car by fire or other causes, they will have a scrap value of $2.50 to $3.00 per car, and are guaranteed to last for the life of the car.

The Cleveland Pressed Steel Carline is designed to be used with any style of roof, whether outside or inside metal, plastic or double board and will increase the life of any car roof with which it may be used. In cars where the under course of boards are laid lengthwise of the car, a special nailing strip is inserted in the carline.

There are two designs of pressed steel carline, the standard U shape section, and a composite carline, being the wooden nailing strip combined with a one-half or Z section of the standard carline. The combined carline is designed particularly for use in connection with longitudinal roofing board construction.

With the use of the Cleveland Pressed Steel Carline, railroads will be enabled to obtain in freight cars and stock cars the very desirable points of increased capacity, greater durability, lighter and stronger construction without material increase in cost.

In addition to the carline, there will soon be ready for the market a new pressed steel spring plank and other pressed steel specialties.



THE CLEVELAND PRESSED STEEL CAR LINE.

Catalogue of Machine Tools, Niles-Bement-Pond Company

We are in receipt of a comprehensive catalogue of machine tools from the Niles-Bement-Pond Company, which is one of the best productions of its kind that has come to our notice. The catalogue opens with six full page illustrations of the various works of the Niles-Bement-Pond Company, and following these are thirteen pages of medals and diplomas awarded the various constituent companies of this concern. These medals date as far back as 1871. The medals of the more recent expositions, however, are much in the majority. The reproductions of the medals are particularly excellent.

After the medals, the main part of the catalogue begins. First are the machines for railroad shop use. These include a most complete line of driving wheel lathes. Fourteen different full-page illustrations are given of these machines, showing all sizes from 51-inch to 100-inch swing, and one or two special machines adapted particularly to the use of modern high power tool steels. The other railroad tools include three different styles of car-wheel lathes, a large variety of axle lathes, cutting-off and centering machines, quartering machines, car-wheel borers and hydrostatic wheel presses.

The next division of the catalogue is devoted to lathes including all sizes from the Pratt & Whitney bench lathe to the massive Bement 125-inch crank shaft lathe. The large variety of heavy lathes shown is especially complete. Besides the standard lathes, a number of special lathes including pulley lathes, turret lathes and automatic screw machines are shown.

Fifty pages are devoted to planing machines, and a specially large variety of heavy planers are shown. Various methods of driving by magnetic clutches and motor mounted on the top of housings are illustrated. The large portable rotary planers are among the most interesting machines described in this section of the catalogue. These machines are self-contained, the motor being mounted on the saddle. The largest has a swing of 120 inches, and is arranged so that it can be lifted by a crane and placed in any position on a floor plate. Slotting machines and milling machines take a large number of pages; several very handsome full-page illustrations being devoted to work done on the Pratt & Whitney thread milling machine. A large number of heavy drills are shown, including vertical drills, radial drills and multiple drills.

Among the most interesting pages in the catalogue are those devoted to boring machines. First are the horizontal boring machines which include all varieties of boring machines in which the work remains stationary, the cutting being done by revolving cutters. A particularly complete line of floor boring machines or horizontal boring, drilling and milling machines are shown, including every conceivable variety of these machines.

Fifty pages are devoted to boring and turning mills. Here again, the large mills are most interesting, but more space has been devoted to describing the smaller machines. The 16-foot and 20-foot mills are particularly massive.

Following the section on boring and turning mills are a few pages devoted to miscellaneous machine tools, and then comes a very complete line of boiler shop machinery including plate planers, bending rolls, punching and shearing machines, hydraulic presses, steam and hydraulic riveters. In the latter part of the catalogue, the full line of Bement steam hammers is illusrtated, together with a number of installations of Niles electric traveling cranes. The last pages are devoted to the small tools made by Pratt & Whitney Company.

In the arrangement of the catalogue, particular care has been taken to put the various machines in their logical order, so that any machine can be found without reference either to the table of contents in the front of the book or the complete index at the back. Metric as well as English dimensions are given throughout and code-words are placed under each machine.

The whole catalogue is a particularly good piece of press work, the cuts coming out with great sharpness and clearness. Some idea of the size of the book can be obtained from the fact that it weighs about 10 pounds. While the catalogue is not intended for general distribution it will be gladly sent to users of heavy machine tools.

The Joy Line's New Steamer

The Joy Line between New York and Providence and New York and Boston has purchased the large and elegant passenger steamer State of Maine, for service in their daily line between New York and Providence. This steamer, together with her sister ship, the Larchmont, provides a service to and from Providence not excelled by any line out of New York. These steamers are provided with all modern appliances conducive to elegance, comfort and safety, and the dining room, where the meals are served a la carte, at reasonable prices, is on the saloon deck. The Joy Line is surely well established as one of the most popular transportation lines out of the port of New York, and its patrons will appreciate the action of the management in providing the best that is to be had, and always maintaining the lowest rates for either passengers, express or freight.

Barrett Jacks for Siberian Railway

The Duff Manufacturing Company, Pittsburg, Pa., sole manufacturers of the Barrett Jacks, have received a large contract for a carload of track jacks for Russia, same to be furnished for the Siberian Railway. This railway, and in fact nearly all the Russian railways, have been using Barrett Jacks for a number of years, but this contract is unusually large on account of the Siberian railway being such an important factor in the Japan-Russian War, in the way of transportating troops, supplies, etc., to the seat of war.

This contract is important also in that it puts aside the somewhat prevailing belief that Russia did not intend to purchase any of its supplies in the United States, but would look to European markets for its requirements.

The order for jacks is to be rushed forward at once as they are urgently needed for the repairing of permanent track, and for the construction of new track to take care of the demands of the Russian government.

It is quite a coincidence that on the same day the Duff Manufacturing Company received the contract from Russia, they received an inquiry for a rush order of Barrett Jacks for the Japanese Railways. It is a peculiar incident that the two warring nations should send specifications for the same article to the same firm on the same day.

Train Operated in New York Subway

The first real train to make a trip through any considerable portion of the subway in New York was taken through by an "L" road engine. It consisted of one of the new subway passenger coaches and a flat car. The cars and engine were drawn by horses to One Hundred and Twenty-third street and Broadway and put on the subway tracks two weeks ago. There the rapid transit road leaves the tunnel and runs on a viaduct across Manhattan valley. A break has been left in the wall at that point. The trip was chiefly for the purpose of inspection by engineers. The start was made from One Hundred and Twenty-third street at 2:30 o'clock. From there the train ran up to the mouth of the tunnel under Washington Heights. Then returning over the viaduct it entered the tunnel at One Hundred and Twenty-third street and continued downtown. The engine, which was between the flat car and the passenger coach, was fitted for burning oil, so there would be as little smoke as possible.

An Interurban Railway Association

On March 31, the managers of a number of interurban electric railways met in Dayton, O., and organized the Ohio Interurban Railway Association. During recent years there has been a great deal of electric interurban railway construction carried out in the state of Ohio, and the necessity for exchange of opinions and for co-operation between the various companies has shown the need of such an organization. More than sixty men, representing about thirty railway companies, were present. The president of the association is Mr. Harry P. Clegg, president of the Dayton & Troy Ry., Dayton, O., and the secretary is Mr. J. H. Merrill, purchasing agent of the Western Ohio Ry., at Lima, O. The next meeting will be held in Cleveland some time during the month of May.

Exhibit of Fish by the Grand Trunk Railway

At the St. Louis World's Fair the Grand Trunk Ry. has a separate pavilion in the palace of forestry, fish and game, in which are being installed some fine specimens of fish native to Canadian waters. The Grand Trunk exhibit also includes heads of game from the forests of Canada. The exhibit is being installed under the direction of H. R. Charlton, advertising agent, of Montreal, and R. McC. Smith, southern passenger agent, of Detroit.

Car Ferry for the Michigan Central

The Michigan Central R. R. has closed a contract with the Great Lakes Engineering Company, of Detroit, for an ice crushing car ferry to go into commission next October and run between Detroit and Windsor. The new boat will cost $315,000. It will be propelled by two screws forward and two aft, each operated by an independent engine.

Golden State Limited Discontinued for the Season

The California season having practically ended the Chicago, Rock Island & Pacific Ry. has taken off their Golden State Limited. The last train, west-bound, left Chicago on April 15th. This train was put on only for the heavy traffic during the winter and will be resumed sometime during November. This company still runs two through trains to San Francisco, one by way of El Paso and one through Colorado, in addition to their Rocky Mountain Limited, which makes close connections with San Francisco and Los Angeles trains.

Notes of the Month

During the past month the offices of the Kennicott Water Softener Company were removed to 525-527-529 Railway Exchange Building, corner Jackson and Michigan boulevards, Chicago, Ill.

After May 1st, the Chicago office of the Baldwin Locomotive Works will be located at 623-625 Railway Exchange Building, and the office of the Standard Steel Works will occupy the same suite.

The four world's fair locomotives recently built by the Baldwin Locomotive Works for the Norfolk & Western Ry. and forwarded to St. Louis last week were equipped with the "Barber" lateral motion truck.

F. W. Bird & Son, of East Walpole, Mass., are shipping over four million square feet of their Neponset insulating paper and six hundred asphalt torsion proof car roofs to the American Car & Foundry Company, for the construction of refrigerator cars.

"Dust Collecting" is the title of the new catalogue No. 57 issued by the Hartford Blower Company to describe their heating, ventilating and drying systems as well as their exhaust and blow pipe system, and forced and induced draft systems. This establishment is located at 160 Sheffield street, Hartford, Conn.

Mr. E. H. Symington, until recently with the Railway Appliances Company, has opened an office at number 315 Railway Exchange Building, Chicago, where he is now located as general western sales manager of the T. H. Symington Company, Baltimore, Md., a well-known establishment handling railroad specialties.

Handsome illustrations of the Louisiana Purchase Exposition are embodied in a strikingly attractive souvenir booklet of views which has been prepared by the passenger traffic department of the Missouri, Kansas & Texas Railway, and is issued exclusively by this company. Copies of the same may be had for 25 cents by applying to Mr. George Morton, general passenger and ticket agent St. Louis, Mo.

The Falls Hollow Staybolt Company is distributing a small pamphlet discussing railway motive power expenses and some of the causes of their increase. This pamphlet touches on several features in railway operation which increase expenses, laying especial stress on broken staybolts, bad water and imperfect combustion. Copies of the same will be furnished by application to the above named company.

The Corliss engines, air compressors, and high pressure boilers manufactured by the Murray Iron Works, Burlington, Ia., are comprehensively illustrated in their catalogue No. 55, which is now ready for distribution. This company was incorporated Feb. 1st, 1870, and has been for 34 years engaged in operating foundries, engine shops and boiler works. Its plants are well located in Burlington and West Burlington, Ia., and Aurora, Ill.

The Pittsburg Crushed Steel Company, Pittsburg, Pa., patentees and sole manufacturers of steel emery and steelite are distributing a booklet directing the attention of the engineering field to the superiority of steel emery for grinding purposes. Steel emery is intensely hard, and does not pulverize and become inert. In ordinary grinding, steel emery is used in precisely the same way as ordinary emery, but special care must be exercised in its use on account of the grains of steel emery being so much smaller than other abrasives.

On May 1st the Walson-Stillman Company. remove their offices and a large stock of goods to 46 Dey street, New York City. In a short time all of their machinery will be removed to their new works at Aldene, Union county, N. J., where there will be ample rom for the plant to expand. This point is located about four miles west of Elizabeth, and one-half mile from Roselle Depot, via trolley. The works are located at the junction of the Lehigh Valley Railroad, Baltimore & Ohio Railroad and on the low grade connection between the Lehigh Valley Railroad and the Central Railroad of New Jersey, with a track 1,000 feet long in the yards.

That the Allen portable pneumatic riveting machines built by John F. Allen, 370-372 Gerard avenue, New York City, will not only do good work, but continue to do it without constant repairs, is confirmed in a statement recently made to the manufacturer by Mr. Wm. F. McNeill & Co., New Glasgow, N. S., Canada, who says: "The riveter purchased of you June 27, 1901, is giving us every satisfaction and has not cost us one penny for repairs since we put it in the shop." This company has recently sold one of the latest John Allen riveting machines to the Southern Pacific Railroad Company at Reno, Nevada. The machine has 55-in. reach, 12-in. cylinder and 20-in. gap, and is one of the largest size riveters built by this well-known concern.

The following list of cars and locomotives were among recent orders received by the Standard Car Truck Company, all to be equipped with the "Barber" lateral motion trucks: Chicago, Lake Shore & Eastern, 250 100,000 capacity cars; Canadian Pacific Ry., 1,600 freight cars; Erie Railroad Co., 200 refrigerators; Erie Railroad Co., 15 elliptical spring milk cars; Delaware, Lackawanna & Western, 1,000 box cars; Delaware, Lackawanna & Western, 500 steel cars; Goodwin Car Co., 60 special dump cars; Great Northern Ry. Co., 27 special fish cars; Central R. R. Co. of New Jersey, 10 special cinder cars; A. E. Bryan Co., Chicago, 2 special purpose cars; Norfolk & Western Ry., 4 locomotive tenders; Bismark, Washburn & Great Falls, 1 locomotive tender.

A foreign exchange states that the Cape to Cairo Railway will soon reach the Zambesi at the Victoria Falls, and the first through train from Capetown to the Zambesi will run in April or May. On Febuary 1 the rails were within 48 miles of the Victoria Falls, and the excavations for the great bridge which is to span the Zambesi were in active progress. The first portion of the bridge work is now on its way to South Africa, and it will be followed by the remaining sections as rapidly as possible, so that the erection of the bridge may be completed this year. With the setting up of the bridge and the completion of the line to that point, the present contracts will expire. The next section of the line to be built will be from the Zambesi northeast to Broken Hill, a distance of 350 miles, in the direction of Lake Tanganyika.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. A. Portrait Gallery

J. C. HARTMAN.

Mr. Hartman was born in Baltimore, and at sixteen years of age entered as an apprentice in a large coach factory; and, after five years of service, was made foreman in charge of entire works. Two years later, on dissolution of the concern, he entered the employ of the Baltimore & Hall Springs Railway as foreman painter. On change of management, four years later, he was employed at the Northern Central railway shop in Baltimore, where he remained until a position as painter in charge was offered him on the Baltimore & Towson

MR. J. C. HARTMAN.

Railway, where he remained eight years, when he again entered the employ of the Northern Central Railway, and remained until the year 1896, when he became foreman painter of the Western Maryland Railroad, to institute the piece-work system, and he retains his position with this company at the present time.

Mr. Hartman became a member of the M. C. & L. P. A. in 1899, and has attended each convention since, and says he has been much benefited, and hopes to attend the next convention at Atlantic City.

The Sherwin-Williams Company, paint and varnish makers, have removed their Chicago city sales offices from the Fisher Building to suite 630-632 Railway Exchange Building, Jackson boulevard and Michigan avenue.

The Duty of an Association Member

It is the plain duty of a member of the Master Car and Locomotive Painters' Association to accept the task assigned him by its officers, unless he has a good reason for declining; and that should be stated to the secretary in writing. He should have loyalty enough to his association to cheerfully do this, even without the thanks of the association. Some associations and clubs have a rule against voting thanks to its members for able papers presented, because it is no more than the duty they owe the society of which they are members. Outsiders, of course, are publicly thanked for similar favors. This seems to be a good and reasonable rule. On the other hand, it is a poor rule that does not work both ways, if members are to be thanked for performing their duties, why may not they be censured for not doing them? What is the M. C. & L. P. A. formed for—an annual picnic with nothing to do except to play and swallow good things? A man who views it in this light, and practices it, should be told by his company to "Get out, or get in line." If a man pays his full fare and loses his time to attend a convention, we should say he had a right to the free exercise of his sweet will, but one has not, at even half fare, with his time allowed him. He is the servant of his company then as much as if at home in his shop. The mere fact of his having to pay half fare may be the result of an unwise rule that his company would gladly wave in his case if they could. Still, we think they should reimburse him for it.

Now the inspiration for all the above is contained in the following words of a private letter from Secretary McKeon, which we are using without his knowledge or consent:

"On February 29 I sent notices to all who were appointed to prepare papers, and several have not replied at all, while others have refused to accept. In one case, after the member chosen by the committee declined, I wrote to three others who also declined, and I have no one yet for the subject."

This letter was written March 29, in response to our request for his full program for publication. Now these things ought not so to be. That is no way to use your officers, especially your old secretary, who is an invalid. You should rather rally to his support as long as you put him in office. Support your leaders and fight with and for them. We hate to speak these things out in writing, or publish them to reach the eyes of your superior officers, but we feel that duty demands it. We hope every superior officer of a mechanical department who reads these lines will summon his foreman plainter to his office and personally and kindly inquire into his case in this matter to find out if he has refused to do his duty in this respect and what the reason is. If he has refused to accept the duty assigned him without sufficient reason, and will not do his best, he should be refused point blank permission to attend the convention at all. It may be that he declines because he doubts his own ability. In that case his superior should stiffen his backbone and inspire him with courage. It may be that he fears he will have to pay his fare. In this case his superior officer should assure him that he will do all in his power to help him in this respect, and reassure him that his time will be allowed not only to attend the convention but to visit a few relatives in the vicinity whom, perhaps, he has not seen in years. In a word, let the M. C. & L. P. A. be well supported all round, as it ought to be, or let us at once hang the thing up among the fossils to dry. If one cannot attend the convention, let him write his paper and send it.

Electric Car Building at The B. & M.'S Concord Shops

It is rather an unusual sight to see electric cars being constructed or repaired in a steam railroad repair shop, yet such is often the case at the Concord shops of the Boston & Maine, though just at present none are under way, the last order having been completed some time ago. They are, however, frequently brought in for repairs, as the company's magnificent new car barn for the city street railway is located in the shop yard; and we noticed one being overhauled there at our last trip.

It happens that the Boston & Maine is in the electric car business in this way: A couple of years ago or so the Concord & Montreal, a leased line of the B. & M., obtained a charter to build a new line to Manchester, N. H., some 18 miles; at about the same time they came into control of the Concord city street railway; and they have built all the cars for the new line, which was built by them and the narrow gauge tracks of the city widened to standard gauge. Not long since orders were issued to letter all the street cars of the city to "Boston & Maine" as fast they came into the shops for repairs, so that this is another novel sight that visitors to the Granite State's capital may see, that of electric cars going about its street lettered with the name of the trunk steam line railroad of the state.

The same is also true of the Portsmouth street railroad, the state's only seaport city, except that the cars there still bear the name of "Portsmouth Electric Railway," but it was built, equipped and is operated by the Boston & Maine.

It will be seen by this that Mr. J. T. Chamberlain, master car builder of the Boston & Maine, and his assistants, in addition to all their other duties, have had electric car building thrust upon them, and they have to know something about it. With a very large steam equipment to look after it will be readily seen that this is quite an added care.

Electric Car Building at the B. & M. Concord Shops.

Our illustration shows one of the last vestibuled electrics under construction, with a "line-up" of four of the carpenters. These cars are as well built as anybody's street cars—better, probably, as they are made by the day-work system—and are tastily painted on the exterior to conform to the B. & M.'s steam cars, as to body color striping and lettering. They are finished on the interior with mahogany, with nicely decorated oak headlinings, and all in all are an up-to-date street car. The electrical work is done under the direction of the road's electrician.

Varnish Removers Economically Considered

In the craze that has developed such a myriad of varnish removers, some bad, some of doubtful utility and others of a useful character, it might be well to stop and consider whether or not we want any of them at all for some kinds of work. We must not run away with the notion that all varnish removing of whatever nature must be performed with a varnish remover, however good a one we may have and however well pleased we may be with it. This is not economy by long chalks. For carved and intricate work of all kinds, with any number of coating of any age and nature, there is no doubt of the general utility of a good varnish remover judiciously applied in the line of economy and thoroughness of work; and if it is detachable work that can be plunged into a tank of the liquid remover, the speed of the work is all the more marked. Also the thinner coating of a varnish that has been not long since applied, which has become grimy and it is desired to remove it for any purpose, there is no doubt but that a varnish remover will facilitate the operation very much. But there is one condition of things where a varnish remover, however good, is simply an added expense; and that is in removing an innumerable number of coatings of brittle varnish from a perfectly plain surface. In that case there is one speedier way—no cheaper way—than to take a well-sharpened hoe-scraper, made of a file-blank, or hexagon steel, with a blade of the required width, say 1½ or 2 inches, and go at the varnish in its dry state. In the hands of an expert it can be done very smoothly this way, the brittle varnish, however thick, coming off at one operation clear to the wood and flying from the scraper, like snow from a rotary snow plow, and may be dusted from the work and swept up with a broom. If it is desired, the surface may be cleansed or finished with some liquid varnish remover, but, generally speaking, sandpapering will be all that is needed to prepare the surface for shellac or varnish to follow, unless it is thought advisable to have the cabinet men dress it off a little with their veneer scrapers. This is the way we did in the old days before the advent of varnish removers; this is the way we should still do today where the conditions are as before described. But every man must be his own judge as to that. At any rate, unless varnish is brittle enough to fly from the scraper in a mealy form it is unwise to get along without a good varnish remover with which, thanks to the chemists, the market teems with a great variety at the present time, fully abreast with all modern appliances for speedy and economical work.

Light in the Paint Shops

We read in the third verse of the beginning of the Good Book that all the Creator had to do to light up the dark world was to say, "Let there be light; and there was light." Unfortunately the master car painter, no matter how smart he really is, or how big he feels, cannot exercise any such power and prerogative, so he has to plod on and do his perplexing, particular work in the dark; and then have it shifted out in God's sunlight later on to have it inspected by somebody who is not always as patient and forbearing and indulgent as the One who made the sunlight.

Noticing a train that had just been turned out of a shop in another state recently, we wrote the foreman painter complimenting him on the fine general appearance of it, and shortly got a letter in reply in which he said: "I am much pleased with your opinion of the train you saw. I have not seen it outside of the shop. It is very dark in the shop for interior work. The striping was done by lamplight; not a very good light to get a good job in, but probably passable to the untrained eye."

The above is a sad comment on [illegible]-shop building generally. We are glad to note, however, that in the more modern and newer-built shops that there is a disposition to put in more glass and less brick, some of the fear of its getting broken out, or something or other, having subsided or been decided in its favor. They have found out a way to heat a shop nowadays so that if it does have a few more windows it does not matter so much about the lack of heat.

Now there are railroad officials who are potent enough in their spheres to say, "Let there be light," and there will be light in the shops where painstaking work has got to be done cloudy days as well as bright days, and short days in winter as well as long days in summer. "Let there be light!" Also let there be patience and forbearance with men who wear glasses, having ruined their eyes in dark shops working by lamplight. Also let there be ditto with the colors attempted to be matched in such places, if they do not match; and with the cleaning done if it is not clean, etc.

An Etching by "Jack Frost"

That "Jack Frost" is an artist of old and high renown is too well known to reiterate here, but we think his work is seldom if ever caught for reproduction. By the kindness of Mr. John H. Kahler, forman painter, Erie R. R. shops, Meadville, Pa., we are enabled to give our readers a sample of "Jack's" work in these columns.

Mr. Kahler describes this freak of nature as follows:

"I will tell you how it was produced. On the 22d of January we had 14 inches of water in our shops, caused by the near-by stream becoming gorged with ice 2 ft. thick. While the water was at this height the temperature took a sudden drop below zero and froze an inch of ice over the entire shop's inside. Four cab sash with glass in them, 24x30 were found on the floor under the ice, after the water went down three days afterward. They were lying flat, or in a horizontal position when found. I noticed they were all frozen together and very frosty between the panes. After awhile I pulled them apart, and as the warmth from the stove got to them this frost evaporated, instead of running down as we would expect it to do, and left plainly visible the muddy settlings of the water. All this time I looked for nothing out of the ordinary, but after the thin layer of mud became dry I looked with surprise when I beheld the design worked out on the glass which is most beautiful to all who have beheld the strange work of Nature. After the water had left the glass the mud remaining; then the freezing took place, and as the minute frost needles crept along over the surface in working out the design, the mud was shoved to either side down the glass, leaving the clear glass to represent the outlining of the design, as it represents a negative just as a photograph negative is produced. The design represents feathers in all positions, and ending in perfect scrolls at the ends. Again, you see fine ostrich plumes, lace work and ferns. Many figures can be picked out. Among several is an Indian head in full-feathered head-gear; also a small oval about three inches long with a decorative frame around it and within is a three-masted vessel riding on the water. Another is a large spider on his web. The design is one that no mortal could conceive, much less execute, as many lines (and all are one graceful sweep, or curve) are fine as a hair and of soft feathery appearance. It is not permanent, but I have protected it by placing another light of glass back of it and painted the back of this a coat of black paint, which throws out the design very bold and plain to see. The thin layer of mud is yellowish grey in color, and with black on the reverse side gives it a pleasing effect. I have two panes with this decorative work on them, the two upper sash. The two lower sash, having too thick mud, the frost did not penetrate to the glass. I believe that if a vitreous pigment in different colorings composed this thin layer of mud, and was put into an oven and annealed it would become permanent and a thing of beauty. Perhaps a lost art. What say you?"

An Etching by "Jack Frost."

Sophisticated Shellac

There is a deal of sophisticated shellac on the market. If one doubts this let him order the ready-cut kind by the barrel and subject it to close scrutiny by various practical experiments as a painter. If he is still in doubt let him take some to an expert chemist who, by some extraction process best known to himself, will separate the parts and give you the per cent of rosin that it contains. The writer has lately been through an experience of this kind. Years ago, having trouble with spurious shellac ready-cut by barred, it was decided to order it in the gum and cut it ourselves, which we did, and we have kept this good practice up until recently when, owing to the very high price of gum—double its former quotation—and learning that it might be possibly better economy to order it cut of a dealer who had a stock on hand bought when it was lower, we ordered some; and now, having obtained some elsewhere and tested it and finding it to contain at least 20 per cent rosin and cut in straight-wood alcohol, we have repented and think strongly of returning to former practice and cut our own, which is the only way to be sure of getting the pure article.

As with everything else, so with shellac; one can get it at any price he wants to pay—from about $1.65 per gallon upwards, according to the amount of rosin and the kind of solvent it is composed of. The cheap grades are good enough for some purposes it is true, as is the case with paints for barns, barrels, bins and bunco dealers; but for interior car work on costly wood finish, nothing but the purest should be used, and little of that as an under stop-coat between the paste filler and the varnish to follow. Pure shellac for this purpose is a good friend, as Mr. Samuel Brown of the New Haven road will tell you, having years ago finished a car interior with it and nothing else, save the paste filler, and became so enthusiastic over it at the Boston convention in 1890, that he was dubbed with the soubriquet of "Shellac"

Brown when this car was exhibited on the train to Plymouth, which the then "Old Colony R. R." so kindly and generously tendered to the association through his efforts. But shellac, like whiskey and many other things, when adulterated turns from a friend to an enemy and is to be eschewed. Rosin is no friend to the painter in any guise he may be dressed up in and smuggled into use. His evil traits will later develop and then you will wish that by some means you had kept him out. And it is fast getting to be so that the only way to keep him and other enemies out is to keep on every railroad an expert chemist as a doorkeeper who, if in touch with the practical painter, ought to make a strong team for purity.

The Shop Boy

Disastrous results can sometimes be traced to the indifference and thoughtlessness of a boy. What is wanted of these employes is right actions and not useless words.

Good management of little tasks brings promotion, whereas those who neglect small details are generally failures in all things, regarded as shiftless and unlucky, and are not in demand.

Attention to small things is meritorious, because "trifles make perfection." Observation of details is the secret of success in every pursuit. An employer sees how his work is done and he does not promote or reward the unsteady and incompetent. But he never forgets those who make his interests their interests. Accuracy, method, punctuality and dispatch are always appreciated by all sound business men.

Everyone who believes in accuracy and thoroughness has at some time echoed the complaint of the man who wrote: "I hate to see a thing done by halves; if it be right, do it boldly; if it be wrong, leave it undone."

There must be the right spirit among boy workers. A youth should never be satisfied until he has done his best. It should be his constant aim to excel and have the quality of his work appreciated by others. This is the real beginning of success. Inferior work should be avoided. A celebrated pottery maker used to destroy ware that did not come up to his idea of what it should be, and begin work again. That is the spirit shown by all honest and competent workmen, however modest their position.—Extracts from an editorial in Boston Globe.

A Novel Cleaning Material

There is much a-going in these days for ground pumice stone for scrubbing cars in cleaning them outside ready for varnishing, that is not pumice at all. It is anything and everything, the Lord only knows what not, ground up together and put up in barrels and shipped to us, in this section of country at least—silax, tene alba, marble dust, oyster shells, etc., ad infinitum, ad nauseam. Its grit is lacking, or cutting power, to remove smoke and dirt properly when loosened up with the usual cleaning liquids. Such as it is—and they always manage to have it weigh heavily—it comes at so much per pound, and a barrel of this stuff costs about $5.

Dissatisfied with it, yet knowing of nothing better, we were strolling along a certain ocean beach last summer when our attention was attracted to the fineness of the sand that had washed up in large quantities along the shore. We examined it and found it to be the finest of the kind that we had ever seen and at once thought, why will not this be a good article to use in place of so-called pumice stone to clean cars with preparatory to revarnishing? We took an empty envelope from our pocket and filled it and brought it to our home shop and tried it, and found it to be "satisfactory;" also sent some to the veteran Warner Bailey at Concord, who is famous for looking into things, and he got his magnifying glass onto it and reported it to be nearly all quartz of a good, sharp quality and well adapted for this work. We ordered a few barrels, one each to Lawrence, Concord, Salem and Somerville, for trial and set the open barrels side by side with the pumice stone that they had been using, and the cleaners took the sand thereafter in place of the pumice stone. At Somerville they were asking for more; and, before the cold weather prevented, we had a car load shipped to the various shops for each to take out their allowance and forward the car to the next, and so on to the last shop in the list. We do not know how long this can be kept up, but at present it is furnishing us with our cleaning material for cars outside. Of course, we are obliged to have some fine pumice stone for rubbing down varnish and for interior work for a suitable finish. The sand, however, does not scratch or in any way injure the surface or exterior for revarnishing.

We suggest that others in their respective localities, wherever there are beaches, look into this matter and see if they cannot find sand fine enough for this purpose. It stops the imposition of sending pumice that is not pumice, and effects a good-sized saving. This is nothing new, of course, to the women folks near the beaches for a house cleaning material, but it is rather new for car cleaning on the varnished surface outside before varnishing.

Painting Car Platforms and Steps

A certain railroad in the North has been painting its steps and platforms to passenger cars for more than thirty years as follows: Shellac the worn parts and, when dry, follow with one coat of Tuscan red mixed with varnish, with the result that a glossy surface is produced, if such a surface could be said to be thus produced on such a worn, rough surface, and yet even this is worn dead by the shop men running in and out of a car before it leaves the shop. And now in winter weather, with snow and ice everywhere, and frost accumulating on the platforms and steps from the congealed vapor of leaky steam couplings between cars, comes the complaint from the claim department that red paint is slippery; that women are slipping down upon it and getting hurt and presenting claims for damages! Nevertheless the long-suffering and patient head of that car department, willing to do almost anything to please, has, at the suggestion of his master painter, cut out the use of shellac for this purpose and abolished the mixing of platform paint in varnish and is mixing it in oil of a suitable drying nature so that the paint will strike into the bare wood and present a dead instead of a glossy surface under foot. The painter has gone a step farther and is putting in a handful of fine beach sand to each pot of paint! The latter will wear off by the time the paint is gone, so that when, in the course of a year or so, the car is again shopped for varnish, there will be none of the old sand left to paint over.

We give this as an item and suggestion for what it is worth to others. It is barely possible that the extensive use of rubber heels on shoes within a few years may account for much slipping on some surfaces, especially when wet. We have come near getting "floored" ourself from this source, though not on car platforms. And possibly the freak-shaped, high heeled shoes of women may account for much of this slipping. We should think it would be a task to stand still in them on dry land, as only the toes and tapering high heel rest on anything stepped on.

N. B.—Paint makers are hereby notified not to take a hint from this to put any more sand in their paint! We will put it in ourselves; we get it for nothing on the line of the road.

The Sherwin-Williams Railway Paints and Varnishes

The latest issue of the railway catalogue of the Sherwin-Williams Company, presents the form of a comprehensive text book on paints and varnishes, rather than the usual appearance of a catalogue. The different lines of paint have been classified therein according to the equipment for which each is primarily intended, and particularly adapted. These are necessarily limited in number and represent but a few samples of the large assortment furnished railroads by this company. The samples shown have evidently been selected with much care and present a very complete list of paint material. Under each heading have been summarized briefly the principal qualities of the paint, the uses for which it is intended and suggestions have been offered as to the best method for its use. Special attention should be given to page 75 wherein is described the Sherwin-Williams method for painting passenger coaches.

Notes and Comments

Chairman Dane informs us that he is to reconvene the special committee on locomotive painting that met in New York in March, as he wishes to amend the report in some features and this is the most feasible way to do it, in order that there may be no hitch and that the report may be ready for delivery to the Master Mechanics' Association at their convention in June, for which purpose and at whose request it is made.

The Boston & Maine R. R. is building fifteen standard refrigerator cars at its Concord shops. The exteriors are being painted yellow in oil—5 lbs. golden octive mixed with 20 lbs. white lead in oil is the regular formula—and lettered in black with Roman letters. The interiors are coated with "Primelac" to prevent the absorption of moisture and preserve the wood and keep them sweet. This shop is also turning out three 60-foot new baggage cars and four new 60-foot combination smoking and baggage cars.

Two hundred and five cars was the B. & M.'s paint shop output for the month of March, as against 187 for that month the previous year, so the deficit of some 100 cars of a few months ago is being overcome and will disappear if the shops can be supplied with men and cars until the middle of June or the first of July. But it is hard to keep men at railroad wages and reduced hours when balmy spring comes and tempting prices for house painting in the open air at eight hours' work, knowing they will be laid off later.

The editor of these columns as been chosen to prepare a paper for the next convention of Master Car and Locomotive Painters on "Passenger Car Roofs—Treatment and Attention of Same." Did the committee put him on the roof to place him at the top, or out of sight? He has, however, cheerfully accepted the assignment and will try to report, whether in attendance at the convention or not; but expects to be there, "should no untold circumstance militate against it." And will try not to forestall his report in these columns meanwhile, though it is hard to keep still.

B. & M. shops at Lawrence, Salem, Somerville and Fitchburg, resumed full working hours—10-hour time—Monday, April 18th, having been put on a 9-hour basis November 16th. The Concord and Lyndonville shops, where both locomotive and car work is done, being electrically lighted, work full time the year round. The N. Y., N. H. & H. shops resumed 10-hour time recently, having been for some weeks on an 8-hour basis. The Maine Central shops worked full time through the winter and were put on 9-hour time in the early spring and were so working at last accounts.

Old track men say that the long cold winter just passed has been a severe one on rails and that bad accidents have been narrowly averted. We have noticed its unusual effect in throwing off old paint, by the action of continued frost, from the iron hoods over platforms of passenger equipment. Always a source of trouble, they are looking worse this spring than ever before. Eight years ago cars began without this attachment and they did not begin any too soon in their abolition, for they are a nuisance and an expense to maintain. It has also been particularly severe on that other nuisance, the tin car roof.

"The reason given for the advance in the price of shellac is the drouth in India two years ago. The seed crop was largely drawn upon to make up the shortage, and it will take several years to recover from the effect. Most people probably have not known till now that shellac grows from seed." We clip the above from "Editorial Points" in Boston Globe, April 20. We wonder if the Globe editor is jesting, or knows that "seedlac" is the form of the gum as it is stripped from the twigs or branches of the trees around which it is formed, and that is "sticklac" when shipped on the twig, and "shellac" when dissolved, strained and run out into shell form and broken up, like glue.

We learn that one large railroad system has ordered eighteen barrels of varnish remover (No. 11 in our recent Test Committee report) in liquid form! The same concern has received an order from the government for 800 gallons! We are inclined to be a little facetious about this and suggest the building of a dry dock to put it in and put a train or battleship into it all over, and clean them inside and out at same time!

Mr. H. M. Butts, master car and locomotive painter of the N. Y. C. & H. R. R. R., at West Albany, is to read a paper at the Central Railway Club, Buffalo, May 13th, on "What advancement has been made in paints for the protection of metal parts and particularly steel cars."

Concerning the general work of the shops on his line he writes the following interesting item:

"At present we are very busy in the paint shop, as a great deal of work crowds in before the summer season of travel begins. We are now turning out of our paint shop about 7 cars a day. The number of cars which must go through our shops this season is considerably less than last season for the reason that many of our cars are in condition to run 17 or 18 months. On account of this extension of time we have been shopping about 37 per cent less cars than formerly. We attribute this better condition of our cars to the manner in which they have been cared for during the past year, they having been cleaned with an oil cleaner which acts as a protection to the varnish."

Established 1878.

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As usual, the convention issue of the Railway Master Mechanic will be published in July, following the conventions almost immediately. As heretofore, this number will contain the important features of the several committee reports, a synopsis of the discussions in the convention hall, the decisions arrived at, together with all other features of interest, including an account of the exhibits, as well as a large number of attractive "snap shots" taken among the railway men and exhibitors. The exhibits assembled at this time are always attractive and illustrating, as they do, the most recent improvements in car and locomotive appliances, they add a valuable educational feature to the other influences of the convention.

A PRACTICAL method has come to our notice whereby the steam cylinders of locomotive air pumps may be retained in good service when small cracks have developed therein. The plan is to plug up the cracks with copper. This is done by drilling holes for a ⅜-in. standard tap all the way through the metal throughout the length of the crack and plugging the holes carefully with copper. Beginning at end of crack a hole is drilled and plugged. The next hole is drilled so that it cuts into the copper plug, which has already been applied, and so on throughout the length of the crack. Each copper plug is made sufficiently long to permit a portion remaining above the casting to be peaned to such an extent that the heads of the plugs may be riveted into a mass which extends the length of the crack, covering it entirely. By using a little care in performing the work a very neat job may be accomplished, and the probability of a leak is entirely eliminated. This method has been successfully tried and is giving good satisfaction.

It is interesting to observe the extent to which die work is being introduced into the blacksmith shops of the more progressive railroads. As an enterprising foreman of a modern shop recently remarked to us with regard to the use of dies: "I can not keep up without them." The reduction in time and labor which may be secured by the intelligent use of such forms in connection with forging machines and heavy hammers, is readily appreciable in actual dollars and cents.

The most recent feature in the application of die work brought to our notice is in the manufacture of the smaller section of an eccentric. Considerable difficulty had been experienced with eccentrics cracking and breaking in their smaller sections, and to overcome this difficulty it was decided to form this part of wrought iron. The work is very simply done with two forms under the steam hammer. The part is made from a short bar of square iron, and when formed the rough ends are cut off by a metal saw and the joint planed.

Some foremen take a great deal of pride in the saving made by using die work to advantage and such men usually have very interesting figures to show incident to their economy.

An acceptable feature provided for the comfort of passengers traveling at night on the sleeping cars of the Georgia Central Railway is the manner of preparing the sections without letting down the upper berths unless they are to be occupied. This arrangement is one appreciated by passengers and speaks well for the considerate thought on the part of the managament.

It is not only more comfortable for the passenger occupying the lower berth when the upper is not let down; but it is also far more healthful for the occupant. When the upper berth is in a horizontal position, little or no fresh air gains access to the small, box-like space between the two berths and the location of steam heating apparatus immediately beneath the lower berth adds further to the discomfort of this close and poorly ventilated enclosure. When the upper is not let down the warm and impure air has an opportunity to rise and escape into the main portion of the car where the ventilators have some effect.

The convenience in dressing consequent upon the arrangement of berths here advocated is too readily apparent to require further comment.

Efforts on the part of a railway company to serve its patrons are not usually followed by expressions of thanks directed to the management, yet provisions of comfort seldom fail to be appreciated except by the most narrow minded and there is a case on record of the suburban passengers who patronize the D. L. & W. Ry. having sent a vote of thanks to the management for the manner in which the road had been handled during the winter.

In this day of close competition where several different roads are striving for the same traffic and all make the same time between two points, for instance, say Chicago and St. Paul, the little things and small details of comfort are what count in attracting patronage.

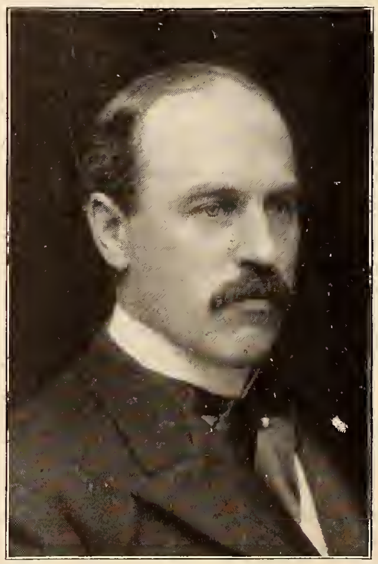
Prominent Railway Officials who Received their Training in the Motive Power Department

IT is a pleasure to the management of the Railway Master Mechanic to be able to present in this issue photographs of a majority of those men who occupy positions of responsibility in the higher departments of railway service to which they have advanced through the motive power department. It has been only within a very recent period that motive power men have achieved such advancement and it is a matter of no little pride to this publication, representing as it does mechanical matters exclusively, that there seems to be an increasing tendency to look to the motive power department for the men who are to take up the larger and more responsible positions in the higher operating departments. From master mechanic to general manager

MR. E. T. JEFFERY,
PRESIDENT,
DENVER & RIO GRANDE R. R.

MR. C. H. SCHLACKS,
GENERAL MANAGER,
COLORADO MIDLAND RY.

MR. FRANK W. MORSE,
THIRD VICE-PRESIDENT,
GRAND TRUNK RY.



MR. W. W. ATTERBURY.
GENERAL MANAGER,
PENNSYLVANIA R. R.

is fast becoming more general than was the case a few years ago.

We mention with pride the names of Mr. George L. Potter, recently general manager and now third vice-president of the Baltimore & Ohio Railroad Company; Mr. Waldo Marshall, general manager of the Lake Shore & Michigan Southern Railway, and Mr. Tracy Lyon, assistant general manager, Chicago Great Western Railway, all of whom have come up from the motive power department. We regret that we are unable to present their portraits with those of Mr. E. T. Jeffery, president of the Denver & Rio Grande Railroad; Mr. Frank W. Morse, third vice-president, Grand Trunk Railway System; Mr. E. A. Williams, assistant general manager of the Erie Railroad; Mr. W. W. Atterbury, general manager of the Pennsylvania Railroad; Mr. Samuel Higgins, general manager of the New York, New Haven & Hartford Railroad; Mr. F. A. Delano, general manager of the Chicago, Burlington & Quincy Railway; Mr. C. H. Schlacks, general manager of the Colorado Midland Railway, and Mr. L. E. Johnson, president of the Norfolk & Western Railway. The following is a brief sketch of the respective careers of these several gentlemen:

Mr. E. A. Williams,
ASSISTANT GENERAL MANAGER,
ERIE R. R.

Mr. L. E. Johnson,
PRESIDENT,
NORFOLK & WESTERN R. R.

Mr. F. A. Delano,
GENERAL MANAGER,
CHICAGO, BURLINGTON & QUINCY R. R.

Mr. Samuel Higgins,
GENERAL MANAGER,
NEW YORK, NEW HAVEN & HARTFORD R. R.

Mr. L. E. Johnson, President of the Norfolk & Western Railway.—Mr. Johnson entered railway service in 1866 with the Chicago, Burlington & Quincy railroad, holding various positions in the locomotive department; in 1888 he was appointed superintendent of the St. Louis and Chicago division of the same road; in 1890 he was appointed superintendent of the Montana Central Railway, and in 1893, superintendent of the Michigan division of the Lake Shore & Michigan Southern Railway; in 1897 he was appointed general superintendent of the Norfolk & Western Railway and in 1899 became general manager of the same road, from which position he was advanced to his present position as president.

Mr. George L. Potter, Third Vice-President of the Baltimore & Ohio Railroad.—Mr. Potter entered railway service in 1876 as machinist apprentice of the Pennsylvania Railroad, serving successively as machinist at Renova, Pa., assistant master mechanic and master mechanic at Fort Wayne, Ind. In March 1893 he was appointed superintendent of motive power of the Northwest System of the Pennsylvania lines west of Pittsburg, and in November, 1899, became general superintendent of motive power; on January 1, 1901, he became general manager of the same lines. From the Pennsylvania he went to the B. & O. as general manager and then third vice-president.

Mr. Waldo Marshall, General Manager of the Lake Shore & Michigan Southern Railway.—Mr. Marshall entered railway service in May, 1897, since which he has been consecutively to June, 1899, assistant superintendent of motive power of the Chicago & Northwestern Railway; in June, 1899, he became superintendent of motive power of the Lake Shore & Michigan Southern, then general superintendent and from that to general manager, which position he now holds. For several years Mr. Marshall was the editor of the Railway Master Mechanic.

Mr. Tracy Lyon, Assistant General Manager of the Chicago Great Western Railway.—Mr. Lyon was born in 1863 at Oswego, N. Y.; he graduated at the Massachusetts Institute of Technology, entering railway service in 1894 as master mechanic of the Chicago Great Western Railway, and in July, 1899, he was appointed general superintendent of the same road; from which position he was advanced to the office of assistant general manager.

Mr. E. T. Jeffery, President Denver & Rio Grande Railroad.—Mr. Jeffery entered railway service with the Illinois Central in 1856, beginning at the very bottom of the ladder; in February, 1871, he became assistant superintendent of machinery of the same road, being appointed successively general superintendent in 1877, and general manager in 1889; in 1891 he accepted the position of president and general manager of the Denver & Rio Grande Railroad.

Mr. E. A. Williams, Assistant General Manager of the Erie Railroad.—Mr. Williams entered railway service as machinist apprentice of the Milwaukee & Prairie du Chien Railroad. In December, 1880, he became roundhouse foreman of the Chicago, Milwaukee & St. Paul Railroad, serving successively as general foreman and assistant general master mechanic of the same road; in July, 1890, he was appointed master mechanic of the Minneapolis, St. Paul & Sault Ste. Marie Railway and became mechanical superintendent of the same road in 1891; in January he accepted the position of superintendent of rolling stock of the Canadian Pacific Railway, which position he held till his recent appointment as assistant general manager of the Erie Railroad.

Mr. W. W. Atterbury, General Manager of the Pennsylvania Railroad.—Mr. Atterbury was born in 1866 at New Albany, Ind.; he graduated from Yale University, entering railway service in 1886 as apprentice in the Altoona shops of the Pennsylvania Railroad, since which he has been consecutively assistant road foreman on various divisions of the same road; in 1892 he became assistant engineer of motive power of the Northwest System, and in 1893 master mechanic at Fort Wayne, Ind.; in 1896 he was appointed superintendent of motive power at Altoona, Pa., and then recently advanced to the position of general manager.

Mr. Samuel Higgins, General Manager of the New York, New Haven & Hartford Ry.—Mr. Higgins entered railway service in 1881 with the New York, Lake Erie & Western, serving successively as machinist apprentice, machinist, assistant foreman and general foreman in the Susquehanna shops. He was for two years assistant engineer of the motive power department, division master mechanic from 1887 to 1892, and assistant superintendent of motive power to Feb. 1, 1904, when he was appointed superintendent of motive power of the Lehigh Valley. On April 1, 1901, he became superintendent of motive power and machinery of the Union Pacific, accepting the appointment of mechanical superintendent of the Southern Railway June, 1902, which position he left for his recent appointment on the N. Y., N. H. & H. Ry.

Mr. Frederick A. Delano, General Manager of the Chicago, Burlington & Quincy Railway.—Mr. Delano was born September 10, 1863, at Hong Kong, China. He is a graduate of Harvard University, and entered rail way service in 1885 as machinist apprentice in the Aurora shops of the Chicago, Burlington & Quincy Railway, with which road he has held consecutively the positions of inspector, assistant to second vice-president, superintendent of freight terminals at Chicago and superintendent of motive power, having been appointed general manager in July, 1901.

Mr. C. H. Schlacks, General Manager of the Colorado Midland Railway.—Mr. Schlacks entered railway service in 1879 with the Illinois Central Railroad. He remained with this road until 1891 when he accepted a position with the Grant Locomotive Works at Chicago; soon afterward he became identified with the Denver & Rio Grande Railroad, receiving the appointment of assistant general manager in in 1894; on July 1, 1900 he accepted the position of general manager of the Colorado Midland Railway.

Mr. Frank W. Morse, Third Vice-President of the Grand Trunk Railway System.—Mr. Morse was from 1889 to 1896 master mechanic on the Wabash Railroad; from 1896 to 1901 superintendent of motive power of the Grand Trunk Railway; on July 15, 1901, he was appointed third vice-president with direct jurisdiction over the transportation, motive power and car departments, which position he now holds.

Danville Shops of the Chicago & Eastern Illinois Railway

THE Chicago & Eastern Illinois is one of the roads constituting the Frisco system and operates 737½ miles of track, owning 198 locomotives, 147 passenger cars and 14,612 freight and miscellaneous cars. The old shops of this road were located at Danville Junction, west of the town of Danville, and as this plant has been outgrown by the demands of the motive power department, a new shop has been constructed east of Danville on a tract known as Oaklawn, near the old soldiers' home. The present new shop includes the locomotive repair department only. However, provision has been made to accommodate the car repair department, and in laying out the plant the buildings erected were located with this end in view. Fig. 2 shows the general layout of the entire plant, including the proposed buildings for the car department and the tracks in the proposed repair yard. The several illustrations presented herewith afford a good general idea of the locomotive department, which, together with the layout providing for the future car department, evidences that ample room has been provided for extensions in both departments. Most of the machinery installed is new, while a portion of the machinery from the old plant has been moved over to the new shop. It will be observed that the buildings are located as near as practical to provide against fire risks and at the same time they are so located as to be readily extended, as future demands require. The power house is so located as to be between the locomotive and car department when the latter has been erected and it is planned to extend the machine shop towards the power house, doubling its capacity. When this is done the present location of the power house will render it adjacent to the end of the machine shop. The boiler shop is located immediately east of the machine shop and any additions to it will be in the direction exactly opposite to the proposed extension of the machine shop. As in the case of the two shops just mentioned the capacity of the blacksmith shop may be doubled by extending it in the direction parallel to the proposed extension of the machine shop. Already the necessity of this provision for doubling the capacities of the several shops has been felt inasmuch as the headquarters of the St. Louis, Memphis & Southeastern Railroad and the St. Louis & Gulf Railway, branches of the Frisco system, have been located at Dan-

FIG. 1—VIEW SHOWING LOCATION OF POWER HOUSE WITH RELATION TO OTHER BUILDINGS OF PLANT. LARGE BUILDING AT RIGHT IS MACHINE AND ERECTING SHOP—C. & E. I. R. R.

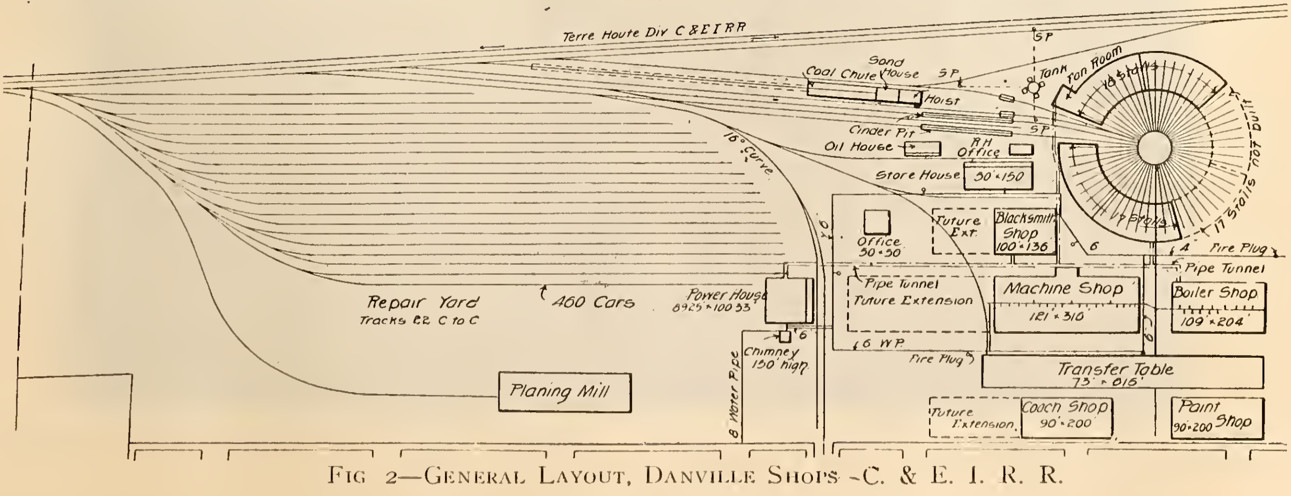


FIG 2—GENERAL LAYOUT, DANVILLE SHOPS—C. & E. I. R. R.

ville and the general repair work of these roads will be done there.

The machine and boiler shops are served by a transfer table and, as shown by the general layout, the coach shop and paint shop will be located directly opposite and served by the same table. This table is 70 feet long with a capacity of 150 tons. It is carried on five rails and the pit through which it operates is 615 feet long. There is no overhead trolley for delivering current to the motor operating the table, but transmission is by two wires arranged along one of the walls enclosing the pit. The speed of travel under load is 125 feet per minute and 300 feet per minute when running light. The table is driven by a 59-h. p. motor and the whole structure, together with its machinery, was supplied by Messrs. George P. Nichols & Brother of Chicago.

The present offices are temporarily located in the second floor of the storehouse. An office for the superintendent of motive power and the master mechanic with their respective forces is to be built near the power house as shown in the plan, and when the car department has been arranged, this office will be centrally located for the entire plant. The office of the master mechanic will be temporarily located in a small building near the round house and the remainder of this building will be used by engine crews between trips, for making their reports, etc.

Fig. 3—Side View Showing Steel Construction of Machine Shop—C. & E. I. R. R.

Power for the entire plant is distributed from the power house. The distribution of electrical power is by a 250 volt direct current system using the two wire system of distribution for motors and the three wire system for lighting. Wires are led from the power house at a point near the roof to a line of cast iron poles by which they are distributed to the several buildings. The main piping lines connecting the power house with the various shops are carried through a tunnel about 1200 feet long. The tunnel is rectangular in section about 6 feet high by four feet six inches wide and the walls are of concrete nine inches thick. The top and bottom are also of concrete and in the bottom a suitable slope and gutter are arranged for drainage. The top is 4 inches thick carried by expanded metal and supported at intervals of 9 feet by steel rails. The top of the tunnel is at grade level and serves as a walk among the several buildings. In the tunnel are installed a 6-inch high pressure steam

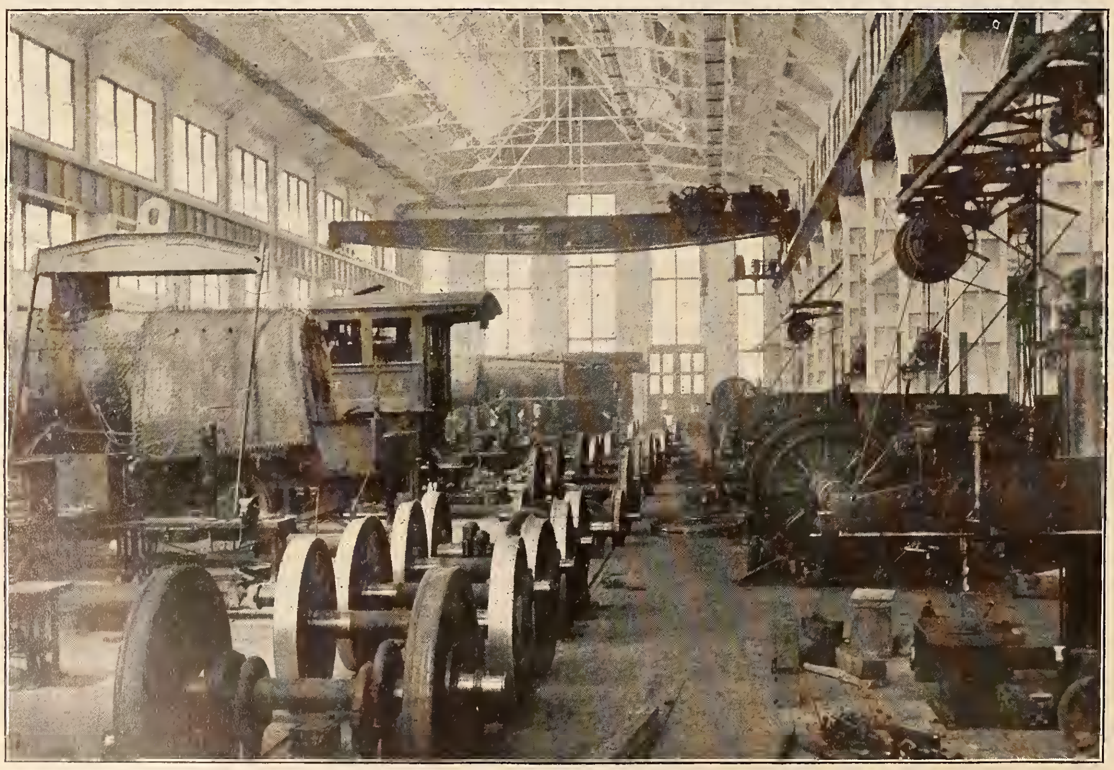


Fig. 4—Erecting Floor, in which Attention is Directed to Machine Tools at Right, Served by Traveling Crane and Method of Arranging Counter Shafts—C. & E. I. R. R.

main, 12-inch low pressure steam main, 6-inch air main, and 4-inch return of the heating system. No expansion joints have been used, but such an arrangement of elbows and bends has been employed as to take care of all expansion. The piping is securely anchored at a point about the middle of the length of the main line of the tunnel. The tunnel starts from the end of the power house and its location and points of distribution to the several shops is readily apparent in the plan drawing. The tunnel is lighted by incandescent lamps hung at frequent intervals throughout its length and is well ventilated, a certain amount of air being drawn through the tunnel into the fan room of the roundhouse.

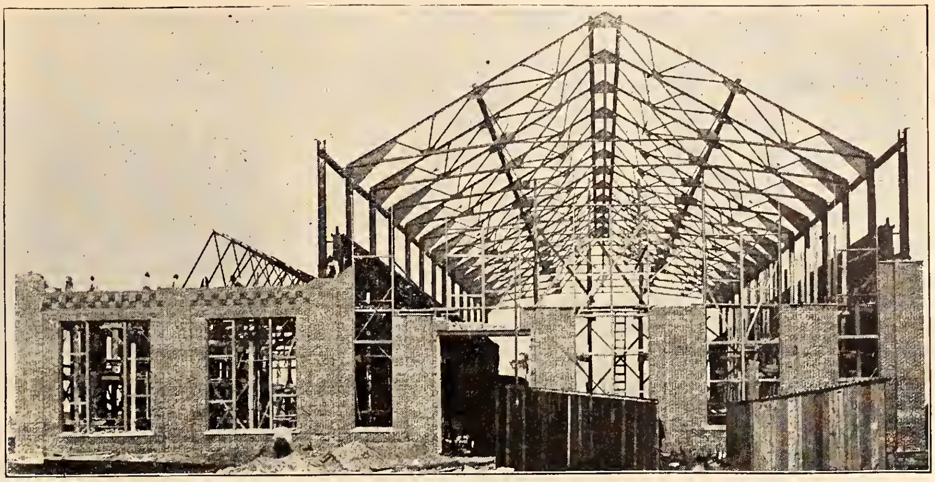


Fig. 5—End View, Showing Steel Construction of Machine Shop—C. & E. I. R. R.

All buildings of the plant are connected by a telephone system installed by the Automatic Electric Company of Chicago. The automatic exchange is located in the power house where it may be under the observation of the engineer who is duly informed by a signal lamp in the event of any disorder. In calling up any desired station the calling apparatus so operates switches located in the exchange as to connect the calling station with the station called. When the stations are so connected a button is pressed which rings the bell of the station wanted. A suitable busy signal is given in the event of the desired station being in service. Hanging up the receiver returns all switches to their normal position. When two stations are connected it is impossible for any other station to interfere so that they have practically all the advantages of a private wire.

The shops were designed under the supervision of Mr. T. A. Lawes, late superintendent of motive power, and Mr. W. S. Dawley, chief engineer. The achitectural work was executed under the direction of Mr. Ernest

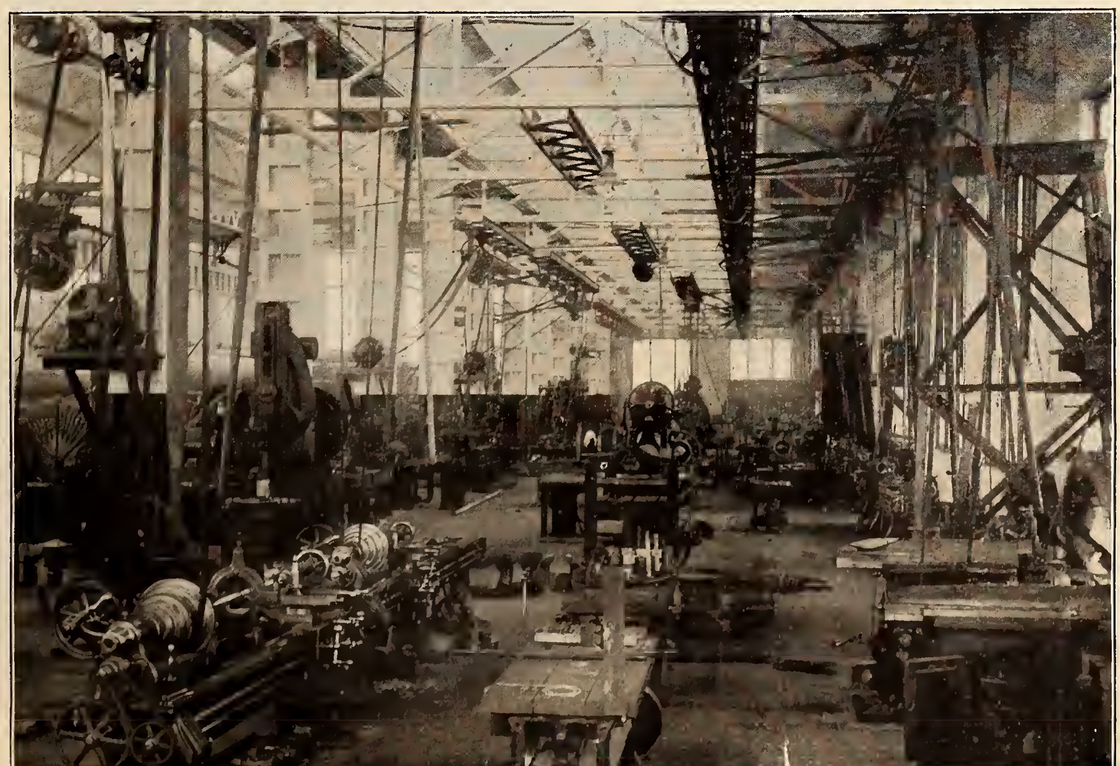


Fig. 6—Machine Bay—C. & E. I. R. R.

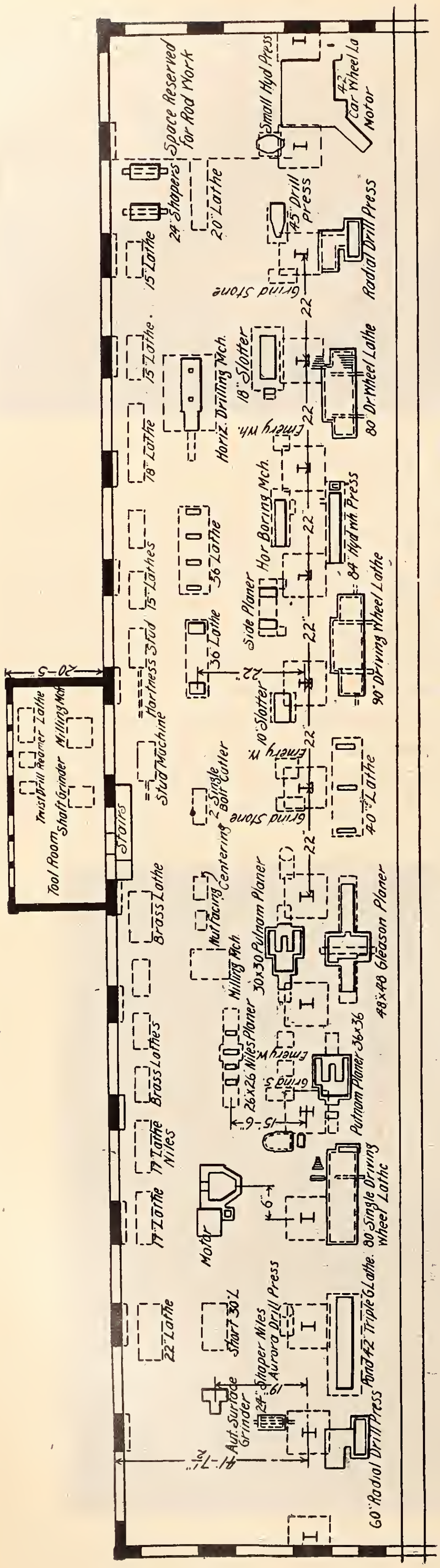


Fig. 7—Floor Plan of Machine Bay and Tool Room—C. & E. I. R. R.

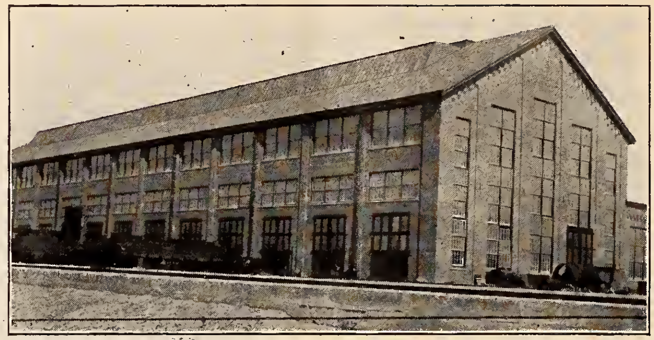


Fig. 8—Exterior View of Machine Shop—C. & E. I. R. R.

Walker and the installation of the electrical equipment was in charge of the Arnold Electric Power Station Company. In presenting the data and information regarding this shop we acknowledge the courtesy of Mr. George W. Smith, superintendent of motive power, and Mr. S. T. Parks, master mechanic.

The Machine Shop.

The machine shop and locomotive erecting floor are located in a building 316 feet in length by 121 feet wide. The building is of brick supported by a steel structure carried on concrete foundations. The floor is divided into two bays. In the main bay there are arranged fourteen transverse erecting pits, which are served by an electric traveling crane of 80 tons capacity, and in this bay are a number of the heavier machine tools which are so disposed as to be served by the crane. The main bay is 76 feet 7 inches in width and the second or side bay, in which the majority of the machine tools are located, is 40 feet wide. The height of erecting shop from floor to roof truss is 43 feet 10 inches and the height between the same points in the machine bay is 20 feet. The crane girders and roof trusses are supported by the same

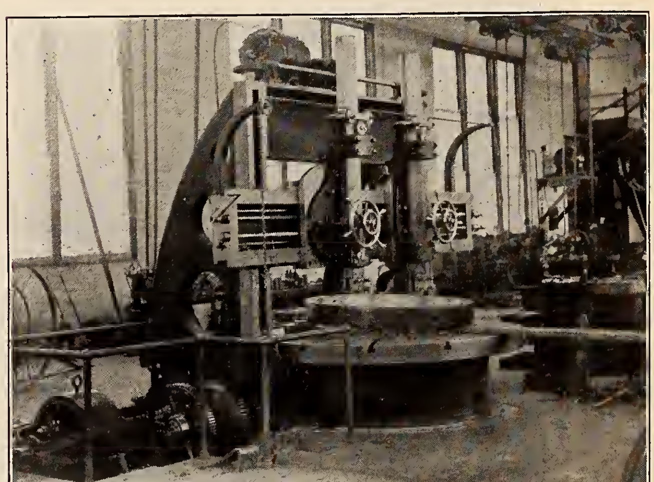


Fig. 9—Niles 7-ft. Boring Mill Driven by 15-h. p. Commercial Electric Motor and Having 3-h. p. General Electric Motor for Operating Cross Rail—C. & E. I. R. R.

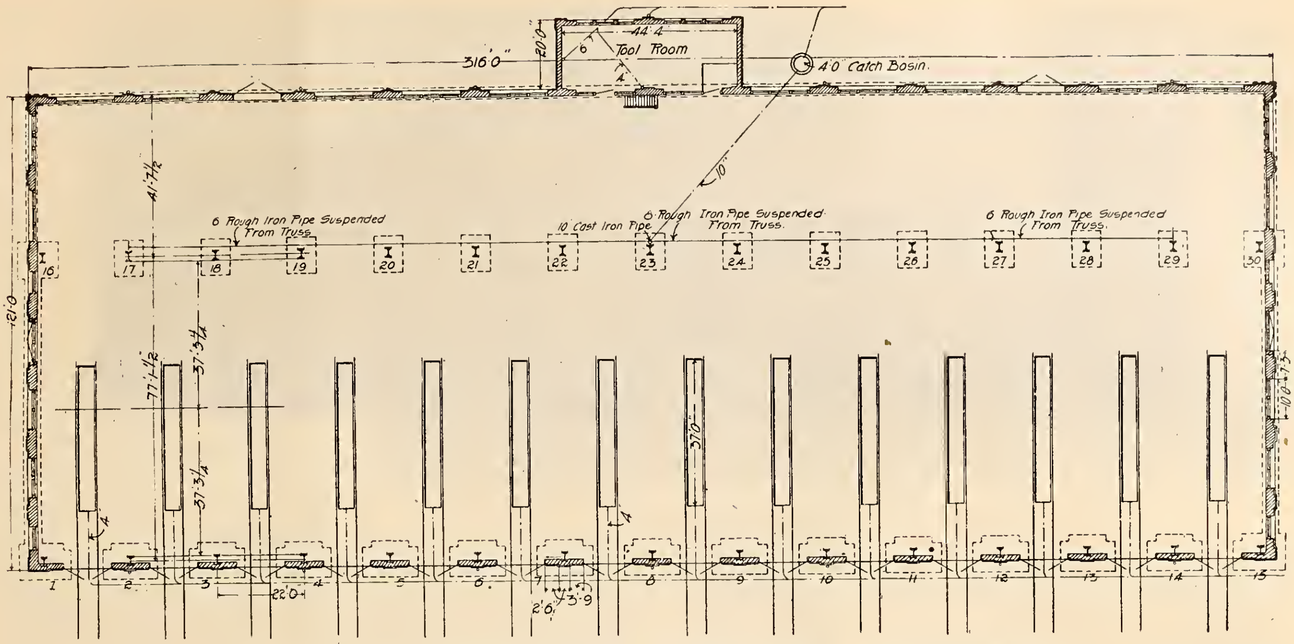


FIG. 10—PLAN OF MACHINE AND ERECTING SHOP—C. & E. I. R. R.

steel columns and the construction of the building is readily seen by the several illustrations presented. The electric crane has a span of 74 feet 6½ inches and as before mentioned has a capacity of 80 tons. The crane has seven motors and each trolley has an auxiliary hoist. This traveler was supplied by Pawling & Harnischfeger, Milwaukee, Wis. In the main bay the rail heads of the crane runways are 31 feet above the floor and above

FIG. 11—GENERAL VIEW OF BLACKSMITH, MACHINE AND BOILER SHOPS DURING ERECTION—C. & E. I. R. R.

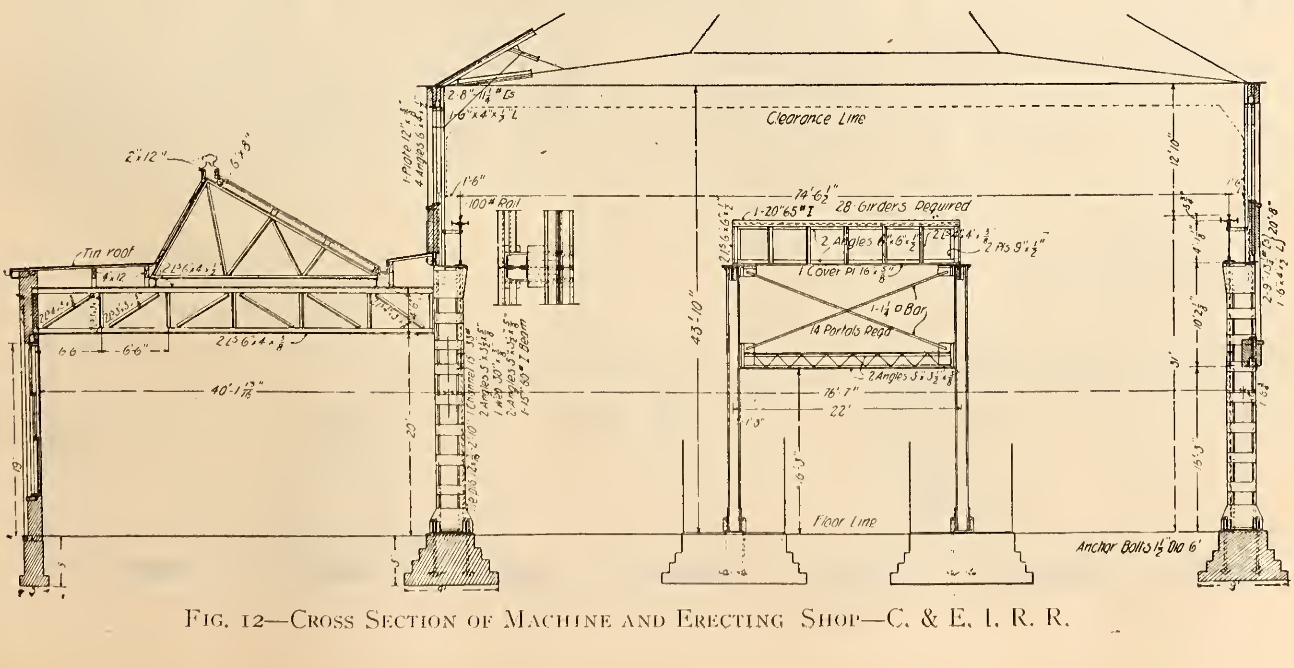


FIG. 12—CROSS SECTION OF MACHINE AND ERECTING SHOP—C. & E. I. R. R.

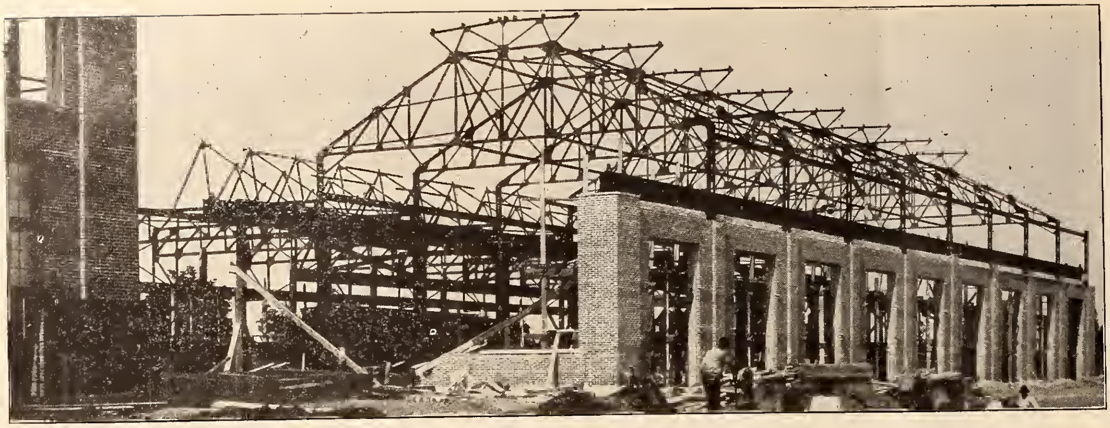


FIG. 13—VIEW SHOWING STEEL CONSTRUCTION OF BOILER SHOP—C. & E. I. R. R.

this line both side walls contain a double row of glazed sash. The wall on the transfer table side contains an additional row of sash above the line of pit doors. Throughout the shop light is afforded by an abundance of glazed sash and in addition to the light received through the windows in the walls there are skylights in the roof of both sections. A single saw-tooth skylight disposed longitudinally over the machine bay affords additional natural light in this department.

Between the ends of the pits and the heavy machine tools in the main bay, there is a longitudinal track extending the entire length of the shop which is used for the storage of driving wheels, etc. The bottoms of the pits are convex and gutters are arranged to drain

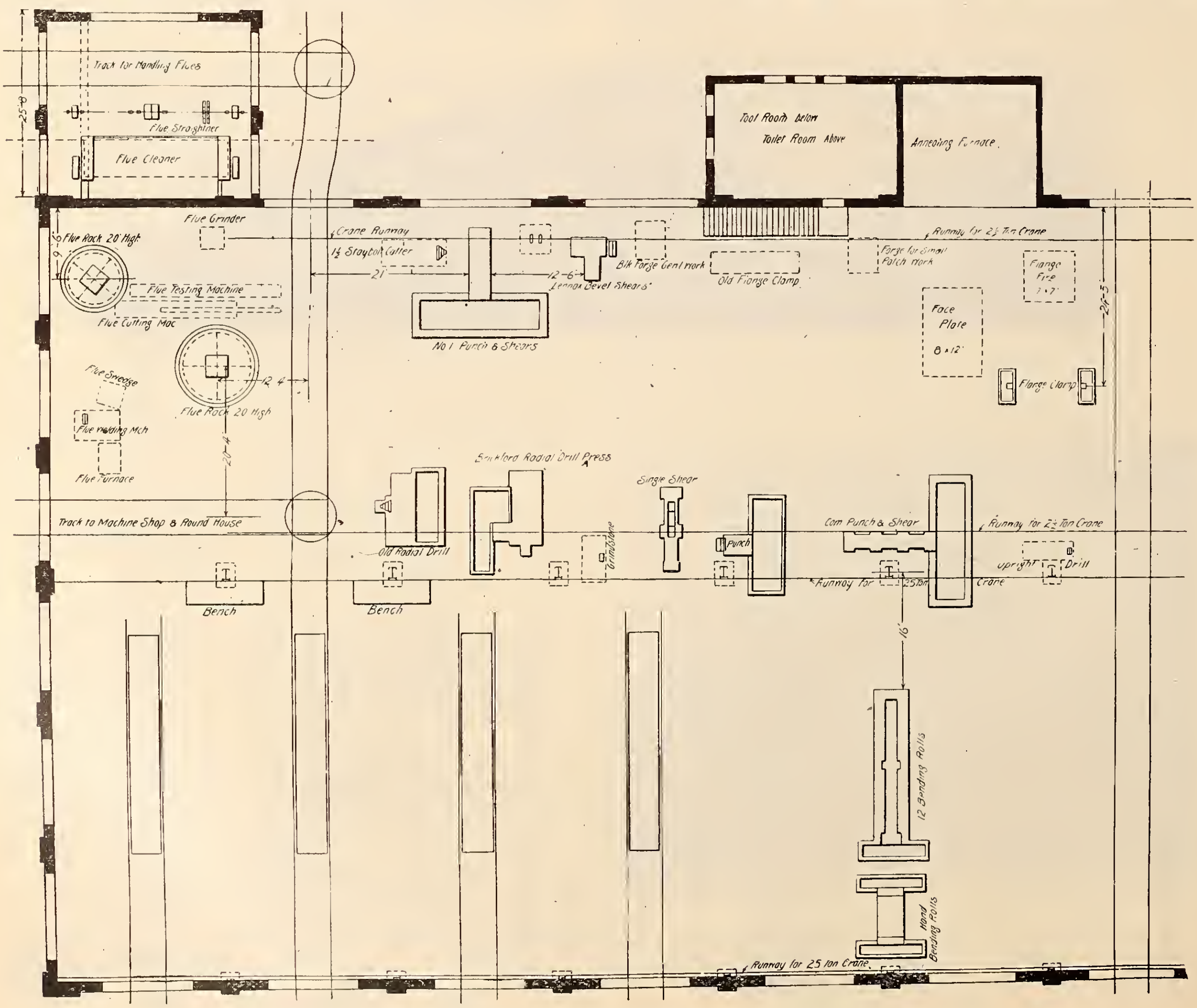


FIG. 14—PARTIAL PLAN OF BOILER SHOP—C. & E. I. R. R.

towards the inner ends of the pits, so providing at all times that the men will have a dry place to stand when working beneath an engine. There are steam connections in every other pit and a water connection in each pit. The compressed air line extends all round the shop and there are air connections arranged at each post and two in each pit.

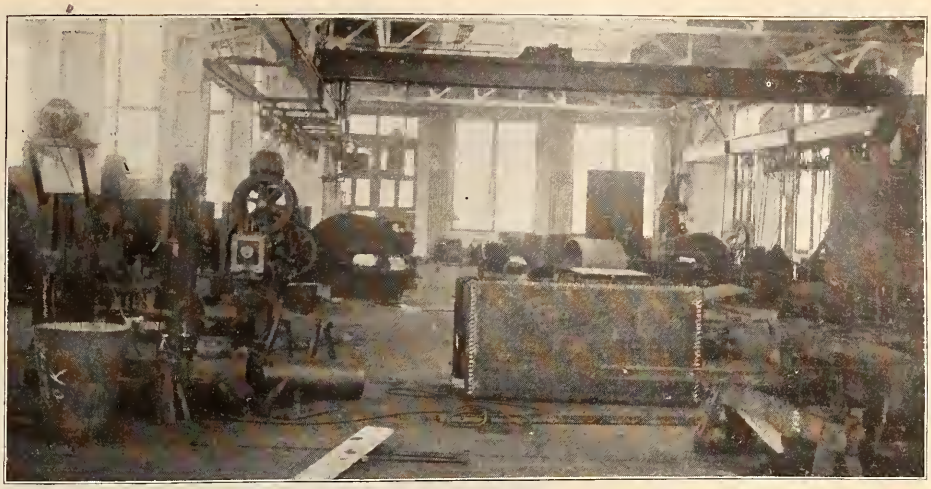


Fig. 15—Machine Bay in Boiler Shop—C. & E. I. R. R.

As shown in the plan drawing of the machine shop the tool room is located in a small wing against the wall of the machine bay so disposed as to be centrally located. Ample light is provided in this room and the partition between the two rooms and the main portion of the shop is of expanded metal. Above the tool room and reached by a stairway is a comfortable lavatory supplied with both hot and cold water.

The larger machine tools are driven by electric motors varying from 1½ to 25 h. p. and the lighter machines are arranged in groups and belted to line shafts, each group being driven by an electric motor varying from 5 to 20 h. p. All machines are wired from a loop which extends all around the machine bay, giving an excellent system of distribution by which very little voltage is lost. To accommodate those tools in the machine bay which are driven in groups there are two lines of shafting extending in sections the whole length of the shop. Each one of these sections is driven by a motor and the shafts are so arranged that one shaft may be connected to its neighbor and run thereby in case of accident to its own motor. The shafting is supported on a structural steel lattice girder laid flat with channels at each side to which the shaft hangers are bolted. There is no traveling crane over the machine bay and to facilitate work in and out of the machines suitable jib cranes and air hoists are to be provided. Most of the machines above mentioned as being located in the main bay, where they are served by the traveling crane, are individually driven by motors, while a few of them are belt driven. The arrangement of counter shafting for these machine tools and the location of the motors together with the form of lattice girders carrying the hangers are shown by Fig. 17, and also partially shown at the right of Fig. 4, which gives a general view of the main bay.

The motors are installed on brackets supported by building columns or attached to the side wall as shown in several of the half-tone engravings. The starting boxes are mounted on the wall on iron columns as may be convenient. These are all provided with double-pole circuit breakers which take the place of main switches. The controllers for the individually driven machines are mounted on pedestals of special design which provide space in the base for necessary resistance. On the back of each controller is mounted the circuit breaker, thus bringing all the operating mechanism within easy reach of the operator. In general the drum type of starting box is being used. All starting boxes and controllers are provided with no load release attachments, which in connection with the circuit breaker for overload will provide adequate protection for the motors. General electric motors have been installed for constant speed work and for such small ranges in speed as can be obtained by field weakening. On those tools where a range of speed of about 4 to 1 is required the Commercial Electric Co.'s system of variable speed tool drive is being used. The tools embraced by this system are the boring mills, 2-wheel lathes, slotter, and a special planer referred

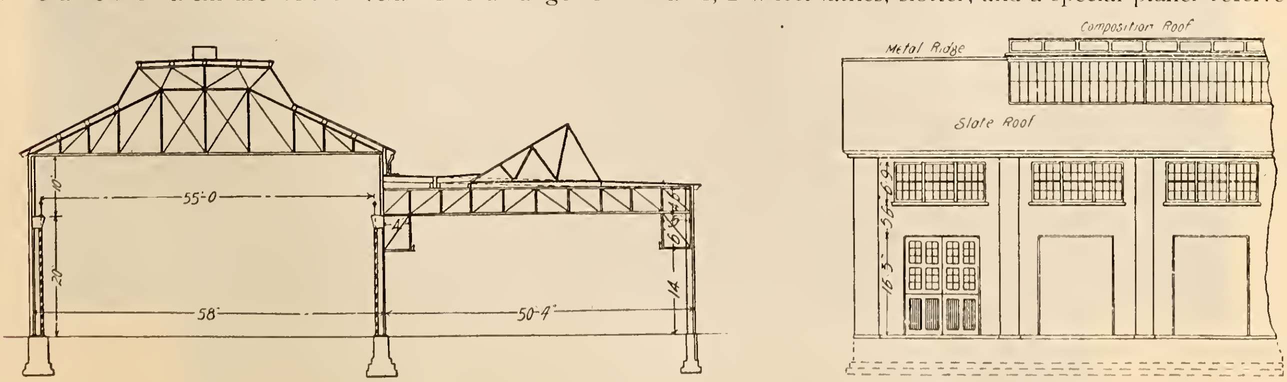


Fig. 16—Cross Section and Partial Side Elevation of Boiler Shop—C. & E. I. R. R.

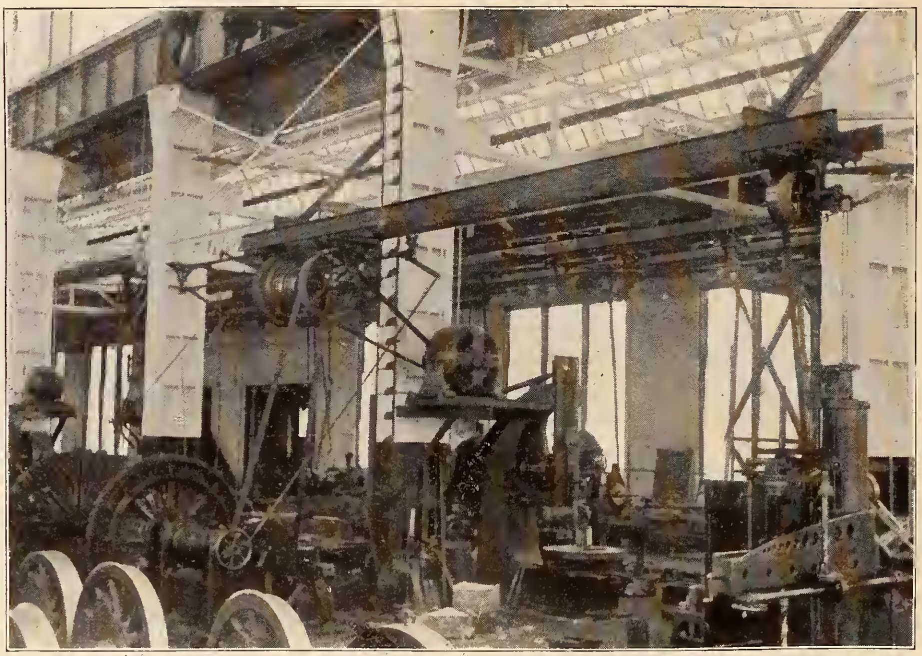


Fig. 17—Showing Arrangement of Counter Shafting and Location of Motors for Driving Machine Tools Served by Traveling Crane—C. & E. I. R. R.

to a little later. Three speeds are secured for these motors by a combination of commutators, which about equally divide the total range, and intermediate steps are obtained by a small amount of field weakening. The variable speed motors on this equipment operate on a 220 volt circuit and no armature resistance is used to obtain a speed variation.

The planer mentioned above is used for all around work and a variety of cutting speeds is required to attain maximum efficiency. Two separate motors are used in driving this machine, a constant speed motor on the return and a variable speed motor for cutting. A constant return speed is obtained irrespective of the cutting speed.

The largest tools in the shop are two 90-inch wheel lathes which are deserving of attention. They are driven by 20 h. p. motors which have speed ranges from 250 to 1,000. There are no belts used on the tools as the feed is operated by a shaft and bell crank attachment below the floor. Each machine is conveniently handled by the operator as the controller is placed in easy reach and he can increase, decrease, stop or reverse the motor as desired. The quartering attachments are operated by two individual 1¾ h. p. motors which are controlled by separate controllers.

A Niles 7-foot boring mill is shown by Fig. 9. This machine is driven by a 15 h. p. reversible, Commercial Electric Motor and a 3 h. p. general electric motor operates the cross rail. The location and arrangement of the

Fig. 18—View Between Blacksmith and Machine Shops, Showing Portion of Each Building, Line of Posts Carrying Wires for Electrical Distribution and Tunnel for Steam and Air Mains—C & E I. R. R.

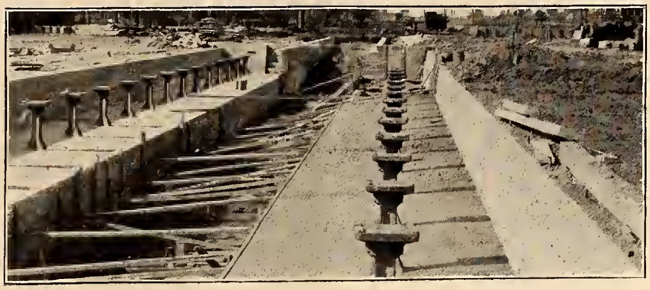


Fig. 19—Concrete Foundation of the Cinder Pit—C. & E. I. R. R.

motors is clearly shown by the illustration and also the controller which appears to the right of the photo-engraving.

The heating system was installed by the Pope Heating Company according to the design of the Consolidated Engineering Company. By this system steam pipes are attached immediately beneath the roof trusses and the radiant heat therefrom is transmitted to the mass of metal on the floor below. The metal in turn acts as a radiator warming the surrounding air. The originators of this system claim that the metal parts congregated in the shop will be maintained at a temperature from 3 to 7 degrees warmer than the surrounding air. Under such conditions the men are working in surroundings which are warmer than the air in the shop, a condition more enervating than when the air is warmer than the surroundings.

For general illumination and working at night or on dark days there are provided 33 arc lights disposed at different intervals about the shop and 300 incandescent lamps. Each machine is provided with an individual incandescent lamp which is carried by a bracket supported on the wall or by one of sufficient height to stand on the floor. On the erecting floor each work-bench is provided

Fig. 21—Showing Relative Positions of Storehouse, Blacksmith and Machine Shops—C. & E. I. R. R.

with two wooden masts carrying two brackets which may be adjusted to arrange the light carried thereby as desired. These masts are also provided with sockets for extension wires to facilitate work on inaccessible parts about the locomotive.

Boiler Shop.

The construction of the boiler shop is similar to that of the machine shop and is arranged in two bays though its main bay is of less vertical height owing to the smaller range of lift required by the crane. There are eight stalls in the main bay in which the principal work is done, and three of these stalls extend through the ma-

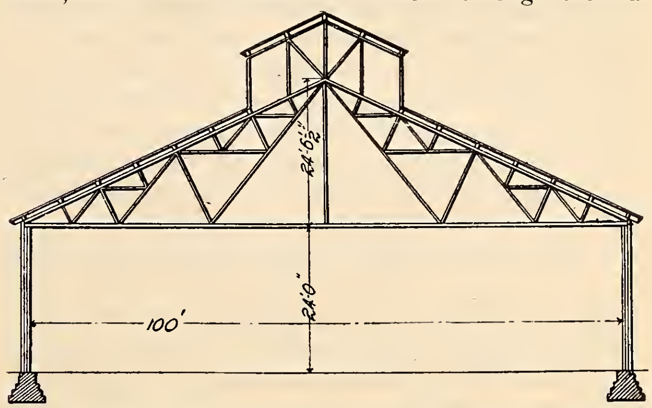


Fig. 22—Cross Section of Blacksmith Shop—C. & E. I. R. R.

Fig. 20—View in Blacksmith Shop—C. & E. I. R. R.

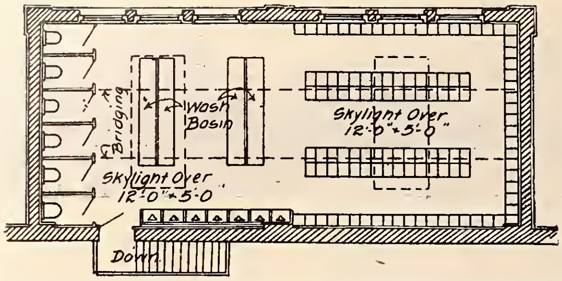


FIG. 23—PLAN OF LAVATORY IN MACHINE SHOP—C. & E. I. R. R.

chine bay to provide for tank work. The machines are disposed as shown in the accompanying plan drawing of the boiler shop and the machine bay is served by a crane of three tons capacity.

Several of the tools are grouped and driven by a single motor and the heavier tools are driven by individual motors. As shown by the plan view, the flue work is done at one end of the building and the flue rattler is located in a small wing adjacent to the corner of the house, connected with the remainder of the building by standard gauge tracks and small turntables. A second wing adjoining the wall opposite to the transfer table includes the tool room and foreman's office on the first floor and the lavatory on the second floor. In this wing and adjacent to the tool room as shown by the plan the annealing furnace is located. The side walls contain an ample amount of glazed sash affording a large amount of natural light which is supplemented by skylights similar to those in the machine shop. The building is 209 feet long by 109 feet wide. The main bay is 58 feet wide and the machine bay is 58 feet 4 inches wide. The former is served by a crane having a span of 55 feet and a capacity of 20 tons. Both cranes in this shop were supplied by Messrs. Pawling & Harnischfeger.

The Blacksmith Shop.

As shown by the general layout the blacksmith shop is located between the machine shop and the store house at a short distance from the roundhouse. The building is 100 feet by 136 feet with brick walls and a steel roof truss, covered with tile. As in the other buildings, the smith shop is lighted by an abundance of natural light. The roof framing is of a different design from that of the machine and boiler shop having a ventilating louvre running nearly the entire length of the building. There are 18 forges operated by the down draft system of the Buffalo Forge Company. An interior view of this building is presented by Fig. 20, which shows the location of the fans for blower and forges, a number of the forges, the arrangement of crane facilities, and at the right is shown a portion of the frame furnace. Two steam hammers are installed, one of 3,000 lbs. capacity and the other of 800 lbs.

LIST OF DIRECT CONNECTED GENERAL ELECTRIC MOTORS.

Motor.		Tool
Horse-power.	Speed.	
1½	800	36-inch upright drill, cap. 2-inch holes.
5	900	Heavy single shear, 48-inch throat, cap 6x1 inch flat.
5	900	7-foot vertical boring mill, two saddles. For operating rail only. (See 7½-horsepower Commercial motor.)
5	550 1100	Plain radial drill.
6	700-900	25x26 inches by 10 feet metal planer.
6	700-1200	42 inches by 19 feet triple gear engine lathe.
7½	815	30 inches double combined punch and shear, cap. 5x⅝ inches flat.
7½	550-800	30x30 inches by 8 feet metal planer.
10	650	36-inch shear. Old tool.
10	650	Double combined punch and shear. Old tool.
10	600-900	25x90 inches open side planer. Old tool.
10	650	84 inch wheel press. Old tool.
15	690	12-foot bending rolls. Old tool.
15	690	
15	600-900	80-inch wheel lathes. Old tool.
15	600-900	48-inch car wheel lathe for steel tires.
25	560	Fan for forges.
25	1300	Blower for forges.

LIST OF GROUP DRIVEN MOTORS.

No.	Horse-power.	Speed.	No.	Horse-power.	Speed.
3	5	1.100 R. P. M.	2	15	690 R. P. M.
1	7½	815 R. P. M.	1	20	650 R. P. M.
6	10	650 R. P. M.			

LIST OF DIRECT CONNECTED COMMERCIAL ELECTRICAL MOTORS.

Motor.		Tool.
Horse-power.	Speed.	
5	450-1800	37-inch vertical boring mill. Old tool.
5	1200	36 by 36 inches planer, for reversing only
5	280-1120	36-inch planer, for cutting stroke only.
7½	250-1000	For 7-foot vertical boring and turning mill. For cutting only. (See 5-horsepower General Electric above.)
7½	350-1400	18-inch slotter. Old tool.
7½	350-1400	Horizontal boring mill.
7½	300-400	38 by 48 inches metal planer.
15	250-1000	48-inch horizontal boring and drilling machine.
20	250-1000	90-inch wheel lathe. Old tool. For operating spindle.
1¾	1600-2400	For quartering attachments, 90-inch wheel lathe.
1¾	1600-2400	

The power house, round house, store house and further details of interest will be presented in a later issue.

Concerning Boiler Design

THERE appeared on page 154 of the May issue of the Railway Master Mechanic a design of locomotive boiler with deep, narrow fire-box and short flues, to be built for a Pacific type locomotive, and editorial comment referring thereto, appeared in the same issue. The boiler in question was designed with the idea in view of reducing troubles believed to be consequent upon long flues, and a shallow, wide firebox. That this design has attracted attention and that the boiler is a live issue is evidenced by the following communications which we are privileged to reproduce:

Editor, Railway Master Mechanic:

I was much interested in reading in your May issue an article entitled, "An Interesting Design of Locomotive Boiler." The design of the boiler is certainly novel and extremely unusual. It is not to be examined, however, from this standpoint, but rather from its proposed performance in actual service.

The first point that attracts attention as being very much smaller in proportion than usual is the grate area. With 37 square feet of grate area it will be absolutely necessary to maintain a very high rate of combustion per square foot of grate surface per hour, and in fact it is questionable whether with the grate area in question enough coal can be burned to produce the necessary amount of heat. There is no question whatever of the value of fire-box heating surface, the fire-box evaporating at least 35 to 50 per cent of the total evaporation, and that the greater the heating surface of the fire-box, the better steamer the boiler will be. While apparently the later designs of engines have shallow fire-boxes with less proportion of fire-box heating surface than the older types of engines, it is very probable that in all these designs there was no desire to decrease the fire-box heating surface, but rather to obtain the necessary grate surface. The depth of firebox had to be sacrificed in order that it might be widened out as the length had either reached the firing limit or was restricted by other features of the design. With the wider type firebox, which must at least clear a trailing wheel, it is impossible to get the depth as great as when the fire-box rested on top of the frames or between the frames. The question becomes, whether it is better to have sufficient grate area to properly and economically burn the necessary fuel, or is it better to have a smaller grate area and a greater area of fire-box heating surface. Evidently the boiler in question is going to determine this point. We may, however, from an analysis of the best designs, form some opinion as to what the new boiler will or will not do, and from such analysis it would seem that it is going to be deficient in great area.

Mr. Vaughan, Superintendent of Motive Power of the Canadian Pacific Railroad, read a paper before the April meeting of the Western Railroad Club on "The Value of Heating Surface." He brought out on this paper some very valuable points that have hitherto been overlooked to a large extent as regards value of heating surface in different parts of flues and fire-box. He also calls attention, very emphatically, to the value of the ratio of tractive power by the diameter of the driving wheels, to the area of grate. He also draws the conclusion that for a satisfactorily steaming engine your ratio should not be greater than 5 for passenger engines, nor greater than 6 for freight engines. On this basis the proposed boiler would be a very poor steamer, having a ratio of 7.71 which is away beyond the limit for freight service, let alone passenger service. In the proceedings of the Master Mechanics' Association for 1902, on pages 212 and 221, will be found a similar method of getting practically the same ratio in different terms. The ratio in this case being that of cylinder horse-power to the grate area, and from the results of a large number of engines which have been built at different times, it was found that the best practice gave this ratio as 25, while the limit was practically 47 for a single passenger engine burning bituminous coal. The proposed boiler falls short also by this method in that its ratio is practically 46. It would therefore appear that, while it may be desirable to obtain a large firebox, it is not advisable to do so at the expense of grate surface.

The shorter length flue is undoubtedly desirable from a maintenance standpoint, and will give less trouble and at the same time waste a very small amount of heat due to the shortening of the flues. It is questionable, however, where any gain is made between a flue 16½ feet long, 2 inches in diameter; over a 2½ inch flue proportionately longer as regards strength and life. The shortening of flues by setting the flue sheet back, considering the distance from the centre of the stack, envolves an exceedingly large volume in the smoke box. What effect this will have upon maintaining the desired vacuum, the working of the fire, draft arrangement, etc., will be an interesting study. It is a radical departure from the present practice, and further information as to results obtained will be doubtless appreciated by all who have read the article.

F. F. Gaines,
Mast. Mech. Wyoming Division, Lehigh Valley Ry.

Editor, The Railway Master Mechanic:

In your issue for the month of May I note the editorial in connection with boiler troubles. In this editorial you seem to group in the same category of evils the long tube and the wide fire-box and you place upon them the blame for having aggravated boiler troubles.

There seems to be a great diversity of opinion as to the effect of long tubes, in causing trouble in locomotive boilers. Some master mechanics who have been using the extremely long tubes have claimed that they have had no additional bad results attributable to the length of tubes; while others have at once seen in the long tubes the source of new troubles.

The very long tube is an accident. Engines were not designed purposely to permit the use of tubes twenty feet long, but rather the desire for greater adhesion and tractive power made it desirable in some cases to use three pairs of driving wheels on passenger locomotives, and in order to provide plenty of steam a large fire-box was required, which had to be carried back of the rear drivers, resulting in the necessity for considerably exceeding sixteen feet in length of tubes.

It is open to reasonable doubt, if the addition of three or four feet in length of the sixteen foot tube can of itself be the cause of any great additional tube leakage.

The wide fire-box itself is scarcely open to the blame for being the cause of greater boiler leakage, unless it be due to the fact that it has been in many instances too small to give sufficient grate area, so that no unusual forcing of the boiler would be required to produce the needed steam for the service which the locomotive was expected to perform.

With the advent of the recent mammoth locomotives has come a tendency to load them up to their full capacity at all times, leaving no reserve power for emergency conditions. This has resulted at frequent intervals in a severe forcing of the boilers, consequent poor firing, followed by hurried cooling, and unwise admission of cold air into the fire-box. The large demand for power the past two winters has caused operating officers to urge the hurried turning of the power, and the boilers have not had the proper character of care in washing, and in thorough round house repairs at terminals. The larger demand on the locomotives has meant unusual evaporation of water, meaning where poor water was used, a large and rapid deposit of scale.

It is believed by many that to these causes, together with the fact that in not a few cases poor boiler work has been done by the manufacturers, are due the added boiler troubles that have been found in connection with many of the locomotives having long tubes and wide fireboxes.

The writer believes that railway companies in general have overdone the fad for increasing the size and hauling capacity of locomotives. There would seem to be strong grounds for calling a halt, and in some cases reducing the size of future construction, even though the size of the trains hauled is correspondingly reduced. The greatly added cost of locomotive maintenance, together with the greatly increased destructive effect on cars and on track, calls for serious analysis and careful consideration.

The special design of boiler shown in your May issue has many excellent points, and also some modifications which are open to serious doubt.

The proper design of a locomotive boiler cannot be made without careful consideration, not only of the size of the cylinders which are to be supplied with steam, but also the wheel arrangement of the locomotive, and last, but most of all, the class of service for which the locomotive is intended. A boiler which is well suited to supply the needs for carrying a ten or twelve-car train at an average speed of forty miles an hour, making frequent stops, or handling an eight-car train on long 1 to 2 per cent grades would not be suited for being a free furnisher of the necessary steam on a fast express hauling six or eight cars, and running long distances between stops at an average speed of from fifty to sixty miles per hour.

Not knowing the kind of service for which the boiler shown in your illustrations is to be used, one is somewhat at a loss in commenting upon the design.

The length of tubes shown seems to be an average length for a modern up-to-date locomotive. It surely does not have the claim to be called a boiler with short tubes.

A firebox that is ten feet and six inches long inside would appear to be too long for a man to successfully fire. It does not seem practical to expect a fireman to satisfactorily throw coal over ten feet into a firebox, and to keep it up, as they would have to do for several hours each trip, and do good work. The short, wide fireboxes surely have the advantages in making good fireing easier.

Deep fireboxes require the carrying a thicker fire than with the wide boxes. There is a large amount of the firebox heating surface, namely, that which is below the line of the fire, which is of little value. In the firebox shown there is at least twenty-four square feet which is of very little benefit. Three inches more in the length of the tubes would undoubtedly be of more value than the additional heating surface gained by using a deep firebox.

It is doubtful if the total heating surface in the boiler is sufficient to make this boiler a free steamer, for reasonably fast passenger service, if the size of the cylinders is to be taken as the index of the power wanted in ordinary service.

It might be open to question whether the grate surface is sufficient to make steam economically with ordinary grades of bituminous coal, in view of the highly successful results which have been obtained during the past few years with fireboxes having a very much larger grate surface.

I am inclined to fear that in the zealous effort to avoid tubes of excessive length, and wide fireboxes, that possibly matters of more importance may have been sacrificed, and that the net results in the end may be disappointing, as compared with what might have been obtained with the use of the wide firebox in the place of the long and deep box.

Yours very truly,

A. M. Waitt.

Yonkers, N. Y.

Editor, Railway Master Mechanic:

In your May issue you illustrate a locomotive boiler intended for a new passenger engine, which is interesting because it embodies what might be called old ideas instead of new ones, and in an editorial reference to this same boiler you state that "many boilers have been recently built embodying wide grates and long flues with no more seeming reason than that they are up-to-date." I think this criticism on locomotive design is an unfair one, at least in the majority of cases. The wide firebox especially is the outcome of necessity, and it cannot be considered a "fad" in any sense. When the wide firebox was introduced for the purpose of burning anthracite culm, every one recognized the fact that a large grate was essential for this purpose, the reason being that the rate of combustion could not be forced much beyond 50 pounds per square foot of grate per hour. The other alternative was to keep the original grate of about 30 square feet area and make the cylinders so small that the steam consumption would not unduly tax the grate. But this would never be accepted by railroad managers, who want a heavy train, and, in passenger service at least, a fast run as well. The same is true of soft coal burners. Several years ago, when connected with the C. & N. W. Ry., the largest passenger locomotives had 19½ by 26 inch cylinders, 75-inch drivers, and 190 pounds of steam, giving an available tractive force at slow speed of 20,000 pounds, the grate area being 30 square feet and heating surface 2,500 square feet. The conditions of traffic required stronger engines—that is, engines that would make up time with heavier trains, and although these engines had been built but one year before, a lot of engines with practically the same tractive force, 20,800 pounds, were ordered, but with 3,000 feet of heating surface and 46 square feet of grate. The power of these engines at high speed was so great that it was some time before the men realized the force under their control and took advantage of it. They could be run 70 miles an hour cutting off about half stroke; this did not tear the fire, as the grate being liberal, the combustion was distributed over a large area. The tubes were 2 inches in diameter and 16 feet long, and the machines were so successful that several later batches were ordered just like them. I understand that these engines have given less trouble with stay bolts and side sheets than the narrow boxes, with the sharp O G bulge just above the wheels that were previously used. The M. M. Committee of last year reached the same conclusion.

With alkali waters the trouble seems to be greater, probably because the radiant heat from a larger fuel bed, must be taken up by a reduced firebox heating surface, and the water being light is at times driven away from the side sheet, resulting in the rapid destruction of the sheet; with solid (non-foaming) waters this does not occur.

Under any circumstances, the locomotive that makes the most steam will do the most work, and we cannot afford to curtail the generating powers. The boiler shown in the Railway Master Mechanic has a ratio of 91 for heating surface to grate area. With western coal (Illinois, etc.) the greatest rate of evaporation which we could expect per square foot of heating surface per hour would be 12½ pounds of water from and at 212 degrees. If we made this ratio 70, by increasing the grate to 48 square feet, we could expect 14½ pounds. For the same heating surface, this means 16 per cent more boiler power, or say horse power. Or again, at the same total coal consumption, we should have a rate of combustion of 154 pounds of coal per square foot of grate per hour in the wide box against 200 pounds in the narrow. Owing to the smaller cinder and spark losses through the stack and the more complete combustion (because slower) we should evaporate about 70 per cent more water per pound of coal. These facts are certainly logical reasons for using the larger grate—that it must be wider is due to the limitations of locomotive dimensions and length of throw for firemen.

Long tubes are due as much, if not more, to the type of engine, as to the wide box. With the 4-4-2 type, 16-foot flues work in very nicely—when we try to put a third pair of drivers between the cylinders and the firebox we must lengthen the tubes; as a rule, however, the diameter is increased nearly in proportion to the length; 2¼-inch tubes 19 feet long would have the same proportions as the 2 in. by 16½ ft. tubes to be used in the new boilers, and it must surely be the relative and not the actual length that governs the heating value of the tubes. The answers to question 28 of last year's boiler committee seems to indicate that the length does not greatly affect the maintenance of flues, but that quality of water and severity of service are the principal causes of trouble. This we believe to be correct. The large boilers will do more work, the superintendents know they will, and they must work to the utmost limit. As an example of this, in oil burning, locomotives will perform 25 per cent more work (in horse power) than the same engine burning coal—the division superintendent realizes this and loads them so that they will have to do it; and the boiler deteriorates so much faster. I do not deny that firebox surface is a better evaporative medium than tube surface, and believe that water tubes of some form could be placed in the firebox with advantage, giving a rapid evaporation, and at the same time protecting the side sheets from some of the radiant heat. The flue sheet is bound to suffer—if an arch could be maintained, it would protect the back ends of the flues from radiant heat, but in bad water territory, the flues must be caulked every trip, and the arch interferes with this work.

One thing must be borne in mind: coal contains a definite number of heat units to the pound—if we burn this in a firebox without any tube surface, we will evaporate almost as much water as if tube surface be used, and if we keep the temperature of the up-take to the normal heat, it matters little how the heating surface is disposed. But we cannot get more heat out of the coal than its constituents indicate, even if our heating surface was measured by the acre, and if more heat is needed to generate steam, we must burn more coal. Even with 7½ inches of water for draft the spark losses are about 22 per cent and as this draft is necessary to burn coal at the rate of 200 pounds per square foot per hour, the limiting rate of combustion seems to be fixed thereby, so that more coal means more grate, regardless to a certain extent, of heating surface.

Yours truly,

G. R. Henderson.

Philadelphia, Pa.

Editor, Railway Master Mechanic:

I have noted carefully the cuts in your May number representing the proposed new type of locomotive boiler. It, of course, is a novelty in design, and may result in proving that we are, up to date, quite wrong in having adopted the wide firebox, long flue boiler. From past experience, however, I am not disposed to admit that the wide firebox with long tubes has been a mistake. Our experience with this type of boiler dates over a period of about two years, and we have not as yet found them more prone to leak than the narrow firebox boiler with shorter flues. We find, however, very much in them to commend. Taking engines of the same size and in the same kind of service over the same territory, also carrying the same pressure, one type equipped with narrow and long firebox and the other with short and wide firebox, we find that the wide firebox engine will do the same work with more regularity of steam pressure, and burning a great deal less coal. With the narrow and long firebox engine our observation has been that the length of firebox, 120 inches or over, prevents the fireman from distributing the coal to any such advantage as may be done in the short wide firebox, and in cleaning the fire it is also a hard matter for the fireman to reach to the front part of the grates in order to clean the fire at that point, the result being that the fire close to the flues becomes dead and the air rushing in at that point is not heated sufficiently to prevent chilling the flues. We believe, with that type of firebox, all else being equal so far as water space between sheets and between the flues are concerned, the long firebox, short flue engine will be found prone to cause more trouble with leaks than the wide firebox long flue engines would be. We have, I believe, in the past more than reached the limit in the length of firebox over which a fireman can distribute coal to good advantage, unless the furnace door be raised from the footboard. This, of course, has its objectionable features, in the fact that it might then be claimed that the work of raising the coal from the level of the floor of the tender to the furnace door would also mean more labor, but I believe this labor would be more than compensated for by the decreased effort necessary to distribute the coal over the grates. What, in my opinion, is more to be desired than anything else at present so far as the construction of our boilers is concerned, is an increased distance between firebox sheets, permitting of a larger body of water, and freer circulation, longer stay bolts, smaller in diameter and spaced closer. Boiler tubes spaced farther apart than has been done in the recent past and placed in vertical rows, so as to permit of freer circulation. With this construction and a sane method of cooling, washing and repairing boilers at our terminals, and more thorough education of our men in caring for boilers, both on the road and at terminals, I believe, our trouble with boiler tubes and sheets will largely disappear.

Yours truly,
J. F. Walsh,
Supt. Motive Power, Chesapeake & Ohio R. R.

Editor, Railway Master Mechanic:

Commenting briefly and superficially upon a design of a large locomotive boiler—73 inches in diameter—with a 42 x 126 firebox which appeared in May issue of Railway Master Mechanic. The distance between driving wheels is a fixed quantity, and I do not believe that an attempt to squeeze the firebox of a big boiler into this space can be considered as a step in advance. This can be done with the firebox of a 50 or 60-inch boiler without distortion, but to jam the firebox of a 73-inch boiler between the same wheels brings about an undeniable distortion which means constricted water spaces, curved side sheets (which pockets the steam) and, in consequence, cracked sheets and broken stay bolts, to say nothing of a grate 10½ feet long.

Boilers are growing bigger and any real advance in locomotive design must be on lines that are capable of a development to the limit, and the right of way should be the limit rather than the distance between driving wheels.

The wide firebox, with straight side sheets and ample water spaces has, in my experience, reduced side sheet and stay bolt troubles to the minimum, and has given the boiler a chance to breathe in an unconfined and entirely healthful way.

But then there are flues. If we assume that the wide firebox in itself is good design, does not the solution of the flue trouble lie in some form of combustion chamber which would move the flue sheet away from the fire and give shorter flues and more firebox heating surface at the same time?

Yours truly,
Tracy Lyon,
Asst. Gen. Manager, Chicago Great Western Ry.

Editor, Railway Master Mechanic:

I have not had experience with the modified wide firebox as recently applied to some of the western locomotives, though have with regulation narrow firebox engines for soft coal burning, and the full wide firebox of the Wooten type as used in the anthracite coal region.

With anthracite coal the wide firebox is a success. I attribute this to the uniform heat maintained with hard coal, and also to the practice of never allowing the fire to go out, except when necessary to blow off the steam for washing out, or other purposes.

I think that there will be more or less difficulty with any kind of a shallow firebox with soft coal as fuel for the reason that there is a great variation in temperature, ranging from cold draughts of air over the surface of an indifferent fire, to the intense heat of perfect combustion; and, with the additional disadvantages of bad water, and harsh treatment, both in the way of excessive load, and indifferent handling by the enginemen, a lot of grief is bound to be experienced with any kind of soft coal burning engine, and probably more as the dimensions of the firebox are increased.

Yours truly,
W. M. McIntosh,
Supt. Motive Power, Central Railroad of New Jersey.

Editor, Railway Master Mechanic:

The writer has had no personal experience with boilers with flues longer than 16 feet, and so far as the locomotive designs are concerned for which he has been responsible, has had no difficulty in getting ample heating surface for boilers of reasonable size with flues of this length. Not being able to speak with the authority of experience on the subject of troubles with very long flues, we can only say that we look upon very long flues with a little distrust, but rather fear that the design of the boiler referred to, while tending to reduce the trouble from leaky flues, has gone back to a form of firebox which will give very much greater trouble with broken stay bolts on account of the sharp "O G" bends at both sides of the firebox, which all master mechanics know are apt to produce grief without end on account of broken stay bolts.

The reasonably shallow firebox with 12 to 16 inches under the flat bricks carried on the water tubes at the front where the grate is not of unusual length so that the fire can be efficiently spread and looked after, seems to give with our fuel and water very good service, and by using the wide grate we accomplish a distinct saving by reducing the number of pounds of coal burnt per square foot of grate per hour to produce a given evaporation.

Yours truly,
R. P. C. Sanderson,
Supt. Motive Power, Seaboard Air Line.

Criticism of Modern Locomotive Boilers

By L. S. Randolph

The enormous demands which have been made in recent years on locomotives, both as regards their tractive and horse-power capacity, has pressed the design of the boilers forward more rapidly than our engineers have been able to study the conditions surrounding the new work required of them and apply the proper remedies, which but for the hurry and bustle with which the work has been done, would have been fully foreseen and arranged for.

The writer read before the Louisville meeting of the American Society of Mechanical Engineers an article on "Strains of Locomotive Boilers," in which the stresses under which locomotives boilers were working at that time were pointed out and some remedies suggested. As long ago as 1885, the writer also published a paper on the "Strength of Stay-bolts" and was the first to call attention to the failure of stay-bolts due to the vibratory motion. This latter subject is now fully understood and designers are fully aroused to its importance, but the other stresses due to the unequal expansion and contracting caused by the unequal temperature and unequal rates of heating and cooling is not understood, has not been studied to any extent and remedies are not being worked out for the dangers arising therefrom.

If we take the fire-box and tubes which are, of course, the weak point and compare them with the earliest designs, we find that the tubes are longer, the fire-box is longer and higher, the temperature of combustion has been increased and the boiler pressure has been raised and consequently the temperature of the steam has been increased so that the three factors governing the flue and fire-box, namely, their total length, their total height, and the temperature of the metal, all three have been increased, and yet, with the exception of one or two cases, there has been no concerted effort to apply remedy and furthermore, the writer, with all modesty, would say that he believes very few locomotive designers have made the above analysis and are aware of these difficulties. Larger boilers have been built simply in proportion to the smaller previous designs which give only fairly good satisfaction under requirements very much less severe. We have had corrugated fire boxes which seem to have worked very well, namely in the Strong locomotive and later in the Vanderbilt type. Whether this is a complete solution of the problem is doubtful, and it would seem to the writer that they introduce objections which are almost as difficult to overcome as these troubles which it is intended to obviate.

The purpose of this article is merely to call attention to this difficulty and point out the writer's idea of the method of the solution which is that boilers must be designed so that the expansion due to the different temperatures of the different parts of the boiler will be taken up easily and readily and where the motion incident to unequal expansion and contraction will not be thrown on the slip joints of the flue sheets and the small radii of the fire-box corners. Until this is done, we are likely to have trouble, and serious trouble, with our flues and fire-boxes. The present design practically makes of each flue end an expansion joint; which is required to operate at high pressure and abnormally high temperature, a thing which is not satisfactorily done at low pressures and temperatures.

Four Cylinder-Balanced Compound Locomotive, N.Y.C. & H.R.R.R

THE Schenectady Works of the American Locomotive Company has recently completed the most interesting engine which has been built since the construction of the Vauclain four-cylinder balanced compound built about a year ago by the Baldwin Locomotive Works for the Atchison, Topeka & Santa Fe Railway. This new engine has been delivered to the New York Central & Hudson River Railroad and was built according to the design of Mr. F. J. Cole, mechanical engineer of the Schenectady Works. It is evident from a consideration of this design that an effort was made to avoid complications and introduce the compound feature with as few changes as possble from the usual type of American simple engine.

The low pressure cylinders are located in the position common to simple engines, being outside of the frames and attached by a saddle casting to the smoke arch. The high pressure cylinders are situated forward of the saddle casting and between the frames which are extended to such length as to support them. The pistons of the high pressure cylinders are connected to the forward axle, which is suitably cranked to accommodate such connection between the frames. The low pressure cylinders are connected to the rear pair of drivers in the manner common to locomotives of the 4-4-2 type. By this arrangement of cylinders long connecting rods are possible both inside and outside of the frames.

The cranks on each axle are at 90 degrees to each other and so disposed that the outside crank is at 180 degrees with its adjacent inside crank. The valves are of the piston type and the valves of both the high pressure and low pressure cylinders on one side are connected to the same valve stem and operate within a continuous valve chest which acts as a receiver between the high pressure and low pressure cylinders very much as in the design of Schenectady tandem compound. The valves are operated by the usual Stevenson link motion so that no complications are introduced in this particular. The high pressure cylinders 15½ inches in diameter by 26 ins stroke, and the low pressure cylinders are 26 ins. in diameter by the same length of stroke. The engines operate under 220 lbs. of steam and the outside diameter of drivers is 79 ins. Applying these figures to the usual formula for four-cylinder compound locomotives evidences this engine capable of a tractive power of 23,800 lbs.

The general dimensions are presented by the following table:

General Dimensions.

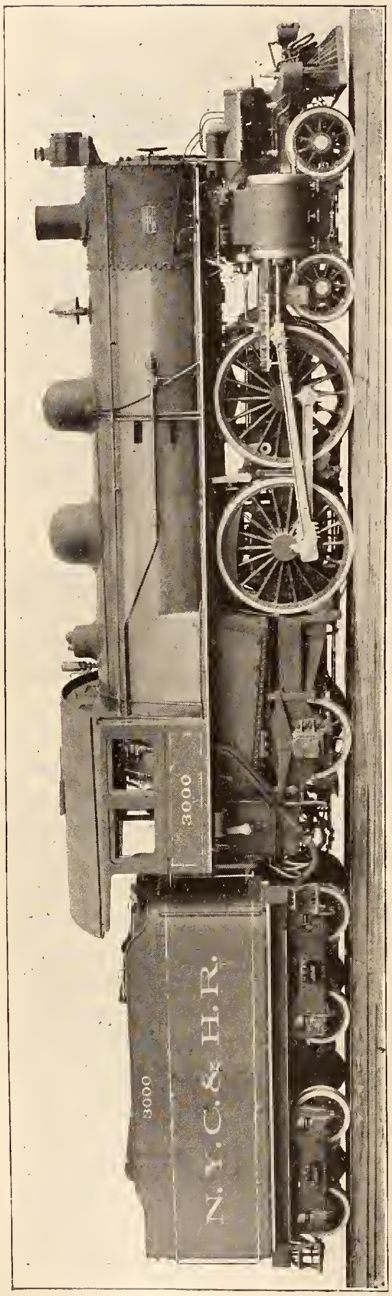
Gauge	4 ft. 8½ ins.
Fuel	Bituminous coal.
Weight in working order	200,000 lbs.
Weight on drivers	110,000 lbs.
Weight, engine and tender in working order	321,600 lbs.
Wheel base, driving	7 ft.
Wheel base, rigid	16 ft. 6 ins.
Wheel base, total	27 ft. 9 ins.
Wheel base, total, engine and tender	53 ft. 8 ins.

Cylinders.

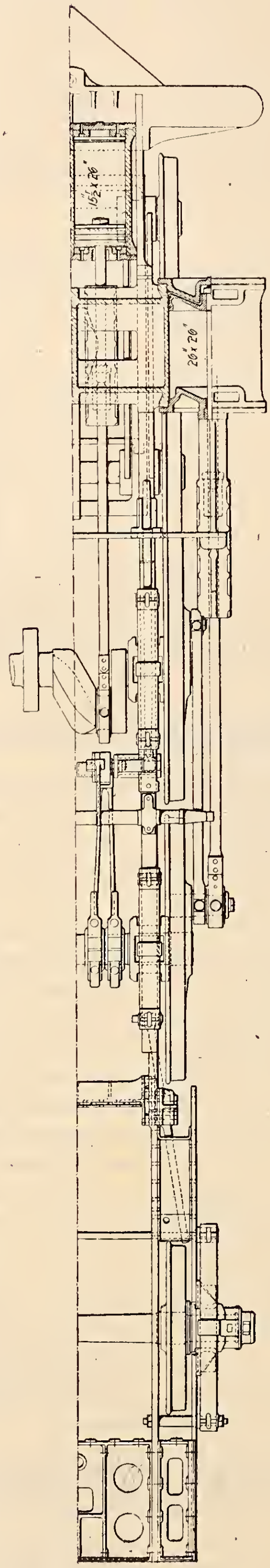
Diam. of cylinders	15½ ins. and 26 ins.
Stroke of piston	26 ins.
Horizontal thickness of piston	L. P., outside, 5¼ ins.; H. P., inside, 6¼ ins.
Diam. of piston rod	3 ins.
Kind of piston packing	Cast iron rings.
Kind of piston rod packing	U. S. metallic with Gibbs' vibrating cup.

Valves.

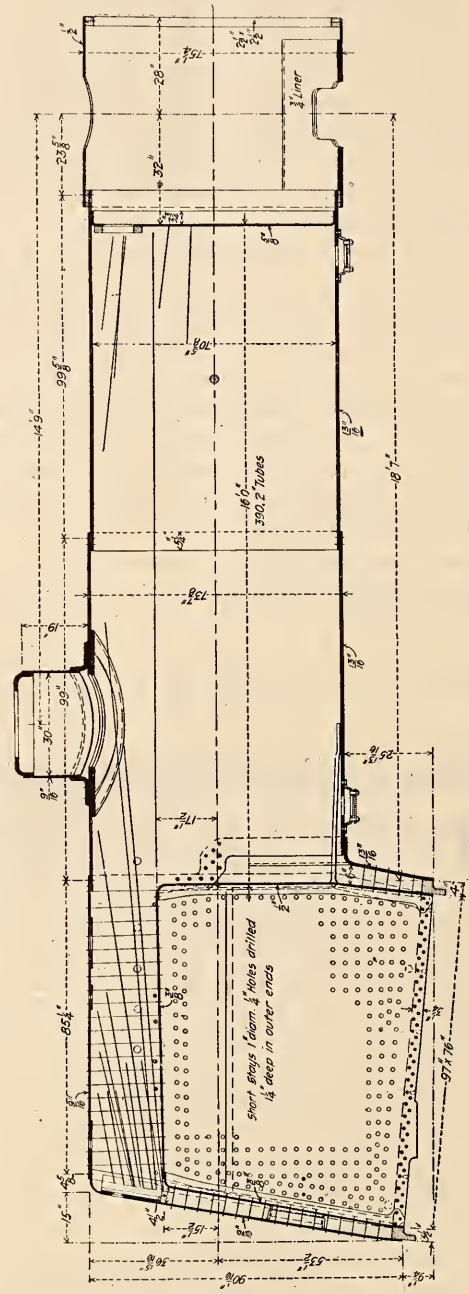
Kind of slide valves	Piston type.



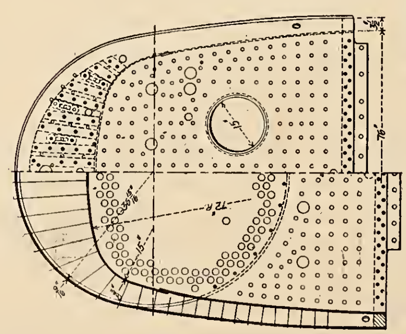
Cole Four-Cylinder Balanced Compound Locomotive—N. Y. C. & H. R. R. R.



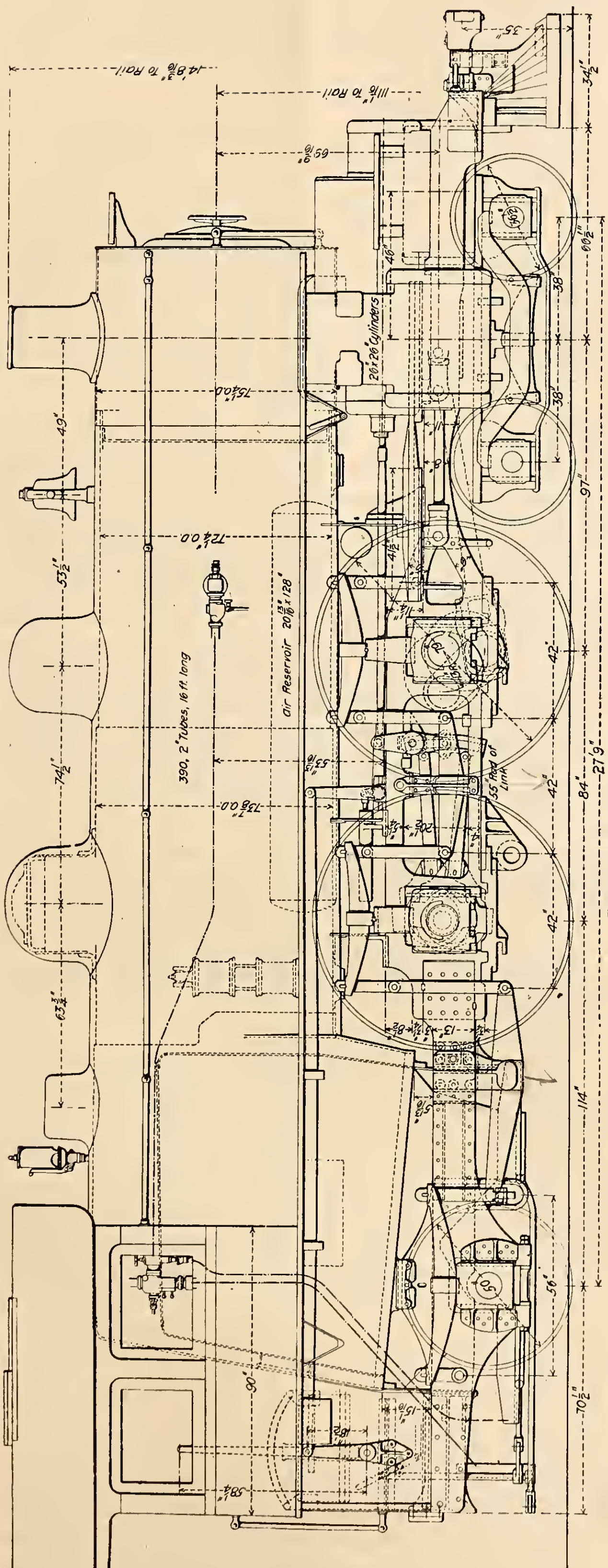
Partial Plan.



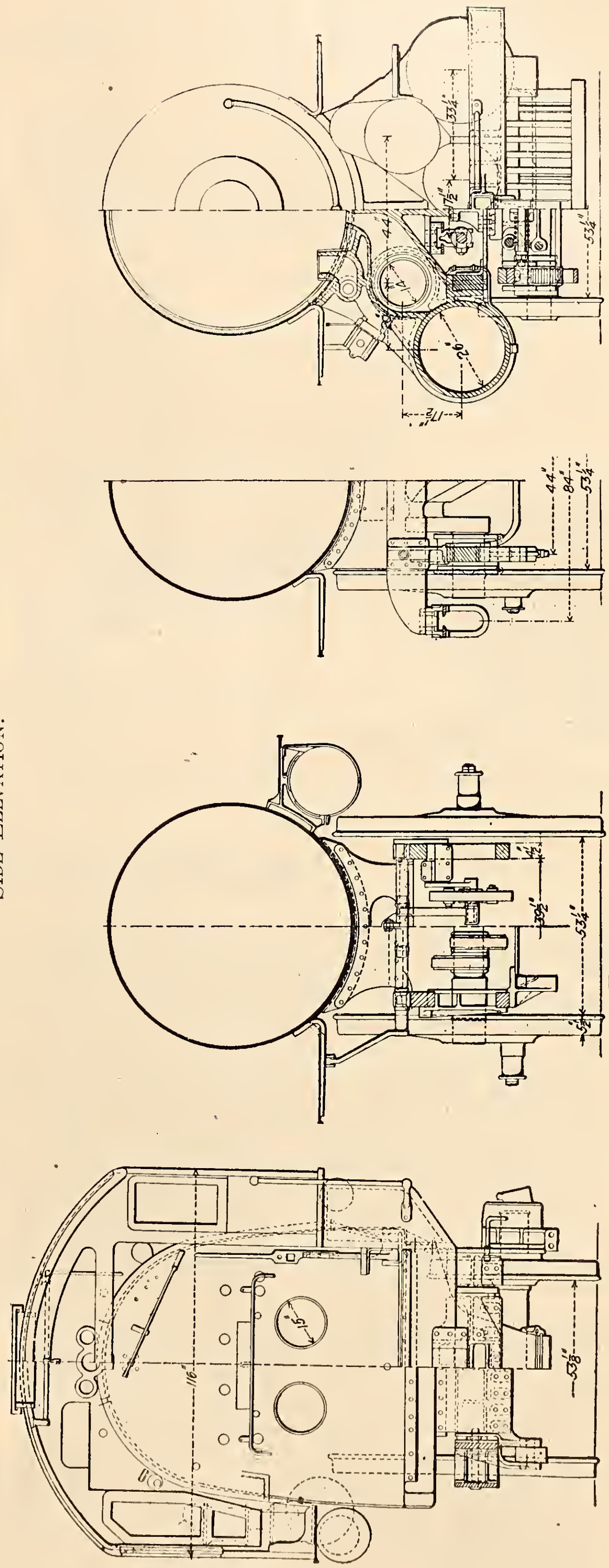
Longitudinal Section of Boiler.



Cross Section Through Firebox.



Side Elevation.



End Elevations and Sections.

Greatest travel of slide valves......................... 6 ins.
Outside lap of slide valves.............................. 1 in.
Inside clearance of slide valves......H. P. ¼ in., L. P. ⅜ in.
Lead of valves in full gear...................¼ in. lead forward motion when cutting off at 11 ins. of the stroke.
Kind of valve stem packing......................U. S. metallic.

Wheels, Etc.

No. of driving wheels.. 4
Diam. of driving wheels outside of tire...............79 ins.
Material of driving wheel, centers..................Cast steel.
Thickness of tire ....3½ ins.
Tire held by..................Shrinkage and retaining rings.
Driving box material.............................Cast steel.
Diam. and length of driving journals..............10x12 ins.
Diam. and length of main crank pin journals (back side 6¾x4 ins.)..................................Back, 6x6 ins.
Diam. and length of side rod crank pin journals.......... ....Front 5x3¼ ins.
Section of rods..................................Main, 1; side, 1.
Engine truck, kind........................4 whl. swing cen. bearing spring centering device, R. R. Co.'s style.
Engine truck, journals......................6½x12 ins. diam.
Diam. of engine truck wheels...........................36 ins.
Kind of engine truck wheels.............................. ....Krupp No. 3, cast iron spoke, 3⅛-in. tire.

Boiler.

Style..............................Straight top, radial stay.
Outside diam. of first ring..........................72¼ ins.
Working pressure......................................220 lbs.
Material of barrel and outside of fire box................ ....Coatsville(Worth Bros.) steel.
Thickness of plates in barrel and outside of firebox.... ....13-16 in., 9-16 in., ⅝ in.
Horizontal seams................Butt joint, sextuple riveted.
Circumferential seams ....Double riveted.
Firebox, length......................................96⅛ ins.
Firebox, width......................................75¼ ins.
Firebox, depth..................Front, 80¼ ins.; back, 69 ins.
Firebox, material..............................Carbon steel.
Firebox plates, thickness.................................. ..Sides, ⅜ in.; back, ⅜ in.; crown, ⅜ in.; tube sheet, ½ in.
Firebox, water space............4 ins. and 5 ins., front; 3½ ins. and 5½ ins., sides; 3½ ins. and 4½ ins. back.
Firebox, crown staying.................................Radial.
Firebox, stay bolts...............Taylor iron, 1 diam. W. S.
Tubes, material and gauge........................ ....Worth charcoal iron No. 11 B. W. G.
Tubes, number..390
Tubes, diam..2 ins.
Tubes, length over tube sheets........................16 ft.
Fire brick, supported on........................Water tubes.
Heating surface, tubes............................3248.1 sq. ft.
Heating surface, water tubes.........................23 sq. ft.
Heating surface, firebox............................175 sq. ft.
Heating surface, total...........................3446.1 sq. ft.
Grate surface.......................................50.3 sq ft.
Grate, style............................Rocking in 4 sections.
Ash pan, style...............Hopper bottom, dampers F. & B.
Exhaust Pipes..Single.
Exhaust Nozzles..............5⅜ ins., 5⅝ ins., 5⅞ ins. diam.
Smoke stack, inside diam..............................18 ins.
Smoke stack, top above rail.......................14 ft. 8 ins.
Boiler supplied by..................N. & Co., Monitor No. 11.

Tender.

Style .... U.
Weight, empty.....................................51,600 lbs.
Wheels, number..8
Wheels, diam..36 ins.
Journals, diam. and length........................5½x10 ins.
Wheel base...................................16 ft. 9½ ins.
Tender frame................................10-in. channels.
Tender trucks.. 2-4 wheel cen. bearing, Fox pressed steel frames and bolsters.
Water capacity ....6000 U. S. gals.
Coal capacity...10 tons.
Brake—Westinghouse American combined on all drivers and trailers operated by air. Westinghouse American combined on tender, and for train Corrington Consolidated Engineers' valve and parts. Signal schedule Westinghouse J. air pump, 9½ ins. left hand. One main reservoir, 20 13-16x128 ins. trailing truck, rigid with outside journals. Trailing truck journals, 8x14 ins.; wheels, 50 ins.; tire, 3 ins. thick. Tires held by lip and shrinkage.

Handling Injectors on the Road

OUR last number contained editorial comment concerning a method of pumping boilers which we are pleased to see has excited some discussion. We remark that we are pleased, because it is by means of discussion that we can learn to best advantage how practices are generally considered. In support of the position taken we would refer to a recent round trip of an engine which had previously given trouble with leaky flues. This is a wide firebox engine which burns bituminous coal and operates over a division of 131 miles. Before starting on the run it was explained to the engineer that he was desired to put in as much water as possible while working steam and as little as possible when shut off. He became interested, and adhered very closely to this method and at the end of the run remarked that it was no more trouble to handle water in this manner than by his accustomed way. On the runs referred to the engine had its full tonnage, steamed freely, and popped but once during the round trip. It reached each terminal dry in spite of the fact that its condition had been such as to lead the engineer to remark before starting that he thought it would be impossible to get in on either occasion with dry flues. During the return trip the grates became disconnected and the end of the run was made under the disadvantage of a very dirty fire and in spite of this fact the engine came in dry.

Presented herewith are several communications which have been forwarded to us discussing this very interesting subject:

Editor, Railway Master Mechanic:

With reference to your editorial in the May issue of the Railway Master Mechanic, would advise that the practice of pumping boilers while standing at stations is to the disadvantage of the boilers, and would also say that your idea of the matter as presented therein is correct, namely, when the throttle is opened, circulation is again suddenly started, temporarily knocking the steam pressure back, and not only doing some harm to the boiler by starting the flues to leak, but it certainly will start them to leak. It is not only hard on the flues but on the firebox sheets; besides, when starting out of the station you will not have steam when you need it the most to get your train in motion.

In several years' practice as a locomotive engineer, I find that the only way to maintain sure water level is to hold your level while engine is working. Simply work injector enough after shutting off the steam to avoid the disagreeable noise of popping while around stations, having water enough in the boiler so that it will not be necessary to work your injectors until after the train is started and your full pressure of the steam has been raised. In case it becomes absolutely necessary to work the injector while around stations to keep your water level up where it belongs, the fire should be forced with the blower to the extent that the steam pressure allowed be kept up against the water that is being pumped into the boiler.

Yours truly,

W. O. Thompson,

Div. Supt. Motive Power, N. Y. C. & H. R. R. R.

Editor, Railway Master Mechanic:

Your editorial in the May issue of the Railway Master Mechanic concerning the effect of feeding cold water into a locomotive boiler while the engine is not working steam, is no doubt theoretically correct and is couched in words that would also look practical to most anybody except a locomotive runner but there are other things that depend upon boiler feeding beside the care and the maintenance of the flues, which are mainly: Fuel consumption and hauling heavy tonnage with dispatch. These requirements necessitate the skillful engineman's storing away thousands of heat units by keeping the boiler as full of water as practical when the engine is at rest, thus having a reserve to draw from while the engine is laboring into speed, to recover from the effects of the stop, and the evil effects are not as great from delivering water to the boiler when the fire is not under forced draft, as is naturally supposed considering the fact that there is a good fire in the fire box under natural draft, and the saving that accrues from skillful manipulation of the injector far outweighs the damage to flues and fire box caused by the variation of boiler temperature. You state the most practical method of handling the injector to advantage, is to hold the water level while the engine is working and use the injector after shutting off steam, merely to the extent to avoid popping off.

Again from a theoretical view point this is absolutely correct, but is it practical to hold water in a boiler anywhere a level considering the sporadic conditions attending locomotive practice? We think not.

First. Because it is necessary to keep the injector at work after shutting off steam, to prevent the wasteful escape from the safety valves.

Second. To store water enough in the boiler so that the engineman may favor the fireman by leaving the injector closed when starting and should the engineman not do this, he would not make many stops before the fireman would be in a demoralized condition with his fire spoiled.

I would like to mention here that a badly clinkered fire is far more injurious to flues and side sheets than putting water into the boiler under any condition when the fire is clean and it can be safely said that the engineman who skillfully handles the injector most favorably to the steaming of his engine and keeps the fire in good condition, adds 50 per cent to the life of the flues and fire box.

In conclusion would state that from observation and many years experience, I am led to believe that flue and fire box deteriorations are mainly due to hostling and firing up locomotives and can be eliminated to a great extent in this direction and Article 8,—in the "Care of Locomotive Boilers," published in your May issue, i. e., —To bring the boiler to the clinker pit as full of water as possible before the fire is cleaned or knocked out, will give greater relief than anything else in hostling the engine. The most noticeable cause for leaky flues and stay bolts came when the railroads changed their method of firing up locomotives, by changing from wood with natural draft to coal and oil under forced draft. This radical change has been responsible for more leaky boilers than anything that has come under my observation.

W. E. Widgeon,

Road Foreman of Engines, Vandalia Line.

Editor, Railway Master Mechanic:

Referring to editorial appearing in the May issue of your publication on the subject of care of locomotive boilers. I beg to say that I agree with you as to the advisability of care in the operation of injectors, and there is no doubt but that a large proportion of boiler failures reported are due to the water supply being handled carelessly and unintelligently.

The rules of instructions for foremen, enginemen and hostlers appearing on page 162 of your May issue are, in my opinion, to the point, and if observed, will largely reduce the number of cases of trouble with tubes reported. I would suggest, however, the addition of a few more "don'ts" to the list shown, as follows:

Don't leave a terminal with fire in condition that will permit of steam pressure reducing twenty to thirty pounds the first two or three train lengths, as this procedure will necessitate delaying admission of water to permit of steam pressure reaching normal.

Don't permit the fireman to become careless in his work. See that he places the coal where needed and keeps his fire as uniformly level as possible, to prevent banking and pitting, with a consequent bad effect on tubes.

Don't forget, when you get over a hill and cut your engine back, to ease your injector proportionately, to enable the fireman to keep steam at normal pressure.

Don't use the blower any more than you can possibly help, for it results in making your fire solid and fills up the box, and anything that is bad for the fire will eventually be bad for flues.

I would suggest the following additions to instructions:

To hostler: Don't forget to close the dampers and door after fire is cleaned, so the cold air will not pull through the firebox and flues when you put engine in the house.

To boiler inspector, I would say: Don't open the dampers and the door and then turn on the blower wide open when you inspect firebox, for if you do, if the flues are not leaking then they probably will be as soon as engine is fired up and expansion takes place.

Yours truly,

James E. Keegan,

Master Mechanic, G. R. & I. Ry.

Editor, Railway Master Mechanic:

Since the transportation department began charging engine failures for everything that occurs on the road where time is not made or tonnage hauled, it has forced the mechanical department to try all means possible to avoid them.

Leaky flues and staybolts figure largely in these failures, and as it has become recognized that the boiler is the life of the engine and source of power, this department is doing everything to increase the efficiency of the boiler and life of the flue.

In localities were the water is bad the troubles from leaky flues are greatest, and there is where every effort should be made to protect the boiler. From the time the engine comes out of the shop until she has completed her mileage every possible effort should be made to guard against failures. First, in cooling boilers to be washed, especially if a brick arch is used, as much time as possible should be given, the injector put to work and left on until it breaks. Then attach the washout hose to feed pipe and open blow off cock and let water run through until water is lukewarm. It is bad practice to blow the steam off and then let the water out and allow the boiler to stand, as this will cause scale to harden on the flues and sheets.

In preventing failures after the engine is turned out for her run every one that has the handling of her from the time she crosses the turntable until she is housed again has a duty to perform, and if done indifferently or carelessly will result in a failure; if not the first trip, it will come soon.

The hostler should leave the engine with proper amount of water and a fire covering all the grates and about 125 pounds of steam with dampers closed.

The engine crew on taking charge should note the condition of the fire and amount of water. Do not start injector with a dead fire; build it up first.

The engineer should know his fire is in proper condition before starting his train. On coming into a station where fire is going to be cleaned do not let it burn down to dead fire. Be sure and shut off the injector before cleaning and use the blower as light as possible. If the injector is working at station to fill boiler keep the blower on and good fire to hold up the steam pressure. He should leave the engine at the terminal with a live fire and plenty of water. At the ash pit the blower should be used just enough to draw smoke and gas from the cab, and as soon as it is knocked out and pan cleaned, the dampers closed and engine put in the house, more damage can be done by moving engines after the fire is out than at any other time; but after all this care has been taken, if the boiler maker does not use the proper tools in caulking they will soon start leaks that cannot be overcome by the watchfulness of others.

I do not know of anything that will assist the mechanical department in reducing engine failures of this kind more than treated water. Since using it on the Union Pacific the failures have almost entirely disappeared. Where in March, 1903, there were 23 failures from engines leaking on a division 173 miles long, in March, 1904, there was none. This water, with the care given at terminals and by crews following out these instructions, are responsible for bringing around these results.

Yours truly,

W. J. Stuart,

Traveling Engineer, Union Pacific Ry.

Editor, Railway Master Mechanic:

I have carefully read the editorial referring to the method of handling injectors which appeared in the May issue of the Railway Master Mechanic and the set of rules on page 162. The rules are something new to me; I did not think there was a road in the country that had gone into this question so deeply.

I certainly agree that a very large percentage of the engine failures are due to boiler troubles, and anything that will have a tendency to reduce them is a good thing. There is one part of the editorial that I do not quite agree with, that is: "The most practical method of handling the injector to advantage is to hold the water level while the engine is working and use the injector after shutting off steam merely to the extent necessary to avoid 'howling' or the disagreeable noise of popping while around stations." The best and most economical engineers I have ever ridden with play their injectors to lose a little while the engine is working and manage to reach the water tank, coal chute or station with the blower on and the injector working; that is, conditions in the firebox are practically the same in both cases, heat being generated and stored in the boiler by the water level being gradually raised. The injector is shut off when starting the train and left off until the lever is hooked up and normal conditions restored in the firebox, then the injector is again worked to lose a little to the next stopping place. The man who manages in this way has the least trouble with flues leaking. The reckless roar of the blower at the cinder pit will undo in five minutes all that a careful crew has done on the entire trip to take care of their boiler, firebox and flues.

I personally talk to our boys at the cinder pit and have them just use the blower strong enough, when cleaning fires, to take the gas and smoke out of the firebox instead of allowing it to go into their faces and lungs.

The care of the boiler is paramount in keeping it in good order. Still there are a great many things that have an important bearing in this subject that are seldom noticed or spoken of. At any rate, they are not given the attention they should receive. I believe if you were to give the matter a thorough sifting, aside from bad water, you will find that the greatest number of boiler failures are where the least attention is paid to stopped flues. When flues stop they are lost as to usefulness; heating surface is reduced; engine don't steam; engineer begins to favor the fireman by shutting off the injector; reaches the station, tank or top of hill with just barely water enough to hold his office; both injectors on; fire crowded by the fireman; there is a struggle between the cold forces and hot forces for supremacy, all at the expense of the boiler. How to run and fire a locomotive without stopping many flues would be an interesting paper and would have a tendency to reduce boiler failures a great deal. It is no uncommon thing to get on a locomotive that is in heavy and hard service and find from fifty to a hundred flues stopped up. Still we wonder why she leaks. We have no regular printed rules or instructions here. All that are given are along the lines outlined in this letter. Yours truly,

J. W. Hardy,

Road Foreman of Engines, Colorado Midland Ry.

Editor, Railway Master Mechanic:

I have read your editorial on care of locomotive boilers with much interest and offer the following:

I cannot agree that most damage is done when throttle is closed, or when drifting or standing on side tracks or over clinker pits. True, much damage can be and is done under these conditions, but the greater amount of damage by far results through using steam when the firebox is poorly protected through insufficient fire on the grates, or exposed for too long a period of time to the inrush of cold air through a wide open door, the latter often being resorted to in order to "cool her off" before shutting off for a station.

It is not very often, in practice, that the water level will be high enough at the moment that the throttle is closed to enable or justify the enginemen in shutting the injector off. Nor do I think it is practical or at least prudent to do so. In any service—freight or passenger—that I am familiar with, the work is so exacting, in most instances, that the fire must be kept up to the top temperature right up to the shutting off point, otherwise fresh coal in large quantities will need to be added to the fire between the time the thottle is closed and time same is opened again. This, to my mind, will do more harm in the matter of reducing firebox temperature by absorption of heat from the live fire than would be likely to result if fire was kept up hot, the injector left working and the blower applied lightly while the engine is shut off for a town or drifting.

Of course, unless the fire is in such shape as will maintain steam pressure without loss, using the injector would be likely to do much harm. We recommend coming into stations with a hot fire, controlling the pops with the injector and shutting the latter off before start is again made.

Evenness of temperature in fireboxes is more easily maintained in this way than in any other, I believe.

It is safe to say that the bulk of abuses to locomotive boilers are due to other causes than that of working injectors after engine is shut off for drifting. Taking, for example, a case where engine crew would figure to have water enough and shut the injector off simultaneously with the throttle, at each stopping or drifting point, it would be necessary in order to avoid popping to have the fire well burned out approaching the shutting off places, and it is almost certain that a larger quantity of fresh coal would need to be added before a start could be made, the fresh coal absorbing the heat from the fire that should be imparted to the firebox sheets, during the time that the start is being made.

Damage is often done after drifting a considerable distance and pulling out again without coming to a stop, through the fire having been allowed to burn down too low. It is certain that pulling out with a fire that is not hot enough to take care of the cold air that is drawn through the grates, or with a fire that is too new, will do more damage than any other form of abuse we know of.

The most practical method of handling an injector on a passenger engine, to our mind, is to come into stations so that the injector can be kept working up to about the moment that the start is to be made, as in that way the fire can be kept up to the proper temperature in approaching stations and the start out from such station can be made with a hot fire, which, in my opinion, is the most important factor of all. Keeping a uniform steam pressure at all times as closely as possible, and not leaving firebox door open longer than is necessary to put in from one to three scoops of coal, are the points that are valuable and should be persevered in.

To accomplish the former the fireman must keep his fire up to a high temperature all the time in order that the heat absorbed in disintegrating the fresh coal will not seriously curtail that which should be absorbed by the firebox sheets.

To accomplish the latter the fireman should not put in more than one to three scoopsful of coal at a fire, thus shortening the period of open door and avoiding too much heat absorption by the fresh coal as above.

The most potent factors in boiler and firebox abuses, I believe, are, first, too light a fire pulling out of stations; second, allowing fire to burn too low and then adding large quantities of fresh coal while start is being made. In either case the results are about the same; in the former the fire is too thin to heat up the cold air that is drawn through the grates, and in the latter the little fire that is on the grates will not give off much more heat than is necessary to raise the fresh coal to the igniting point, and in both cases the air that is drawn into the firebox will be cold, so to speak, and the box, especially the tubes, will suffer from contraction.

Yours truly,

D. R. MacBain,

Division Master Mechanic, Michigan Central R. R.

Editor, Railway Master Mechanic:

I heartily agree with your deductions as brought out in your editorial in the May issue of the Master Mechanic relative to the care of boilers, both on the road and in the shop.

I agree with you that more care in pumping an engine while in the hands of the engineer will, in a large measure, overcome many of the road failures due to leaky flues, etc., especially in the bad water districts. Some objections might be urged in that it is not always practical to follow out this method while on the road, yet if it is not entirely practical, an effort should be made to follow this practice as far as possible, and the engineer will soon realize that it is not as difficult as he first imagined.

Referring to your article on the "Care of Locomotive Boilers," page 162 of the same issue, I will state that, while our rules are not exactly similar, they cover practically the same ground, and we have found that we can very materially add to the life of the flues and firebox by giving them the attention as outlined in these instructions, and especially in the instructions to the boiler washers relative to cooling an engine preparatory to washing same.

Yours truly,

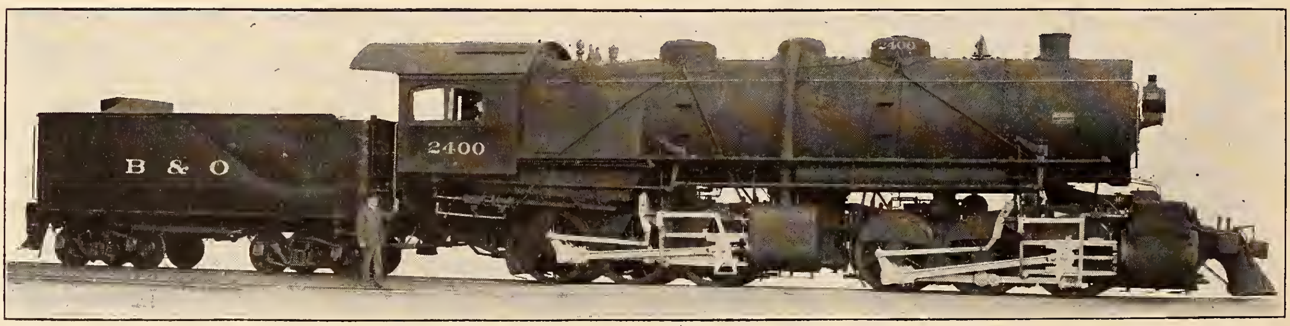
F. P. Roesch,

Master Mechanic, Chicago & Alton Ry.

Mallet Articulated Compound Locomotive for the B. & O. R. R.

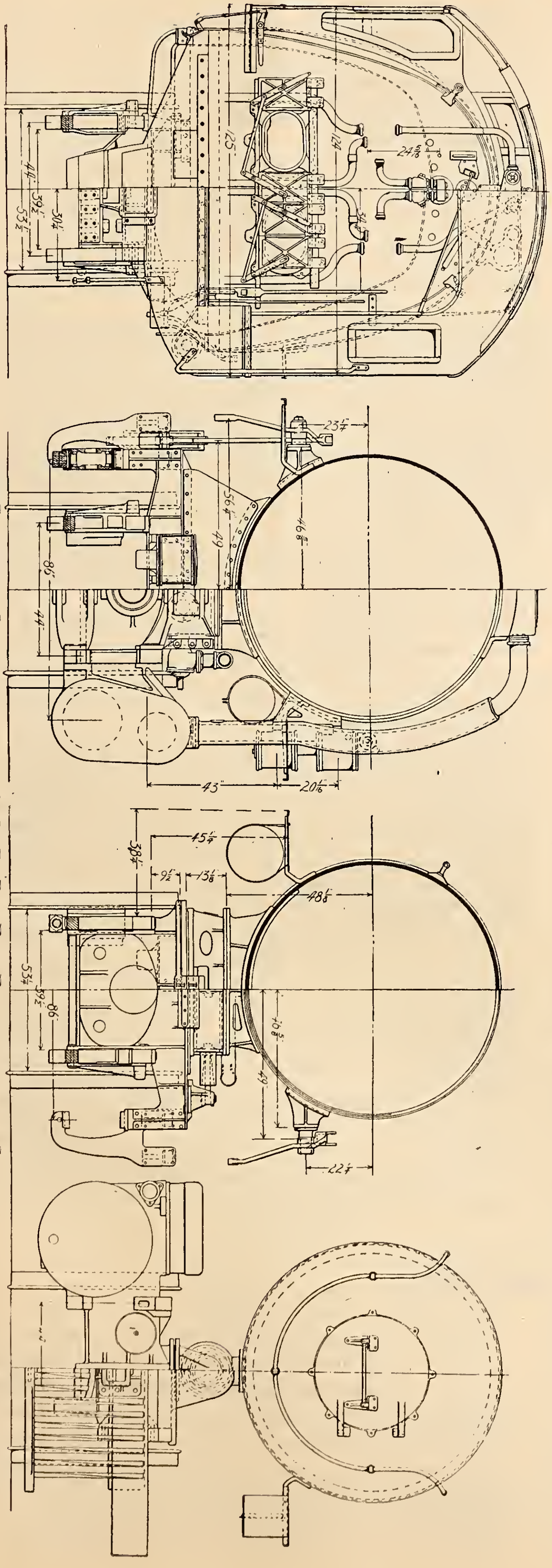
THE Schenectady Works of the American Locomotive Company has recently built a large Mallet articulated compound locomotive for the Baltimore and Ohio Railroad, which is the largest engine ever constructed. Its total weight is carried on drivers and is therefore entirely available in providing for tractive effort. Bituminous coal is the fuel used and the engine operates under 235 lbs. of steam. The arrangement of cylinders, wheels, valve motions, etc., is such as practically to constitute two engines supplied with steam from the same boiler. The high pressure cylinders are located about centrally between the two ends of the boiler and the low pressure cylinders are situated forward of the smoke arch. The driving wheels operated by the high pressure cylinders are independent of the forward drivers, or those operated by the low pressure cylinders, and carry separate and independent frames. The boiler is attached to the rear frames in the usual manner with a saddle casting and expansion pads. The attachment of the boiler to the forward frames is such as to permit the three forward pairs of drivers considerable lateral motion to enable the locomotive to take any curve which it may encounter, so that the 10-ft. wheel base of the rear drivers practically constitutes the rigid wheel base of the locomotive. The rear ends of both the upper and lower bars of the forward frames are joined by pieces which form a swivel joint about pins carried by two castings secured between the upper and lower bars of the rear frames. The forward portion of the boiler is carried by castings, including bearing surfaces which are free to slide within limits, thus giving the forward frames and drivers the freedom of a radial truck. Above the guide yoke a spring attachment is arranged on each side of the boiler to bring it central when the locomotive has resumed the tangent after passing a curve.

The high pressure cylinders are 20 ins. in diameter by 32-in. stroke, having piston valves, and the low pressure cylinders are 32 ins. in diameter by the same stroke, using the ordinary type of balanced slide valve. Steam distribution is accomplished by Waelschaert valve gear. The motion work operating both the high and low pressure cylinders are controlled by the same reverse lever so that while both valve motions are independent of each other, they operate in concert.

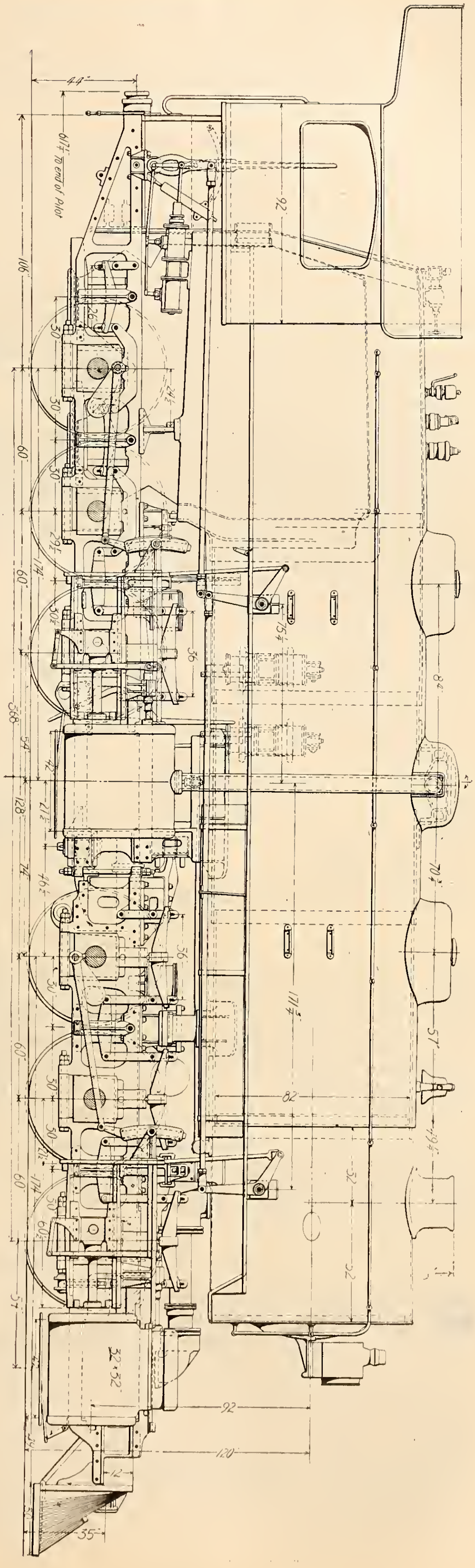


MALLET ARTICULATED COMPOUND LOCOMOTIVE—B. & O. R. R.

Steam is delivered to the high pressure cylinders from a steam dome located immediately above them by carefully lagged pipes which pass down on each side of the boiler. Exhaust steam from each high pressure cylinder passes to a large pipe carried beneath the boiler and located a little below the top line of the frames, which acts as a receiver and delivers steam to the low pressure cylinder. To provide for the lateral motion of the fore part of the locomotive, this pipe is supplied with flexible joints. From the low pressure cylinders exhaust steam is



Mallet Articulated Compound Locomotive, B. & O. R. R.—End Elevations and Sections.



Mallet Articulated Compound Locomotive, B. & O. R. R.—Side Elevation.

carried to the smoke arch through a horizontal pipe located above the top line of frames, made necessary by the extreme forward position of the low pressure cylinders. This pipe is provided with elbows and flexible joints.

The boiler is of the straight top, radial stay type, 84 ins. in diameter at front. There are 436 tubes, 2¼ ins. in diameter and 21 ft. long, giving a tube heating surface 5366.3 sq. ft. The heating surface in the firebox is 219.4 sq. ft., making a total heating surface 5585.7 sq. ft. The grate surface is 72.2 sq. ft. Coal is fired through two openings which are closed by sliding doors operated by levers. Both check valves are placed on the back head of the boiler and feed water is delivered through pipes inside of the boilers to the forward end. The reverse lever is operated by a steam reversing mechanism.

Determining the tractive effort by the usual formula for tandem compounds, this locomotive is capable of a tractive power of 70,000 lbs.; the ratio of tractive effort to total heating surface is 12.5; the ratio of total heating surface to firebox heating surface is 25.4; the ratio of total heating surface to grate area is 77.3, and the ratio of firebox heating surface to grate area is 3.03. The several weights have not yet been determined.

While the origin of this type of locomotive is foreign, it is used but little abroad and the present engine is the first of its kind to be built in America.

The following table contains the principal dimensions of interest:

General Dimensions.

Gauge	4 ft. 8½ ins.
Fuel	Bituminous coal.
Wheel base, driving	10 ft. and 10 ft.
Wheel base, rigid	10 ft.
Wheel base, total	30 ft. 8 ins.
Wheel base, total, engine and tender	64 ft. 7 ins.

Cylinders.

Diameter of cylinders	20 and 32 ins.
Stroke of piston	32 ins.
Horizontal thickness of piston	5¼ ins. and 5⅞ ins.
Diam. of piston rod	3¾ ins.
Kind of piston packing	3⅝ in. square packing rings.
Kind of piston rod packing	U. S. metallic with Gibbs' vibrating cup.
Size of steam ports	L. P. 20x2⅜ ins.
Size of exhaust ports	L. P. 20x3 ins.
Size of bridges	L. P. 1¼ ins.

Valves.

Kind of slide valves	H. P. Piston, L. P. Allen Richardson
Greatest travel of slide valves	6 ins.
Outside lap of slide valves	H. P. 1⅛ ins., L. P. 1 in.
Inside clearance of slide valves	¼ in.
Lead of valves in full gear	⅛-in. lead F. & B., both engines constant.
Kind of valve stem packing	U. S. metallic.

Wheels, Etc.

No. of driving wheels	12
Diam. of driving wheels outside of tire	56 ins.
Material of driving wheel, centers	Cast steel.
Thickness of tire	3 ins.
Tire held by	Shrinkage.
Driving box material	Best cast iron.
Diam. and length of driving journals	9x13 ins.
Diam. and length of main crank pin journals(main side 7¼x5 ins)	6½x7 ins.
Diam. and length of side rod crank pin journals (inter 5x4¼ ins) F	5x3¾ ins.
Section of rods, main	I Side, rectangular.

Boiler.

Style	Straight top, radial stay.
Outside diam. of first ring	84 ins.
Working pressure	235 lbs.
Material of barrel and outside of firebox	Worth steel
Thickness of plates in barrel and outside of firebox	1 in., ¾ in. and ⅝ in.
Horizontal seams	Butt joint sextuple riveted.
Circumferential seams	Double riveted.
Firebox, length	108⅛ ins.
Firebox, width	96¼ ins.
Firebox, depth, front	80½ ins. back, 72 ins.
Firebox, material	Worth steel.
Firebox plates, thickness	Sides, ⅜ in.; back, ⅜ in.; crown, 7-16 in.; tube sheet, ½ in.
Firebox, water space	6 ins. front; 5 ins. sides; 6 ins. back.
Firebox, crown staying	Radial.
Firebox, stay bolts	Wrought iron to B. & O. spec'n, 1 in. diam. W. S.
Tubes, material and gauge	National charcoal iron No. 11 B. W. G.
Tubes, number	436
Tubes, diam	2¼ ins.
Tubes, length over tube sheets	21 ft.
Heating surface, tubes	5366.3 sq. ft.
Heating surface, firebox	219.4. sq ft.
Heating surface, total	5585.7 sq. ft.
Grate surface	72.2 sq. ft.
Grate, style	Rocking.
Ash pan, style	Hopper.
Exhaust pipes	Single.
Exhaust nozzles	5½-in. diam.
Smoke stack, inside diam	20 ins.
Smoke stack, top above rail	15 ft.
Boiler supplied by	2 inspirators, Hancock, type F, 5000 gals. capacity.

Tender.

Style	Water bottom, hopper type.
Wheels, number	8
Wheels, diam	33 ins.
Journals, diam. and length	5½x10 ins.
Wheel base	20 ft. 2 ins.
Tender frame	Steel channels.
Tender trucks	4 whl. cen. bearing with wrought iron side bars and cast steel bolsters.
Water capacity	7000 U. S. gals.
Coal capacity	13 tons.
Brake	Westinghouse, American, combined on all drivers and tender, operated by air.

Two 9½-in. left hand air pumps.
Two main reservoirs, 18½x140 ins.

Valve Lubrication

REPORTS of fancy records with valve oil impelled an expression which was published in the May issue of the Railway Master Mechanic, with regard to the effect produced by excessive wear as a consequence of seeming oil economy. The writer of this article expressed a readiness to compare repair accounts, maintaining the position that a good oil record at the expense of fuel and repair work represents a loss.

Referring to this subject we have received the following communications:

Editor, Railway Master Mechanic:

Replying to the statement of Mr. E. N. Wiest, M. M. of the M. & N. E. Ry., regarding the use of valve oil, will say that I have no figures that I can compare with Mr. Wiest as all our engines are switching and transfer. It has been the practice of all the master mechanics for the past twenty-five years to hold the engineers accountable for the use of more than one pint valve oil for one hundred or two hundred mile runs. They seem to lose sight of the loss of coal, etc., and hold nothing else in account but valve oil. I am surprised at the number of miles they make without ruining the cylinders, and no doubt they would be ruined if it was not that the steam is somewhat of a lubricant in itself. If you take into account the number of square feet, etc., in an engine to be lubricated in one day, it is very hard to see how it can be done. The cylinders of an engine 31 x 20 ins., piston 20 x 6 ins., valve, seat, and packing on valve, makes for one cylinder 2,704 sq. ins., and the two 5,408 sq. ins., and for one revolution 10,816 sq. ins., or 75 sq. ft. to be lubricated. A 51-in. driving wheel makes 390 revolutions in a mile and therefore 29,250 sq. ft. to be lubricated. Then take it for 40 miles it would be 1,170,000 sq. ft., equal to 26 acres of surface to be lubricated. This is figuring 6,500 drops of oil to the pint. One hundred miles would make 2,925,000 sq. ft. of surface, equal to 67 acres, and with 600 miles to the pint, makes 17,500,000 sq. ft., equal to 403 acres of surface. I give these figures in acres just to show the amount of wearing surface, which does not include the piston rod and the surface of the cylinder heads which, of course, would collect some oil and some possibily might be lost out of the stack in stopping and then starting.

I have never seen a road on which they stinted the engineers on oil, that there was not more or less blows in the valves which, of course, would cause the loss of a considerable amount of steam and it takes coal and water to make it. For instance coal at $2.00 per ton, makes 10 lbs. for a cent, and a shovel of coal about 24 lbs., 2½ cents value. It is not an unfrequent occurrence to see a fireman throw in 8 or 12 shovels of coal when stopped waiting for a signal, etc., value of which is from 20 to 30 cents, more than the value of the oil an engine will use in a whole day. I think if we paid a little more attention to the keeping of our valves and pistons in good shape, and allow a little more oil, we would save money at the end of the year. I have never yet stinted the engineers on valve oil and we have faced but very few seats and have no engines blowing. I have spent days riding in the cab with engineers and seen the engines operated where the engineers complained about not having enough valve oil, and when I found they were not getting enough more was allowed them. We are satisfied with 40 or 50 miles for one pint valve oil, and we are not troubled with the valves blowing, and have no waste of steam or fuel, from valves or pistons blowing.

Yours truly,

Peter H. Peck, Master Mechanic,

Chicago & Western Indiana R. R.

Editor, Railway Master Mechanic:

"Are not valves, false seats and cylinder bushings cheaper than valve oil?"

This text is taken from an article in the May issue of the Railway Master Mechanic, by Mr. E. N. Weist, M. M., entitled "Valve Lublication."

There is no doubt that the saving of oil in recent years has been carried to the extreme and, as a natural consequence valves and cylinders have suffered. An engine that makes 600 miles to a pint of oil has not, in my opinion, been treated right and the foundation has been laid for a disease that will gradually and surely effect all of its vital parts, growing worse day by day, and the man who handles the lever regularly and feels its pulse can detect this—to his sorrow. It consumes more fuel and water each trip and is worked harder until finally laid up for extensive repairs to eccentrics, links, valves, cylinders, etc., whereas if 18 cents worth of oil had been used instead of 6 cents worth, per 600 miles it might have made three times the mileage and been a more satisfactory machine while in service. It is customary in some instances to make monthly statements showing oil used on different divisions. The man using least is considered economical and the one using the greatest quantity extravagant, while it may be the one using the greatest quantity is the most economical. I cannot give any figures that would be interesting, for the engines now in service have not been in use long enough to make comparisons. I have, however, a 16 x 24 in. 8 wheel Baldwin, 56 in wheel centers and 140 lbs. steam pressure, Richardson balanced valves, in daily service which has run for 21 months, one month of which it only made 63 miles. Its record shows 78,193 miles on 637 pints cylinder oil in 21 months, averaging 123 miles per pint. Its seats and valves are in perfect condition and may not, from present appearance, need facing for at least 18 to 24 months. This engine has a 9½ in. air pump lubricated at both ends with the same oil. I might add that a little of this oil was used on main pins.

J. S. Booth, M. M.,

Car. & N. W. Ry., Chester, S. C.

(From a Master Mechanic.)

Editor, Railway Master Mechanic:

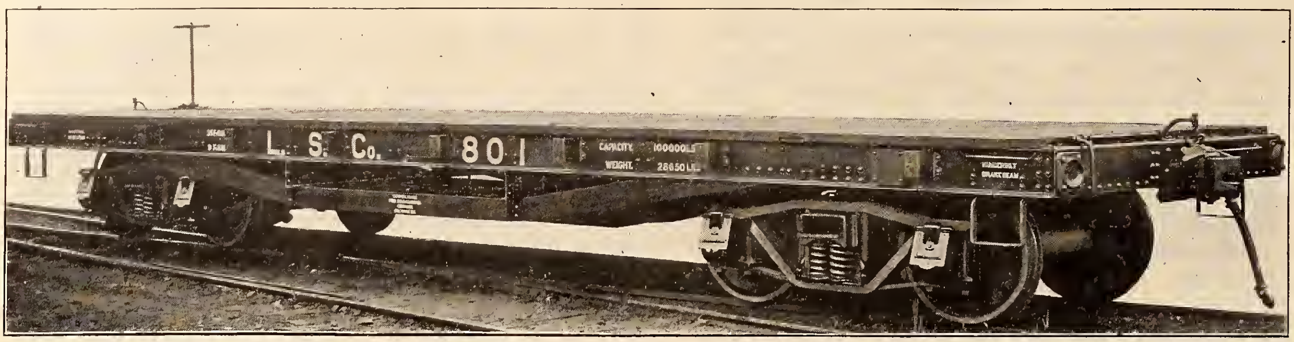
The quality of material being lubricated has so much to do with the wear to the lubricating parts that any statement of wear and pints of oil per 1,000 miles, would be of little value, unless there was a complete information of the quality of the cast iron.

Our oil records are watched closely, not so much with the view of making excessive mileage per pints of oil, but to keep tab on possible waste. My instructions to enginemen are to run the engine cool and do it with as little oil as possible, but run them cool, remembering that if three drops fill an oil hole, four or five drops is a waste, that gallons of oil on the machinery and ground will not prevent hot boxes.

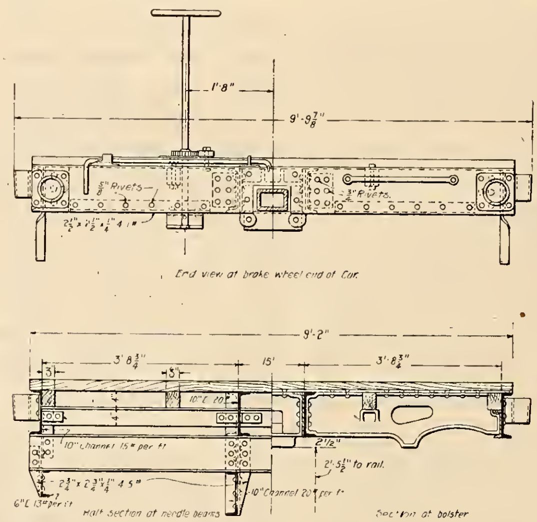
So far as the valve and cylinder lubricants are concerned, we always find that they have been lubricated, and some are badly worn and others show little wear. This is purely a question of material and statistics of miles run to pint of oil would throw no light on the matter whatever.

Vanderbilt 100,000-lb. Capacity Steel Flat Car

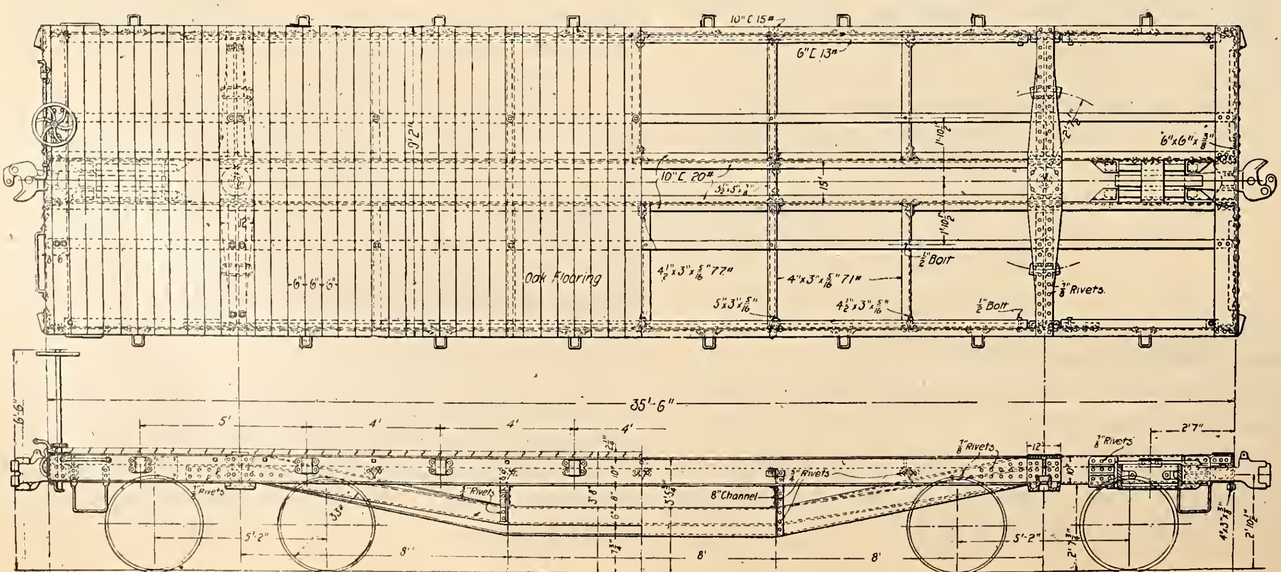
THE accompanying engravings illustrate the design of a 100,000-lbs. capacity flat car recently built by the South Bethlehem Steel Car & Foundry Co. for the Lackawanna Steel Company. The design and construction was supervised by Mr. L. A. Shepard and the car is patented by Mr. Cornelius Vanderbilt. The entire frame is of structural steel and the flooring is of wood. The most interesting feature of this construction is the design of sills. The use of an unusually light sill is made possible by a form of truss of structural steel instead of using the usual truss rod, thus producing a sill which is much lighter than an entire channel section or the deep fish belly. The center sill is a 10 inch channel weighing 20 lbs. per foot, 35 ft. 5¼ ins. long, trussed by a 10 in. channel weighing 20 lbs. per foot bent as shown in the elevation of the car and riveted at the ends with the web of the truss against the web of the sill and the lower flanges flush. The side sill is a similar construction composed of a 10 in. channel weighing 15 lbs. per foot and trussed by a 6 in. channel weighing 13 lbs. per foot. On account of the absence of metal along the neutral axis the construction of each sill is unusually light and the sill proper constitutes a compression member while the truss constitutes the tension member of the entire structure. Between the upper and lower members, two 8 in. channels are disposed as needle beams which are firmly secured to both by heavy angle plates thus strengthening the car laterally. Cross braces of angle iron are disposed at intervals between the center and side sills and these constitute floor beams to which the nailing strips are secured. The sills are supported at each truck by a bolster of cast steel arranged in three sections between the sills, as indicated by the sectional view of the car showing the bol-



Vanderbilt 100,000-lbs. Capacity Steel Flat Car.



Vanderbilt 100,000-lbs. Capacity Steel Flat Car—Sectional Views.



Vanderbilt 100,000 lbs. Capacity Steel Flat Car— Plan and Side Elevation.

ster. The structure at this point is strengthened by a steel plate 12 by 3/4 ins. secured with 7/8 in. rivets to the upper flanges of the sills and bolster castings. Each end sill is a 3/8 in. steel plate bent to L shape, cut away at the center to accommodate the coupler and stiffened by angle irons rivetted at the bottom. The car is 35 ft. 6 ins. long over end sills, 9 ft. 2½ ins. wide over side sills, 24 ft. between truck centers, with a light weight of 28,650 lbs. The height from top of rail to top of floor is 3 ft. 8 ins., and height to top of brake shaft 6 ft. 6 ins. The capacity of the car is 100,000 lbs. between bolsters or capable of a concentrated load of 55,000 lbs. between the needle beams. They are equipped with Tower couplers having M. C. B. 5 inch by 7 inch shank, New York air brakes, Sessions standard friction draft gear, Vanderbilt brake beam and Atha cast steel bolsters.

Some Suggestions Regarding Methods of Educating Shop Apprentices

Editor, Railway Master Mechanic:

Several years ago the writer inserted a short article in the Railway Master Mechanic advocating a certain amount of technical education for shop apprentices, and pointed out a few problems that would have to be solved before a system that would be beneficial both to employer and apprentice could be decided upon, and that the greatest obstacle to be overcome was the person who teaches them. The purely technical man is hampered by his technicalities, and the practical man by his numerous rules of thumb. The personnel of the apprentices, their fitness for their calling, and their adaptability to assimilate education of a technical character, should be considered, their classification by trades into different classes, the amount of education they have, the interest they take in their studies, and the trades they are to follow.

The system inaugurated by the L. S. & M. S. at Elkhart has several features that are to be commended, especially the lectures at one class, and their discussion at the following one. But I think two features will stand some criticism, and that is all branches of trade into one class; and instead of having the management supporting it, the boys should have an incentive to study by supporting it themselves; they could pay into a general fund a nominal sum monthly to provide text books and instruments, and make their advancement in the shop keep pace with their advancement in their studies, the classes to be divided into two distinct classes, one in one class who are learning boilermaking, tinsmithing and sheet metal work, their studies to consist of practical geometry, development of patterns and arithmetic, including all branches up to square root. Those who are learning the machinist and pattern making trades to be taught mechanical drafting, elementary machine design and mathematics, including the branches taught the metal trades, cube root and the reading of formulas. Although I am sure that the outlined plan is open to criticism and that certain modifications will render it more perfect, I will submit it as a ground work of something more efficient.

Of late years the correspondence method of teaching has accomplished a large measure of good, but I find from my observation a singular fact, and that is those who are deriving the most benefits are the ones with settled habits; men who are out of their apprenticeship, who realize education is the only road to advancement, men who are married and are looking ahead to a future, and what good shop apprentices are deriving from it is almost nil. Of course my observations have been somewhat limited, but what is a fact in a small circle may apply to one of a larger radius.

Yours truly,

W. H. Graves,

General Foreman, C., R. I. & P. Ry.

Editor, Railway Master Mechanic:

There is a rule upon our road that the employees' sons are given the first chance for apprenticeship. They are required to stand a written examination consisting of examples in arithmetic, writing and spelling. We have no night school, but some of them have taken up the correspondence system with success, while others have made very little progress which is due to their own fault.

I feel that the apprentice question is one of the most important questions to be dealt with, both for the good of the employer, the maintaining of the standard of proficiency of the trade in which the apprentice has started, and to the apprentice himself.

When a boy enters the shop the company knows that it will be some time before he can earn his wages, but they are in hopes to be able to make a good man out of him.

The question where to start a boy and have him the most useful and where he can learn the most in a given time should be studied with the utmost care.

You may put the best of tools in a shop and place the boy on one of them, give him a certain piece of work to do; if he does not have an idea where that piece goes on an engine, how it should be fitted, or had no instructions in the reading of drawings, he will make very little headway if left by himself and with all the duties that are now required of a foreman, there is very little of his time left to instruct the apprentice. If we had a teacher in our public school who would advocate the putting of a boy in algebra before he had had addition of numbers, we would think he was departing from all good sound reason. Is it not the same with putting a boy upon a machine first? Should not that boy be placed where he can learn every part of an engine? Their names, location, and how each should be fitted? How will he learn this the most quickly? By being thrown in with them and seeing them in their worn-out condition, and then next seeing a new one inserted in its place.

If a boy spends, say, two years on the pits, if he has applied himself as he should he will know pretty nearly where every part of an engine goes. If he does not in that time, he had better learn the baker trade. Should he show some mechanical ability then put him on the machine side of the shop. Should a drill press fall to his lot first, he will know the importance of having a hole drilled where it is laid out and not a 1-16-inch out of the way. Should a bolt cutter come next he will know whether the bolt should be cut a loose or tight fit for the nuts.

If he is given a frame bolt to make next he will know where to find the hole to fit that bolt to and how it should be fitted.

As he passes along down from one machine to another for the next two years he will at the end of his apprenticeship be able to do any of the ordinary jobs on the engine, and his employer will find that he is of some use to him, and not merely a machine capable of doing but one thing.

During the apprentice time the boy should be taught to say I can. Be made to see that there is always room at the top of the ladder. That there is always a place waiting to be filled by men of experience and new ideas. That he can not reach them by sitting down and saying "I can't. I have no one to push me along," but he must be shown that he must improve every spare moment. If he has not the advantage of a night school take up one of the many correspondence schools that may be had.

Let him know that he is being watched and if he spends his time hanging around street corners, pool rooms or dance halls, try to show him the folly of such thing.

If it is possible to organize a class as a great many of our shops are doing, make it an evening that they will look forward to. Have them make the evening profitable by having questions to ask, don't always try to answer them that evening, put over, have them study on them and come prepared at the next meeting to answer them; by so doing they will remember them a great deal longer. It is knowledge gained by actual work which can never be lost. Show him, though he may be black and greasy for ten hours a day, that it is an honest and noble calling, and it is better to be the son of toil than a nabob waiting for dead men's shoes. Teach him economy, not to spend all of his wages. and that by saving a small portion each month, at the end of his time he may be able to take a course in some well established mechanical school; thus combining the practical and technical work and making a man that in after years his first employers can point to with pride.

Yours truly,

H. A. Beech,

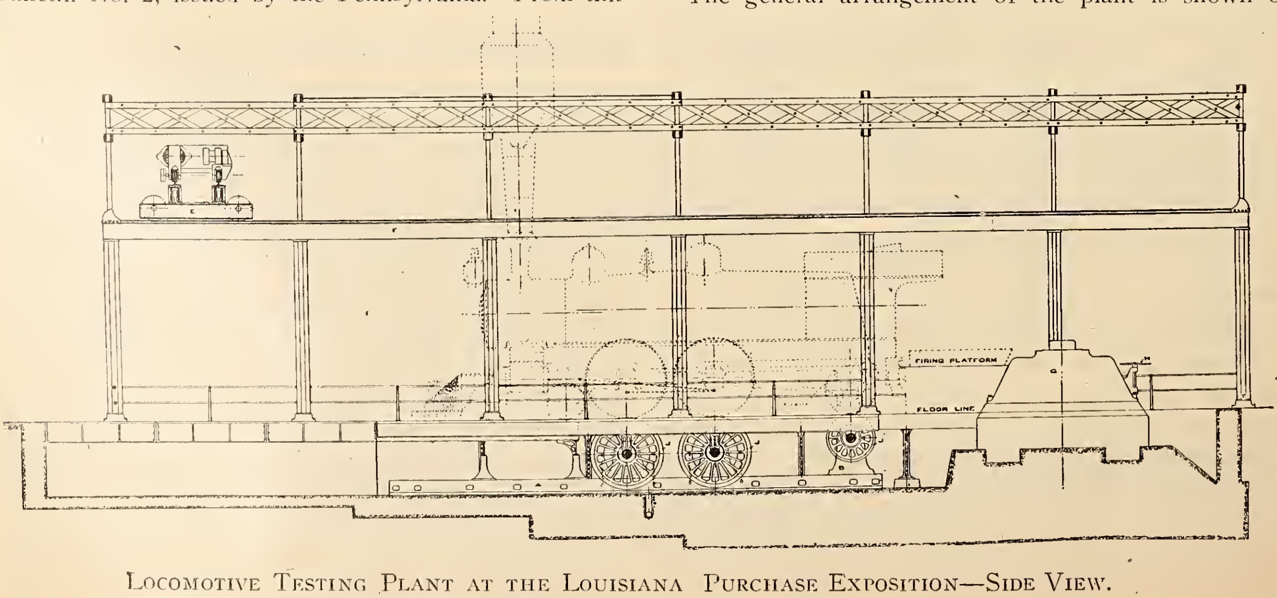
Foreman Locomotive Department, Ann Arbor R. R.
Owasso, Mich.

Locomotive Testing Plant at The Louisiana Purchase Exposition

THE first locomotive to be tested on the plant established at the Louisiana Purchase Exposition as a part of the exhibit of the Pennsylvania Railroad was placed on the plant early in May and was run daily for the purpose of breaking in the apparatus. The plant was placed in regular service on May 10th and has since been running smoothly. The principal features of the plant have been described in Bulletin No. 2, issued by the Pennsylvania. From this bulletin we take the following, together with the illustrations of the plant:

The Pennsylvania Railroad System has been assigned a space in the Transportation building of the Louisiana Purchase Exposition, three hundred feet in length and ninety feet in width, a portion of which will be devoted to the locomotive testing plant. Located in the second bay from the south side of the building and facing one of the wide entrance of its western exposure, this space is easily accessible for the locomotives which will be tested.

The general arrangement of the plant is shown on



Locomotive Testing Plant at the Louisiana Purchase Exposition—Side View.

three plates forming a part of the bulletin, in end elevation, side elevation and in plan. The letters designating the essential parts are the same on each plate.

The locomotive under test is carried on supporting wheels whose axles are extended to receive absorption brakes. The turning of the driving wheels causes the supporting wheels to revolve, but these are retarded by the brakes to any extent desired.

The work actually done by the locomotive consists in overcoming the frictional resistance of the supporting wheels and brakes, the resulting force exerted at the drawbar being measured by a traction dynamometer.

The upper faces of the supporting wheels "J" are at the level of the tracks and of the floor of the building, with a pit of sufficient depth for these wheels and their supports.

The base of the plant consists of two longitudinal bed plates, "A," of cast iron, secured to concrete foundations of ample depth for the weight to be carried, and to resist the shocks transmitted from the locomotive driving wheels when revolving at high velocities. The bed plates are provided with T slots running longitudinally, and by means of suitable bolts the pedestals, "B," are secured to them, thus permitting adjustment lengthwise, in order that the supporting wheels may be located to correspond with the spacing of the driving wheels of the locomotive to be tested.

There will be two sets of supporting wheels, one consisting of three pairs, 72 inches in diameter, for use under passenger types of locomotives having large driving wheels, and one set of five pairs, 50 inches in diameter, to be used under locomotives with smaller wheels and designed for freight service. The pedestals will be of two heights; the lower ones for the supporting wheels of larger diameter, the higher ones for the smaller supporting wheels.

The journal boxes carried in the pedestals are self-adjusting so as to secure uniform support for the journals. The lower half of the box contains a bronze bearing of suitable composition, while the upper half, which acts only as a cap and carries no weight, is made of cast iron. The bearing surface is ample for the weight to be carried, but in order to provide against any possibility of heating, the journal boxes are cored out and arranged for cooling by water circulation. The lubrication is accomplished by two chains over each journal dipping into a bath of oil.

On the ends of each supporting shaft are the absorption brakes "C," which form the resistance which the locomotive must overcome, in order to exert its tractive effort at the drawbar. They are designed on a plan which enables them to work with perfect smoothness, to be used with ease and convenience and to have a large capacity. This type of brake was first used as a dynamometer at the Worcester Polytechnic Institute, and is the invention of Mr. G. I. Alden, M. M. E., formerly a member of the institute faculty.

The brake in its simplest form consists of:

1st. A smooth, circular, revolvable cast iron disk, with radial grooves, keyed to the shaft which transmits the power to be absorbed.

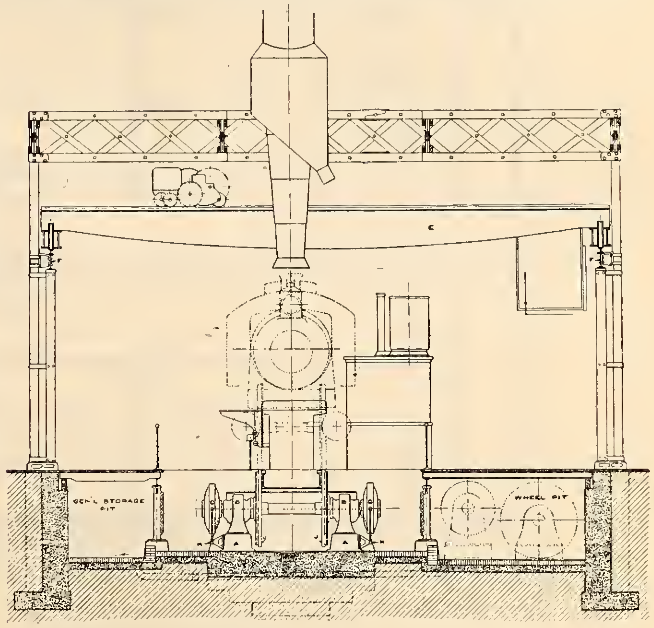
2d. A non-revolvable housing having its bearings upon the hub of the revolvable disk.

3d. A pair of thin copper plates fastened to the housing, one face to each copper plate being close and parallel to the sides of the revolvable disk, the other face of each plate having back of it a chamber in the housing.

4th. A system of piping and connections by means of which water under pressure can be circulated through the chambers between the copper plates and the housing.

5th. A system of piping and connections by means of which oil is circulated in such manner as to insure perfect lubrication of the copper plates which are next to the revolvable cast iron disk.

To insure sufficient capacity, each brake is provided with two disks revolving inside of each housing with an



Locomotive Testing Plant at the Louisiana Purchase Exposition—End View.

arrangement of copper plates and water chambers, to allow pressure to be exerted on both sides of each disk.

Oil for lubrication between the revolving surfaces enters near the hub of the disks and is carried by centrifugal force along the radial grooves in their sides and out to their peripheries, completing the circuit through external tubes.

The housings of the brakes are secured against turning by rods attached to brackets "K," which in turn are held to the sides of the bed plates by bolts in T slots.

The seats on the supporting shafts for the hubs of the brake disks are tapered, as shown at "D," keys being placed in the shaft and hub to prevent turning. Nuts on the smaller end hold the hubs in position. Eight absorption brakes are provided, and may be used either on the shafts having the 72-inch supporting wheels, or on the shafts with the 50-inch supporting wheels, means for removing the brakes readily being provided by the taper fit, already mentioned, and a nut at the large end of the taper, so that the hub of the brake can be backed off without difficulty or delay.

When the brakes are in use, water under pressure flows through the chambers in the housings pressing the copper plates against the sides of the revolving disks and causing resistance to their rotation. The pressure of the water is regulated by valves controlling both the inlet and outlet independently. The water thus performs the double function of supplying by its pressure, the required friction, and by its rate of flow means of carrying off the heat generated.

The pipes leading to and discharging from the brakes are brought together at one point where all the valves will be located, so that the pressure and rate of flow, can be readily adjusted to the work being done.

To keep the speed of the locomotive constant, would ordinarily require hand manipulation of the valves controlling the ingoing and outflowing water, but in order to secure as nearly as possible constant speed, there is a by-pass around the main valve controlling the supply of water for all the brakes, and in this by-pass is an automatic valve controlled by the speed of the locomotive. If the speed increases beyond the desired number of revolutions per minute, the by-pass valve opens, so as to increase the pressure on the brakes, and if, on the other hand, the speed of the locomotive falls below that desired, the automatic valve closes, and decreases the pressure on the brakes.

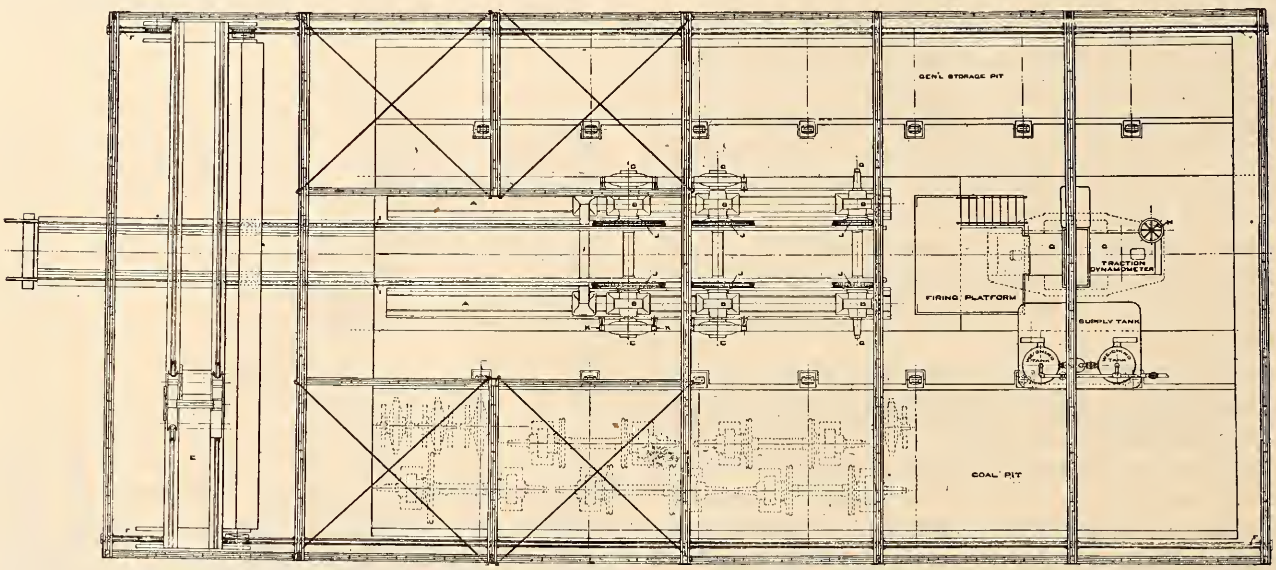
The supporting wheels resemble in form, the usual locomotive driving wheels, having cast steel centers with tires shrunk on, and held in addition by retaining rings.

The contour of the tire is approximately that of the head of a rail, but provided with means of keeping away from its bearing surface the oil which will necessarily drip from the locomotive while running.

The pit containing the parts already mentioned is extended sufficiently to provide room for the storage of the supporting wheels, axles, brakes and pedestals which are not in use, and provides storage for such other supplies and appliances as will be necessary for the operation of the plant. The floor covering this portion of the pit, is made in sections, so that it can be removed as occasion may require. The central portion of the pit, however, will be entirely open with the exception of sufficient platform to enable those taking part in the tests to secure indicator cards, make observations of temperatures and obtain other information of this character.

A traveling electric crane "E" of 10 tons capacity, and having a span of 43 feet between centers or runways "F," serves the entire space occupied by the testing plant, also sufficient space beyond the pilot of the longest locomotive to be tested, to reach the cars loaded with supplies for the plant. The crane will be used for handling the supporting wheels, axles, brakes, pedestals and other parts, when necessary to change their setting and, further, for handling all of the coal used during the tests.

The water required for locomotives under test will be weighed in two tanks, filled alternately, and run from these into a third tank, from which it will be taken by piping to the connections for the injectors. As a check on the weights thus obtained, the whole supply used will be metered and readings taken at such intervals as will enable the amount shown by weighing to be compared.



Locomotive Testing Plant at the Louisiana Purchase Exposition—Plan.

The traction dynamometer "G" which measures the drawbar pull of the locomotive is of the lever type and is constructed on the "Emery" principle, in which flexible steel plates take the place of knife edges used in ordinary scales. The weight of each lever is taken by a vertical plate in a plane intersecting that of the receiving fulcrum plates at their center of rotation, thus relieving these plates of all transverse load. The yoke embracing the dynamometer and to which the drawbar is attached is also mounted on flexible plates and braced by long and flexible rods, to insure frictionless motion in the horizontal plane only.

The total motion of this yoke and drawbar, due to the leverage of the machine and to stress of parts when under full load, does not exceed four one-hundredths of an inch, so that a locomotive exerting a drawbar pull equal to the full capacity of the dynamometer, will not move forward on the supporting wheels more than the amount specified. The drawbar is provided with a ball joint, to allow for any side motion of the locomotive, or motion of the locomotive on its springs.

Near the base of the dynamometer, the oscillating motion of the ends of the last levers is transformed into a rotary motion by means of steel belts wrapped around a drum and kept in constant tension by suitable clamping devices. The belt drum is mounted on a tube guided in ball bearings, and inside of it is a rod, the upper part of which is securely fastened to the tube, the lower end being firmly attached to the frame of the machine. It will thus be seen that when the belt drum is rotated, the rod inside of the tube is in torsion, and this resistance forms part of the total resistance of the machine, and is constant for the same travel of the recording pen.

To the upper end of the tube already mentioned are secured two radial arms, the extreme ends of which are finished to a circle having its center at the center of the tube. The angular motion at the end of one arm imparts straight line motion to a carriage, guided by a grooved track and carrying the recording pen. The opposite arm is coupled by steel belts to a rotary oil dash pot, to reduce violent oscillations of the recording pen, the extent of which can be controlled as desired. The principal resistances in the dynamometer are flat springs, placed under the second levers and deflected by the motion of these levers. There are three sets of these springs, varying in resistance so that a travel of eight inches of the recording pen, corresponds to a drawbar pull of either 80,000 pounds, 40,000 pounds or 16,000 pounds, as may be desired. The drawbar pull is traced upon a strip of paper 18 inches wides, made to travel at a known rate of each mile run by the locomotive, and this will form the permanent record of the drawbar pull in each test.

The yoke and drawbar of the dynamometer can be adjusted vertically through a range of 12 inches by means of a wheel "H," in order that the different heights of locomotive drawbars can be accommodated.

The smoke from the locomotive will be carried out of the building by a stack, which can be moved longitudinally of the plant to any position required, and the lower portion of which will be made telescopic, so that it can be raised and lowered for adjustment, and permit the passage of the electric crane, when necessary. The stack has deflectors, so that the sparks discharged by the locomotives can be caught, weighed and form a part of the data obtained.

The instruments necessary to get full information for the tests will consist, in addition to the dynamometer, of steam engine indicators, gauges for steam pressures, draft gages for smoke box, fire box and ash pan, thermometers for temperatures in the smoke box, calorimeters for getting the quality of the steam, a revolution counter and a tachometer for showing the speed in revolutions per minute.

Means for bringing the locomotive safely to its position on the plant form a most important part of the installation. The supporting wheels have been placed in position corresponding to the spacing of the drivers. I beams resting on the supporting shafts, and extending the full length of the pit, will be bolted securely to the inside faces of the supporting wheels. Supports at the ends of the pit and at as many intermediate points as may be necessary will be provided. On the upper flange of the I beams is riveted a grooved rail, so located that the flanges of the driving wheels will run in this groove; in other words, the locomotive will be moved to its position on the plant by being run on the flanges of its driving wheels, leaving the treads free to come into position upon upon the supporting wheels. When in place, the special rails and I beams will be disconnected, from the supporting wheels and removed, so as not to interfere with the operation of the plant. Provision will also be made for taking care of the driving wheels without flanges, which will be run over the same grooved rails, the grooves being filled by a suitable section of rolled steel.

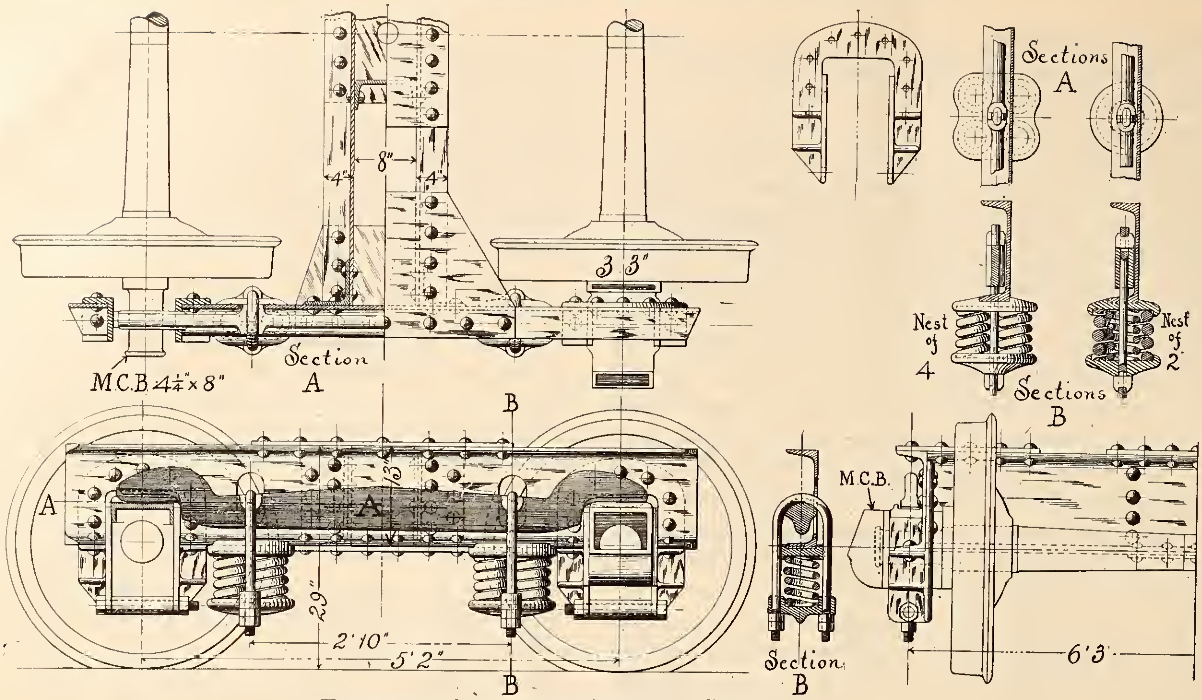
A director of tests will be in direct charge of the plant, and of all the tests made. Under him, will be an assistant, and a foreman, who will give his attention to the machinery, care of the intruments and other necessary work of this character. There will be a large staff of observers for the coal and water used, for taking indicator cards, temperatures and readings from all the instruments forming the equipment of the plant.

In order that all of the data obtained may be worked up promptly, computers will be employed, so that the data coming from the observers on suitable blanks, will be tabulated and final results for comparison completed for each test, before similar data for the next run comes to the computing room. A force of 25 men will be constantly employed. All apparatus has been carefully selected and the most approved methods will be used to insure accuracy; the results will be put in a form convenient for reference.

Equalizer Truck for Freight Cars

THE sides and transoms of this truck consist of 13-in. rolled steel channel beams cut to the required lengths and united by gusset plates and connection angles. The ends of the side pieces are notched out to receive light cast metal pedestals with flanges which guide the journal boxes. The equalizers are of cast metal and support U-shaped hangers, one leg of each hanger passing through a hole in the web of a side piece. The springs rest upon cast metal seats located beneath the side pieces and the latter are supported upon the springs. To adjust the frame and car body so as to bring the draw bar and coupler to the required distance above the track it is necessary only to turn the nuts upon the hangers.

An equalizer truck for freight cars has long been a desideratum, but the excessive first cost of the ordinary types has heretofore prevented its general adoption. A



EQUALIZER TRUCK FOR FREIGHT CARS.

compound spring, two springs, or a nest of four springs may be employed, as occasion may demand. The design shown was worked out by Mr. R. C. Wright, of Philadelphia, Pennsylvania.

Personals

Mr. O. M. Laing, heretofore purchasing agent of the Tennessee Central, has been appointed general storekeeper.

Mr. M. Marea, heretofore road foreman of engines of the St. Louis, Kansas City & Colorado, at Eldon, Mo., has been appointed general foreman of shops of the Baltimore & Ohio at Garrett, Ind.

Mr. F. F. Hildreth, heretofore master mechanic of the Vandalia, at Terre Haute, Ind., has been appointed mechanical engineer of that road.

Mr. J. H. Stearns has been appointed road foreman of engines of the St. Louis, Kansas City & Colorado, at Eldon, Mo.

Mr. Howard D. Taylor has been appointed Superintendent of Motive Power and Rolling Equipment of the Philadelphia & Reading Railway Company, and also of the Atlantic City Railroad Company, owned by the Philadelphia & Reading.

Mr. John Dickson, superintendent of shops of the Great Northern at Everett, Wash., has been appointed master mechanic of that road at Larimore, N. D., and is succeeded in his former position by Mr. K. Frowbergh.

Mr. W. H. McNoldy, night foreman of the Pennsylvania railroad shops at Juniata, has been appointed foreman of the machine shops of the Buffalo & Allegheny Valley railroad at Olean, N. Y.

Mr. W. L. Harrison, master mechanic of the Chicago, Rock Island & Pacific, at Little Rock, Ark., has resigned.

The position of superintendent of locomotive and car shops on the Nebraska division of the Union Pacific has been created, and Mr. Alex. W. Whiteford, piece-work inspector at the new Omaha shops, has been appointed to fill it, reporting directly to the superintendent of motive power.

Mr. W. R. Carrie has been appointed division foreman of the Frisco System at Enid, Okla., vice Mr. W. R. Randell, transferred.

Mr. John Howard, division superintendent of motive power of the New York Central & Hudson River, has been appointed superintendent of motive power and rolling stock of the Boston & Albany. Mr. C. H. Hogan, master mechanic of the New York Central at East Buffalo, N. Y., has been appointed division superintendent of motive power at Depew, N. Y., and Mr. William Smith, master mechanic at Mott Haven, N. Y., has been transferred to East Buffalo in a similar capacity.

The position of superintendent of machinery of the St. Louis & San Francisco has been abolished and Mr. George A. Hancock, formerly holding that office, has been appointed superintendent of motive power.

Mr. George W. Smith, superintendent of motive power and machinery of the Chicago & Eastern Illinois, with headquarters at Danville, Ill., has had his jurisdiction extended to cover the St. Louis, Memphis & Southeastern and the St. Louis & Gulf.

Mr. H. M .Meason has been appointed assistant master mechanic, Pittsburg division, Pennsylvania railroad, with office at Pittsburg, vice Mr. J. E. Mechling, who has been made master mechanic of the Terre Haute & Indianapolis.

Mr. C. E. Boss has been appointed superintendent of motive power and machinery of the Paris & Great Northern, with headquarters at Paris, Tex.

Mr. W. A. Nettleton, formerly superintendent of motive power and machinery of the Kansas City, Fort Scott & Memphis, and afterwards assistant superintendent of motive power of the Atchison, Topeka & San Fe, has been appointed general superintendent of motive power of the St. Louis & San Francisco system, and the Chicago & Eastern Illinois, with headquarters at Saint Louis, Mo.

Mr. J. F. Olsen has resigned as master mechanic of the Houston & Texas Central at Ennis, Tex.

Mr. H. A. Bowen has resigned as master car builder of the Cold Blast Transportation Company at Chicago.

Mr. B. E. Stevens has been appointed general foreman of the locomotive department of the Illinois Central at the shops at Burnside, Ill.

Mr. W. L. Davis has been appointed assistant master mechanic of the Buffalo division of the Pennsylvania Railroad, with office at Buffalo, N. Y. Mr. Davis heretofore has been employed in the erecting shop at Altoona, Pa.

Mr. J. J. Thomas, Jr., has been appointed master mechanic of the Atlantic Coast Line, with headquarters at South Rocky Mount, N. C.

Mr. F. E. Sowersby, heretofore chief clerk to the master mechanic of the Erie at Susquehanna, Pa., has been appointed assistant to the master mechanic of the Ulster & Delaware, with office at Rondout, N. Y.

Mr. W. L. Wilt, assistant to the chief motive power clerk for the Pan Handle, at Columbus, O., has been appointed chief motive clerk of the northern system of the Pennsylvania, at Fort Wayne, Ind. He succeeds Mr. F. D. Reed, who goes to Chicago as chief motive clerk for the Rock Island. George N. Sweringen, chief shop clerk at Wellsville, O., has been transferred to Columbus, going into the motive power department as assistant and chief clerk.

Mr. J. J. Dewey, heretofore acting master mechanic of the Erie at Galion, O., has been appointed master mechanic at Galion, and T. J. Cole, acting master mechanic at Meadville, Pa., has been appointed master mechanic at that point.

Mr. T. Rumney, heretofore master mechanic of the Erie, at Jersey City, N. J., has been appointed assistant mechanical superintendent of that road with office at Meadville, Pa. Mr. H. B. Hunt, heretofore assistant to the general manager, has been appointed assistant mechanical superintendent, with office at Meadville. Mr. William Schlafge has been appointed master mechanic of the New York division, with office at Jersey City, N. J., to succeed Mr. T. Rumney, promoted. Mr. J. Wolfenden has been appointed general foreman boilermaker, with office at Meadville, Pa.

Technical Publication

Up-to-Date New York Air Brake Catechism, by Robert H. Blackall.—An up-to-date catechism on the New York air brake by Robert H. Blackall, author of the Westinghouse Air Brake Catechism, has just been published, the use of the New York air brake having created a demand for literature descriptive of the parts of the apparatus employed and explaining their operation. A special effort has been made to render this work valuable to those in road service, who are required to pass examinations concerning their knowledge of the air brake and its operation. The information contained is equally instructive to those interested in the installation and maintenance of the air brake mechanism as to those handling the brake. Detailed information is contained bearing on the peculiarities, troubles, care and remedies, and other chapters contain a large amount of general information on the broader subject of brakes, train handling, train inspection, leverage, formulae, rules, etc. Published by the Norman W. Henley Company, New York. Price, $1.25.

"739 Paint Questions Answered." This is the title of a comprehensive reference book, compiled from the pages of the Painters' Magazine. One of the features of this magazine has been the attention given to answering questions concerning the knotty problems and difficulties encountered by painters in their daily work. This feature has assumed such proportions and has been so successful in dealing with questions of general interest to the painter's trade that the practical answers to these questions have been accumulated and put into book form so as to constitute a valuable addition to a library of reference. The volume includes a treatise which deals with the principles presented in replies to 739 of these questions. Published by the Painters' Magazine, New York. Price, $3.00.

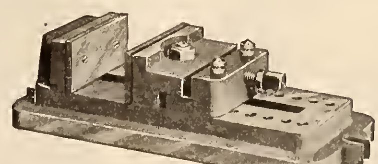
Train Rules and Train Dispatching, by H. A. Dalby. The train dispatcher, his position as a factor in the successful operation of American railways, his growth, the methods and appliances by which he controls the movement of trains, constitute the subject of this work. The book begins with the story of an interesting incident of the first use of the telegraph in authorizing the movement of trains. It contains much instructive information and includes a number of valuable suggestions derived from the experience of one who has acted as operator and dispatcher in various parts of the country. Among other valuable features are given an outline of the origin, organization and object of the American Railway Association, the establishment of standard time, explanation of what constitutes a train, the necessary signals to be carried, much descriptive matter covering the time table, train order, work trains, train order signals, identification of trains, the relation which should exist between the dispatcher and the men on the trains, the author's opinion what the department of train dispatcher should consist, the standard code, as well as a number of illustrations of semaphores, target signals, diagrams of hand signals, train markers, etc. Published by the Derry-Collard Company, New York. Price, $1.50.

Diaphragms

Fearing that the wording in which certain statements were couched in an article referring to a type of sewed diaphragm, appearing on page 170 of our May issue, might be misleading in conveying the proper conception of the situation, we wish to state that the figures quoted refer to a single manufacturing company. We wish to state further that riveted diaphragms are still being manufactured and continue to be used among railroads.

A Vise for Holding Drill Press Work

The illustration herewith shows a vise especially designed for holding work securely upon the table of a drill press. The vise is bolted to the table, and when so secured is in position to accommodate a large number of jobs without being re-set. A large part of the work that would otherwise have to be bolted to an angle iron can be much more readily and quickly secured, so that its value is readily estimated. Work is held between the jaws which are 5 ins. wide, 2 ins. deep, and open 6½ ins. The stop pins are hardened and cannot fall out, but by lifting and turning slightly, will stay up so the jaw and follower can be easily moved to the desired position and the pins dropped into place. The holes in base for stop pins are ¾ in. apart and the jaw has 1 in. travel with screw, so it can be quickly adjusted to the work. Its weight is 40 lbs. A drop forged wrench, fitting binding nut and screw, is furnished with the device.



This vise is manufactured and marketed by the Hopkinson Machine Works, Springfield, Mass.

Roofing

Many of the principal railroads of the country have adopted "Perfected" granite roofing to a large extent for the roofs of their shops, roundhouses and other buildings. Among these may be mentioned the New York, New Haven & Hartford R. R., who have used this type of roofing uninterruptedly for over fourteen years and have from two thousand to three thousand roofs of all sizes covered with this material.

An interesting instance of the use of this roofing is in connection with the saw-tooth roof over the machine shop of the P. & L. E. R. R. at McKees Rocks, Pa. While planning the erection of these shops considerable anxiety was experienced in regard to obtaining a suitable roofing material for covering the saw-tooth section of the roof—particularly the trench portion, as it had been thought desirable to make it waterproof for at least one foot above the bottom to take care of snow and water. As one side of this trench is vertical, the condition will be appreciated as being unusually severe for asphalt roof construction. The roofing material has, however, been put in place, meeting the above conditions by the Eastern Granite Roofing Company of New York, manufacturers of perfected granite roofing, under an absolute guarantee for ten years.

Some of the claims for this roofing is that it can be laid properly by an inexperienced laborer, that it is sightly, light in weight, and easy to handle, that it is long lasting and will resist the action of fire, as well as that of acids, chemical fumes, steam, gas or intense heat or cold, that it may be laid smoothly over old shingles or tin and will not warp, buckle, rust, rot or crack. Comparative tests have established the fact that it is adapted to any and all kinds of roofs. We are informed that there are buildings throughout the country with roofs that have been covered with this material over ten years and that these roofs are in neat, excellent condition, not having had one dollar expended for repairs during that time. One strong point in regard to this product is that it cannot be ripped from the roofs by high winds, which so frequently happens in the case of tin roofs. The roofing itself is made from the best grade of wool felts compressed and held together by a composition, the top surface of the felt base is coated heavily with the composition into which white pebbles of uniform size are firmly pressed by the application of machinery.

The rapidly increasing demand for the ready-to-lay roofing manufactured by this company in the states bordering the Mississippi, as well as the necessity of maintaining a distributing center for the Western trade, has induced them to establish offices and salesrooms at 305 Frisco building, St. Louis, Mo., as well as to locate extensive warerooms in order that a complete stock may be kept constantly on hand to enable orders to be filled promptly at short notice.

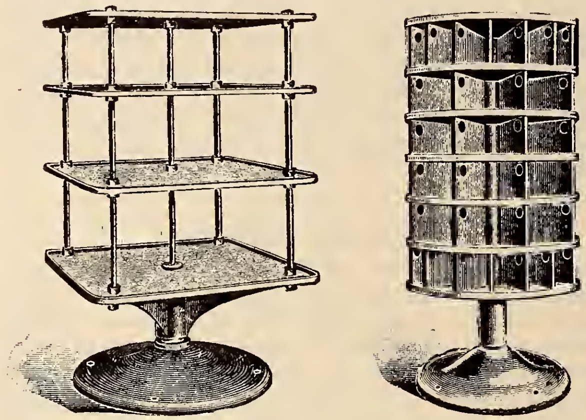
It is very probable that within a short time the company will also begin manufacturing in the vicinity of St. Louis, as it has been considered advisable to establish a plant on Western territory.

The Eastern Granite Roofing Co. published a very handsome photo pamphlet, which describes the roofing and explains its economy and general adaptability. This book is embellished with photographs showing a number of railroad buildings and large industrial establishments covered with Perfected Granite Roofing.

"Perfected" Granite Roofing.

Revolving Racks

Order is generally recognized as a desirable condition. In manufacturing this is particularly so, and anything which promotes order, which systematizes, and which economizes time or effort needs but little urging upon the wide-awake shop manager of today who appreciates the profit to me made by providing against wastes. Tool racks, lathe pans and other useful articles, unobtrusive but ever at hand, presenting



Revolving Tool Racks.

the right tool in the proper place at the instant required, give the great saving and service for a very small outlay. Appreciating the value of such appliances, the New Britain Machine Company directs attention to their tool racks among the furniture in iron and steel which they handle. This company is now prepared to offer in connection with their line of machine shop furniture the revolving screw racks and revolving tool racks formerly made by George Gorton Machine Co. of Racine, Wis.

The screw rack has proven to be a great convenience in stock and tool room because it holds a large supply of screws, nuts, bolts, etc., in very small space, and in such shape that any size is almost instantly accessible and the supply of a given size may be seen at a glance. The step is supplied with a ball bearing, so that but a touch is required to revolve the rack.

The tool rack is very desirable for use in assembling room, in tool room, at machine, or where it is desirable to have large shelf room close at hand for fixtures or rough and finished work. A ball bearing also facilitates the revolving of this rack.

These racks are illustrated by the accompanying engravings.

Pintsch Side Lights for Suburban Coaches

The New York Central & Hudson River Railroad have effected an innovation in lighting by introducing side lights in some of their suburban coaches and the results have been so satisfactory that it is probable that many more of their coaches will be equipped with these new fixtures. These new side lamps were developed at the request of Mr. Brazier of the Central, by the Safety Car Heating & Lighting Company, and the general style of the fixtures, as well as the manner of applying, may be seen in the accompanying illustrations.

The side deck center suspension lamp, now known as Pintsch lamp No. 442, has proven particularly satisfactory. It has all of the draught proof features of the standard Pintsch center lamp and is proving very efficient in service. It is fitted with a 2-flame burner, therefore it consumes but half the amount of gas that a center lamp burns. These fixtures are suspended from the side deck directly over the seats as shown in the first illustration.

FIG. 1—PINTSCH SIDE LIGHTS FOR SUBURBAN CARS—SHOWING THE NO. 442 LAMP.

The lamp shown in the second illustration is the Safety Co.'s No. 373 bracket. These lamps, it will be observed, are fastened to the panels between the windows. They are single flame, open burners, fitted with opal shades and can be depended upon to give satisfaction, especially when used in combination with the regular number of center fixtures.

There are great possibilities in this matter of side lighting for railway passenger equipment, and the use of these lamps by the Central has demonstrated that there are no insurmountable difficulties in connection with their employment. It would not do of course to depend entirely upon side lights for illumination, but when some, or all of the center fixtures are retained, the result achieved may truthfully be termed a brilliant one.

Mr. T. F. DeGarmo, now representing the Flannery Bolt Company, manufacturers of the Tate flexible stay-bolt, in the west, is located in Chicago.

FIG. 2—PINTSCH SIDE LIGHTS FOR SUBURBAN CARS—SHOWING THE NO. 373 BRACKET.

Riveting Machine With Special Universal Bail

The accompanying half-tone engraving illustrates a 26-in. riveting machine built by the Chester B. Albree Iron Works, of Allegheny, Pa., which is equipped with a special Albree universal bail which enables the machine to be turned to any position for riveting on a sphere. This machine is made up in the most careful manner. The yokes are O H steel castings; all other parts except the cylinder are steel forgings, and all the working parts are bushed with hard phos-

RIVETING MACHINE WITH SPECIAL UNIVERSAL BAIL.

phor bronze bushings. The entire head of the machine is bushed with a phosphor bronze bushing turned inside and out. The head of the machine is bored accurate to take the bushing.

Green River Opening Die Bolt-Cutter, Nut-Tapper Pipe-Threader and Cutting-Off Machine

The accompanying illustrations show the Green River opening die bolt-cutter, nut-tapper, pipe threater and cutting-off machine, designated as number 55, with plain countershaft, cutting-off attachment, extra scroll chuck on back end of spindle, nut holders, etc., manufactured by the Wiley & Russell Mfg. Co., Greenfield, Mass., together with a larger view of the chuck supplied with machine and a more detailed view of the opening dies, holders and carriage.

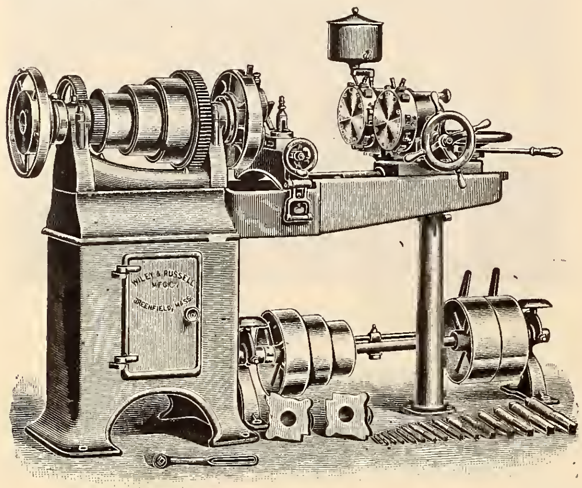


Fig. 1.

The machine is illustrated by Fig. 1. Its capacity is for bolts and nuts, or pipe 1/4 to 2 inches. It is powerfully backgeared. Has six changes of speed, which are obtained by throwing gears in and out, as with an engine lathe, which makes it possible to get suitable speed or power, as the nature of the work may require. It has a hollow spindle, hole through spindle being 2 1/2 inches. The machine is operated by a 3 1/2 in. belt.

The chuck used with this machine is shown by Fig. 2. The jaws of this chuck are made of the best tool steel, and are carefully hardened and tempered. They have three changes to enable taps, pipe, or iron, large or small, to be properly grasped. The great advantage of this in keeping the jaws sharp and in good order will be highly appreciated. The jaws will hold firmly square or round iron, from 1/4 to 2 3/4 inches in size. Hole clear through, 2 3/8 inches.

The cutting-off attachment, which cuts off bars or pipe in front of chuck, is a very valuable feature for some kinds of work. It swings back out of the way when not in use.

The dies used with this machine do not need to be adjusted, but stand always ready for work. With opening-dies, bolts or pipes are instantly released when threaded, without running backwards over the screw, thereby saving nearly half the time, and also much wear on the dies. By simply turning the hand wheel the dies separate, and the work can be taken out. The quickness and convenience of such an arrangement is a very desirable feature. It is very simple and substantial, so that workmen of ordinary skill can use it with good results and without danger of breaking.

The dies (as many as ten different sizes in assortment), see Fig. 3, are secured in two equal wheels (die-holders) set side by side, and controlled by a right and left screw, each die being divided, the half in one wheel opposite to the half in the other, in such a manner that a complete working die is made by bringing the wheels together, and the finished screw released by separating them, thus saving running back over the threads.

Each die has independent stop-pins controlling its cut, which can be either shortened or lengthened, enabling a perfect adjustment to be maintained, all the different dies standing ready for use, so that any size may at once be brought into line by turning the wheels to the proper places, thereby making it possible to thread a lot of bolts of different sizes almost as quickly as if all were of the same size. Each die cuts a full thread at one operation, and the hollow spindle allows a screw of any desired length to be cut.

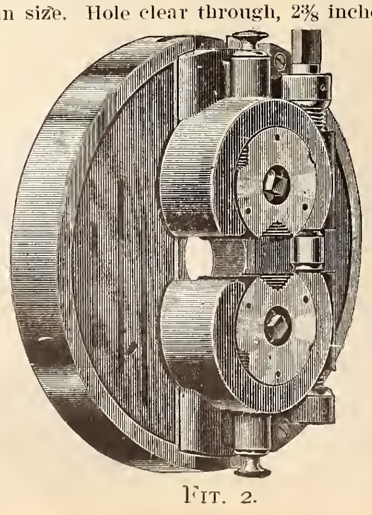
Mechanical Dust Collecting Systems

The Hartford Blower Co., of 100 Suffield street, Hartford, Conn., have received a large order from the well-known firm, Sargent & Co., New Haven, Conn. This system is for collecting the shavings, saw dust, chips, etc., from their woodworking machinery and conveying same to their boiler house.

Another large order just received by the Hartford Blower Co. is from the Scovill Mfg. Co., Waterbury, Conn. This is for collecting dust from their crushing machinery. Orders of this kind from such well-known firms speak well of the Hartford mechanical dust collecting systems.

A copy of the Hartford Blower Co.'s new sectional catalogue No. 57, entitled "Dust Collecting," will be mailed to any one interested who writes to the company at the above address.

This company makes a specialty of installing mechanical dust collecting systems of all kinds, as well as heating, ventilating and drying systems, mechanical draft, dry kilns, blowers, exhaust fans, etc.



Fit. 2.

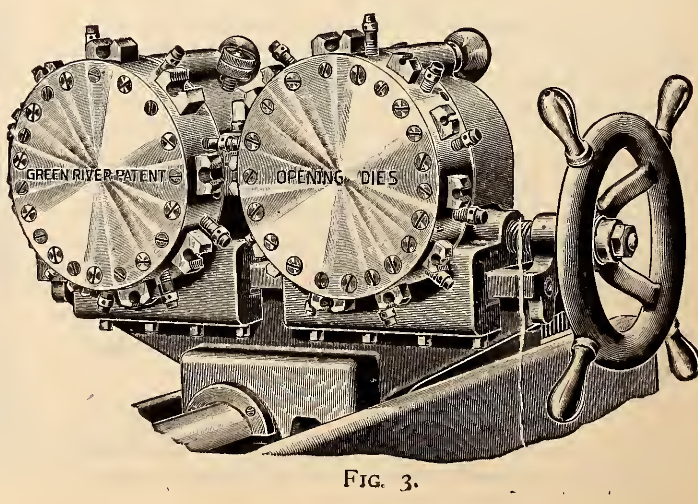


Fig. 3.

Improved Re-inforced Symington Journal Box Lid

The T. H. Symington Co., of Baltimore, Md., have recently improved their regular journal box by the addition of two lugs placed at the bottom corners of the lid, which enable it to ride up and drop down over the engaging tit on the box, without necessitating any other movement than a circular one around the hinge bolt.

On the old design lid it was necessary in closing the lid, to lift it as well as swing it around, and by the use of the inclined plane lugs on the new lid this double motion is obviated.

The new design lid has also been materially strengthened by the addition of stiffening ribs and the finished appearance of this latest design is very attractive.

Atlantic City

There is an odd charm in that famous resort on the South Jersey coast known as Atlantic City. At one time it was considered purely a health resort where invalids congregated to renew their vigors in a climate ever temperate and always healthful. Gradually, however, there came a change, and instead of the sickly inhabiting the famous city by the sea, the robust pleasure seeker finds in Atlantic City attractions social as well as climatic, the like of which is not found at any outing place on the Atlantic seaboard.

Grand hotels, untold pleasures, a five mile board walk, bathing facilities which are unexcelled, sports and entertainments of all kinds, boating, fishing and the like take up one's time and after a visit to America's well named fashionable Spa there is always a desire to go again. The New Jersey Central has excellent train service between New York and eastern points and Atlantic City, and if you are interested send for time table to C. M. Burt, G. P. A., New Jersey Central, New York City.

Notes and Comments

Mr. J. C. McQuiston, until recently secretary, has been appointed superintendent of the Westinghouse Companies' publishing department, having charge of matters relating to the publicity of the products of the various Westinghouse interests in the United States and Canada.

The Great Western Railway Company of England has lately placed an order with the Kennicott Water Softener Company for the equipment of their Aldermaston (Berkshire) Water Station with one 10,000 imperial gallons per hour Kennicott water softener. This order was secured through the Kennicott London office, 29 Great St. Helens, London, E. C. This company has lately opened an office in Paris at 7 Rue Meyerbeer.

It is with sincere regret that we learn of the death of Mr. J. A. Hinson, president of the National Car Coupler Company. Mr. Hinson was apparently in the best of health when he was suddenly stricken with appendicitis and died Thursday morning, the 12th, after a brief illness. He was well known in railway and supply circles, having been closely associated with the railway supply business during the past twenty-five years. Mr. Hinson invented a number of railway appliances and was closely connected with the development of the automatic coupler.

The management of the Bickford Drill and Tool Company has produced a pamphlet of testimonials which is unique in its arrangement and attractive in its design. This pamphlet is entitled "Bouquets," and contains a number of testimonials complimentary to the Bickford drill, presenting fac simile letters written by users of these machines. In addition to these there is appended a partial list of concerns who have recently installed one or more Bickford drills.

The Damascus Bronze Co., Allegheny, Pa., has purchased the adjoining lot to their property formerly owned by the Martin Hardsocg Mfg. Co. The ground is 70 feet front by 180 feet deep, and will be covered by a modern steel building. This addition is necessitated by the large demand of their Damascus nickel bronze, which is giving such excellent results in railroad service, and for rolling mills and stationary engines. There are now some five million pounds of this metal in active service without a single complaint.

Mr. M. F. Cunningham has severed his connection (after 15 years' service) with the Waltham Emery Wheel Co. to assume the management of the Superior Corundum Wheel Co., of Waltham, Mass., and is making emery and corundum wheels, and stones for all purposes.

H. I. McMinn has been appointed agent and storekeeper of the Safety Car Heating & Lighting Company, in charge of storehouse and real estate in Jersey City; vice James N. Andrews, resigned. He will receive and ship all materials on instructions from the second vice-president and will inspect and test same to approved standards.

John F. Allen, 370-372 Gerard Ave., New York City, manufacturers of all kinds of riveting machines, has put upon the market a new riveter especially designed for light riveting.

The American Car & Foundry Co. recently obtained a contract for 1,000 cars made of pressed steel for use in the New York Subway and after examining other tools in the market, placed an order for four of these new machines to be delivered at Berwick, Pa. All the rivets, ¼ in. and ⅜ in., are driven cold and this machine will do them all, including those on seams, seats, corners, etc.

Mr. Allen reports quite a demand for this new riveter on such work as house range tanks, etc., where small rivets are required. The machine will drive, however, up to ⅝-in. hot rivets and as it is only 9 in. over all can be operated inside of very small tubes.

We are in receipt of a pamphlet describing the Haverhill Eclipse dry dust fire extinguisher, which is marketed by Adreon & Company, Security Building, St. Louis, Mo. The chemical dust contained in this extinguisher dissipates the flames by means of rapidly expanding gases. When the dust meets the heat it generates 2,000 times its volume of fire-killing gases, which immediately displaces the oxygen in the air. Where there is no oxygen, there can be no combustion, and the fire is smothered. The dust will extinguish fire that water has no effect upon, such as fires caused by exploding lamps or stoves, gasoline, naphtha and electrical fires. Two-thirds of the fires are of this nature. The dust will not injure the finest fabric in any way. It cannot harm person or any kind of material. The gas arising from the dust is not injurious except to fires.

The Falls Hollow Staybolt Company announces the receipt of a large order from the Norwegian State Ry. Co. for both Falls' hollow and solid staybolt bars, through their agent at Christiania, Norway. This is the third large order received from this railway company in the past year and is gratifying to the manufacturers in view of the fact that it comes from a country which has the reputation for producing a good grade of iron. A portion of the raw material, from which the Falls' hollow and Solid staybolt iron is made, is imported from Norway and Sweden. It is then blended with a high grade of native charcoal iron, which gives the combined product the necessary tensile strength and other requirements to make good staybolt iron, which is very much appreciated by the Norwegian State Ry. Co., the Japan government railways, the railways of other foreign countries, also the U. S. government, leading railways of the States, Canada and Mexica, marine boiler manufacturers and ship builders.

Railroad Paint Shop

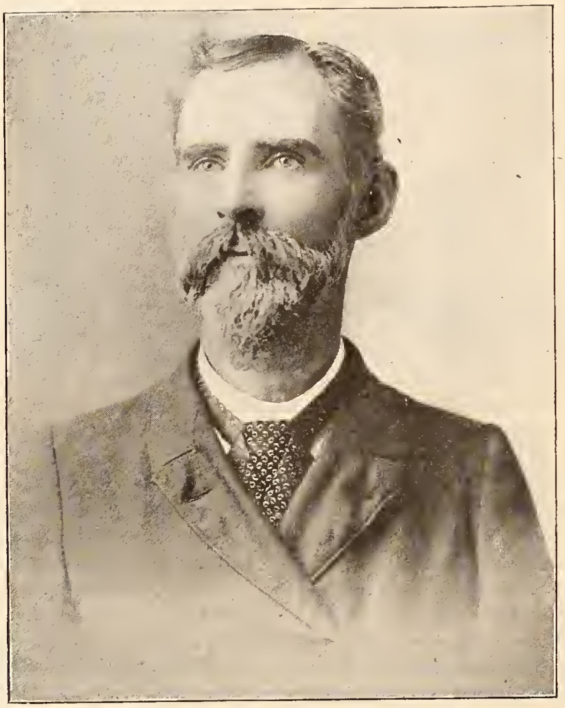
Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

In Memoriam

Many of our readers will be pained to learn of the sudden death of Mr. George H. Worrall, foreman painter of the B. & M.s' Somerville shop, which occured May 23. In company with the Foreman Carpenter, Mr. Joseph Staples and Mr. James Beede he went to Winchester, a distance of about 8 miles, on an errand connected with his shop, and, on alighting from the train at that point, fell to the platform in an attack of heart failure. A Boston-bound express train was stopped and his stricken form placed thereon and borne to



Mr. George H. Worrall.

the hospital, where every means were resorted to to bring him to life and consciousness, but without avail.

Following is a portrait and extract from a sketch of Mr. Worrall which was published in the "Railroad Car Journal," September, 1896, then the official organ M. C. & L. P. A.:

"Mr. George H. Worrall, foreman painter, Somerville shop, B. & M. system, was born in Philadelphia, Pa., in 1850. When he was very young his parents removed to Kennet Square, Chester county, where he received a common school education. After getting through school, with nothing in particular in view, he drifted to the West, and, traveling through a number of the Western states, finally settled down in the State of Iowa and attended a Western college two or three terms, with the intention of becoming a master of penmanship. After teaching penmanship a few terms he became, to use his own language, "paint struck," and served three years at carriage and sign painting under Mr. B. F. Seaton, in Marion, Ia., and, strange to say, has not seen his old master since closing the bargain of his apprenticeship, for he went at once to Cedar Rapids to work for the Burlington, Cedar Rapids & Minnesota R. R. at that place, where he worked two years under Mr. Thomas Shiverton, who was then foreman. His next move was to return home and go to work for the Jackson & Sharp Company, Wilmington, Del., under Mr. Galbreth. He worked in Wilmington in the different contract shops until 1880, when he left there and went to Salem, Mass., and took charge of the painting of the old Eastern Railroad, "the Seashore Line to the White Mountains," afterward leased by the Boston & Maine. After fourteen years there, he was transferred to Somerville, Mass.

"He joined the M. C. & L. P. Association in 1884 in Boston, Mass., when the convention was held at Young's Hotel, and has been an active and useful member."

The Foreman Painter's Responsibility

Does the foreman painter try to see where he can save his company a dollar, either in material or labor? If not, it is a question whether or not he is a profitable investment. True, he may not, for some reason or other, be given the prices of the materials he uses—this is the case in some shops—and he may have no voice in their selection. This may not be his fault, but it is dead wrong, if this is the practice anywhere. It would seem to show that they do not want him to know the prices of materials for fear he will give them away to "the other fellow" when he comes along; and so this is one way—a bad way for the company—to keep painting materials in the control of the office. It is to be hoped that the office is not ashamed to give the painter the prices of the articles he uses?

The foreman painter, if he is what he ought to be, should not only know the prices of materials in his use, but he should be accorded a large latitude in their selection. Does anybody know better than he, with his long experience, what is best and most economical to the company to use? If he is throttled in this and like the sail aboard of the man-o'-war, "not allowed to think" by the captain, then it need not be surprising if he has reached a don't-care spirit as to what anything costs the company so long as he gets his bread and butter and is fairly taken care of and his position is assured. But this is a long way off from the right condition that things should be in order to produce the best results for the company that employes him. Possibly a divided responsibility is better here between him and his superior; but enough responsibility should be put upon his shoulders in this respect, if he is worthy of it,—if he is not someone else should be employed—so that he will feel it in the prosecution of his work in order to produce the best results; and he should thus be held accountable for them. Personally we have no grievances. We write for the benefit of others.

Then, again, there is the other important question of labor. In too many cases the foreman painter has no voice in the hiring of his help. Indeed, he may not know the wages paid. He doubtless knows what they are worth before he has had them a great while—he may know that they are worth little or nothing. Perhaps politics or friendship also cuts some figure in furnishing him some hindrances, otherwise termed "help." Some "ward heeler" who has worked hard (?) to elect a man to the legislature favorable to the road has ninety and nine hangers-on who are looking not particularly for something to do but something for doing little or nothing. These must often be provided for in day-work shops, though to the praise of the piece-work system be it said that this usually steers clear of them, or soon weeds them out. The foreman painter usually gets the lion's share of this kind of help in some quarters on account of the lack of a trade that most of these men have and the thought that almost anybody can work at painting!

This, and many other things and conditions that might be named, puts the painter in some places where he has as little control over the labor question as over that of materials. Is it any wonder, then, that he has degenerated into a spirit of don't-care-what-anything-costs so long as it is done? Or whether it is durable or not? But under all this handicap the chances are that his efficiency will be questioned just the same as if nothing interfered with the exercise of his authority and selection. Pretty much a zero in the strife, he will likely be blamed for not being a hero in it. Tied down to this and to that in an inextricable fashion, he will likely be censured for not showing more agility and try to jump over the moon.

This is no overdrawn picture; it is true to life in some quarters. But we are grateful that it is not so everywhere. The foreman painter is chosen for his ability and character in many places and is accorded that respect for his opinions of men and materials which is due him, and therefore is a factor in the economical prosecution of the company's business. Not unmindful of friendship and the amenities of life, still he is not bought nor "bull-dozed"; he calls a spade a spade whether in the hands of friend or foe. Such should be employed, trusted and respected, because he is "every inch a man," and not a tool. The best results are obtained where the foreman painter and his superior officer conscientiously and thoughtfully pull together in all that is for the betterment of the service. We rather look upon this condition of things than to contemplate the other.

Another Shop Fire

Learning through the Boston daily papers of a destructive fire at the West Albany Shops of the New York Central, during the last week in April, we wrote to Bro. Butts for an authentic account for publication, if he would grant us the privilege, believing that he could do the railroads at large and the members of our association in particular a favor by doing so. He has kindly consented and we subjoin his interesting letter. We think such true accounts of the causes of fires in our shops should be published in our official organ for the benefit of others, that they may take warning and avoid the danger which has entrapped their fellow workers. It will be seen that this is still another case of varnish remover, but this most useful help in the paint shop should not be ruled out on this account—it need not be. Means of safety must be devised and maintained for its use, and that is simple enough. Now the writer has a tank of varnish remover in his shop and this timely letter and advice of Bro. Butts will be profited by in looking after it in the future in a different way than we have in the past. Please note his suggestions.

West Albany, N. Y., May 6, 1904.

My Dear Friend Copp:—Yours of May 4th at hand. I am very glad to say that the loss sustained in the burning of one of our shops is not as great as was reported by the newspapers. The fire burned about one-quarter of the building known as shop No. 5; this was what we commonly called our "Wash Section," where the cars are taken in and are stripped, cleaned and are then transferred to the erecting shop where the carpenter work is done. This section held at the time of the fire 13 coaches and one dining car. There was also one dining car just completed which stood immediately outside near the end of the building; all of the 13 coaches and the two diners were destroyed.

According to the reports made by the watchman, the fire originated in one end of this building at about 2 o'clock in the morning in the room that is used for the purpose of scraping small work, such as sash, doors, blinds, etc.; in one corner of this room is a small tank filled with varnish-remover in which is immersed the small work, such as seat-ends, window-stops, etc., for the purpose of removing the varnish. This tank had recently been filled with varnish-remover. The watchman states that he entered this room (carrying a lighted lantern) which he presumed was closed up tight when the whistle blew at 6 o'clock, and when within a few feet of the tank there was a flash which soon filled the room with flame. It spread rapidly through this section of the building up to the brick cross-wall where, by the heroic efforts of the firemen, it was stopped. The estimated loss is $65,000, covered by insurance.

Fortunately this part of the shop could be better spared without seriously inconveniencing our work than almost any other part of the shops. Our work is going on just the same. One track in our large paint shop is being used for washing cars. Workmen are already cleaning away the debris where the new shop will be erected at once, which will be a decided improvement over the one burned. The new shop will have much better light, cement floor, drainage, and other modern facilities.

Varnish remover is certainly proving to be a dangerous enemy as well as a help in the paint shop. In the new shop we desire to have a room for its use which is made as nearly fire-proof as possible, with abundance of ventilation in the shape of a hood coming down over the tank, with a pipe running up through the roof which will carry off the gases that are constantly escaping from the tank.

No one was injured by the fire. Our shop is full of work and we are pushing hard to get every car possible done before the excursion season begins.

I have just come into the office from a trip over the line and have not the figures before me of our last month's output. I will try and send them to you later on.

Yours truly, H. M. Butts.

The Shellac Question

The price of pure orange shellac gum ("D. C.") is said to have reached the altitude of 90 cents per lb. of late! This is about triple its former value. Other grades are proportionately less. This will naturally open the floodgates of adulteration and substitution upon the market. We may yet be driven to the extreme of using some good substitute, so it is well enough to be forearmed by trying some to see which is best. "Siamlac," at $1 per gal. for orange and $1.10 for white, is making quite a bid for recognition. Ever tried it? Shellac as an interior sandpaper surfacer for finished wood is no longer used as formerly for car work. It is merely used as a stop-coat between the paste filler and two coats of rubbing varnish to follow, the surfaee being put upon the varnish. Why may not, then, some good substitute be used for this purpose which has all the charactertistics of shellac, since it is protected by the varnish and is mainly used to stop the suction of the latter, being only lightly sandpapered before varnishing? Something that will not evaporate so quickly that large surfaces cannot be easily covered with it by an ordinary brush in the hands of a skillful operator before "setting" ought to be satisfactory, other things considered. One thing is pretty sure: It is no longer necessary to use "D. C." gum cut in straight grain alcohol. As the latter is about $2.40 per gal. and it takes about 5 lbs. of the gum per gal. of alcohol it will be readily seen that this is a pretty costly article. That is to say, the above costs $6.90, which amount of gum in a gallon of alcohol will make about 1½ gallons of shellac, or $4.60 per gallon. Of course this mixture being too heavy for most work to apply its cost will be farther reduced by the addition of more alcohol; but even then it is unnecessarily extravagant.

Probably the pattern maker is the greatest crank on the kind of shellac he uses on his patterns. For his use "black shellac" is prepared by mixing into the usual article lampblack dry in the requisite proportion and thinning same to working consistency with alcohol. He must apply several coats, sandpapering each nicely and smooth in order that the pattern may be drawn from the sand properly by the moulder in order to present a good surface on the casting. He is strongly prejudiced against any innovations here—more so, if possible, than the painter. He will sniff his pot as a dog scents his master's tracks to see if it is O. K.—no wood alcohol, or any other substitute for the pure thing smuggled into it by the adroit painter or stock-keeper. If so, it won't work! But perhaps the most unexpected complaint against anything but the pure grain alcohol shellac comes from the electric car barn, where shellac is used on the wire-wound armatures. They say that wood alcohol shellac will not work here; that it gathers a moisture, etc., and so the pure grain alcohol shellac has to be supplied for this purpose anyhow! Does any reader know anything about this, pro or con? If so, he will confer a favor by communicating with the editor of these columns.

For pattern makers use a grade of gum known in the market as "B. R." and about half the price of "D. C." could be just as well used, cutting it in straight grain alcohol, if preferred, rather than a portion of refined wood spirits. This is native gum and is simply too dark-colored for some work, but where lampblack is added to any shellac for the pattern maker's work of course this dark gum cuts no figure.

Grades of gum designated in the market as "Octagon B.," "S. D." and "A—S. S. L.," are all right for the painter's use for an orange shellac. For white shellac he should order "Bone-dry, pulverized." If he will get these and cut his own shellac in any spirits he likes he will have no trouble in getting good shellac.

Notes and Comments

We understand that the Hotel Committee has chosen the "Rudolf" as the headquarters of the Master Car and Locomotive Painters at their convention to be held in Atlantic City, Sept. 13-16.

The son of the editor of these columns has chemically concocted a front-end black for the heated parts of locomotives that seems to be meeting with favor and from which he expects great things. This will "fill a long-felt want," to use a hackneyed phrase, if it meets expectations, for many have tried it and failed. Seven years in the shop with his father and 2½ years with the Sherwin-Williams Co., in testing laboratory, he ought to have some practical information. He is general manager, Atlantic Paint Co., Cleveland, O., where he has been for a year.

We have received a note under date of April 26, from our esteemed associate, Mr. D. B. Vail, of Buffalo, N. Y., wherein he says he has resigned his position held for 15 years as foreman painter at the Erie R. R. shops at that point, and is in the field for a position as traveling salesman for some good paint and varnish house. We trust he will be thus put in communication. His address is 10 Putnam St. He makes this move in the interest of his health, the close confinement of the shops being a continued detriment. Having known him for some ten years, we give him a hearty indorsement and hope he will become associated in the field he desires.

Chairman Dane of the Special Committee on Locomotive Painting, says: "I have just received (May 17), the report of the committee from its long journey which it was necessary for it to take to obtain the signatures of its members, and I have forwarded the same by registered mail to Mr. J. W. Taylor, secretary A. R. M. M. Association, Chicago, Ill. The committee has worked hard to compile this report and I hope the results will be satisfactory to both associations."

Following is Secretary Taylor's acknowledgment of its receipt, which is quite complimentary to the committee:

658 Rookery Building, Chicago, Ill., May 18, 1904.

A. P. Dane, Esq., Foreman Painter, Boston & Maine R. R., Boston, Mass.

Dear Sir:—I have yours of May 16th enclosing report of the special committee of the Master Car and Locomotive Painters' Association on "What is the Best Practice for Painting Locomotives," etc., and much obliged to you for the splendid shape in which it is presented. I will submit the matter to the Master Mechanics' Association as a special report from your association.

Yours truly,
Jos. W. Taylor,
Secretary A. Ry. M. M. Assn.

Extraordinary Test of Graphite Paint

The true value of "Superior Graphite" paint was exposed by the recent disastrous fire which occurred in the business district of the city of Baltimore. Among the buildings injured or destroyed was the Union Trust building and an examination of the paint covering its steel structural work, after having been subjected to great heat, demands the attention of those interested in preservation by paint. The building was erected in 1897-98 and the steel work was painted once in the shop and twice after erection with what is known in the trade as "No. 30 Superior Graphite" paint. Much of the steel has been stripped of its terra cotta and other coverings and about one-third of it has been exposed. Although these surfaces which are now open to examination were subjected to great heat, the paint remains glossy and elastic. A few rivet heads show rust, but they are always likely to do so on account of the scale which adheres to them after being driven, and their condition is unimportant. Practically speaking, the paint remains as serviceable today as when applied six or seven years ago.

A blotter, in which an illustration of the remains of the Union Trust Building is displayed, together with a short account of the facts connected with this building, is being distributed by the Detroit Graphite Mfg. Co., the establishment making the paint which withstood the test whose results were exposed in such an extraordinary manner.

Established 1878.

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THE late appearance of this July issue is unavoidable, owing to the later date at which the Saratoga conventions were held, but it seemed preferable to delay the date of publication rather than to wait until the August issue to give a report of the proceedings and discussions. It is with no little pride that the management of the RAILWAY MASTER MECHANIC sends out to its readers this July issue, which is the largest single number ever issued by any railway publication on account of these annual conventions.

The June Conventions

HISTORY is said to repeat itself, but it does so in resemblance rather than in fact, just as one springtime is like unto its predecessor, but differs in the growth and development of the year that has intervened. So we may say that the Saratoga gathering of 1904 was like the one of the year before in that there was the same congregation of supply and railroad men, the same exhibition of appliances, the same series of papers and reports and discussions and the same sound of social gaieties that have become such a marked feature of these annual meetings. But to those who are most intimately in touch with what is done and doing a development is apparent from year to year that speaks a substantial progress all along the line. It goes without saying that the present status of the associations and their conventions has not been reached at a bound, but through long years of patient effort; and to those who have been associated with the work, the relation to the past resembles that of a sturdily growing tree in its maturity to the sapling struggling for existence.

The standing of the two associations is now established beyond all peradventure and it is curious to note how their relations to the outer world of railroad policies has developed with the growth in importance of their members. In the earlier days when the work of the master car builder and master mechanic was largely that of mere shop superintendence, frequently being an imperceptible degree removed from that of a general foreman, the associations had but little power to obtain an acquiescence in and use of the several standards that they chose to adopt. The introduction of representative members and the right to enforce observance of the rules of interchange was the entering wedge, and from that time the increase in influence has been steady and uninterrupted.

It has often been observed, of late, that the duty of the present superintendent of motive power is administrative and executive rather than mechanical, and so partaking somewhat of this nature the work of the two associations has become administrative and legislative to a great degree. We find this to be especially emphasized by the relations that now exist between them and the Interstate Commerce Commission.

In his opening remarks before the Master Car Builders' Association, Mr. Moseley brought out the importance of the work that had been done and took the "opportunity of repeating that the standards of your association are fully recognized by the Interstate Commerce Commission."

The importance of this matter of the standards can best be realized by a consideration of the conditions that would exist if they were to be done away with. It is interesting, too, to note how the appreciated value of this portion of the association's work has grown, as evidenced by the greater ease with which new standards are adopted as compared with a few years ago.

It is to be hoped that the encouragmenet received and the cordial relationship that now exists with the Interstate Commerce Commission will be maintained and strengthened, and probably no better means can be taken for the accomplishment of such an end than in an address by the secretary which has been so valuable a feature at the last two conventions.

Finally to add one more word regarding the standards attention may be called to President Brazier's admirable address, in which he reviewed the work before the associations and some of the problems that were presenting themselves and then especially urged the desirability of still further extending the list of standards.

In regard to the work of the committees much could be said in its praise and still more of its value. The old catechising form of circular with the tiresome and uninstructive categorical replies has almost disappeared, and where it is used its functions are limited to statistical work for which it is admirably well adapted. The real work of the committees has now become one of scientific investigation. Not necessarily scientific in the sense of elaborate experimentation, but scientific in its methods. It is no longer attempted to finish a subject in a day or a month, but the work is continued from year to year until something definite has been accomplished and at least one new base line established.

A notable example of the effect of this method is to be found in the handling of the rules of interchange. The day assigned for the report and discussion of the changes was considered one to be dreaded. Time was consumed and the proceedings lumbered with a collection of words from which it seemed impossible to disentangle the sense. Members discussed knotty problems of wear and tear, of responsibility for damage, of price and inspection to which they had really given but little thought. Illy conceived and undigested opinions were expressed on the spur of the moment and rules were formulated that were capable of a variety of interpretations. Today this is changed. The report presented by the arbitration committee last month was very full and complete. A great number of suggestions were made and after their tabulation followed the brief remark: "The committee does not concur in these suggestions," or "The committee approves of this suggestion." Apparently this sufficed for the convention. The arbitration committee, through its long years of hard labor, has earned for itself a reputation for "consistency and justice," and now it is reaping its reward in the confidence placed upon it by the members. They know that there are good reasons to support any decision that may be rendered, and so the discussion on the rules has dwindled from hours to minutes and the real work is done by a few thoughtful men who are familiar with all the ins and outs and influences that surround the formulation and administration of these important rules.

It is natural that as the world progresses and new industries are being created new topics should be brought to the fore in the convention discussions. There have been whispers of it before, but this year electricity has come out as a new influence to be counted with. The address of Mr. Vreeland, in which he foretold the coming of electric traction and the problems which it would bring to the motive power officers, was a very significant indication of the trend of current events. To this was added a report on the proper location of the third rail, so that it seems safe to predict that, in the future, electricity and its applications will constitute a part of the work of both associations.

It does not take so very old a man to remember when wooden trucks were common in freight service, though they have now disappeared, and the use of steel has spread over the underframing and even climbed up into the sides and roof of box cars. A year ago attention began to be directed to the use of the steel truck for passenger cars and since that time several examples of steel passenger car construction have been brought out, and at last the attention of the association has been formally directed to this method, and urged to look into the matter.

In the Master Mechanics' Association the work has been equally broad and valuable. Probably the most radical proposition of the year came in the first report that was presented, where it was suggested that the work of the switching locomotive be placed upon the basis of ton hours instead of a pure mileage one as heretofore. Last year the committee made a report in which it was shown conclusively that the present rating of switching engines was altogether too high and that three miles an hour was nearer the mark than six. Then came the problem as to the exact amount of work that such an engine ordinarily performed. The impossibility of making an exact determination for all engines led to the ton-hour proposition, which consists in multiplying the weight on the driving wheels by the hours in service. It is a notable instance of the effect of education that while the report last year, in which the six-miles-an-hour basis was shown to be untenable, was warmly attacked, there was hardly a word of opposition raised to this new suggestion and the recommendation was adopted at once.

Another new feature at the second meeting was the introduction of a change in the construction whereby representative members will be admitted to the association after the manner of those of the Master Car Builders'. The influence of these representatives has been so healthy and has contributed so much to the growth of the other association that it would seem strange that they had not been provided for before, were it not borne in mind that there is no interchange of locomotives and that, therefore, there was no demand for them as an assistant to an enforcement of rules of interchange or the adoption of standards. Now, however, the work of the association has broadened to such an extent that co-operation is needed in the prosecution of investigations that lie beyond the power of any one road to carry out, and the representative member has become a necessity.

It would be interesting to review in detail the work that was done, but the limits of space make this an impossibility, and attention can only be called to the reports that are given in greater detail elsewhere. In conclusion a word must be said in regard to the masterly manner in which the whole business of the two conventions was carried on. Certainly no meetings have ever been conducted with greater vim, and the affairs carried through with more life than at these two. Both presidents seemed imbued with a vigor that is seldom seen and the discussions were kept moving at a pace whose speed has rarely been equaled. At the same time there was no curtailment of the freedom of discussion and nothing was left in an unfinished condition.

As for the supply men their chairman and committee managed the entertainments and exhibition in such a businesslike manner that there was a spirit of preparedness and finish extending throughout the whole that made the flow of events as smooth as the oily tongues of some of their representatives. In fact, taken all in all, anyone who was in Saratoga between the dates of June 21 and June 29, 1904, is to be congratulated on being a part of so notable and important a gathering.

The Camera and the Conventions

THE thirty-eighth annual convention of the Master Car Builders' Association was held at Saratoga, N. Y., June 22, 23 and 24, 1904. The thirty-seventh annual convention of the American Railway Master Mechanics' Association was held at Saratoga, N. Y., June 27, 28 and 29, 1904. There was a good attendance of the members of both associations. There were also a number of supply men present as their guests. In another part of this issue will be found an account of the practical work done in the convention hall, which work from all reports seems to have been well done. But that is all told in another chapter.

While perhaps a story of the Saratoga conventions of 1904 as seen outside the convention hall is not as important as the record of what went on inside it would seem to have its place. We might go to our annual conventions and work all the time and emulate "Uncle" Russell Sage in his no-vacation theory. Then, again, we might not. The presence of the ladies, as usual, added greatly to the pleasure of the social side of the conventions.

The members of the associations may well point with pride to their record of nearly forty years, as each succeeding annual convention has shown an added improvement to the rolling stock of the railways of North America. The fact that with the work at each convention there has been combined a little recreation, has detracted not at all from the important matters there discussed and de-

"O LISTEN TO THE BAND."

MR. F. W. BRAZIER AND MR. H. H. VREELAND HEADING THE LINE OF MARCH.


Marching to the Convention Hall the

cided, but has rather given added zest toward their better performance.

Very naturally the presidents of the two associations which have just concluded their annual convention at Saratoga, were the centers of interest during the convention. We hesitate to say too much in regard to the admirable way in which both conventions were conducted for fear that our compliments may seem like flattery. The fact that Mr. Brazier was elected president of the Master Car Builders' Association and Mr. Lewis president of the Master Mechanics' Association is sufficient evidence to our mind of their fitness for those offices. Perhaps it may be of more interest to recall to our readers a few incidents of a number of years ago which would tend to show why these gentlemen have attained positions of honor in these two associations. Not so very long ago, for Mr. Brazier is still a young man, we find the following item in the files of the Railway Master Mechanic: "It may be some years before F. W. Brazier, foreman of the new car shops of the Fitchburg road, can be an alderman, as he is yet tall and slender, and has not that protuberant front outline which is associated in the minds of the people with that official position. But the citizens of Fitchburg have made him president of their municipal corporation, and he is therefore equal, officially, to several aldermen. He is more proud, however, of the new shops, and especially of the great bed of old-fashioned flowers which flourishes in the rear of one of


Morning of the Opening of the

Thirty-Eighth Annual Convention of the

the main buildings. The sight of their brilliant colors will put heart into tired men, and make them feel that life is, after all, worth living."

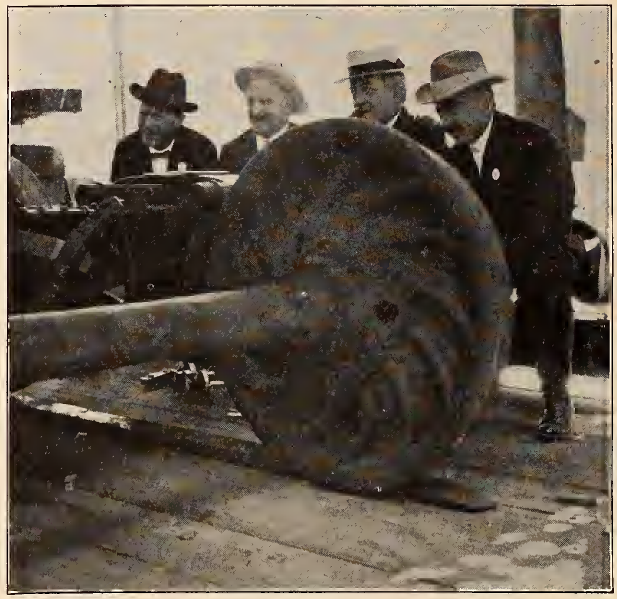
Perhaps another item which appeared in the Railway Master Mechanic in April, 1893, would give some indication as to why Mr. W. H. Lewis, president of the Master Mechanics' Association for the past year, has reached the prominent position which he now occupies in the motive power department. Mr. Lewis is evidently one of the men who has always believed in the importance of little things, as is shown in the following which we quote from the files of the Railway Master Mechanic of over ten years ago: "Mr. W. H. Lewis, master mechanic of the Chicago, Burlington & Quincy, has managed to make an engine run 1,720 miles on a little over one quart of valve oil, and the valves and cylinders were then found to be in good condition."

For convenience and brevity the annual conventions of the Master Car Builders' Association and the American Railways Master Mechanics' Association are referred to as the "Saratoga conventions," so often have we met in the same place. This year, as in other years, there have been suggestions definite and indefinite as to other meeting places. Without doubt, a change is desirable and the suggestion that Atlantic City be the next meeting place was favorably though informally discussed. Certainly

Master Car Builders' Association.

Mr. W. H. Lewis, Mr. F. W. Brazier and Mr. J. W. Taylor.

Mr. J. J. Conally, Mr. J. J. Hennessey.



Mr. Bettendorf Shows His New Truck.

there should be some suitable meeting place somewhere in the United States where a hall with good acoustic properties could be provided for the use of the two associations. An enterprising committee, consisting of Messrs. Bradish, Westcott and Dunlop, was present at the convention to make a plea for Atlantic City for the coming year. If the enterprise of these gentlemen in any way indicates the enterprise and push of Atlantic City the conventions would certainly be well taken care of at that place.

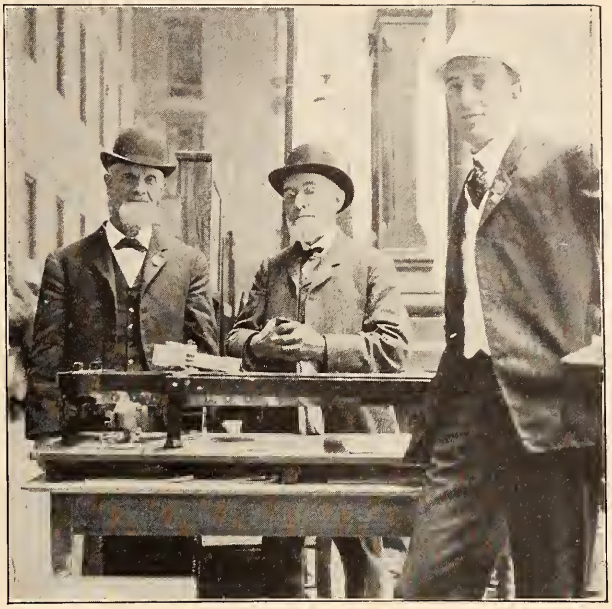
The "snap shots" in this issue we leave to tell their own story. As is usual, a number of pictures did not "pan out" as expected, and among the missing are the electric signs of the Sherwin Williams Co., Paul Dickinson, the smoke jack man; the exhibit of Philip Carey Mfg. Co., and many others, among which was a picture of the locomobile of the Gould Coupler Company of New York City. This company is already famous for a number of things in the railway supply line, and it has now added to its already good record by shortening the automobile running time from Trop to Saratoga to one hour and fifteen minutes. A touring locomobile carrying the members of the Guold company who attended the conventions made this trip of about 32 miles in the time mentioned.

The supply men's meeting, which has come to play a

Mr. Peter H. Peck.

Mr. J. T. Chamberlain and His Historic Umbrella.

MR. THOS. FILDES.



MR. C. H. CORY AND MR. S. W. MIDGLEY.

very important part in our annual conventions, was held on Tuesday night previous to the opening of the convention. Mr. George A. Post, who was the chairman, certainly has missed his calling. He should preside over the senate or be a speaker in the house of representatives. While we notice that the Daily Age gives him the title of "Czar Post," no one could accuse Mr. Post of using any of the powers generally attributed to the man who is supposed to guide and control the destinies of Russia. ..Not only Mr. Post as "boss of the pleasure mill," but Messrs. Toothe, Ross, Walbank and Dinsmore, who were chairmen of various committees, should be congratulated on the amount of work well done in providing entertainment for the members of the two associations and their guests.

General Charles Miller, president of the Galena Signal Oil Company and president or director of more railway supply concerns than any other one man in the United States, was in attendance at the conventions this year. The snap shots of the general, published in this issue, are not especially clear, but anyone who knows General Miller knows that he is far too busy a man to ever be found quiet. A number of railway supply men representing General Miller's various interests would make a small army. And it may be taken for granted that this army is well trained, as the "General" is as well posted in military affairs as he is in business.

Mr. William E. Magraw, known among the railway and railway supply fraternity as the "Red List" man, seems to be very unfortunate when attending the conven-

MR. L. C. NOBLE, MR. D. C. NOBLE.

MR. THEO. H. CURTIS, MR. P. M. ELLIOTT.

General Charles Miller in Characteristic Attitudes.

tions. Last year his signs for the "Red" and "Blue" became torn in some mysterious manner. He had forgotten all about this until reminded of it by the somewhat similar accident which recently occurred in St. Louis, where the balloon of Santos-Dumont received bad treatment at the hands of someone unknown. This year Mr. Magraw brought to the conventions a small sized trunk filled with his souvenir albums, containing the pictures of the "men who feed the railroads and the plants from which they are fed." The aforesaid trunk was watched with jealous care, not only by Mr. Magraw, but also by his partner, Mr. Bagnell, and by their representative, Mr. Puterbaugh. It is stated that these three named gentlemen divided the day into three watches of eight hours each and took turns guarding their treasured trunk. During one of the watches while Mr. Magraw was on guard he was enticed away from his post by what he thought was a chance to add "another name to the index," and upon his return the trunk was missing. It is not necessary to dwell upon the harrowed feelings of Messrs. Magraw and Bagnell, but it is enough to say that the trunk and the books therein were found with the assistance of the hotel detective, who discovered them in the large and more spacious trunk of the Simmons' Hardware Company, which occupied the space next to them.

The Armstrong Bros. Tool Co., whose exhibit is usu-

The [Symington] "Lid is On."—This Illustration Shows Either a "Tight" or a "Tough Joint." However the Tension on the Money Would Indicate that Things Are Not Running "Wide Open."

Mr. J. T. Wilson Shows His Exhibit.

Mr. A. M. Waitt, Mr. E. F. Slocum.

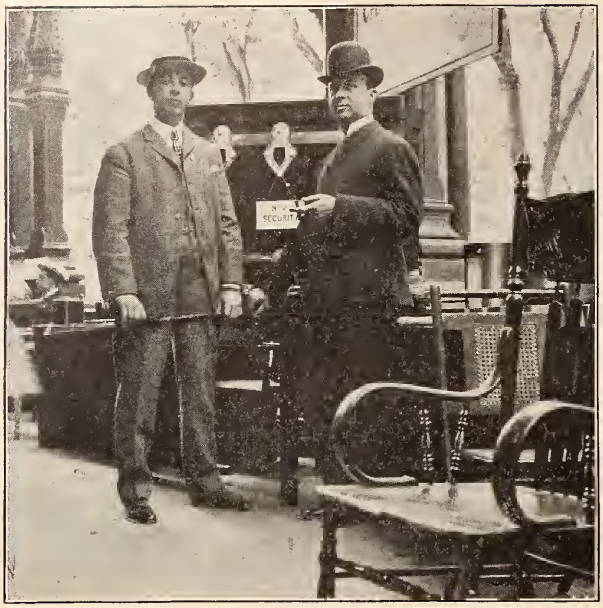
Miss Janes, Miss Purves and Mr. Noble.

ally seen at Saratoga, was missing this year. Mr. Paul Armstrong, who has attended the conventions regularly in former years, found himself so rushed with their increasing business that it was impossible to be there this year, but next year he promises a larger and in every way more interesting exhibit than ever before. The Armstrong company's exhibiting this year is being done at the St. Louis exposition, where they are displaying a very fine and complete line of tool holders.

The face of Mr. John J. Cummings, president of the McGuire-Cummings Manufacturing Company, will be remembered as having been a familiar one at the convention several years back. Mr. Cummings, however, has not been in attendance for four years. During a part of that time he has been largely engaged in the supply business, but not railway supplies—he has been supplying the several and various municipalities of the country with iron and steel work for the interior of buildings in which their more strenuous and unwelcome guests are housed. The word welcome suggests an experience had by Mr. Cummings while in this business, in a county seat far from Chicago. Mr. Cummings was the successful bidder on a new jail for the county in question. The subject of adornment for the new structure which was to be the pride of the county came up and Mr. Cummings in a spirit of humor suggested that he send along a steel wire mat in which

Gold Car Heating and Lighting Company.

Mr. G. L. Weiss and Mr. W. S. Bidle.



The "Dromedaries," Isbester and Elliott.

Mr. Symington's Specialty Entertaining the Ladies.

marbles so arranged to spell the word "Welcome" should appear. The idea was seized upon by the county commissioners, to Mr. Cummings surprise, as an excellent one, so a large fine mat bearing this suggestive and unusual inscription was duly installed at the portals of the county's new bastile, and to this day evildoers of that town upon whom the law lays its hands and imposes punishment are met on entering this house of enforced abode with the cheerful greeting "Welcome," and the joke—is it on Mr. Cummings or the other fellow?

The photograph of Mr. George A. Post engaged in his official duties, as shown on page 247, would lead one to naturally suppose that Mr. Post was the possessor of a long white beard on one side of his face. This, however, is not the case, as the sun shining through the window back of him is responsible for this effect.

We print the following advertisement which was received too late for insertion in its proper place in the advertising columns: *"Found on the floor of the Convention Hall a solid gold badge bearing this inscription, 'The Champion Buck and Wing Dancer of the United States.' The finder will return same promptly to owner on payment of suitable reward."*

McCord and Company, who are well known in the railway fraternity because of their journal boxes and a number of other good things, are destined to become

Franklin Mfg. Co.'s Exhibit and Mr. R. J. Evans and Family.

Mr. D. W. Call and Mr. Charles Riddell.

Mr. H. W. Frost and Mr. G. W. Austin.

Mr. L. R. Pomeroy.

better known in the future because of the handsome silk flags which they distributed at the convention this year. To say that these souvenirs were popular is putting it mildly. They seemed to have become a necessity not only to the members of the associations and their guests but to the entire town of Saratoga. Messrs. Dunn and Lamon have the reputation for being fairly good natured individuals, but their patience was sorely tried in the distribution of their flags. One flag was not enough and in some cases a half dozen flags did not seem to satisfy some people.

Messrs. D. Hunt, Jr., A. W. Foote and C. E. Randall.

In this connection it should be remembered that many of the supply companies have discontinued the giving of souvenirs for this very reason.

Many of the souvenirs were given out among which we note that of the Galena Signal Oil Company, which as always was something handsome and this year the handsome egg cup was an exceedingly pretty gift. Everybody got one and no one received more. The Philadelphia Pneumatic Tool Company's fob, with their trade mark monogram attached, was seen hanging from many watch pockets.

[illegible]

Mr. and Mrs. C. H. Reynolds.

Mr. Thomas Madill, of the Sherwin-Williams Co., Taking Orders for Paint.

Mr. M. H. Haig, Mr. W. B. Leach and Mr. F. A. Morrison.

The Franklin Manufacturing Company's pass book was put to immediate use by the railway officials. Nails for knockers and for other people as well were distributed by the American Brake Shoe Company.

Among the "snap shots" that we wish could have been would have appeared that of Mr. E. F. Slocum, of the Safety Car Heating Company, and also of the entertainment committee, as he appeared "after the ball." Mr. Slocum's exertions in behalf of those attending the ball had made him look as though he had been through the wash and had not yet been hung up to dry.

Sherwin-Williams Company, we understand, left their chameleons at home this year because the chamelon in real life changes color and for that reason is not the proper trade mark for paints which never fade or wear out.

We would offer as a suggestion to the Philadelphia Pneumatic Tool Company, the Rand Drill Company and others that they invent a noiseless tool for exhibition at the conventions. But perhaps good tools have to make a noise, and if so we will have to put up with the racket.

Mr. Ray Lovell of the Columbus Rolling Steel Shutter Co.

The Committee From Atlantic City: Mr. R. T. Dunlop, Mr. J. L. Wescott, Mr. A. J. Bradish and Mr. L. M. Taylor.

Mr. C. W. Ambrust and Mr. F. W. Edmunds.

Among the large and varied exhibits we note the following as being the more interested and well displayed. Photographs of many of these exhibits appear in the accompanying pages.

President Lewis Wonders—

Mr. A. L. Guilford of the Ajax Mfg. Co.

The American Balance Valve Company, of Jersey Shore, Pa., was represented by J. T. Wilson, whose name has become well known in railway circles as being associated with the high-pressure slide valve. Models of the J. T. Wilson high-pressure slide valve, internal and external admission, were shown, and also an American semi-plug piston valve which had been in service for two years and nine months. Mr. Wilson's souvenirs were, as usual, of the best.

The American Brake Shoe and Foundry Company, of New York and Chicago, had its usual well placed

Mr. J. C. Barber and Mr. C. T. Schoen.

Mr. C. A. Anderson, Mr. Geo. T. Anderson and Mr. S. D. Anderson.

Mr. John C. Duner.

and interesting exhibit, showing their large and varied line of railway brake shoes and miscellaneous iron and steel castings. They were represented by F. W. Sargent, Otis H. Cutler, J. D. Gallagher, J. S. Thompson, R. S. Mercer, Louis Seibold, E. L. Adreon, Jr., F. H. Coolidge, H. S. Bradfield and Frank Barbey.

The American Steel Foundries of New York, Chicago and St. Louis showed the R. E. Janney all cast steel coupler, models of American, Ajax and Player trucks and body bolsters. Their representatives were S. A. Watson, J. V. Bell, R. H. Weatherly, H. M. Pflager, W. O. Jacquette and W. A. Blanchard.

The Aurora Metal Company, of Aurora, Ill., were represented by A. Christenson and G. Thurnauer. Dr. Thurnauer showed their exhibit of the Lewis and Kunzer metallic piston packing, which is fast becoming recognized as one of the necessaries in good railroading.

The exhibit of the Ashton Valve Company was displayed in one of the rooms of the Grand Union Hotel, where were shown their locomotive muffler and pop safety valve, blow-off valves, steam and air pressure gauges, gauge testers and chime whistles. They were represented by Fred A. Casey, Albert C. Ashton and J. W. Motherwell.

W. C. Baker exhibit showed a two-coil perfected heater, a two-coil fireproof heater, the "Mighty Midget" car heater, a single-coil fireproof heater connected with 500 feet of pipe, and two steam attachments. Mrs. Walker and James A. Demarest represented the company.

Mr. W. J. Smith and Mr. E. E. Davis.

Mr. W. R. Toppan and Mr. Cass L. Kennicott.

Mr. R. T. Brydon and Mr. Walter La Parle.

Mr. Nat C. Dean and Mr. William St. John.

The exhibit of the Bettendorf Axle Company, of Davenport, Ia., and Chicago, was one of the most interesting exhibits on the grounds because of the new Bettendorf truck which was shown. That the opportunity given for the inspection of not only the truck, but the other Bettendorf products, was appreciated by the members of the M. C. B. and M. M. associations, was evidenced by the numbers of motive power officials who carefully inspected the exhibit. One of our accompanying "snap shots" illustrates this and proves beyond question the increasing value to the railroad and the railroad supply men of the exhibits at these annual conventions. In addition to the trucks, the Bettendorf steel tank car, steel underframes and the Bettendorf I beam bolsters were shown. W. P. Bettendorf, G. N. Caleb, J. H. Bendixen and J. W. Ball represented the company.

One of the new exhibitors this year was S. F. Bowser & Co., of Fort Wayne, Ind., showing their self-measuring oil tanks and pumps, which are used for storing and handling all kinds of lubricating oils, and are especially adapted for use in machine shops or power plants—in fact, wherever lubricating oils are used. They were represented by C. A. Dinkelberg and P. F. Cashman.

The Camel Company, of Chicago, was well represented by P. M. Elliott and his exhibit showing car doors and hose clamps. A picture on one of the accompanying pages tells the whole story.

L. C. Chase & Co., of Boston, represented by Wil-

Mr. R. D. Gallagher, Jr., and Mr. H. H. Sessions.

Messrs. G. F. Slaughter, W. D. Lowry, J. R. Niederlander, John E. Ward, G. E. Scott and W. W. Butler.

Mr. Chas. L. Sullivan and His Exhibit.

Mr. Geo. L. Rich.

liam Walden, showed their usual full line of Chase leather, Chase curtain fixtures and Chase car curtains.

Chicago Railway Equipment Company, Chicago, showed the "Diamond" special beam for high-speed brakes, "Diamond" adjustable brake beam and "Creco" automatic frictionless side bearing. They were represented by H. C. Buhoup, A. J. Farley, C. F. Huntoon, B. F. Pilson, E. G. Ely, E. G. Buchanan and A. J. Schevers.

The Cleveland Car Specialty Company, of Cleveland,O., showed their pressed steel car lines, Cleveland City Forge & Iron Company's turnbuckles, drawbar yokes and general car forgings. They were represented by Geo. B. Maltby, Geo. L. Weiss and W. S. Bidle. Their exhibit showed in an interesting and practical way the use and advantage of the pressed steel car lines, and a photograph of the exhibit is reproduced on one of the accompanying pages.

The Columbus Steel Rolling Shutter Company, of Columbus, O., was represented by Ray Lovell, who exhibited samples of their steel rolling shutters and the advantages of their use in roundhouses.

The Davis Expansion Boring Tool Company, of St. Louis, showed their boring tools for car wheels and their exhibit well illustrated their economy. C. Willis, J. Smith and E. E. Davis represented the company.

The Detroit Lubricator Company, of Detroit, Mich., exhibited their original bullseye type of locomotive lubricators in all sizes, strictly up to date. They were represented by F. W. Hodges, A. B. Wetmore, A. D. Homard and W. T. Simpson.

Paul Dickinson, of Chicago, better known as "Dick-

Messrs. Rosser, Symington and Washburn.

Mr. W. F. Hall.

Mr. W. J. Cooke.

Mr. J. J. Cummings.

inson, the smoke-jack man," had an exhibit which worked night and day, the big electric sign showing by night and the Dickinson movable and Dickinson Giant smokejacks for roundhouses which attracted attention by day. Paul Dickinson and Arthur J. Filkins represented the exhibit.

The Jos. Dixon Crucible Company, of Jersey City, N. J., well known throughout the entire world by their liberal and judicious advertising, were represented by H. A. Nealley and G. P. Hutchins, who showed the Dixon Graphite paints and lubricants.

The Duff Manufacturing Company, of Pittsburg, showed their Barrett improved car jacks in the exhibit of their agents, the Fairbanks, Morse Company. T. A. McGinley, vice-president of the Duff Company, attended the conventions and represented his exhibit.

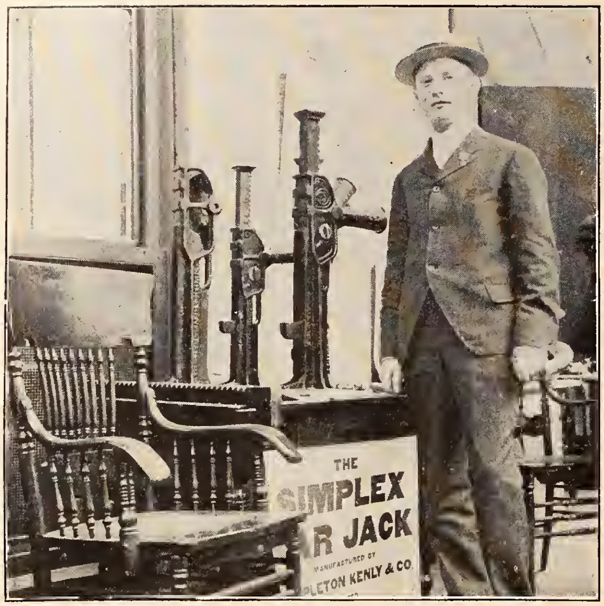
The Farlow Draft Gear Company, of Baltimore, Md., had a large exhibit showing four styles of their draft gear, single, twin, tandem and friction, applied to steel and wooden cars. They were represented by D. F. Mallory, I. O. Wright, M. A. Garrett and John Farlow.

The Franklin Manufacturing Company, Franklin, Pa., showed their asbestos dust guards, magnesia boiler covering, asbestos train pipe covering, journal box packing and all kinds of asbestos goods. They were represented by R. J. Evans, Wallace W. Johnson, Fred Alford, H. S. Hayward, Jr., C. B. Holdredge, W. A. Trubee and Geo. E. Cushing.

The Franklin Railway Supply Company, Franklin,

Detroit Lubricator Co.

The Standard Paint Co.



Mr. W. B. Templeton.

Franklin Railway Supply Co., Represented by Mr. S. G. Allen.

Pa., showed the Sheedy's cylinder circulator, McLaughlin flexible metal conduits for steam and air, McLaughlin lock nuts, Worthington coupler, Player brake shoe, Elvin driving box lubricator. Represented by S. G. Allen and A. G. Elvin.

The Handy Car Equipment Company, Chicago, Ill., showed the Handy swinging pilot coupler, Snow car and locomotive replacer and Handy journal box jack block, and were represented by Chas. L. Sullivan, R. L. MacDuffie and Henry Oersterich.

The Gould Car Coupler Company, New York, showed their improved M. C. B. journal boxes, improved malleable draft rigging for freight equipment with spring buffer blocks, improved M. C. B. coupler for 100,000-pound car, and improved locomotive tender coupler for heavy equipment, steel passenger platform with friction buffer and draft gear, friction draft gear for freight passenger cars and locomotives, improved roller side bearings for freight cars and steel couplers. E. P. Huntley, G. Milne, W. F. Richards, C. M. Gould and T. L. McKeen represented the company.

The Homestead Valve Manufacturing Company, of Pittsburg, had their usual exhibit showing the Homestead locomotive blow-off, and those who looked carefully into the large sized model voted it the most interesting exhibit on the grounds. F. Schuchman and Tom R. Davis represented the company.

Jenkins Bros., of New York, Chicago, Philadelphia, Boston and London, exhibited a full line of valves for high and low pressure and Jenkins' "96" packing.

Mrs. A. Fenton Walker and Mr. Jas. G. Demarest, Representing the Baker Car Heater.

Mr. D. F. Mallory of the Farlow Draft Gear.

MR. F. SCHUCHMAN AND THE HOMESTEAD VALVE.

RAND DRILL CO., REPRESENTED BY MESSRS. TRAVER AND HURLEY.

They were represented by Charles J. Jackson, J. H. Williams, Arthur C. Langston and Chas. W. Martin, Jr.

The Manufacturers' Railway Supply Company, of Chicago, had a large and well displayed exhibit showing the interlocking car and driver, brake shoes and interlocking driver brake head. In the exhibit was also a large number of shoes illustrating how completely they wear out. They were represented by C. W. Armbrust and H. G. Fuchs.

The Mason Regulator Company, of Boston, Mass., showed a complete line of their steam specialties and locomotive reducing valve; also exhibiting the Mason automobile engine, model "C." They were represented by Wm. B. Mason and F. A. Morrison.

The McConway & Torley Company, of Pittsburg, Pa., exhibited their steel and malleable iron couplers for freight and tender, of the Kelso and Pitt patterns, and 3-stem couplers for freight cars. They were repsented by E. M. Groves, I. H. Milliken and H. C. Buhoup.

McCord & Co., of Chicago and New York, showed their usual exhibit of their malleable iron journal boxes, McCord spring dampener, McKim gasket, McCanna force feed lubricator and Gibraltar bumping post. They were represented by James A. Davis, Judson A. Lamon, Morrill Dunn, William May and W. G. Dunham. In addition to this exhibit the flag given out by them as a souvenir attracted universal attention and made the annual march of the Master Car Builders to the convention hall more than usually interesting.

A BUNCH OF ADVERTISING MEN: MESSRS. PUTERBAUGH, TYLER, SHERMAN, SIMMONS, MAGRAW AND WITHROW.

MR. JUDSON A. LAMON OF MCCORD & CO., THE MOST POPULAR MAN AT SARATOGA.

MR. AND MISS COFFIN.

AN INFORMAL DISCUSSION.

The McGuire-Cummings Manufacturing Company, of Chicago, showed a new release grain door and safety door brackets. W. J. Cooke and John J. Cummings represented the company.

Merritt & Co., of Philadelphia, Pa., exhibited sheet steel and expanded metal lockers, showing a variety of different constructions adapted to all classes of work. They were represented by S. P. Carter.

The Nathan Manufacturing Company, of New York, showed injectors, lubricators and Klinger reflex water glass. They were represented by J. C. Currie, Edward S. Tooth, James E. Minor, Sanford Keeler, John M. Stayman and Charles Shults.

The Modern Tool Company, of Erie, Pa., showed the Wallace chaser, grinder, self-opening dies, hollow mills, tapping attachments and "Magic" chucks. They were represented by E. L. Warner.

The National Car Coupler Company, of Chicago, Ill., exhibited their steel platform and buffer for passenger cars, National freight car coupler, National centering yoke, Hinson draft gear, Hinson drawbar attachment, Hinson emergency knuckle, and were represented by S. W. Midgeley.

The National Malleable Casting Company, Cleveland, O., showed the Tower and Climax locomotive coupler, Tower and Climax freight coupler, National journal box and National car door fastener. J. V. Davidson, F. R. Angell, W. E. Coffin, D. W. Call, Maurice C. Pilson, J. H. Jaschka, S. L. Smith and John W. Stephenson represented the company.

A. O. Norton, of Boston, otherwise known as "Norton, he makes jacks," exhibited ball-bearing lifting jacks, journal, bridge and track jacks, and was represented by Harry A. Norton and J. O. St. Pierre.

MRS. W. B. LEACH AND MR. A. O. BERRY, M. M., OF THE B. & A. R. R.

MR. H. M. PERRY.

Mr. E. H. Gold, T. F. Downing and the Chicago Car Heating Co.

Mr. G. H. Bryant—Mr. G. W. Greenwood.

The Philadelphia Pneumatic Tool Company, of Philadelphia, showed a large and well displayed exhibit of their chipping, calking and riveting hammers, yoke riveters, rotary drills, breast drills, foundry rammers, air hoists and complete pneumatic equipments; also a Herron & Bury compressor. They were represented by Julius Keller, W. H. Keller, A. G. Hollingshead, William Curtis, Harry A. Pike, A. M. McFarland, James L. Fanon and Edmund Bury.

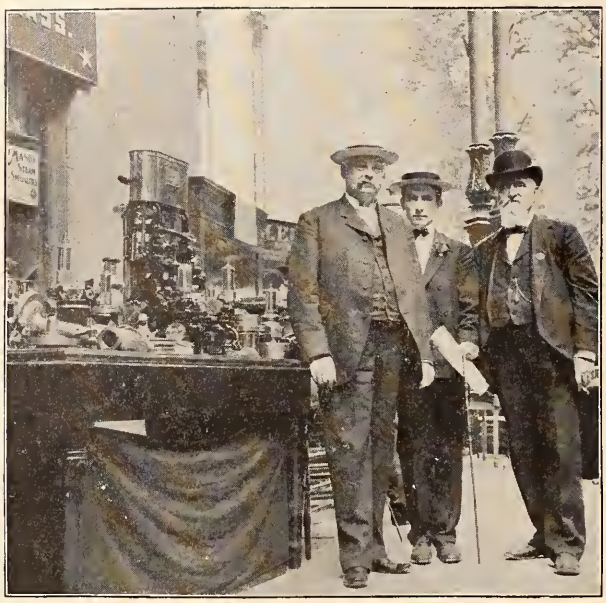
The Pittsburg Spring & Steel Company, Pittsburg, Pa., showed miscellaneous springs for locomotives, cars, street railways and valve springs. They were represented by D. C. Noble, L. C. Noble, H. A. Noble, S. F. Krauth and T. N. Motley.

The Railway Appliances Company, of Chicago, Ill., exhibited the Oldsmobile railway inspection car, for which they have been appointed exclusive agents for the United States for the railway trade of the Olds Motor Works, of Detroit and Lansing, Mich. They were represented by Geo. H. Sargent, B. T. Lewis and Geo. C. Isbester.

The Rand Drill Company, of New York, showed their steam, electric and belt driven compressors, compound belt driven type 10 air compressor operated by 50-horse power Westinghouse motor, driven by a Morse chain, with Cutler, Hammer Company starter and pressure regulator; also one type 10 steam driven compressor, one type 11 electric driven compressor and type 11 belt driven compressor, Rockwell oil rivet forge. They were represented by F. M. Parson, F. M. Hitchcock, Geo. A. Howells, J. D. Hurley, A. B. Holmes, Clarence Peck, Cade Peck, O. S. Shantz, W.

Mr. J. E. Meek and the H. W. Johns-Manville Co.'s Exhibit.

Isbester, Elliott and Cooper, Who This Year Is a Thorn at the End of Two Roses.



The Mason Rgulator Exhibit and Messrs. Mason and Morrison.

The Philadelphia Pneumatic Tool Exhibit, With Messrs. Keller and Hollingshead.

H. Travers, W. E. Gilman, J. A. Prescott, R. O. Hodges, F. C. Weber, M. DeF. Sample, A. M. Bosworth, E. M. Mackie.

The Safety Car Heating & Lighting Company, of New York City, exhibited their car lighting and heating apparatus. The new features are fancy deck lamps, bracket lamps and a steam heating exhibit in cottage "L," showing all the latest improvements in this line and buoy lantern. They were represented by R. M. Dixon, D. W. Pye, William St. John, E. F. Slocum, W. H. Hooper, J. M. Towne, J. S. Henry, A. Sebold, F. A. Brastow and H. L. McMinn.

W. H. Salisbury & Co., of Chicago, exhibited their new vestibule diaphragms. They were represented by F. F. Bennett.

The Sherwin-Williams Company, of Cleveland, O., left the chameleons at home this year, and instead made a fine exhibit, showing "metalastic" paint, system of car surfacing and painting, system of locomotive finishing and samples showing rattan seat enamel, full line of varnishes and paint and varnish remover. They were represented by Thomas Madill, E. M. Richardson, W. B. Albright, J. H. Eames and F. A. Elmquist. Their electric sign was a reminder by night of the fact that they sell paint.

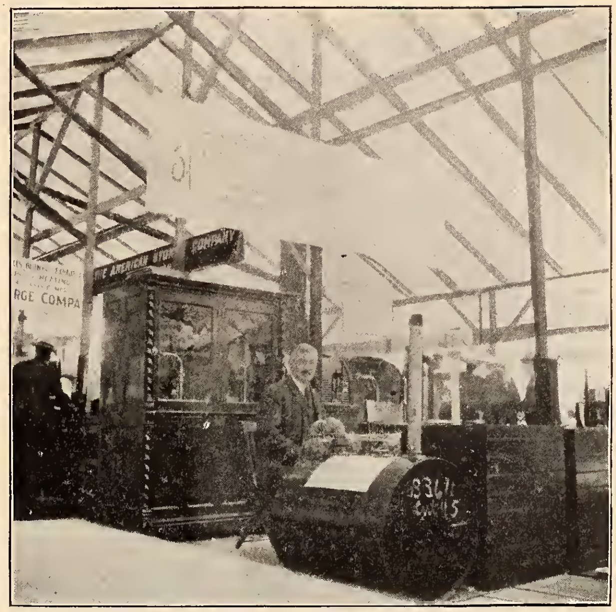
The Standard Car Truck Company, of Chicago, showed models of Barber roller bearings for lateral motion on trucks, and were represented by J. C. Barber and Lee W. Barber.

The Simplex Railway Appliance Company, of Chicago, showed Simplex bolsters for 100,000, 80,000 and 60,000 pound capacity cars, Susemihl frictionless bear-

Miss Coffin, Mrs. Magraw and Mr. Brydon.

Around the Main Entrance.

Mr. George A. Post, the Boss of the Pleasure Mill.



S. F. Bowser & Co.'s Exhibit.

ing brake beams for all service, coil and elliptic springs for all classes of equipment. W. V. Kelley, R. P. Lamont, W. W. Butler, Geo. C. Scott, Robt. Ripley, Geo. C. Murray, F. L. Susemihl and Geo. C. Slaughter represented the company.

The Standard Coupler Company, of New York, exhibited the Standard steel platforms, Sessions' standard friction draft gear, Standard couplers, and were represented by G. A. Post, H. H. Sessions, A. P. Dennis, R. D. Gallagher, Jr., and J. S. Turner.

Templeton, Kenly & Co., Ltd., of Chicago, exhibited their Simplex jacks, and were represented by W. B. Templeton and Frank A. Barbey.

The Walworth Manufacturing Company, of Boston, Mass., exhibited ratchets, Walworth injectors, Stilson wrenches, stocks and dies; pipe taps, pipe vises, pipe cutters, nipple holders, Smith's railway track ratchet. They were represented by Geo. E. Pickering and G. F. Elliott.

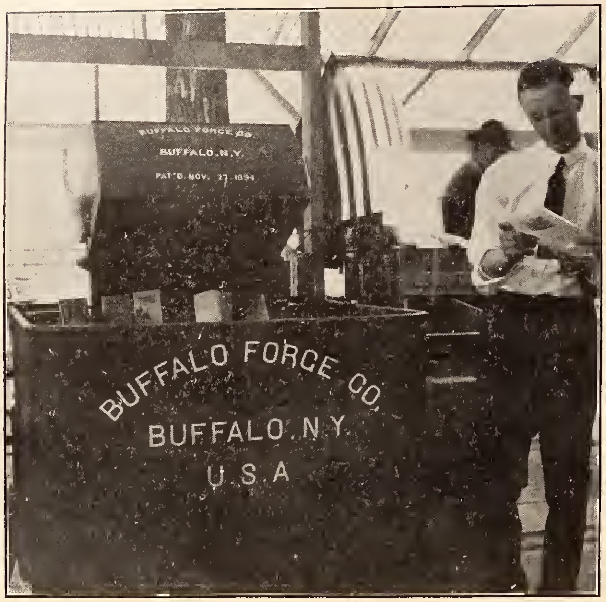
The Washburn Company, of Minneapolis, Minn., showed freight couplers, flexible head passenger couplers and switch engine couplers. They were represented by W. W. Rosser and Edwin C. Washburn.

The George R. Rich Manufacturing Company exhibited the "Rich" improved drill chuck, and were represented by Geo. R. Rich and R. Dale.

The Westinghouse Air Brake Company, of Pittsburg, Pa., were represented by H. H. Westinghouse, E. M. Herr, John F. Miller, L. F. Purtill, E. D. Adreon, H. S. Kolseth, S. D. Hutchins, Robt. Burgess, A. L. Humphrey, R. H. Blackall, F. M. Nellis. They showed the Westinghouse joint exhibit. Operating

American Brake Shoe & Foundry Exhibit.

Exhibit of Paul Dickinson, the "Smoke-jack Man."



THE BUFFALO FORGE EXHIBIT.

MR. F. D. FENN OF THE CRANE COMPANY.

model of the Westinghouse combined automatic and straight air brake for electric railway cars, with motor compressor and electric pump governor; operative model of the Westinghouse magnetic brake; operative model of the Westinghouse automatic air and steam couplers for both freight and passenger service; exhibit of the Westinghouse friction draft gear.

Among the number of supply men who were in attendance at the convention who did not exhibit were John T. Brown, of the Damascus Bronze Company, of Pittsburg; also W. B. Klee, president of the company.

The Falls Hollow Staybolt Company, of Cuyahoga Falls, O., manufacturers of hollow and solid staybolts, was represented by C. M. Walsh.

The Excelsior Car Roof Company, of St. Louis, manufacturers of the galvanized soft steel "Excelsior" car roofs, were represented by Frank B. Hart.

The Ewald Iron Company, of St. Louis, the well-known manufacturers of "Tenn. C. C. Bloom" staybolt, were represented by S. F. Sullivan, G. S. Thompson and J. W. Place.

B. M. Jones & Co., of Boston and New York, agents for "Taylor Best Yorkshire Staybolt Iron," were represented by G. H. Williams.

The Galena Signal Oil Company, while not exhibiting at Saratoga, was well represented by S. A. Mageath, J. S. Coffin, Col. Barton Grundy, E. W. Hayes, J. C. Peabody, Col. E. W. Grieves, Fred A. Guild, J. S. Seeley, Alexander Turner, W. O. Taylor and E. H. Baker. As usual, their souvenir was of the best and everybody got one.

The Railway Materials Company, of Chicago, manu-

EXHIBIT MODERN TOOL COMPANY.

EXHIBIT OF THE GOULD COUPLER COMPANY.

Mr. John T. Brown.

Norton "He Makes Jacks."

facturers of the Ferguson furnaces, were represented by W. M. Simpson, George L. Bourne and T. B. Cram.

Thos. Prosser & Son, of New York, were represented by Thos. Prosser, F. A. Barbey and G. C. Bryant.

The Rogers Locomotive Works, of Paterson, N. J., was represented by G. E. Hannah.

The Fabrikoid Company of Newburgh, N. Y., manufacturers of the "Better than Leather" goods, was represented by J. K. Rodgers.

The Wadsworth-Howland Company, of Chicago, also known as "Carburet Black," was represented by R. T. Brydon.

The Standard Pneumatic Tool Company, of St. Louis, manufacturers of pneumatic tools and car roofs, were represented by S. D. Anderson.

The Lowe Brothers Company, of Dayton, O., paint manufacturers, were represented by Nat. C. Dean and Charles Stannon.

The Consolidated Railway Electric Lighting and Equipment Company, of New York, was represented by John T. Dickinson, P. Kennedy and W. E. Kennedy.

The Niles-Bement-Pond Company was represented by James K. Cullen, George F. Mills, Samuel Prince, H. M. Reed and Frank B. Ward.

Heath & Milligan Manufacturing Company, of Chicago, paint mannfacturers, was represented by Gorham B. Coffin.

The Sligo Iron and Steel Company, of Pittsburg, manufacturers of staybolt iron, was represented by Omar S. Decker.

Warner & Swasey of Cleveland, O., were represented by David Hunt, Jr.

Just a Bunch—Messrs. Sharp, Garrett, Stimpson, Bellman, Hamilton and Allen.

Exhibit of the National Malleable Castings Co.

Master Car Builders' Association

Thirty-Eighth Annual Convention

WEDNESDAY'S SESSION.

THE thirty-eighth annual convention of the Master Car Builders' Association met in the ballroom of the Grand Union Hotel, Saratoga Springs, New York, Wednesday, June 22, 1904. President F. W. Brazier called the meeting to order at ten o'clock, and the exercises were opened with a prayer by the Rev. Dr. Joseph Carey. In his usual pleasant manner, Mr. Knapp, president of the village of Saratoga, welcomed the visitors and members of the association.

Mr. H. H. Vreeland, president of the New York City Railway Company, and president of the New York Railroad Club, was introduced by President Brazier, and in an instructive and inspiring address predicted the future relation between electric traction and the present steam railways. An abstract of his address is presented elsewhere in this issue.

In his presidential address Mr. Brazier referred to the degree of progress attained by the association in improving both freight and passenger cars, the harmony acquired among the different roads through the rules of interchange, and the comforts now to be had by the traveling public. All the developments brought to mind by a review of car construction and design since the inception of the Master Car Builders' Association reflects great credit to that body, to the Master Mechanics' Association, and to the operating departments of railroads. He expressed the opinion that the Master Car Builders and Master Mechanics' Associations should be brought together as one organization, believing that the interests of the two associations are not now sufficiently far apart to warrant separate organizations. A number of valuable suggestions were made regarding improvements and standardizations, which may be summarized as follows: The adoption of a standard coupler; standardizing the pivot pin and the material to be used in its manufacture; investigation of coupler side clearance; a standard formula for journal bearings and linings; improvement in the quality of waste for use in freight and passenger service; an addition to be made to the requirements of the standard brake beam, calling for test across line of the fulcrum; the standardization of steel freight cars; the use of 40 and 50 ton capacity box cars, from an economical standpoint; improvements in uncoupling arrangements on couplers; adoption of standard archbar truck; an adequate apprenticeship system.

In view of the many interesting and important features suggested and discussed, the address is reproduced in abstract on another page of this issue, in order that the points of argument may be more readily appreciated.

The secretary's report showed a total present membership of 581, composed of 335 active, 217 representative, 10 associate and 19 life members. The total number of cars represented in the association is 1,755,682.

The report of the treasurer, John Kirby, showed a balance on hand on June 15, 1904, of $3,469.38.

Having a large balance last year, it was considered wise to reduce the dues to $3. This balance having been considerably reduced, it was voted to again increase the dues to $5.

Upon motion of Mr. R. P. C. Sanderson (S. A. L.), the recommendations contained in the president's address were referred to the executive committee for action in the matter of committee work for next year.

The secretary read a letter referring to Mr. Casper Wicke, of Chambersburg, Pa., in which it was stated that after nearly half a century of service in railroad life he had retired. The secretary reported that the executive committee, at its meeting last evening, instructed him to present to the convention for life membership the name of Casper Wicke, Cumberland Valley Railroad.

Mr. Wicke was duly elected a life member.

Pursuant to notice given at the convention of 1903, Article 3, Section 3, was amended to provide that private car lines owning over 1,000 cars shall be entitled to representative membership.

REPORT OF COMMITTEES.

Revision of Standards and Recommended Practice.

The report of the Committee on Revision of Standards and Recommended Practice was read by Mr. W. P. Appleyard, chairman. In order to save time in the discussion, the report was considered by subjects. With regard to brake beams it was decided that the committee should consider leading dimensions for standard form of brake beam covering all clearances.

Inasmuch as the subject of safety chains for freight cars is covered by a report of a committee on this subject of practice, the part of the report regarding safety chains was ordered to lie on the table until the report on safety chains should be taken up.

Those sections of the report to which no objection was raised by the association were accepted and it was stated by the secretary that the sections which were disapproved will not be included in the letter ballot.

Address of Mr. E. A. Moseley.

Mr. E. A. Moseley, secretary of the Interstate Commerce Commission, spoke to the association at this time as it was expected that he could not remain to deliver his address later in the meeting. He called attention to a number of matters of mutual interest to the railroad representatives and to the commission, which are of vital importance to the railroads, their employees and the public. He directed attention to the recognition of the standards of the association, by the Interstate Commerce Commission, the desirability of clearer understanding between the commission and the association and pointed out several instances in which defects might be remedied. The need of high braking power is a feature to which the association could properly give its earnest and careful attention, and he further suggested the desirability of two air pumps on all locomotives designed to haul the heavy freight trains common to-day. He believed that this would largely do away with the necessity for cutting out cars, the reason for which is often given as insufficiency of air. Two pumps would also give a substantial feeling of security in case of the failure of one pump, and believed the good results would more than offset any additional cost.

The great necessity for a practical gauge for estimating the wear of couplers was pointed out and he said that the one adopted by the association is perhaps the most perfect device that could have been selected for that purpose, but it requires the separation of cars before it can be used. The congestion of traffic that has prevailed at almost all the principal terminals of the country renders the use of the present gauge impracticable, therefore he believed it clearly evident that an instrument which will show approximately the wear of couplers when cars are connected should be devised and put into use.

A matter which Mr. Moseley believed to be of great importance is the set of rules governing the loading of long materials. While this is perhaps outside the province of the commission, he promised the aid of that body in securing the proper observance of any rules which may be adopted by the association governing the matter. Before closing, the speaker expressed his appreciation of the opportunity to become better acquainted with the members of the association, believing that great benefit would be obtained in the advancement of the commission's work by a pleasant relation between members of the association and representatives of the commission.

Upon motion of Mr. G. R. Henderson it was decided to appoint a committee to confer with the Interstate Commerce Commission as was done last year.

REPORT OF COMMITTEES.

Triple Valve Tests.

The report of the committee on triple valve tests included the report on the revision of air brake and signal instructions. This report carries a revision of all the air brake and signal instructions and there are changes throughout the report. Inasmuch as the matter is necessarily submitted to letter ballot it was decided to submit the report to such ballot in the form in which it was presented, when the members will have an opportunity to compare the proposed revision with the present rules.

Brake Shoe Tests.

The committee advised that there was no report to make on this subject, as no brake shoes had been submitted for testing by manufacturers, railroad companies or individuals.

In this connection Prof. Goss (Purdue University) stated that shoes have been submitted to the university and tested as a private matter, so that the machine of the association has not been entirely idle during the year. He attempted to excite the interest of the association in conducting elaborate investigations and endeavored to induce more activity in requesting roads to send in brake shoes to be tested. In line with this suggestion Mr. William Garstang (Big Four) offered a motion to the effect that in the case of the representative of any railroad company having any new shoes, that have not been tested, a sample of the shoes be sent to the university, and that the committee be furnished with the formulae of the material in the brake shoes to be tested, and that the result of the test of such shoes sent to be tested during the coming year be made the subject for a report at the next meeting.

Mr. R. C. P. Sanderson offered an amendment that the Brake Shoe Committee include any other shoes that they may know to be sufficiently important to investigate. The motion as amended was adopted.

Test of M. C. B. Couplers.

The report of the committee on this subject was read by Mr. W. P. Appleyard. Mr. W. E. Fowler (Canadian Pacific) asked on what degree curvature the new contour line of coupler was tested as there is at least one curve of 22 degrees on his road. Mr. R. L. Kline (P. R. R.) replied that the tests had been made on curves that gave the 15 degrees allowed in the coupler and added that the new contour line will not couple on a much shorter curve than the old contour line. Some little discussion followed regarding trouble from the wear of pin holes. Mr. W. F. Bentley (B. & O.) believed that the users of couplers would be much benefited by spending a little more money by making a machine fit, if necessary, to take up more of the clearance now allowed, saying that this would result in less couplers condemned and a smaller number of break-in-twos on the road. As soon as the rough places are worn off it causes continual play and wears the holes oblong, and for this reason couplers are frequently condemned before they have given anything like the amount of wear which they should. He expressed the opinion that the clearance between the pin and hole should be reduced. Mr. J.L. Lawrence (Cumberland Valley) thought that the hole in the knuckle should not be allowed to be cored, but should be drilled, as a true hole can be obtained and the clearance reduced to 1-32 in.

Standard Location of Third Rail for Electrical Operation.

The report on this subject was read by the secretary, the report accepted and the committee discharged.

Stenciling Cars.

The report of the committee on stenciling cars was read by the secretary and accepted by the association.

Coupling Chains.

The report on coupling chains was read by Mr. R. P. C. Sanderson, chairman. As there was some difference of opinion among the members of the committee, it was decided to continue the committee in order that a report might be prepared embodying the views of all the members.

THURSDAY'S SESSION.

REPORT OF COMMITTEES.

Air Brake Hose Specifications.

The first report taken up on Thursday morning was that on air brake hose specifications. The report was presented in abstract by Mr. Le Grand Parish, chairman. On motion of Mr. A. M. Waitt, it was decided that the committee be continued and be instructed by the association to conduct such tests, made as thoroughly and as extensively as possible in connection with Purdue University, as will enable them to give definite data another year on the subject of the life of hose and any other points pertaining to it, and that these tests be conducted in connection with hose made under the present M. C. B. standard specifications and other hose made under the modified specifications suggested by the committee.

After some discussion of the report it was decided by the association that the present M. C. B. standard specification should be abrogated and the specification submitted by the committee should be substituted in its place as recommended practice for this year.

Draft Gear.

The report of the committee on draft gear was presented by Mr. Parish, who read the body of the report. Mr. Sanderson expressed himself as strongly in favor of the round back yoke, but thought better results could be had by using a follower of a round back construction made of malleable iron, in preference to using the wrought iron flat follower and the filling piece referred to. He believed that if the recommendations of the committee were to go through as presented, it would practically mean the use of a filling piece in the back of the yoke. He thought the option ought to be recommended to use a malleable iron follower, which will fill the round back yoke properly. Mr. Parish concurred in this opinion.

Mr. J. J. Hennessey (C., M. & St. P.) believed that there were more failures to-day among the 1⅛-in. rivets than in any other part of the M. C. B. coupler. This matter received some discussion, after which, upon motion of Mr. Hennessey, it was decided that the size of holes in the pockets should be increased to 1⅜ ins. and that the size of the tail piece should be increased ½ in. in width. The subject was referred to the committee on standards with this recommendation.

Upon motion of Mr. Waitt, it was decided that the suggestions which constituted the report should be referred to the committee on standards, with the request that they canvass the matter thoroughly with the different roads during the coming year and come next year prepared to make definite final recommendations.

Stake Pockets.

Mr. W. F. Kiesel (P. R. R.) expressed the opinion that the pocket shown in the report was rather weak at the top, where it is only ½ in. thick. He thought also that the recommended size of temporary stake, 4 by 5 ins., would not allow sufficient clearance on many cars now in service and stakes 4 by 4 ins. would therefore be more desirable.

Mr. Ball thought the committee should have recommended that the weight of the castings should not be less than a certain amount, rather than a maximum, because the tendency is to make malleable castings very light.

The report was finally referred to the committee on standards.

What Is the Best Preventive of Rust on Steel Cars?

Mr. H. S. Hayward, chairman, read the report of the committee on prevention of rust on steel cars, and stated that since the report had been made up some four or five additional roads had sent in answers to the inquiry sent out by the committee, but that these answers corresponded very nearly with the replies received from the other roads.

Mr. George W. West (N. Y. O. & W.) called attention to the mixture used by steel plate manufacturers and steel car builders for marking dimensions, saying that in many cases he noticed the only paint visible on cars passing his line was that used for dimension figures. He said also that the white lead used on locomotive front ends was visible for such a length of time that it must be mixed with some material having good staying qualities on steel plate. Mr. Hayward had noticed similar staying qualities in the marks on plates of which boats were being built. From ship builders he received the information that they used nothing but white lead and linseed oil, made very thin and using just enough lead to whiten the oil.

Mr. Sanderson called the attention of the association to a method of protecting the steel underframes of cars having wooden floors by using tar roofing paper under the floor and over the steel sills and bolsters, held in place from underneath by a light false floor, making a regular umbrella overthe steel structure. He believed this method would save much trouble in painting, cleaning, etc., after the cars had been in service some time.

Mr. W. M. McIntosh (C. R. R. of N. J.) offered the suggestion that the time to paint steel cars is when the cars are being built. He said that if they are thoroughly painted with good material at the outset, a foundation has been laid that is easily taken care of.

The report of the committee was accepted.

Report of Arbitration Committee.

Under this head the rules of interchange, the report of the arbitration committee and the report of the committee on prices for repairs of steel cars were considered. The report of the arbitration committee was presented by Mr. Hennessey, and upon motion of Mr. Sanderson the association endorsed the decisions of the committee in the cases which have been passed upon during the past year. The rules of interchange were passed with the amendments recommended by the arbitration committee, omitting the hose specifications and excepting the prices for steel cars.

Mr. R. F. McKenna (D., L. & W.) presented the report of the committee on prices for repairs to steel cars, reading the recommendations of the committee. Following a discussion of prices, it was decided, upon motion of Mr. Hennessey, that as the committee had been unable to come to a conclusion as to the proper amount to charge for repairs of 80,000 lbs. capacity steel cars as compared with 100,000 lbs. capacity steel cars, it would be best to appoint a committee to advise with owners of 80,000 lbs. capacity steel cars and determine upon an equitable basis for repairs. Following a number of questions addressed by different members to the committee, the question of prices was referred to the arbitration committee.

Upon motion of Mr. H. F. Ball (L. S. & M. S.), a committee was appointed to investigate the rules for interchange of passenger cars submitted by the New England Railroad Club and report at the next convention.

Outside Dimension of Box Cars.

Mr. W. P. Appleyard, chairman, presented the report of the committee on this subject. Mr. H. La Rue (C., R. I. & P.) asked the committee in regard to the distances from the front of the end sill to the center of the truck, with reference to inside or outside of end sill, or thickness of dead wood. He believed that measurement should be taken from the pull of the drawbar. Mr. Appleyard replied that the majority of the roads from whom the committee received information used the dimension as given in the report. At the same time he agreed with Mr. La Rue that the dimension should be given from the pulling force of the drawbar.

INDIVIDUAL PAPER.

The Use of Steel in Passenger Car Construction.

A paper on this subject was presented before the association by Mr. William Forsyth (Railway Age.) The paper is presented in abstract on another page of this issue. Mr. Forsyth called attention to a number of interesting features touched upon in the consideration of the subject and the paper was opened for discussion. The remarks of the president and the ensuing discussion evidenced a high appreciation of Mr. Forsyth's paper and his suggestion that the steel car should be considered in the list of subjects for the coming year, met with favorable comment. Mr. George R. Henderson thought that good work could be done in the beginning by laying down certain ideas or rules which would be considered good practice and which would assist in arranging a standard design as the steel passenger car develops. He suggested further that the committee appointed to consider this subject could recommend to advantage what might be termed a list of suitable trimmings, interior finishings, etc., to give a proper appearance to the interior of the car with a minimum amount of combustible matter.

Mr. H. F. Ball (L. S. & M. S.) said that if a committee is appointed to go into the subject, he would like to see them consider it in two ways—present a design of steel underframing, including platforms and end frame, to prevent telescoping, as many roads would adopt that construction in the development of the all-steel frame car and make use of it, and a design of an all-steel car, side frame as well as roof frame.

The paper was referred to the committee on subjects.

REPORT OF COMMITTEES.

Cast Iron Wheels.

Mr. William Garstang, chairman, read the report of the committee on cast iron wheels, and recommended that the committee's recommendations be submitted to the letter ballot for recommended practice. The ensuing discussion evidenced appreciation of the work done by the committee and the results accomplished. Following an extended discourse on the subject of cast iron wheels, on motion of Mr. Waitt, the report was referred to letter ballot for adoption as recommended practice.

TOPICAL DISCUSSIONS.

What Are the Advantages or Disadvantages of 2-Inch Main Steam Pipe with 1⅝-Inch Steam Hose?

This was the first subject taken up for topical discussion. It was opened by Mr. Hennessey. His road had experienced no little difficulty during the extreme cold weather of the past winter in heating the last cars of 13 and 15 car trains with 1½-inch main steam pipes. Mr. Hennessey anticipated considerable difficulty in coupling the larger hose and requested the experience of other roads.

Mr. H. F. Ball referred to a test conducted last winter on a 16-car train which demonstrated that it is possible to heat that train with 30 pounds pressure, using a 2-inch steam pipe, whereas it would require 80 pounds pressure with the 1½-inch pipe. It shows that the 2-inch pipe is better than the 1½-inch pipe. He went to the 1⅝ steam hose and 1½ coupling last winter, but notwithstanding the severity of the winter he had better results than previously, so that he is in favor of the larger pipe. His road is putting on the 2-inch pipe as rapidly as possible, but so far have no trains running with the 2-inch pipe in all the cars and therefore could not tell from actual experience what it will do.

Mr. Garstang referred to some tests made a year or so ago whereby it was demonstrated that with 1½-inch hose it required 70 or 80 lbs. of steam, and sometimes as high as 90 lbs., to heat the sleepers on the rear of the train when using 1½-inch hose. With 1⅝-inch hose he found the pressure required was greatly reduced and 60 or 70 lbs. steam proved sufficient at all times.

Mr. Ball referred to the fact that there is no question about the radiation inside the car, saying that 2 lbs. pressure will heat the car satisfactorily. The trouble is in getting steam back to the rear cars and the damage done to the hose by high pressure. He added that his road had derived great benefit from the increased size of the coupling in the hose and expected to derive still greater benefit from the use of 2-inch pipe in connection with larger hose and coupling.

To What Extent Does Friction Draft Gear Reduce Repairs, Expenses, Etc.?

A discussion of this subject was presented in a paper by Mr. E. B. Gilbert, read by the secretary.

To What Extent Will a More Rigid Inspection of Car Couplers At Terminal Points Reduce Accidents and Repairs?

This subject was opened by Mr. James Macbeth (N. Y. C. & H. R.), who directed attention to the necessity of the closest inspection of couplers and attachments to avoid break-in-twos because of the trouble, expense and inconvenience of such accidents. He believed that inspections should be made not only at terminal points, but also wherever inspectors are located, and wherever it is possible for inspection to be made. In the discussion which enued the advisability of a gauge and the necesity of closer inspection were brought out.

The Advantages and Disadvantages of the Different Varieties of Side Bearings Now in Use.

A paper, contributed by Mr. L. H. Turner and read by the secretary, opened this subject. Following some remarks by Mr. George L. Fowler regarding a number of tests made by himself on an electric line, the next question was taken up.

Cannot the Present Method of Securing Spring Pockets to Couplers for Freight Cars Be Improved Upon?

Mr. Ball believed that inasmuch as the number of spring pockets is increasing so largely in practice with the introduction of friction draft gear and the variety of tandem spring gears, some form of pocket could be arranged which could be removed at the small interchange or repair points. By having such a pocket and attachment, which could be removed from a coupler that was taken out on account of defects and applied to a new coupler, would save shipping in this coupler to the larger repair point or shops to have coupler pockets removed and put on other couplers.

Mr. Ball also showed a blueprint of a design of coupler having a flexible connection between the coupler and pocket, which would allow greater lateral motion of couplers.

The matter was referred to the committee on subjects with a view of making it a special subject for next year.

Brake Beams—The Proper Hanging of Brake Beams to Secure Brake Shoe Clearance.

In opening this subject the trend of Mr. W. E. Fowler's remarks was with regard to brakes hung from trucks. He thought there should be no divergence from the opinion that the only proper place for attachment of the brake hanger is to the truck, and to that part of it not affected by spring movement, this being necessary to secure uniform piston travel and breaking power.

Stronger Draft Gear for Passenger Cars—Wherein Should Present Practice Be Modified?

In opening this subject Mr. La Rue showed a blueprint of a casting devised to strengthen the draft arrangement used with wooden draft timbers. He believed the ideal arrangement to be one in which the first ¾ inch of the travel of the drawbar should be comparatively easy or about the same as the present 8-inch spring. The balance of the travel should go up in strength very quickly and much stronger, the above operation to suit both light and heavy trains, and also the space occupied by such an arrangement should be but a very little more than the present single spring arrangement, so that the same length of drawbar can be maintained on all classes of cars.

FRIDAY'S SESSION.

Immediately after the meeting was called to order Friday morning, a communication was read calling attention to the fact that Mr. J. A. Doran, who had entered railway service in 1860 and entered the association in 1882, had retired from active service in 1900. On motion, Mr. Doran was elected a life member of the association.

REPORT OF COMMITTEES.

The report of the arbitration committee concerning the questions submitted to them since the opening of the convention. On motion the recommendations of the committee were adopted.

The rules of interchange, including both freight and passenger rules, as amended, with the recommendations of the arbitration committee, were adopted as a whole.

Revision of Rules for Loading Long Materials.

The report of this committee was presented by Mr. A. Kearney (B. & O.), chairman, who called attention briefly to the principal changes and suggestions recommended. In opening the subject for discussion, President Brazier commended the committee for the very able report presented, and continuing he directed attention to the necessity of making rules and sticking to them. Mr. Waitt offered a motion to the effect that the committee on loading long material be made a standing committee of the association and at all times during the year when difficulties come up with the work in connection with the loading of long material or recommendations for changes in these rules arise, that they be submitted to the chairman of the committee at once, and the committee can make a report from year to year, making the rules more up-to-date and more satisfactory to meet all the requirements on the roads in the various parts of the country. The motion was carried. After considerable discussion which centered largely about the dangers incidental to loading flat cars with cross ties and fence posts it appeared difficult to come to a final understanding satisfactory to all members. Upon motion of Mr. Appleyard it was finally decided that the rules for loading long materials, as reported by the committee, should be submitted to letter ballot for action upon each rule.

Steam Line Connections.

The report of the committee on steam and air line connections was presented by Mr. H. F. Ball. The dimensions furnished last year were deemed insufficient and experience has demonstrated the necessity for more detailed dimensions of coupler to insure absolute interchangeability. The committee therefore recommended that the subject should be left open for another year. This, it was decided to do.

Subjects.

The report of the committee on subjects was presented, and, as usual, was referred to the executive committee.

Tank Cars.

The report of the committee on tank cars was read by the secretary. No action was taken on the report at this time and the committee was continued to make a final report next year.

The last mentioned subject brought the report of committees to a close.

Election of Officers.

The secretary read the list of nominees for officers of the association presented by the committee on nomination. Upon motion of Mr. Sanderson, the secretary cast the ballot for the officers nominated. The result of the election is as follows: President, W. P. Appleyard, Pullman Company; first vice-president, Joseph Buker, Illinois Central Railroad; second vice-president, W. E. Fowler, Canadian Pacific Railway; third vice-president, George N. Dow, Lake Shore & Michigan Southern Railway; treasurer, John Kirby. Executive committee: James Macbeth, N. Y. C. & H. R.; A. E. Mitchell, L. V.; H. D. Taylor, P. & R.

Mr. George A. Post, president of the Supply Men's Association, in a clever and fitting address presented Mr. Brazier with the badge of the past president of the Master Car Builders' Association.

American Railway Master Mechanics' Association

Thirty-Seventh Annual Convention

MONDAY'S SESSION.

MR. W. H. LEWIS, president of the American Railway Master Mechanics' Association, called the thirty-seventh annual convention to order Monday morning, June 27, 1904, in the ball room of the Grand Union Hotel, Saratoga Springs, New York. The convention was opened as usual with a prayer by the Rev. Dr. Joseph Carney. While it has been the custom to call upon the president of the village for an address of welcome, the formality was omitted in order to proceed more quickly with the business of the convention. Saratoga has assured the association so often that it is always welcome, that the members were made to feel at home without the necessity of a formal welcome.

In his presidential address, Mr. Lewis called attention to the very satisfactory reports received of the students holding scholarships under the jurisdiction of the association. Referring to a question to be presented in regular order, he expressed the opinion that the adoption of standards by letter baliot vote, based on the number of locomotives of the company that the member represents, is in the line of progress and concurred in the recommendation to establish a representative form of membership, similar to that adopted by the M. C. B. Association. Considering the growth of the association he pointed with pride to its present magnificent proportions as compared with the original membership of 41. Pointing to the progress made together with its growth, Mr. Lewis presented a carefully prepared analysis of the growth of the locomotive, including significant figures comparing past and present statistics, which are worthy of careful consideration. The question of the heavy locomotive and tonnage rating was prominently mentioned and in directing attention to the advantages to be gained by improved shop methods he emphasized the revolution made possible by the use of electrical energy in shop practice. With the progress of electricity, the necessity of preparing to meet the demands of its advancement, was impressed upon those present and instead of considering a conflict between steam and electricity, he believed that the latter should be anticipated and met by due preparation on the part of those handling present motive power. The design of locomotives, the investigation of locomotive operation, the care necessary in training apprentices and the relation between officials and men were given careful attention. Referring to the suggestion offered by the president of the Master Car Builders' Association that the M. C. B. and Master Mechanics' Associations should consolidate, Mr. Lewis expressed the opinion that there are many good reasons for such a consolidation and recommended that the executive committee of the Master Mechanics' Association be instructed to confer with the executive committee of the Master Car Builders' Association with a view of treating in a spirit of cordial cooperation the proposal of consolidation of the two associations.

REPORT OF SECRETARY AND TREASURER.

The secretary presented his report, by which it appeared that the present membership of the association is as follows: Active membership, 738; associate membership, 16; honorary membership, 37; total membership, 791.

The report of the secretary was received and referred to the auditing committee.

The secretary presented the report of the treasurer, which showed the financial transactions of the association during the past year, as follows: Balance, 1903, $3,085.56; balance, 1904, $2,874.80.

Both of these reports were received and referred to the executive committee.

ANNUAL DUES.

The recommendation of the executive committee fixing the dues of the current year at $5 per vote was approved.

Mr. A. Beckert and Mr. Henry Schlacks were elected honorary members of the association.

AMENDMENTS TO THE CONSTITUTION.

The following amendments to the constitution were adopted:

Article 3, Section 1. An addition: "One representative member may be appointed by any railroad company to represent its interests in the association; such appointment shall be in writing and shall emanate from the president, general manager, or general superintendent. Such member shall have all the privileges of an active member, including one vote on all questions, and in addition thereto shall, on all measures pertaining to the determination of what tests shall be conducted by the association or the expenditure of money for conducting same, have one additional vote for each full 100 engines which are in actual operation or in process of purchase by the road or system which he represents. Such membership shall continue until notice is given the association of his withdrawal or the appointment of his successor."

Article 3, Section 3. An addition: "A representative member shall pay, in addition to his personal dues as above, an amount for each additional vote to which he is entitled, as shall be determined each year by the executive committee, pro-rated upon the cost of conducting such tests as may be determined upon at each convention, provided that no such assessment shall exceed $5 per vote per year."

"Any proposition recommending the adoption of standard constructions or practice shall be in writing and be accompanied by drawings if the latter are necessary for a clear understanding of the subject. Such propositions shall then be submitted to the association for discussion, after which a vote shall be taken to decide whether the proposition shall be submitted for decision by letter ballot to all the members entitled to vote. If decided in the affirmative, the secretary, within three months from the time the vote of the association is taken on such measure, shall send by mail to each member a blank ballot, and a copy of the proposed recommendation, with a report—to be approved by the executive committee—of the discussion thereon. Such ballot to be filled up, signed and remailed to the secretary, who will count all the ballots received within thirty days from the date that they were sent to members, and he shall then announce the vote in such manner as the executive committee may prescribe. Any recommendation securing two-thirds of the votes cast shall be adopted by the association.

"Section 5. All reports, resolutions and recommendations involving the use, or proposed use, by railroad companies of any device or process which forms the subject-matter of any existing patent, shall first be submitted to the executive committee, and shall be submitted to the association only by the executive committee."

Mr. W. P. Johnson, locomotive and carriage superintendent of the Bombay, Baroda & Central India Railway, was introduced by President Lewis. In a short address Mr. Johnson touched upon the fund of information to be gathered from the proceedings of this association, expressed his admiration for the work done on American railways and anticipated the advantages to be gained from a visit to this country.

In due course, Mr. David Meadows, representative of the Traveling Engineers' Association, was extended the privilege of the floor and invited to take part in the discussions.

REPORT OF COMMITTEES.

TON-MILE STATISTICS.

The report of the committee on ton-mile statistics was presented in brief by Mr. G. R. Henderson. While taking exception to the suggestion of the committee that the total weight of switch engines be used in determining their credit of ton hours, Mr. William McIntosh (C. R. R. of N. J.) thought the committee had solved the problem very nicely. He believed the weight on drivers should be used in this connection. The ensuing discussion evidenced that the suggestion offered by Mr. McIntosh was a good one and upon motion of Mr. Henderson it was decided to recommend to the American Railway Association the adoption of such locomotive statistics on the ton-hour basis, and that in determining ton-hours the adhesive weight shall prevail.

In view of the interest taken in this subject by Mr. C. H. Quereau and the work done by him on this subject, both for this and previous reports, the secretary was instructed to advise Mr. Quereau of the appreciation of the association for the work he has done and express the sympathy of the body with him in his present illness.

INDIVIDUAL PAPER.

GRATES FOR BITUMINOUS COAL.

A paper on this subject was presented by Mr. J. A. Carney (C., B. & Q.), who presented the paper in abstract and directed attention to a table of data furnished by 23 railroads, giving the results of analyses of different grades of coal which they are using. There are given some data in reference to the theoretical openings necessary in the ash pans and grates to admit sufficient air to burn about 85 pounds of coal per square foot of grate per hour, provided there are no interferences with the air passing through the ash pan and grates.

During the ensuing discussion a number of questions were asked and in replying to these Mr. Carney said his reasons for advocating doing away with the netting over the opening in the ash pan is that the netting cuts down the opening area about 50 per cent. The practice on his road at the present time is to use netting over such openings where there is any liability of fire falling out. Some of the more recent designs of engines have a kind of deflector plate, which allows the ashes to fall on the plate and then drop down inside the box in such a way that the liability of being blown out of the ash pan is very small. Ordinarily, he figured that the amount of opening in the ash pan is the total area of the part that is covered by the netting, but he believes that the mesh of the netting is a detriment to the draft and it is necessary to figure about 50 per cent on that account. Another objection offered to the use of netting is that it clogs up, especially on western roads, and will choke off any draft which would otherwise come through.

REPORT OF COMMITTEES.

COAL CONSUMPTION OF LOCOMOTIVES.

The report of the committee on coal consumption of locomotives was presented by Mr. H. T. Herr, chairman, who referred in brief to the several subdivisions of the report. Much of the discussion centered about the selection, training and ultimate promotion of firemen. In closing the discussion, Mr. Herr replied to a number of members by saying that there was very little economy in the large grate except from the standpoint of spark losses, due to a milder draught, but that was partially offest by the difficulty in firing a large grate, as compared with a small grate. He believed that a good deal of trouble in the wide firebox engine is due not to the design of the engine, but principally to the skill which is required in its operation—meaning that the fireman has more trouble in maintaining a uniform fire over a large grate than over a small grate, resulting in fluctuations in temperature which are detrimental to the sheet and cause more or less leaking.

One of the members spoke of ton-mile statistics for coal records and in reply to this he said that there is a method proposed in the paper which is probably a little simpler than that, if it can be carried out. It entails the method of introducing an equated tonnage rating and then basing the performance of the engine on the mileage of the engine itself, based on a standard engine, which would make comparatively simple statistics and would put the statistics on a power basis.

One of the gentlemen also touched on the roundhouse organization as affecting economy, and in this connection it was the opinion of the committee that the maintenance of power on the road is one of the most important features to obtain good economy in fuel and operation in road service.

LOCOMOTIVE FRONT ENDS.

Mr. H. H. Vaughan (Canadian Pacific), chairman of the committee, presented the report on locomotive front ends, explaining that without the necessary funds it was impossible to make the investigations for which the committee had been appointed. The executive committee had been unable to grant the necessary funds to carry on the work. On motion of Mr. Vaughan the executive committee was authorized to appropriate at their discretion the amount of $2,150 to carry out a series of experiments outlined in the report, when money for such work shall be available.

MONDAY EVENING SESSION.

TOPICAL DISCUSSION.

For Lubricating Main, Side Rods and Driving Box Bearings, Which Is the Better Practice, Grease or Oil?

This subject was opened by a communication from Mr. F. F. Gaines (L. V.) read by the secretary. This letter implied that the writer had had very gratifying experience with grease, not only on the score of economy, but also on account of a smaller number of engine failures, such as hot boxes and hot pins. Grease can be wasted as well as oil, but not nearly as easily, nor in any such quantities. The consensus of opinion as evidenced by the ensuing discussion was in favor of grease and a number of experiences cited agreed with those of Mr. Gaines.

With the Modern Engines Equipped with Power Brakes, Is Not Screw Reverse Mechanism Preferable to Present Hand Lever Arrangement and Is Quick Reversal a Vital Consideration?

Mr. John Player (American Locomotive Company), opened the discussion and expressed his opinion that the lever as it stands and is used today is suitable for American practice. Several members spoke and it was generally agreed that the lever is more desirable than the screw reversing mechanism and that it would not be desirable to adopt the screw.

What Is the Best Practice with Reference to Providing Air Spaces Under Locomotive Grates, Especially with Wide Firebox Locomotives?

This topic was opened by F. J. Cole (American Locomotive Company), who read a short paper. The air currents are very rapid and no matter where the air openings are located, but little time is allowed for heating before passing through the fire. As the heat is taken in all cases from the fire, it does not seem to make much difference in this respect as to the exact location of the openings, provided all the air passes through the grate and the live fire before going into the firebox. The conclusions are as follows:

1. Provide in front of ash pan as large unobstructed openings as possible.
2. Openings in back.
3. For deep ash pans provide side openings, preferably protected by netting and inclined plates.
4. For wide fireboxes provide openings directly under firebox frame, which will admit air and facilitate the removal of ashes from the slopes.
5. The total net unobstructed air openings should not be less than 75 per cent of the flue openings, but it does not seem necessary to exceed the total flue area, provided the openings are unobstructed.

Mr. J. L. Laurence (Cumberland Valley), thought that the question of intelligent firing and good coal enters into the matter as well as the question of front and back dampers. With a properly perforated front and back ash pan damper, the normal position of the damper to be closed, having sufficient area through the damper, he believed sufficient air would reach the grates to effect perfect combustion.

Prof. W. F. M. Goss (Purdue University), thought the ash pan problem might well embrace the whole apparatus which controls the movement of air from the outside atmosphere through the mechanism of the engine and back into the atmospheric air. If such course is considered it will be found that there is first the front end, taking it in reverse order, then the flues, and then the grate, and then the ash pan. This movement is stimulated by the action of the exhaust jet, and evidently if any one of the elements named is unduly constrained then the exhaust jet will be called upon to do more work than it otherwise would be called upon to do to overcome the constrained condition. So, if the opening in the ash pan is small, evidently it is necessary to compensate for that small size of opening by doing a larger amount of work with the exhaust jet, and if endeavoring to get the highest efficiency in all parts of the engine, of course, it is necessary not to have constrained areas where they are avoidable. Evidently the tube area cannot be changed materially. That is a factor which is fixed by the general design and proportions of the engine, and the draft must be made to act through the tubes at whatever cost. But very great freedom may be had in controlling the opening in the ash pan, and too great a duty which it is possible to avoid, should not be imposed upon the exhaust jet.

What Is the Best Method of Caring for the Exterior of Locomotive Front Ends from the Standpoint of Cost and Appearance?

Mr. W. O. Thompson (N. Y. C. & H. R.) opened this discussion and in the course of his remarks referred to a material known as Walker's smoke-stack black, thinned with Sipe's Japan oil, in proportion of one part Japan oil to two parts of stack black. It is very quick drying, has considerable elasticity, with a deep black color, has good wearing qualities, and when it does scale the tendency is to all scale off instead of in spots. Like a good many paints, cleaning a rough surface, that will in time call for expensive scraping of the whole surface. The cost of labor for applying on large locomotives is 17½ cents each. Several other methods were tried, such as boiled oil and soap, plumbago, asphaltum and Japan oil, beeswax and soap, etc. Any of the above mentioned mixtures can be applied considerably more cheaply, but in order to have a fairly good looking front end with their use it is necessary to keep it clean and well sandpapered, which makes the whole cost more in the end.

Packing for Air Pumps for High Speed Brakes.

Mr. A. J. Cota presented a few remarks on this subject and in the course of his talk said in general that he believed it to be considered by air pump repair men that there are three essential points to be observed in order that good service may be gotten from any piston rod packing.

First, the air and steam cylinders must be in perfect line.

Second, the packing in piston heads must make a perfect bearing on the walls of the cylinder during the entire length of the piston stroke.

Third, that the piston rod must be true and well lubricated.

Given these conditions and there are a number of different kinds of packing that will give very good service either on freight or high speed passenger trains.

The Advisability of Reducing the Diameter of Staybolts and Shortening the Space Between the Staybolts Proportionately."

This subject was opened by Mr. G. R. Henderson and after some general consideration of the staybolt question the subject was closed.

TUESDAY'S SESSION.

Before beginning the regular programme of the morning, Mr. Forsyth proposed referring the president's address to the executive committee, in view of the number of excellent recommendations embodied therein. This suggestion was adopted.

The topical discussions not finished the night before were taken up and disposed of previous to receiving the committee reports.

LEAKY FLUES IN WIDE FIREBOXES.

The topical discussion on "Leaky Flues in Wide Fireboxes" was opened by Mr. M. K. Barnum. He believed that leaky flues in wide firebox locomotives are due more to improper firing and to bad water than to any peculiarities of design. On account of the large grate area it is more difficult for a fireman to so distribute his coal that the grates will be evenly covered and the fire will burn level, and he is more apt to allow holes to burn in the fire than in a narrow firebox. He added further that he thought wide fireboxes are not generally fitted with brick arches, while most roads use arches in narrow firebox engines. The brick arch affords considerable protection to flue sheets from cold air admitted through the fire door and grates, and this may cause an apparent difference as to leaky flues in favor of narrow fireboxes.

Mr. G. R. Henderson referred to the fact that it is possible to convert incrusting water into foaming water and that the latter in many cases is as destructive as the former. Mr. Vaughan attributed leaky flues to two causes—a distinct overheating of the flue end that heats the flue sufficiently to practically anneal it and remove the strained state which keeps the flue against the sheet. The other cause he referred to is the almost instantaneous contraction of a few flues through the passage of a little cold air through them while the others may be left warm. Mr. J. F. Walsh (C. & O.) voiced the results of his experience by speaking very favorably for the wide firebox engines, both from the standpoint of leaky flues and coal consumption. He said that his roadmen were in favor of the wide fireboxes and had no trouble in firing them.

Mr. H. T. Bentley mentioned very satisfactory results obtained by the use of water purification plants. Where his road had encountered almost an epidemic from engine failures, since the introduction of water purification plants these have become eliminated, engines can be turned in half the time and the boiler force has been cut in half.

Limit of Width of Soft Coal Burning Fireboxes, with Reference to High Evaporative Efficiency.

This subject was opened by Mr. Lawford H. Fry (Baldwin Locomotive Works) and in the course of his remarks he said that there are two extremes which have to be avoided in designing a firebox. If the grate is too small the combustion is too rapid, the draft carries a large proportion of fuel through the flues, and the engine gives a low economy. On the other hand, if the grate is made too large the fire will be too light and an excess of air is carried through, producing considerable losses. The evil of this excess air had been forcibly brought to his attention. From some observations made by his company, he found that some locomotives when taking a 13-car train would burn 85 pounds of coal per square foot of grate per hour and would evaporate 7 pounds of water per pound of coal. When they were working with a lighter train of 10 cars the combustion was 75 pounds of coal per square foot of grate, and as a consequence of this lighter rate of conbustion the evaporation was cut down to 6 pounds of water per pound of coal, the difference being due to the excess air which was carried through the fire.

Prof. Goss emphasized the necessity of due consideration of the question of imperfect combustion. With the narrow firebox engines, motive power men were concerned with the unconsumed fuel that was discharged and now with the wide firebox engines the question is the excess air which carries off heat and reduces efficiency.

Following the topical discussion, President Lewis introduced Mr. W. F. Allen, secretary of the American Railway Association, who addressed the members briefly.

REPORT OF COMMITTEES.

Locomotive Driving and Truck Axles and Locomotive Forgings.

The report of this committee was presented by Mr. L. R. Pomeroy (General Electric Company), who reminded the association that the committee was presenting a progress report, the committee having been appointed to co-operate with similar committees of the American Society of Mechanical Engineers and other kindred societies, with a view to getting together with the American Society for Testing Materials to present a report on the standard specification before the meeting of the International Railway Congress which meets next year.

Mr. J. F. Kincaid (American Locomotive Company) showed a drill with which the test piece could be obtained in from twenty to forty minutes as against several hours by the previous method of removing a test specimen. He also displayed a specimen removed with this drill.

BOILER DESIGN.

In presenting the report on boiler design Prof. Goss read the report of the committee in abstract and advised the development of a more elaborate scheme by which the committee might attain more desirable results.

Mr. A. M. Waitt believed that as there is such general interest in the subject of boiler design, that there are many railroads, possibly some individuals, and also some of the locomotive companies that would be glad to join in getting official data and facts that would serve as a reliable basis for proper boiler design. He therefore offered the following resolution:

"That the executive committee be authorized and empowered to promote and direct the raising and expenditure of a special fund not exceeding $5,000, to be used under the direction of a special committee for conducting a careful series of experiments and tests concerning the values of varying proportions and dimensions of heating surface, grate surface, and such other important features of boiler design as may, in the opinion of the committee, be found desirable."

This was finally put in the form of a motion and carried.

REVISION OF STANDARDS.

The several specifications appearing in the report were referred to letter ballot and it was decided to appoint a special committee to investigate the shrinkage of wheels.

REVISION OF AIR BRAKE AND SIGNAL INSTRUCTIONS.

The report of the committee on this subject was also submitted to letter ballot.

PISTON VALVES.

Mr. William Macintosh (C. R. R. of N. J.) presented the report of the committee on Piston Valves. It was noted that the committee recommended that Mr. C. B. Young (C., B. & Q.) should be requested to continue his experiments on the proper lubrication of valves when drifting and the relative setting for piston and slide valves. This request was made of Mr. Young and he was asked to present the subject in an individual paper.

INDIVIDUAL PAPERS.

TECHNICAL SCHOOL GRADUATES.

This subject was presented in a paper written by Mr. R. D. Smith (B. & M. R.) and abstracted by Mr. Pomeroy. Mr. Smith had been called away soon after his arrival at Saratoga and therefore did not have an opportunity to present the paper.

Much interest was shown in the technical graduate during the ensuing discussion, though no real suggestions were offered in addition to those made by Mr. Smith in his paper. Mr. H. A. Gillis (American Locomotive Company), cited a number of interesting incidents of his career soon after graduating from a technical institution and entering railroad work. He directed especial attention to the fact that the wages offered a young technical graduate as an inducement to enter railway service are very low. Mr. A. O. Berry (B. & A.) offered a very pertinent suggestion that the superintendents and master mechanics might remember the special apprentices when they returned to their offices. Mr. Walsh believed the real question at issue is whether or not it pays to use the technical graduate.

TERMINALS FOR LOCOMOTIVES.

An individual paper relating to the subject of Terminals for Locomotives, written by Mr. Robert Quayle (C. & N. W.) was presented by Mr. H. T. Bentley (C. & N. W.) Among the several points worthy of consideration to which Mr. Bentley directed attention, are the location of roundhouses with relation to passenger and freight yards, the provision for future growth, coal chutes, power for turntables, symmetry of opposite rails on the same track, ventilation, smoke jacks, water for washing out boilers, up-to-date tools and the organization.

Some discussion on the subject of smoke jacks followed the presentation of this paper. The consensus of opinion as expressed was very unfavorable to wooden smoke jacks because they are very unsatisfactory and are a constant menace on account of fire.

WEDNESDAY'S SESSION.

The first business taken up at the meeting Wednesday morning was the report of the auditing committee. This committee reported that the books had been examined and found correct.

INDIVIDUAL PAPER.

IMPROVED TOOL STEELS.

Mr. W. R. McKeen, Jr. (U. P.) presented in brief his paper on Improved Tool Steels and directed especial attention to the following statement, which he considered very important: While reductions in time are largely due to the alloy steel, I must mention that our improved shop methods and system have also entered largely into the economies.

Mr. Pomeroy considered that much valuable information had been presented in the paper and congratulated the association on receiving the result of the experiences referred to. He spoke especially with regard to the relationship between the motors and tools and between their adaptability and flexibility in the use of new tool steel. Mr. F. F. Gaines (L. V.) emphasized the fact that the strength and capacity of present machines are overtaxed by the high speed steels recently introduced and that most of the machines designed previous to two or three years ago can not stand the full capacity of the steel. Notwithstanding this fact, however, high speed tool steel has made radical changes in all shop methods where it has been introduced.

Mr. C. A. Seley (C., R. I. & P.) considered this an economical question which, carried to its conclusion, would point this way—that the high speed steel be used for its special object in heavy work and used to a point where it could be used no longer from the standpoint of size of the tool. It does not seem to pay to use expensive steel in cases where the cheaper steel would do the work. Undoubtedly, when tools are worn down in size, but still retain the properties which will permit of their high speed use, there are a number of special holders on the market which will enable the use of a piece of steel down to a very small point indeed. In such a case it would appear possible to use a high speed steel entirely for new work in the class to which it properly belongs.

In regard to the matter of tool holders, Mr. McKeen said that he had started in at first to make these tools out of a poor steel, but had now gone to the use of a patent tool holder which he uses almost exclusively, with great economy in the cost of the tool. The large tools of the alloy steel are very expensive and if they are introduced very extensively into a shop they run into thousands of dollars.

VARIABLE SPEED MOTORS.

A paper entitled Variable Speed Motors was presented by Mr. C. A. Seley. Mr. Pomeroy referred to the paper as a record of what machines and tools are doing and considered it an appendix to the report of the committee last year on electrical equipment of shops, adding to the value of that report by giving specific and definite tests.

PAINTING LOCOMOTIVES.

A report on this subject was asked for from the Master Car and Locomotive Painters' Association about two years ago. Mr. A. P. Dane, representing that organization, was extended the privilege of the floor and presented the report. The thanks of the Master Mechanics' Association was tendered the committee represented by Mr. Dane and the report was accepted.

AUTOMATIC STOKERS.

Mr. J. F. Walsh presented the report on automatic stokers. In discussing this subject Prof. Goss said that it could not be expected to get any large increase in efficiency from the application of a stoker to a locomotive, because history shows that we have not obtained any large increase in efficiency by the application of stokers to stationary plants. There are certain conditions which have to be met in stationary service where stokers are used that are not found in locomotive service, and which will make difficult the application of those types of stokers or automatic furnaces which are used in stationary service. Thus, with a chain grate, or with other forms of stokers used in stationary boilers, it is quite essential that there be no very sudden changes of load upon the boiler. It takes a given time for the furnace to respond to a change in condition, and of course the locomotive stoker must respond promptly to changes in condition. Therefore it appeared to him extremely difficult to expect a chain grate or any other of the normal forms of stokers to have any great success upon a locomotive. He referred to the stoker discussed in the report as an automatic shoveler and said that instead of putting the coal into the furnace, a scoopful at a time, it puts in a fraction of a pound at a time, and it spreads it perfectly, and because it goes in a small quantity at a time, and is well distributed, freedom from smoke results.

Mr. David Brown (D., L. & W.) and Mr. Gaines did not believe that an automatic stoker could be used to advantage in firing anthracite coal because the combustion in the wide firebox necessary is constantly changing from one portion of the box to another and the points necessary to be covered are constantly changing.

Mr. L. R. Johnson (Canadian Pacific) thought that the gauge of the work done by the mechanical stoker, or by an ordinary fireman, is practically the steam gauge, and the work and weight of the train and the time it makes over a certain division. If we can accomplish more in each of these directions by the use of the mechanical stoker than by the ordinary hand firing, he thought it a good recommendation for the stoker.

LOCOMOTIVE FRAMES.

Mr. T. S. Lloyd, chairman of the committee appointed to investigate the subject of locomotive frames, not being present, Mr. Pomeroy was called upon to present the paper in view of the work which he had done in preparing data for the report. He remarked upon its being rather noticeable that if a vote was taken by roads or individuals, it would be overwhelmingly against steel frames, but when it is placed on the basis of locomotives it turns the scale the other way. He considered this an excellent illustration of what representative membership letter ballot may be when it gets into operation.

As to the selection of the design of the frames, each member of the committee delegated one of its mechanical engineers to meet in separate sessions and select the frames which they considered as representing good practice. These frames were submitted to a committee representing the Foundrymen's Association to see if they had any objection to the design from the foundryman's standpoint, but all of the matter met with their approval, and they are introduced as exhibits in the report.

In regard to the bracing suggested by the committee there is one interesting point in this respect, that this condition can be more easily met with a girder or plate frame than with the bar frame, and that would, in the judgment of the committee which was discussing this matter, form an excellent opportunity of calling attention to the possibility of plate frames, that is, as to their investigation and some of the results which might be reached by their use.

Mr. Macintosh thought there are too many bolts in present design of frames and said that a frame should be as nearly a homogeneous mass as possible.

Mr. Vaughan referred to some careful observations which had been made under his jurisdiction and said he had found that binder bolts 2¼ inches in diameter were not only loosening but were actually stretching. He considered this largely responsible for broken frames and therefore advocated the use of clip binders. Referring to the use of clip binders instead of thimble binders Mr. Pomeroy said that the roads favoring clip binders represented 11,395 locomotives and the roads favoring the bolt and thimble binders represented 6,299 locomotives.

COST OF LOCOMOTIVE REPAIR SHOPS.

Mr. R. H. Soule, chairman of the committee, presented the report and referred to it as an attempt to classify and tabulate information obtained from members through circulars and also a certain amount of information obtained from other sources. The report received little discussion, however, in view of the hard work which it represented and the very valuable data and information which it contained, the thanks of the association were extended to the committee in general and to Mr. Soule in particular.

SAFETY APPLIANCES FOR LOCOMOTIVE FRONT ENDS.

This report was received and given the approval of the association. But little discussion followed its presentation.

SUBJECTS.

The report of the committee on subjects was read by the secretary and adopted.

ELECTION OF OFFICERS.

The following officers were elected for the ensuing year: President, P. H. Peck; first vice-president, H. F. Ball; second vice-president, J. F. Deems; third vice-president, William McIntosh; treasurer, Angus Sinclair.

In his usual graceful and clever manner Mr. George A. Post presented Mr. Lewis with the past president's badge, which was as gracefully accepted by Mr. Lewis.

The American Society of Mechanical Engineers

THE forty-ninth meeting of the American Society of Mechanical Engineers convened in Chicago May 31st. A feature of unusual interest at this meeting of the society was the presence of more than ninety members of the Institution of Mechanical Engineers of Great Britain, including Messrs. J. Hartley Wicksteed, president, J. W. Spencer, member of council and Edgar Worthington, secretary.

The meeting was business-like and well conducted throughout. Agreeable arrangements were made by the local committee for the enjoyment and entertainment of visitors and members. Many points of interest about Chicago exhibiting engineering skill and ability, were visited and the meeting as a whole was considered thoroughly successful by members of both the American and British societies.

At the opening of the first regular session and following the report on the election of new members, Secretary Hutton made a report on the progress of the new engineering building made possible by the gift of $1,500,000 from Mr. Andrew Carnegie. This gift as first offered was for the sum of $1,000,000, to be used by the four national engineering societies of America, the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Electrical Engineers, and the American Institute of Mining Engineers, for the purpose of erecting a building wherein they could be properly housed. After giving the matter thorough consideration the American Society of Civil Engineers decided that they would not join in the acceptance with the other societies. This decision was communicated to Mr. Carnegie, who then raised his gift to $1,500,000, to be controlled by the three accepting societies. The buildings, of which there will be two, one to be occupied by the Technical Club of New York, which will occupy a site of 50x100 ft. on Fortieth street, and the main building, occupying a site of 125x100 ft. on Thirty-ninth street, will be nearly back to back and be practically one building. The main building as planned at present will be a twelve-story structure, and is to contain quarters for the present and future needs of the three national and allied small engineering societies. Each national society is to have a separate floor of 9,000 sq. ft. space for its especial use. There will be a large auditorium of a maximum seating capacity of 1,500 persons, and a number of small auditoriums to be used by the smaller societies or for the smaller attended meetings of the other societies. The top floor is to be given over to library purposes, containing the combined libraries of all the societies. This is to be essentially a working library in which those using it are to have access to the books themselves. It is expected that some sort of co-operation will be arranged between the New York city public library and the Engineers' library, as one will be across the street from the other.

During the session an amendment to the constitution of the American society was offered by a member, which was to the effect that an amendment to the constitution could be sent out for final vote to the members by the society upon being sent in to the secretary in writing and having received the signatures of twenty members. This was done for the purpose of doing away with the necessity of having to print and send out the same amendment for a vote twice, as has to be done at present.

The first paper presented was a "Rational Basis for Wages," by Mr. Harrington Emerson, of New York, which was read in abstract by its author. The ensuing discussion was principally by the English visitors and the paper was considered largely irrational and to a certain extent obscure. The purpose of the paper was an attempt to determine upon a method by which wage-earners' value could be so analyzed as to arrive at a basis from which to adjust a fair wage satisfactory to employer and employee. In doing this the author compares the purchase of labor to that of coal which is sold by weight instead of natural heating value.

Following were two papers considering practically the same subject, "The Burning of Town Refuse," by Mr. George Watson, of Leeds, and "Refuse Destruction by Burning and the Utilization of Heat Generated," by Mr. C. Newton Russell, of London. As the titles imply, the papers were largely records of experience in building refuse destructors in Great Britain and methods for utilizing the heat developed in the generation of steam for industrial use.

Continuing the regular program of professional subjects, the following papers were read in abstract and discussed: "Some Theoretical and Practical Considerations in Steam Turbine Work," by Francis Hodgkinson; "The De Laval Steam Turbine," by E. S. Lea and E. Meden; "The Steam Turbine in Modern Engineering," by W. L. Emonet; "Different Applications of Steam Turbines," by A. Rateau; "The Potential Efficiency of Prime Movers," by C. V. Kerr.

Much information concerning the engineering features connected with tall office buildings was contained in two papers presented and discussed together. Both papers were entitled "The Power Plant of the Tall Office Building," and were presented by Mr. J. H. Wells and Mr. R. P. Bolton, both of New York City.

The next paper was on the "Middlebrough Dock, Electric and Hydraulic Power Plant," by Mr. Vincent L. Raven of the North Eastern Ry. of England. The discussion on this paper was chiefly concerned with the relative advantages of electric and hydraulic cranes for dock purposes. The results given in the paper were from experience with electric, hydraulic and steam cranes used at the Middlebrough dock. This dock used steam cranes originally. When it was extended hydraulic cranes were installed and at a still later date these were abandoned for electric cranes.

"The Use of Superheated Steam and of Reheaters in Compound Engines of Large Size," a paper by Mr. Lionel S. Marks of Cambridge, Mass., was read by the secretary. It gives the results of a number of tests, the object of which was to determine the performance of engines under different loads, both with and without jacketing and reheating. The paper was severely criticised by several members, a number of the diagrams being objected to and much of the material being considered as old and reworked.

A paper entitled "Commercial Gas Engine Testing and Proposed Standard of Comparison," by William E. Flint, discussed the subject of reducing observations upon gas engines to a basis upon which the performance of engines of different sizes can be compared, relative performance of various sizes and types can be determined, while those of new sizes can be predicted. The author advocates the friction brake for the determination of the output in preference to the indicator. By plotting results in diagrams the above comparisons may be made.

"Appendix 4 to Sixth Report of the Alloys Research Committee." This paper, by Dr. William Kempbell, related to investigations of structures formed on the surfaces of small ingots and buttons of aluminum, antimony, bismuth, cadmium, copper, gold, lead, platinum, silver, tin and zinc. Each of these metals were treated in detail and the report contained a large number of illustrations from photographs made by the microscope of the metals under examination.

"Cast Iron, Strength Composition Specifications," by Mr. J. W. Keep. This paper is the result of an investigation of nineteen series of tests made by the committee on tests of the A. S. M. E. in 1894 and 1895 and of twelve series of tests made in 1899-1901 for the committee on tests of the American Foundrymen's Association. During the discussion several members stated that the tables included in the report had been given a trial with very satisfactory results. Some of the representatives from England raised objection to the use of a round test bar. The standard test bar in England is rectangular, 2 by 1x36 ins. and these gentlemen believed that such a bar cast flat was the fairest test.

The paper presented next, "Experiments with a Lathe-Tool Dynamometer," by Mr. J. T. Nicholson, of Manchester, England, embodied the results of a very interesting series of experiments which are the outgrowth of trials upon high-speed tool steels made by the writer for the Manchester committee at the Manchester Institute of Technology. The consideration of the design of lathes for the rapid and heavy cutting rendered possible by the introduction of high-speed tool steels calls for a thorough and systematic investigation of the forces acting upon a cutting tool and these experiments were made to determine the forces exerted not only in turning the work against the tool, but also for moving the slide rest and saddle in both traversing and surfacing. The paper records the results of over 300 serial trials each requiring the making, recording and reducing of from 50 to

100 observations; yet it is looked upon merely as a first installment of the work required to be done. Two dynamometers were made and used in these experiments, each capable of measuring forces up to 15 tons on the tool point when taking the cut. In the first of these means was provided for measuring vertical forces only, while the second measured both vertical and horizontal forces. The paper includes illustrations of the dynamometers used, together with extended tables and numerous diagrams of the results obtained.

The papers relating particularly to locomotives were presented near the conclusion of the meeting, and due to lack of time were given but little discussion. The three papers on this subject were read in abstract. Reports of a series of tests of locomotives in actual service on the Hocking Valley railroad and made by students of Ohio State University, constituted a paper by Prof. E. A. Hitchcock, of the University, entitled "Road Tests of Consolidation Freight Locomotives." The report embodied a description of the apparatus used in making the tests, table of dimensions of the locomotives, tables of results obtained, together with indicator cards and diagrams plotted from the data gathered.

The next paper presented covering the locomotive was by Prof. W. F. M. Goss, of Purdue University, "Locomotive Testing Plants." This paper opened with the experiments of Alexander Borodin, engineer-in-chief of the Russian Southwestern Railways, made at the shops at Kief. The first and second experimental testing plants at Purdue University were illustrated and described and also of the testing plants of the Chicago & North-Western Railway, Columbia University and that of the Pennsylvania Railroad at the Louisiana Purchase Exposition.

In the paper by Mr. G. J. Churchward, of the British society, "Testing Locomotives in England," the author describes the plant for testing locomotives installed by the Great Western Railway in their erecting shop at Swindon. A second part of this paper is by Mr. W. F. Pettigrew, locomotive superintendent of the Furness Railway, and deals with the instruments and observations required in making a thorough and satisfactory test.

Copies of any of the papers presented at the meeting may be had for a nominal sum by applying to the secretary of the society. Most of the subjects discussed are foreign to the field of this journal and but a brief outline is here presented, merely directing attention to the several subjects taken under consideration so that those interested in greater detail may provide themselves with copies of the papers desired from the secretary at No. 12 W. 31st St., New York City.

Personals

Mr. L. L. Bentley, formerly chief draughtsman of the Lehigh Valley, has been appointed mechanical engineer of that road, with headquarters at South Bethlehem, Pa.

Mr. M. McGraw, roundhouse foreman of the Illinois Central at the Burnside shops, Chicago, has been appointed master mechanic of that road at East St. Louis, Ill.

Mr. Samuel F. Prince, Jr., who recently resigned as superintendent of motive power and equipment of the Philadelphia & Reading, has accepted a position with the Niles-Bement-Pond Company, with office at New York.

Mr. R. V. Wright, mechanical engineer Pittsburg & Lake Erie, has resigned to accept a position as associate editor of the American Engineer and Railroad Journal. Mr. Wilbur P. Richardson has been appointed mechanical engineer, succeeding Mr. Wright.

Prof. Albert W. Smith, who was recently at the head of the College of Mechanical Engineering at Leland Stanford Jr. University of California, has been appointed as successor to the late Dr. Robert H. Thurston at Cornell University. Professor Smith is a graduate of Cornell, class of 1878, and during the years 1887 to 1891 he was assistant professor of mechanical engineering in Sibley College. He then went to the University of Wisconsin, where he was professor of machine design, and thence to the University of California. On May 7 he was elected dean of the College of Mechanical Engineering, Cornell University.

Mr. Frank J. Mannix has been appointed general foreman of the Pennsylvania shops at Wellsville, Ohio.

Mr. Thomas Coyle, for nearly thirty years employed by the Lehigh Valley Railroad Company, at Perth Amboy, has been made master mechanic of the Mahoney & Hazelton divisions, with headquarters at Wetherly, Pa. He succeeds Mr. John H. Fildes, who has been transferred to Buffalo.

Mr. W. L. Kellogg, assistant master mechanic of the Missouri Pacific at Fort Scott, Kas., has been appointed master mechanic at De Soto, Mo.

Mr. Chas. E. Weeks, foreman of repairs to steam shovels, stationary engines and pumps, has been appointed foreman of the tool room in connection with his former duties, at the Cheyenne (Wyo.) shops of the Union Pacific.

Mr. Webb C. Ball has been appointed time inspector of the Detroit & Mackinac Railway, with headquarters at Cleveland, Ohio, effective June 1, 1904.

Mr. H. C. Pearce, assistant purchasing agent of the Chicago, Rock Island & Pacific, has been appointed general storekeeper of that road, with office at Chicago.

Mr. C. B. Chance has been appointed superintendent of motive power of the St. Louis, Brownsville & Mexico, with headquarters at Kingsville, Texas.

Mr. A. Harrity, heretofore division master mechanic of the Atchison, Topeka & Santa Fe at Raton, N. M., has been appointed division master mechanic of the Coast lines at Albuquerque, N. M., to succeed Mr. S. L. Bean, promoted.

Mr. J. J. Anderson has been appointed master mechanic of the Georgia, Florida & Alabama Railroad at Bainbridge, Ga., vice W. E. McCarthy, resigned.

Mr. F. T. Robertson, chief engineer of the Montana Railroad, has also been appointed general superintendent of that road in charge of operation, maintenance and mechanical departments, with headquarters at Lombard, Mont.

Mr. T. West has been appointed master mechanic of the Cleveland, Painesville & Eastern, with office at Willoughby, O.

Mr. Arthur H. Fetters, heretofore assistant mechanical engineer of the Union Pacific, has been appointed mechanical engineer of that road, with headquarters at Omaha, Neb., and Mr. Cubitt B. Smyth has been appointed assistant mechanical engineer to succeed Mr. Fetters.

Mr. D. A. Sulier has been appointed master mechanic of the Atchison, Topeka & Santa Fe at Raton, N. M.

Mr. W. B. Stahl has been appointed general foreman of the car department of the St. Louis & San Francisco Railroad at Kansas City, Mo., to succeed Mr. C. C. Crewson, resigned.

Mr. John Henney has resigned as superintendent of motive power of the New York, New Haven & Hartford, effective on July 1, and Mr. F. N. Hibbits, heretofore consulting mechanical engineer of the Southern Railway, has been appointed to succeed Mr. Henney, with the title of mechanical superintendent.

Mr. E. Dawson has been appointed superintendent of motive power and machinery of the El Paso Northeastern system, with headquarters at Alamogordo, N. M.

Mr. Roy Hoffhines has been appointed storekeeper and fuel agent of the Louisiana & Arkansas, with headquarters at Stamps, Ark.

Mr. W. J. Haynen, master mechanic of the Illinois Central at Clinton, Ill., has been appointed master mechanic of the Missouri and Illinois division of the St. Louis, Iron Mountain & Southern, with headquarters at De Soto, Mo.

Mr. R. L. Ettinger has resigned as mechanical engineer of the Cleveland, Cincinnati, Chicago & St. Louis, to accept the position of consulting mechanical engineer of the Southern Railway, with headquarters at Washington, D. C.

Mr. W. G. Anderson has been appointed general foreman of the Southern Railway at Louisville, Ky., in place of Mr. P. Drescher.

Mr. E. T. James, master mechanic of the Lehigh Valley at Buffalo, N. Y., has been appointed superintendent of the new shops which that road is building at Sayre, Pa., effective on June 1.

Mr. Nelson M. Maine has been appointed master mechanic of the Northern district of the Chicago, Milwaukee & St. Paul, with office at Minneapolis, Minn., vice Mr. John Taylor, resigned.

Mr. W. J. Buchanan, heretofore assistant master car builder of the Bessemer & Lake Erie, has been appointed master car builder of that road, with office at Greenville, Pa., and the former position has been abolished.

Mr. David Van Alstyne, superintendent of motive power of the Chicago Great Western, has been appointed mechanical superintendent of the Northern Pacific, with headquarters at St. Paul, Minn., effective on May 26.

Mr. N. C. Bettenburg has resigned as master mechanic of the Great Northern at Larimore, N. D.

The headquarters of Mr. C. T. Bayless, mechanical engineer of the Mexican Central, have been removed from the City of Mexico to Aguascalientes, Mex.

Mr. J. W. Taylor has been appointed general storekeeper of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, in place of Mr. Theron Higby, resigned.

Mr John H. Wynne, general foreman of the Pittsburg, Cincinnati, Chicago & St. Louis, at Richmond, Ind., has been appointed mechanical engineer of the Illinois Central at Chicago.

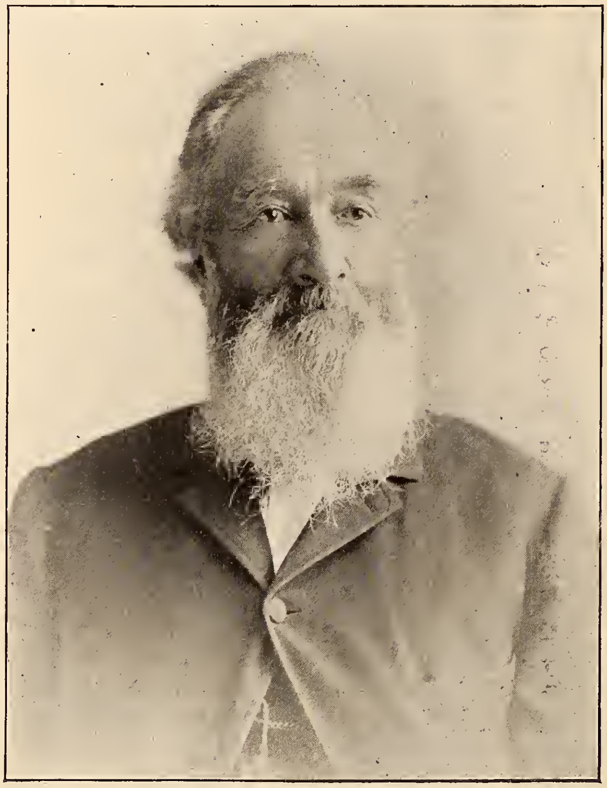
The Oldest Living Master Car Builder

The Boston & Maine Railroad, the first seven miles of which now large system were built in 1836, from Andover to Wilmington Junction, has had but three master car builders during its sixty-eight years of history, including the present incumbent, Mr. J. T. Chamberlain, who has held that office for the last fourteen years. Favorable to the road, or to the records of these gentlemen, or to both, this fact is noteworthy in comparison with many roads whose equipment officials are changed so often.

This road also has the unique distinction of having its first master car builder now living on its line at the advanced age of nearly 89 years, who filled that position from the beginning of the road in 1836 to 1867, when he was succeeded by his assistant, David C. Richardson. We refer to Mr. M. C. Andrews, who was born in Hebron, Me., Dec. 15 1815, and now lives at Andover, Mass., where he is surrounded by his children and grand-children, and every comfort, except his estimable life-companion, who died a few years ago. He is rather hard of hearing, but otherwise his vitality and health are well preserved for one of his years and labors.

He can safely, we think, be called the oldest living master car builder in the United States or Canada. He was president of the Master Car Builders' Association from 1871 to 1873, succeeding Mr. Van Houten of the Pennsylvania R. R., who was, if we mistake not, the first president, and with whom, and such veterans as Mr. Kirby of the Lake Shore, Mr. Calvin A. Smith, Mr. Forney, Mr. F. D. Adams, Mr. Leander Garey and others, he was a colleague.

After leaving the Boston & Maine, about two years of Mr. Andrews' life were given up to inventions. He was the father of what is known as the swing bolster. He also patented a synchronous ventilator for passenger cars by which all those on one side of a car could be opened or closed at



MR. M. C. ANDREWS, THE OLDEST LIVING MASTER CAR BUILDER.

the same time by simply throwing a lever.

In 1869 Mr. Andrews was appointed Master Car Builder of the New York, New Haven & Hartford road, being located at New Haven. He had a desire to live in the Elm City in preference to New York, where he could have gone, as the Erie road wanted him to take charge of its car department. He remained in New Haven five years, and afterward took up his residence in New York City, having become interested in a car spring company with which his son Frank, since deceased, was associated. He and his son were connected with the concern for about ten years, after which he again found himself in the quiet town of Andover, the scene of the busy activities of his early days, where he has lived ever since.

The car shops, first constructed in Andover, were removed to South Lawrence in 1848, where, though they have been twice destroyed by fire (the last time in 1866), the same brick chimney remains, which is 148 feet in height. Mr. Andrews tells an amusing story how the original design of 150 feet was cut down by the capping two feet to outwit the then penurious president, who found fault with the extravagant outlay in shop buildings and was bound that the chimney should not be so high. Mr. Andrews' memory of events is good and his fund of stories of the early days of railroading and the evolution of the passenger car from the stage coach are amusing and instructive. A lengthy article concerning this, together with his portrait, was published in the Boston Herald some four years ago. He is entitled to the distinction of being the first person to pass over the road in a passenger coach. President Hobart Clark called on him and requested that someone be sent over the road from Andover to Wilmington to see that everything was in order for the running of trains, because a number of new passenger cars that had been ordered from the Lowell Machine Co. would be at Wilmington Jct. The master car builder decided that he would perform the service himself, and the next day started on foot for the junction. When he arrived there the cars and locomotive, all new, were in waiting. He jumped aboard, gave the signal to start and without incident finally arrived at Andover.

On June 27, 1833, Mr. Andrews was one of a cavalcade of fifty horsemen to meet at the town line President Andrew Jackson and his distinguished associates and escort them to Andover, who were on a visit to the factory towns of New England. They rode in carriages, as there were no cars then. He tells an amusing incident that happened when the party reached Andover. A citizen shouted, "Three cheers for Andrew Jackson!" Another cried, "Three cheers for the devil!" to whom the former shouted, "Well, you may hurrah for your candidate and I'll hurrah for mine!"

The last public function of importance with which Mr. Andrews has been identified was the annual convention of the Master Car Builders' Association at Saratoga, some five or six years ago. The members were desirous to have him attend and passes were sent him and all arrangements for a comfortable journey made. He received much attention and gave a talk on the early days of car building. And not long since he received a past president's gold badge, which he prizes very highly.

He lives with his son in a fine old colonial house at 71 Main street, Andover, which was formerly occupied by President Edwards of the famous theological seminary at that point. He gives evidence that many more years may be allotted to his long and useful life.

His portrait appears in this issue, which is from a photo taken about ten years ago, but there is no marked change in his looks; it is a fair likeness of him today.

Notes of the Month

Mr. H. M. Marsh, formerly assistant superintendent of the Armour Car Lines, Chicago, has been appointed mechanical superintendent of the shops of Templeton, Kenly & Co., Ltd., Chicago, Ill., manufacturers of the Simplex Jacks; effective July 1, 1904.

The National Car Coupler Company, of Chicago, manufacturers of freight and passenger couplers, steel platforms and platform buffers, centering yokes, Hinson draft gears and friction buffers and the Hinson emergency knuckle, have issued an attractive pamphlet illustrating and describing their several devices.

The Ashton Valve Company, Boston, Mass., announces that J. W. Motherwell has become associated with the railroad department of their company, with headquarters at 160 Lake street, Chicago, Ill. Mr. Motherwell has for the past eleven years been connected with Fairbanks, Morse & Co.

The Soule Dust Guard Company, of Boston, Mass., have received a large order for Soule raw hide lined dust guards from the Louisville & Nashville R. R. and shipment on this order has been begun.

The Hendrick Mfg. Co., of Carbondale, Pa., one of the largest manufacturers in this country of perforated sheet metals, have concluded to open an office in New York City in the Singer building, 149 Broadway, corner of Liberty street. Mr. C. J. Thompson, who has had a broad experience along mechanical lines, will be the resident manager and will furnish estimates and quotations at short notice.

As a supplement to the larger and more complete catalogues of the Rand Drill Company, a small pamphlet is being distributed by this company to illustrate and briefly describe some of their standard types of air and gas compressors. The lists are necessarily condensed, yet sufficient for the selection of a compressor of suitable style and size for ordinary requirements. Among the machines listed in this pamphlet may be mentioned the Corliss engine driven compressor, the girdle frame compressors having steam and air cylinders arranged in tandem, the "Imperial" or latest type manufactured by the company, belt or rope driven compressors, rock drills, pneumatic tools, etc.

W. F. M. Goss, dean of the schools of engineering of Purdue University, received on Wednesday, June 8, the honorary degree of Doctor of Engineering (D. Eng.), which was bestowed by the University of Illinois.

Mr. Henry Allison Nealley, for three years special paint representative for Dixon's Silica-Graphite paint in New York City and New England, has been appointed manager of the new paint office of the Joseph Dixon Crucible Company, Paddock building, 101 Tremont street, Boston, Mass.

The Michigan Technic--1904

The 1904 issue of the Michigan Technic, published by the Engineering Society of the University of Michigan, contains a number of scientific articles both interesting and valuable to the engineering profession. The papers presented are representative of graduates of the University of Michigan and the number includes, among others, descriptive matter concerning the manufacture of Portland cement, by Prof. R. C. Carpenter, professor of Experimental Engineering at Cornell University; switchboard and panel board design and construction; drafting room system; value of gas analysis in gas engine tests, and locomotive road tests. The publication evidences an earnest and conscientious effort on the part of the managers in the selection of subjects attractive to engineers.

Smoke Jacks to Provide for Cranes in a Round House

THE DICKINSON ADJUSTABLE JACK.

The roundhouse has changed from a building in which to store engines to a shop for making quick repairs. New roundhouses are being equipped with facilities for doing work and provided with means for the comfort of the workmen in a manner unthought of a few years ago. These changes have been made because of the demand incidental to the increased size of locomotive parts and because of the economy which they represent in quick repairs to larger locomotives. In order to comply with requests of train dispatchers for more power it is often necessary to turn the motive power equipment and make the necessary repairs in the least possible time. To prevent the transportation department from charging all loss of time to engine failures and to get the tonnage over the road these repairs must be made properly. It is in making repairs properly and in the least possible time that facilities providing for convenience made themselves felt.

It is not unusual to see a hand hoist carried on a jib hung to the smoke stack used in lifting heavy steam chest covers, and some heavier locomotives have had small jib booms attached to their front ends. Blocks and tackles are sometimes suspended from the roof trusses to assist in lifting heavy loads, but none of these makeshifts can meet requirements nearly so well as a traveling hand crane which spans the pit or a portion of the pit. The crane can always be found; no time is lost in looking for it or going to the tool room for it and it is always so located as to be readily run to desired position over the engine. Heretofore the presence of smoke jacks presented an obstacle to the consistent use of cranes in the roundhouse, but this difficulty has been removed by a form of smoke jack originated by Mr. Paul Dickinson of Chicago and specially designed to allow a crane to pass above a locomotive in the round house without obstruction. This provision is made by building the jack in sections and arranging the sections to telescope in multiple. As usually built, two sections telescope into a third, though as many sections may be used as are required by the height of the house.

Another feature of interest connected with this type of jack, and a very valuable one, is the arrangement by which it may be moved horizontally, or parallel with the pit, so as to be readily adjusted immediately over the smoke stack regardless of where the locomotive is stopped, within limits of course. The jack is suspended from a roof so arranged over the monitor as to be made to travel parallel with the pit. Both the telescoping sections of the jack and the movement of the monitor roof are operated by sets of chains and controlled by hand wheels conveniently situated on the round house wall. The entire arrangement is well shown by the accompanying illustration by reference to which the several features of advantage may be readily seen.

Unless great care is observed a locomotive entering a round house will not be stopped immediately beneath a jack and if it is not so stopped a portion of the smoke issuing from the stack is distributed throughout the house. Smoke from a number of stacks, together with steam often present in a round house, renders such a shop a very uncomfortable and inconvenient place in which to work at times. There is no question that men work to best advantage when comfortable; hence the attempts to thoroughly ventilate the round houses most recently constructed.,

Showing Crane in Roundhouse with Adjustable Smoke Jack.

Due consideration of this fact is evidenced by the design shown in the illustration above referred to, from which it will be seen that the jack may be so lowered as to completely encircle the upper portion of the stack, thus ensuring the smoke being delivered through the jack. To provide for smoke that may escape and for the gases and steam which may be present in the building, as mentioned before, the jack is located within a monitor. The sides of this monitor are of glazed sash so arranged as to be opened and closed at will.

The convenience of the several features of this design of smoke jack may be readily appreciated. Not the least among these is the provision that the locomotive may be stopped with any pair of drivers over the drop pit, it may be pinched in one direction or the other to set valves, remove pistons, or for any other purpose without affecting the relative position between stack and jack.

It is interesting to observe further that automatic locking devices are included in this design to prevent collision between the crane and jack. This locking device stops the crane in its travel toward the jack when the latter is lowered into position over the stack, and when the crane is standing immediately above the locomotive a similar device prevents the jack from being lowered.

The Bettendorf Steel Truck

A new design of car truck has been perfected by Mr. W. P. Bettendorf, of Davenport, Ia., in which the ideas combined are applicable to both passenger car and tender trucks as well as to freight car trucks, the class of service for which the design was originally prepared. The object of this type is to reduce the number of parts of the present arch bar truck, so far as is practical, retain all the good features of the latter and at the same time produce a stronger truck of lighter weight. The reduction in the number of parts was accomplished by making the side frames, including the journal boxes, of one piece of metal, obtaining thereby a girder instead of a truss construction, and employing thoroughly annealed open hearth cast steel. A comparison of the illustrations presented herewith, designated as Figures 1 and 2, evidences very clearly the manner in which this reduction has been made. Fig. 1 shows the 41 parts composing one side frame of an arch bar truck, while Fig 2 shows the single piece which has been substituted. The parts of the Bettendorf truck, except the wheels, axles and springs, which are common to all types of trucks, are shown by Fig. 3 The assembled parts complete and ready for service are shown by Fig. 4 From a consideration of the several parts as shown individually, together with the view of the finished truck, the simplicity of the design is readily apparent.

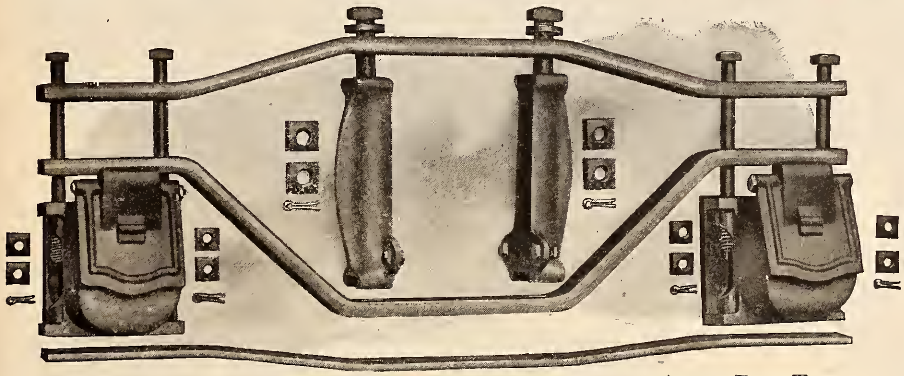


Fig. 1—Illustration of the Number of Pieces in an Arch Bar Truck.

The truck is erected without the use of bolts or rivets. The two side frames are held in position by the column guides on the bolster and by the cross tie bar. Transverse ribs in the latter engage with recesses in the spring seats.

The absence of projecting nuts and ends of bolts, together with the smooth surface presented by the bottom of the cast side frame is considered a feature of advantage in case of derailments. The column and journal box bolts extending below the tie bars of the arch-bar frame are often the cause of much damage to truck frames, bolsters, and tracks in such cases, as they catch in the ties or against the rail, tearing up the track. The motion of the trucks being arrested and the body of the car continuing to move forward, the trucks, bolsters and car framing are subjected to injurious stresses and distortion. The journal boxes are also likely to be broken by the bending of the journal box bolts. The smoothness of the Bettendorf frame will permit it to slide along, offering little resistance, with consequent saving in damage to trucks, cars and track.

If one of the journal boxes in these frames should be broken, the whole frame is rendered useless. The manufacturers, however, meet any objection which might be urged against the adoption of the truck on this account by agreeing to replace the frame for the cost of an ordinary malleable iron journal box and its bolts. In the case of failure of the truck frame through wrecks or other causes, the design permits of substituting the ordinary arch bar frame, as the Bettendorf frames are made to interchange with them.

To dismantle the truck for wheel removal and reassemble it, it is said that not more than 30 minutes are required with the ordinary appliances of a car repair yard. This operation has been performed in 17 minutes by men not specially skilled in the work, therefore, it is thought that wheel removals for this truck should not cost more than for arch-bar trucks. The absence of all bolts and rivets greatly facilitates this operation, and undoubtedly accounts for the readiness with which the work can be done.

Besides reducing the number of parts from 164 pieces per car in the arch-bar truck to only four in the Bettendorf truck the weight is re-

Fig. 2—Side Frame of Bettendorf Truck.

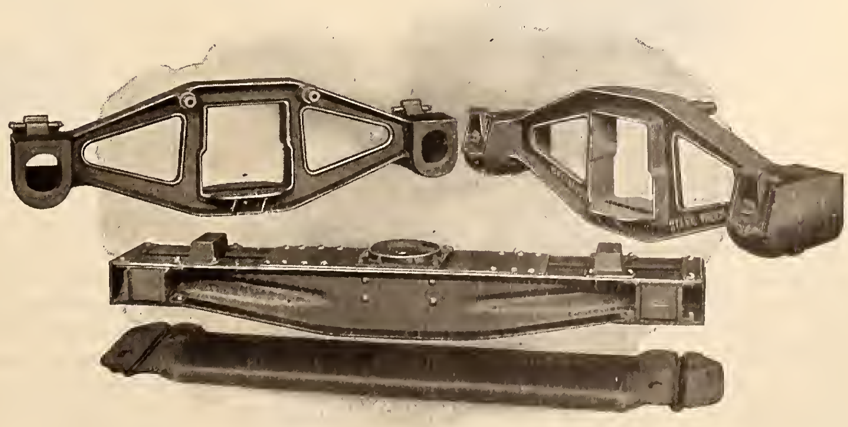


Fig. 3—Side Frame Bolster and Transom of Bettendorf Truck.

duced from 1,000 pounds per car, while increased strength is claimed as heretofore mentioned. Passenger car trucks of this type are now being built, and a number of trucks have been in service over a year without a single failure. These trucks are manufactured by the Bettendorf Axle Company, Davenport, Ia. Sales offices of the company are in the Old Colony building, Chicago, and at 42 Broadway, New York City.

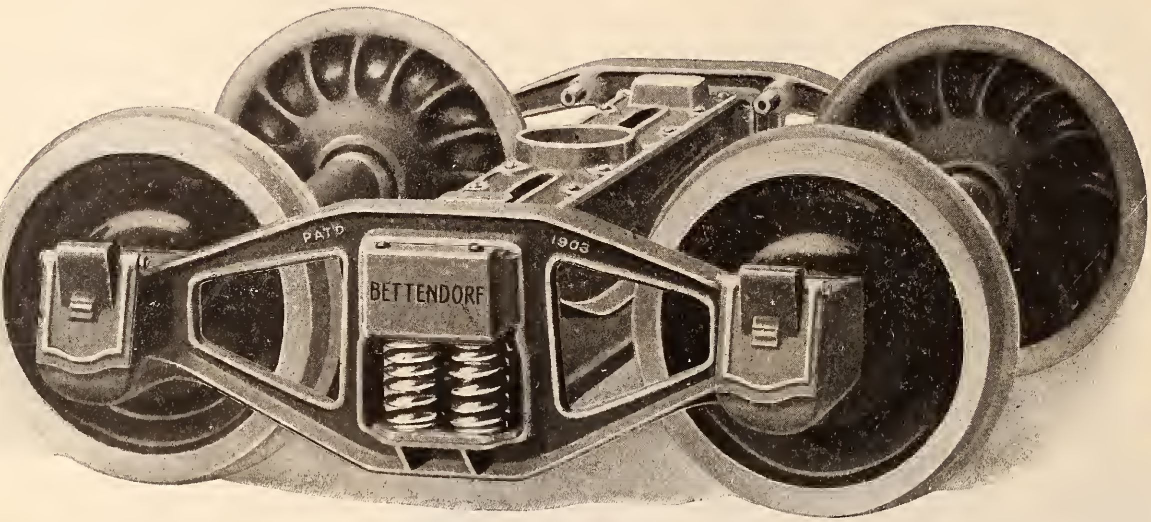


Fig. 4—Bettendorf Steel Freight Truck.

Adjustable Boring Tool Holder for Lathe Work

With the introduction of high-speed tool steel a number of tool holders have been devised for the purpose of providing sufficient reach and at the same time to reduce that portion of the tool actually made of high-speed steel to little more than a cutting edge, thus economizing on the use of steel of high price. A tool holder designed for this purpose and to facilitate a wide range of boring on a lathe is illustrated by Fig. 1.

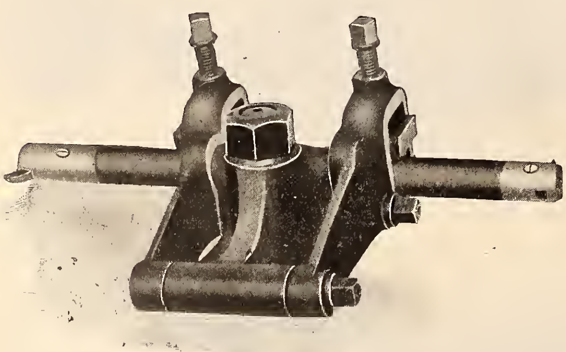


Fig. 1—Adjustable Boring Tool Holder for Lathe Work.

The holder consists of a base or carriage supporting a tool bar and each end of the bar is arranged to hold a small tool securely. When applying this holder the tool post is removed and the base is placed upon the cross slide. It is held in position by two bolts with heads of such form as to engage the tool post slot. The bar is made of crucible steel and is firmly secured by two clamps held by set screws. To arrange the height of the cutting edge to suit the cut being taken, the position of the bar is adjusted by a set screw and when the desired adjustment has been made it is securely held by a second set screw. At one end of the bar is a slot for holding the cutting tool straight, or at right angles to the center line of the tool bar, and at the other end the slot is arranged at an angle. The cutting tool is held in position by a screw having a shoulder arranged in the form of an eccentric, so that by giving this screw a partial turn the tool is secured or released. The arrangement of this screw is such that the thrust of the cutter tends to increase the grip of the screw. This arrangement is shown by Fig. 2.

The holder is made in two sizes, numbers 2 and 4, the latter being the size which is here illustrated. The former is capable of holding bars from ½ in. to 1¾ in. diameter and the No. 4 holds bars from ¾ in. to 2½ ins. diameter.

In addition to boring, this device may be used for facing off the outside of work which can not be swung over the carriage of the lathe, for instance, fly wheels, pulleys, etc. The length of the bar may be adjusted as desired by simply loosening the clamping set screws and sliding the bar to the required position. It is adaptable to any lathe having a swing of 20 ins. or over.

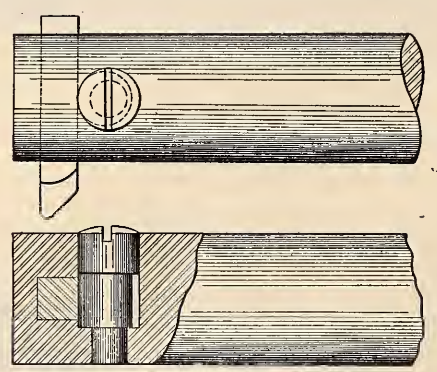


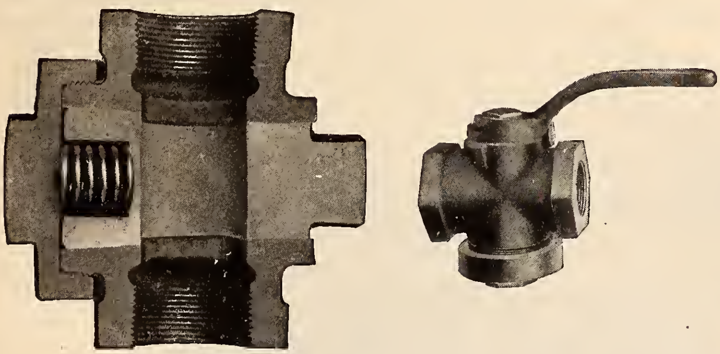
Fig. 2—Tool Bar for Boring Tool Holder.

A holder of the size and form here illustrated was accepted by the Illinois Central Railroad at its Burnside shops, Chicago, after a trial of 30 days.

These holders are marketed by C. A. Nordquist, manufacturers' agent, Chicago.

A New Spring Stop Cock

The accompanying illustrations present the general appearance and details of a special stop cock for which decided advantages over the ordinary form of plug cock are claimed. The plug in this stop cock, instead of being held rigidly in place by a nut at the bottom of the plug, is seated by means of a spring, as shown in the illustration. The result of this arrangement is that the cock is always tight. Should the plug for any reason bind, a slight tap on the top will loosen it so that it will turn easily, but not be left in a leaky condition. The ordinary stop cock is frequently so hard to turn that the nut for tightening the plug has to be unscrewed and



AMEW SPRING STOP COCK.

the plug loosened before it can be used. As it is frequently left loose, the result is a leaky cock. With this special stop cock such expensive difficulty is obviated. The cock is always ready for use, can be quickly and easily operated, and remains perfectly tight under all conditions. It is particularly adapted for use in compressed air and in steam lines.

When desired these cocks are made with quarter stops and handles. The handle is provided with a lug which, when brought to the stop, gives a wide open or fully closed valve.

As cyanide solution eats out lubricant and causes ordinary cocks to leak all iron cocks of this type have been largely introduced at a number of large cyanide plants. A loss from leakage, where the solution is worth from 10 to 50 dollars a ton is a great annoyance so that the saving affected by these cocks is considerable. "Amew" stop cocks are manufactured by the American Engineering Works, 303 West Lake St., Chicago, Ill.

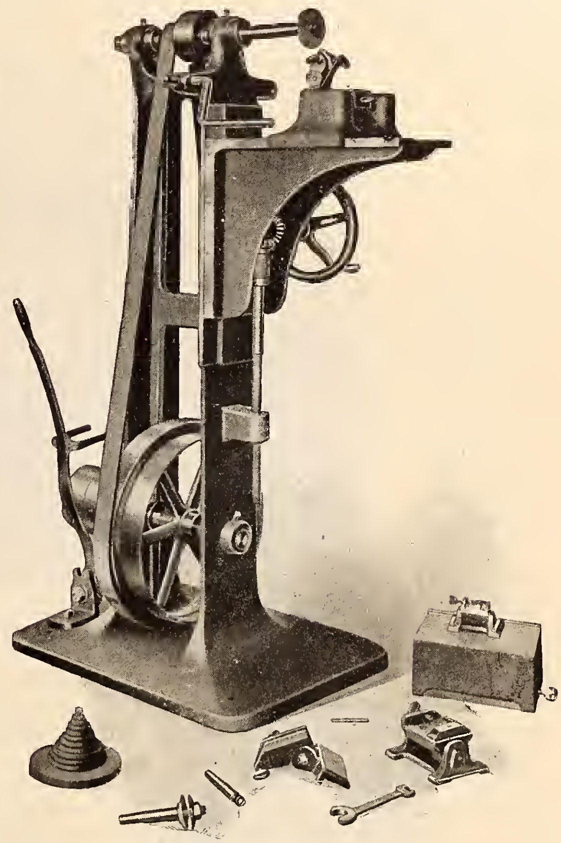
Mechanical Draft Apparatus

Those interested in economical combustion and highest steaming capacity of boilers will find valuable information contained in catalogue Number 60 of the Hartford Blower Company concernnig the application of the Hartford forced and induced draft apparatus. The increased adoption of the fan in place of the chimney for draft production has led to the special design of fans for this purpose. They may be applied in either of two ways: For forced draft where the air is forced into the ashpit and an excess of pressure maintained therein; or for induced draft where the hot gases are drawn through the fan and a partial vacuum created above the fire. Which methods is to be applied must depend upon the conditions, but evidently the fan should be designed in accordance with the method of application. The catalogue here referred to illustrates and describes a number of applications of forced draft apparatus. The Hartford Blower Company, 160 Suffield street, Hartford, Conn., manufacture blowers, exhaust fans, mechanical dust collecting systems, heating, ventilating and drying systems, forced and induced mechanical draft, dust collectors, automatic furnace feeders.

Chaser Grinder

The chaser grinder illustrated by the accompanying engraving, is a design resulting from long and varied experience with thread cutting tools. It was found impossible to grind chasers by hand satisfactorily and for obtaining good results, the grinder proved more practical because of the accuracy and correctness in gauge of threads which could be maintained.

The grinder is simple in construction and is easily operated. The bearings are bronze bushed and are adjustable for wear. The spindle is of tool steel and hollow. Arbors for wheels are held in by a threaded bar, facilitating change of



CHASER GRINDER.

wheels and reducing the possibility of breaking wheels in making a change. The regular equipment supplied with this machine includes all attachments for grinding throat and face of all kinds and sizes of detachable die chasers; three arbors for wheels, one 5-inch wheel and wheels ranging from ⅝ to 3¼ ins.

This grinder was designed by Mr. J. Bennett Wallace, for many years superintendent of the Metric Metal Works and is made by the Modern Tool Company, Erie, Pa.

Galvanized Iron and Steel Sheets

Although thin plates or sheets of iron and steel were already used to some extent in the early ages, the production and consumption of such commodities have grown to immense proportions during the nineteenth century.

In ancient days the production of thin sheets of iron was accomplished by a very laborious process. Pieces of wrought iron were heated in blacksmiths' fires and hammered flat and as thin as possible on an anvil; then several pieces were piled on top of one another, reheated to a red heat and again hammered until the several layers had reached the required thickness. Later on the crocodile or helve hammer, driven by water power, came to ease the hard manual labor of the smiths.

The process of rolling sheets was first invented in England in the eighteenth century. This was a marked step in advance in that it not only produced sheets of uniform thickness and more pliable, but also materially reduced the cost.

Early in the nineteenth century the rolling of iron sheets was first started in the United States, and from old records it appears that the first American sheet rolling mill was built in Pittsburg in 1818. Mr. James M. Swank, the expert iron statistician, in his book "Iron in all Ages," quotes from the Pittsburg Almanac of 1819:

"A very extensive establishment under the superintendence of Joshua Malen, formerly of Valley Forge, and whose talents will be an important acquisition to this section of the Union, has been made by the Pittsburg Steel Engine Company, Wm. Robinson, Jr., and Joshua Malen. At their mill, which has two engines, each of 120 horse power will be manufactured bar, rolled and sheet iron".

From that time on the industry grew at first slowly but steadily until after the end of the Civil War enterprising American manufacturers in the Eastern and Middle States wrested the control of this trade completely out of the hands of the English, Russian and Belgian competitors.

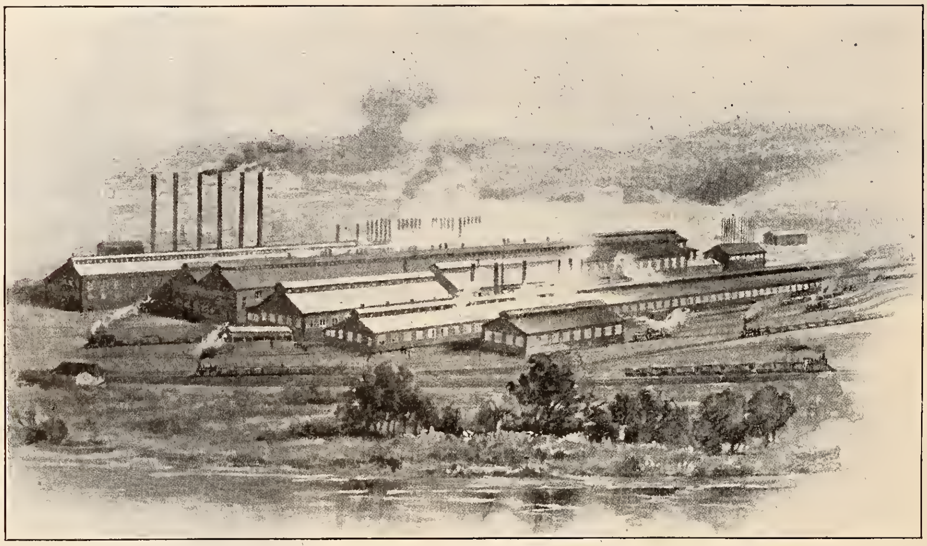
On account of its flexibility, ductility and tenacity, the purposes for which this material is used, have become so manifold, that limited space forbids to make an enumeration of the same, but it may be stated that a vast amount of it is used in railroad equipment and construction.

Black Sheets, i. e., iron or steel sheets composed of the iron substance alone without being mixed or coated with other materials, are suitable for hundreds of purposes, but the affinity of iron and oxygen has ever been a source of trouble for it causes rust and hinders the use of iron in its natural state for many other desired purposes.

To overcome this difficulty, various methods by which atmospheric air is prevented from coming into direct contact with iron, have been devised; chief amongst these is the covering of the iron sheets with a coat of spelter or zinc and thereby producing the article known in commerce as galvanized iron.

Galvanized sheets are very suitable material for the roofs of cars or train sheds, for corridors, gables, cupolas, skylights, etc., etc., but in saying this, it is presupposed of course that the best galvanized sheets are used. The brand which has for years enjoyed an excellent reputation is the Apollo Best Bloom, which is manufactured by the American Sheet & Tin Plate Company, principally at its extensive works at Vandergrift, Pa. That such is the fact and that this brand attracts the attention of master mechanics and purchasing agents, is no wonder to those who ever had the opportunity to observe the strict order, supervision and systematic shop practice which prevails in the works of that Company and the control it possesses over the manipulations of the necessary materials from the pig iron and the zinc slabs to the finished sheets. Indeed, the effect which this highly efficient management has brought about is that the words "made by the American Sheet & Tin Plate Company" signify a degree of excellence reached by few.

In the course of the last one or two decades many labor saving devices in auxiliary machinery and for detail work were invented, and American ingenuity is still actively at work, and there is no doubt that in the near future still more highly improved methods will be developed.



APOLLO WORKS OF THE AMERICAN SHEET & TIN PLATE COMPANY.

An idea of the wonderful development of the sheet iron business can be obtained when it is noted that the first sheet rolling mill in this country, with 240 horse power, was considered an extensive establishment, and then observe that the Vandergrift plant, which is only one of the twenty odd sheet mill works owned by the American Sheet & Tin Plate Company, is equipped with over 12,000 combined horse power, and that at these works twelve and one-half acres are under roof and that the combined length of the several buildings is one and one-quarter miles.

An illustration of the Apollo Works of the American Sheet & Tin Plate Company, when the "Apollo Best Bloom Brand" is manufactured, is presented herewith.

Graphite as a Lubricant

Under the title of Graphite as a Lubricant, the Joseph Dixon Crucible Company is distributing a revised edition of their pamphlet concerning the use of graphite as a protection against abrasion of rubbing surfaces. The pamphlet is well worthy of consideration, as it contains much information of value based on actual service conditions, which is gathered from M. C. B. tests, railroad club proceedings, etc. The first chapter discusses friction and lubrication. Continuing, the remainder of the paper is more closely identified with the use of graphite, either alone or mixed with oil, and the many forms and types of machinery on which it is used to advantage.

Mica Metallic Packing

Mica metallic packing derives its name from one of its ingredients and consists of small pieces of anti-friction metal, perfectly coated with a compound of ground mica and graphite, after which it is molded into rings of any desired size, or placed in a cotton cover or hose and applied as a soft packing by cutting off the required length.

By having the metal thoroughly permeated with the ingredients as mentioned, when it is placed in the box and the gland tightened, it readily forms itself into one solid body completely filling every portion of the box and every groove in the rod, hence it can readily be seen that it is not necessary to have a perfectly round rod to apply this packing.

It is not dependent upon oil for its life, as it contains its own lubricant and when worn to such an extent that the gland has no more pressure on the packing, it is repacked by simply removing the gland and inserting more packing, therefore the users of this packing get the wear of every ounce of material purchased.

This packing has been in successful use upon locomotive throttle stems, valve stems, and air pumps for a period of seventeen months and when removed for the purpose of

MICA METALLIC PACKING.

overhauling the engine was yet in perfect condition. It is made by the American Metallic Packing & Supply Co., 46 South Water street, Cleveland, O.

The Pintsch Lighting System

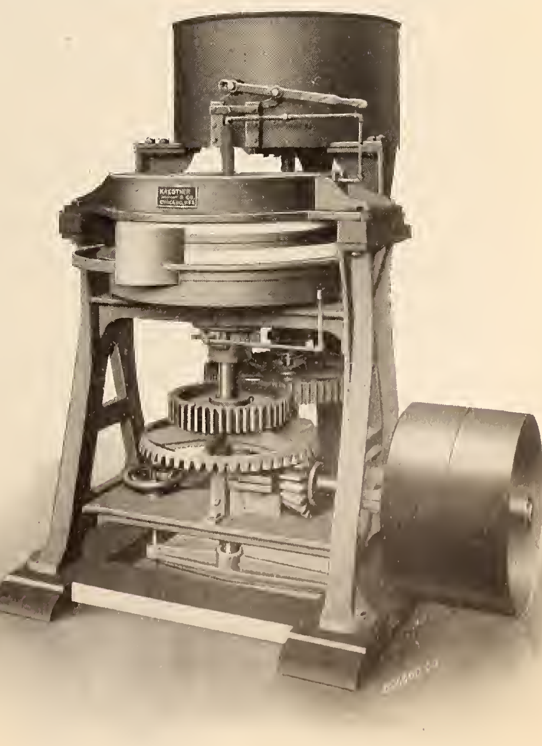
A statement from the Julius Pintsch Co. of Berlin, to the Safety Car Heating & Lighting Co. of New York, embraces very comprehensive statistics of the application of the Pintsch system of lighting to the railroad cars, locomotives, buoys and beacons throughout the world. The figures given below show that 130,000 cars, 5,800 locomotives and 1,700 buoys and beacons are equipped with this system and that 372 gas works are in operation to manufacture gas for the Pintsch system of lighting which has been adopted by many of the railroads and light house departments of the world.

PROGRESS IN THE USE OF THE PINTSCH GAS LIGHTING SYSTEM TO MAY 1, 1904.

Germany	45,200	5,583	75	155
Denmark	45		3	21
England	21,100		87	370
France	7,500		30	370
Holland	2,700	5	10	100
Italy	1,570		5	20
Switzerland	410	2	1	
Austria	5,525		10	5
Russia	4,000	132	13	20
Sweden	750	53	4	2
Servia	220		1	
Turkey	120			
Bulgaria	98		1	
Egypt	150		3	70
Canada	450		2	255
Brazil	825	31	2	45
Argentine	1,150		10	5
Chili	50		2	
Australia	3,000		13	40
India	10,500		16	
United States	23,500		80	250
Japan	150		2	20
China			1	25
Mexico	125		1	
Total	130,138	5,806	372	1,703

Paint Plants for Railroads

The illustration herewith shows one of the many different paint grinding mills and mixers, being sold to the railroads for use in grinding their own paint. The mill is known as the Solid A frame and has mixer attached. Is built in four sizes—stone diameters being 24, 30, 36 and 42 inches—with proportioned mixers and with capacities ranging from one to three tons of paste paint daily, depending largely upon the materials being ground. The railroads of the country are awakening to the fact that it pays to grind their paint, as the process is very simple. The expense for repairs is slight and the original outlay for plant small, when results obtained are considered. The mills are suitable for grinding white lead, zincs, and all kinds of pigments and mineral paints in oil either in heavy paste form ready for thinning down, or if desired the paints are ground down ready for use. Among the many users of paint mills who find it profit-



HEAVY PASTE MILL.

able to do their own paint grinding and whose plants were equipped by Kaestner & Co., of Chicago, the builders of the mill we illustrate, are the following: The Illinois Steel Co., North Works; the C. & N. W. R. R., Chicago; B. & O. Railway Company, Wells & French branch, Chicago; the International Harvester Company, Chicago and Chatham, Ont.; the C., M. & St. P. Railway shops, Milwaukee; Mexican International Railway Company, Mexico, and others. The manufacturers, Messrs. Kaestner & Co., Chicago, have had over 40 years' experience in the building of white lead and paint plants, and are prepared to submit plans and specifications for plants of any size and capacity. Their engineering department as well as technical knowledge of paint machinery is available for the asking. Their works are located at 241 and 261 South Jefferson street, and 2 and 50 Lowe avenue, Chicago. Their catalogue will be sent on application.

Universal Grinder

The Universal grinder, illustrated by Fig. 1, is designed to meet the de-

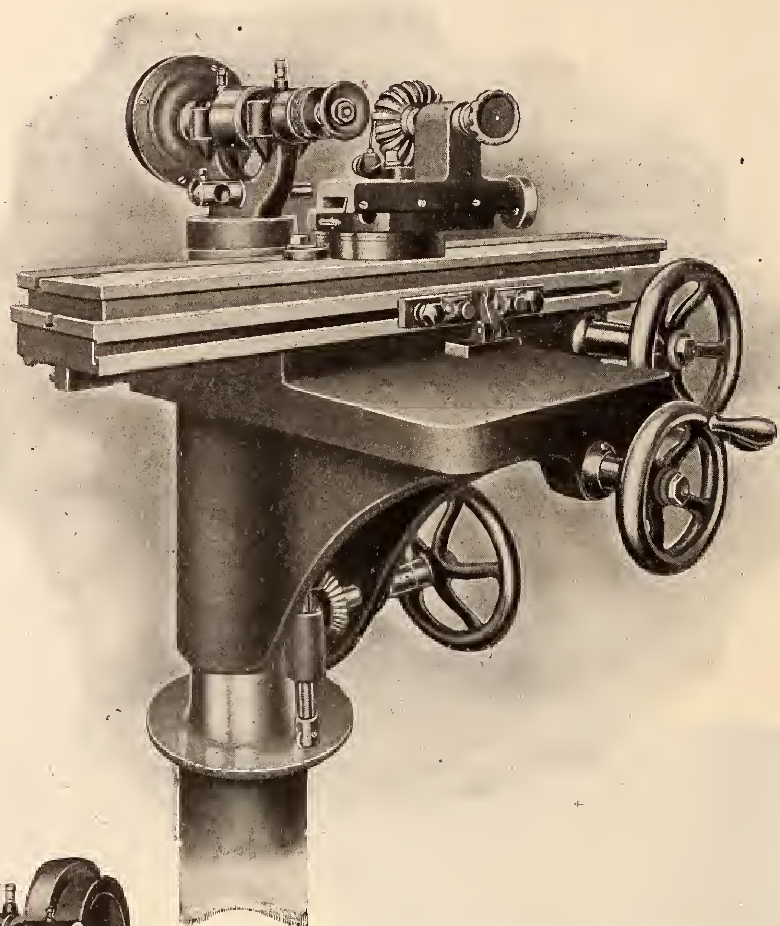


Fig. 2—Special Attachment for Grinding Round Convex Cutters.

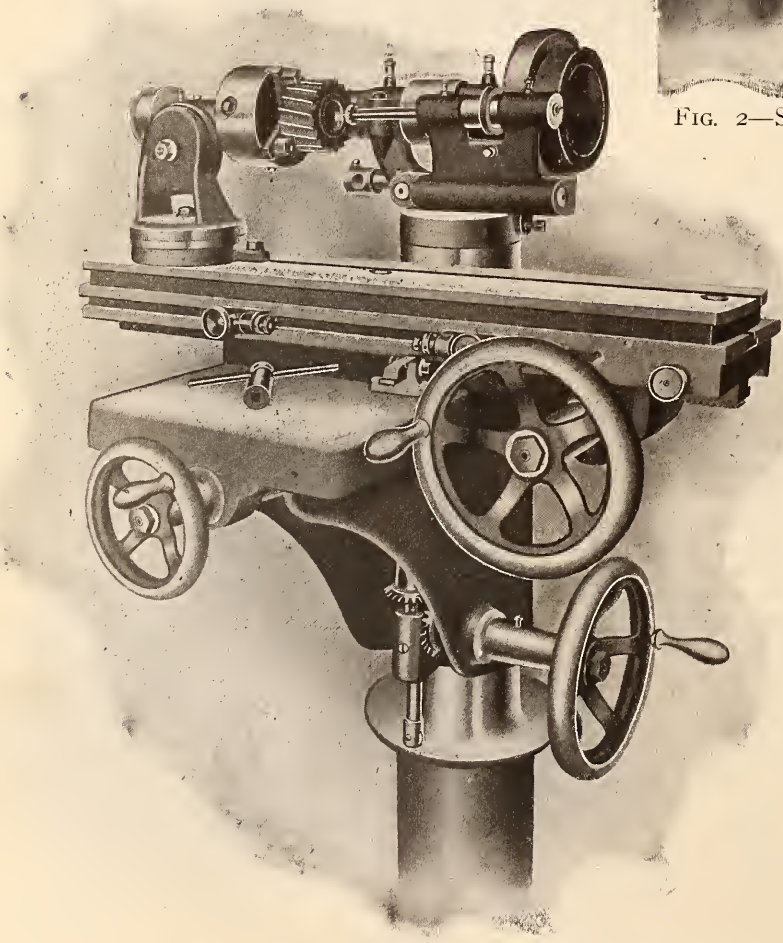


Fig. 3—Method of Internal Grinding.

mands of shop managers who require, at a moderate cost, a medium size universal grinder, accurately constructed and capable of doing a large variety of work economically. The machine is beyond the experimental stage and the high grade workmanship used throughout its entire construction is thoroughly inspected before the machines are delivered.

It is adapted for grinding to size, straight and taper arbors, cylindrical or conical work upon centers or in the chuck; for sizing internal work and for sharpening straight, taper or rose reamers; spur, bevel, spiral, form or end cutters; taps, countersinks, counterbores; for grinding gauges, dies, keys, ends of rods and many other similar operations.

The spindle is carefully ground and all sliding furfaces and bearings are scraped to fit and well protected from dust. The cross feed screw is graduated to thousandths of an inch, also the top swivel slide is graduated to ⅛ in. = 1 foot and is provided with screw adjustment for aligning the centers. The circular standard allows the knee and slide to swing around the head at any convenient angle with the wheels. The wheels are held on taper centers and, when taken off and put back, will remain true.

Fig. 2 shows a special attachment used in connection with this machine for grinding the face of round convex cutters where it is necessary to reduce the outside diameter and grind the clearance on the tooth after hardening.

The fixture is provided with adjustments for bringing the center of the circle on the face of the cutter, directly over the center of the bolt on which the attachment swivels, thus allowing the tooth to be ground in a perfect semi-circle.

The cutter is moved towards the wheel by means of the hand wheel connected with the long slide and using one of the adjustable stops.

This fixture will grind cutters up to 6 ins. diam. by 1½ ins. thick with ¾-in., or 1-in. holes.

Fig. 3 shows the method of internal grinding. The 4-in. chuck and holder is made to fit the lower part of fixture and will swivel in any required angle either vertical or horizontal. The chuck is revolved by a belt from the overhead drum.

The internal grinding spindle is driven by a small friction wheel held against the periphery of the cup wheel holder by means of an adjusting screw. Either kerosene or a very light running oil should be used on this spindle and a coarse emery wheel gives the best results.

The chuck is also convenient in grinding the end of short rods square with the sides, also countersinks, counterbores and bevels on collars, etc.

This grinder is manufactured by the Greenfield Machine Company, Greenfield, Mass.

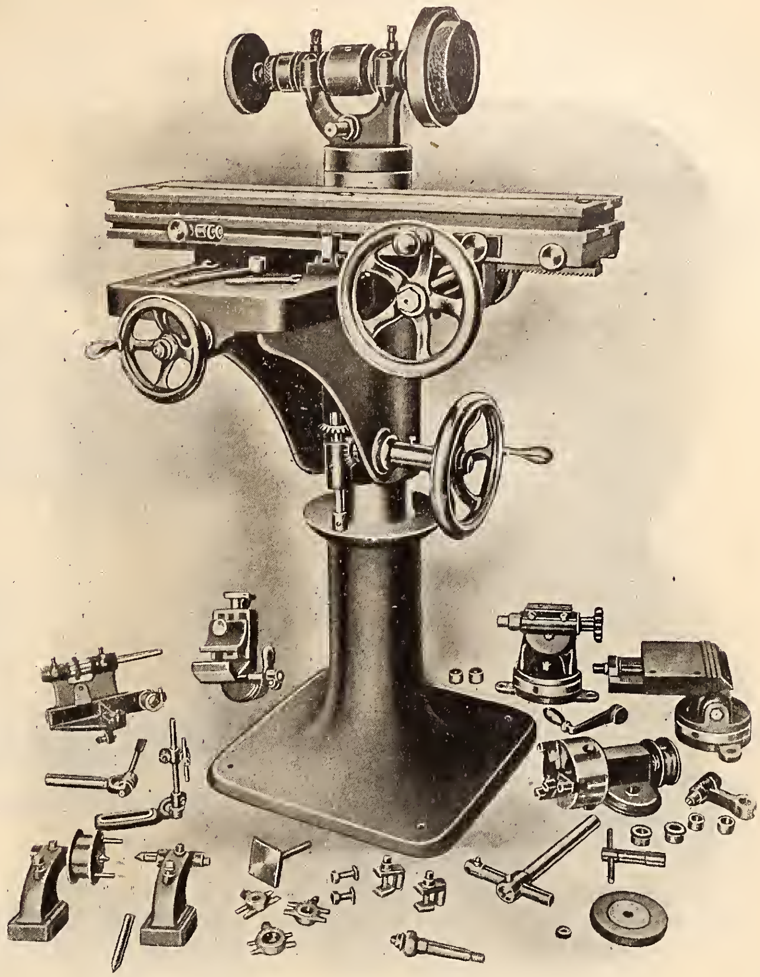


Fig. 1—Universal Grinder.

American Semi-plug Piston Valve

In our issue of July, 1900, we published an illustrated description of the American semi-plug piston valve. At that time we were unable to present any data regarding the efficiency and wearing qualities of this valve. Recently, however, a letter has come to our notice wherein the record of set of valves of this type was set forth, and we reproduce the communication herewith to demonstrate the performances of this valve in service.

Mr. J. T. Wilson, Pres. & Genl. Mgr.,

American Balance Valve Co., Jersey Shore, Pa.

Dear Sir:—Referring to the set of American semi-plug piston valves together with the valve cages for the same, which we have just removed from our engine No. 111 for the purpose of forwarding to you for exhibition purposes at the St. Louis fair. The record of these valves on this engine is as follows:

The valves were applied to the engine June 11th, 1901, and have been in continual service up to March 31st, 1904, or a little over two years and nine months, excepting, of course, when the engine was in for necessary repairs. During this time no repairs of any nature have been made on the valves. They have not been removed from the valve cylinders except for the application of metallic packing and once at your request for examination. During this service there has been no blow whatever detected in the valves, they being perfectly tight when removed, and, from the present condition of the valves, I see no reason why they should not continue to give this same service for five years yet. During the period of service mentioned the engine has made 91,341 miles. I hand you a profile of that part of the road on which the engine has been in service, which shows the amount of drifting done by the engine. In this connection I would advise that it has been our practice to drop the reverse lever on this engine while drifting, the same as we handle slide valve engines. The engine drifts freely and during this service we have noticed no bad effects from drifting. There are no by-pass or relief valves on the steam chests.

I very much regret being unable to secure the bushings for you, as you requested, but we found it impossible to get these bushings out of the cylinders without destroying the same. I examined the bushings very carefully and could not find any shoulder on them. We applied the new valves to the old bushings and could not see any evidence of any blow. We have placed the engine in service and cannot see any difference in the performance of the engine.

Yours very truly,

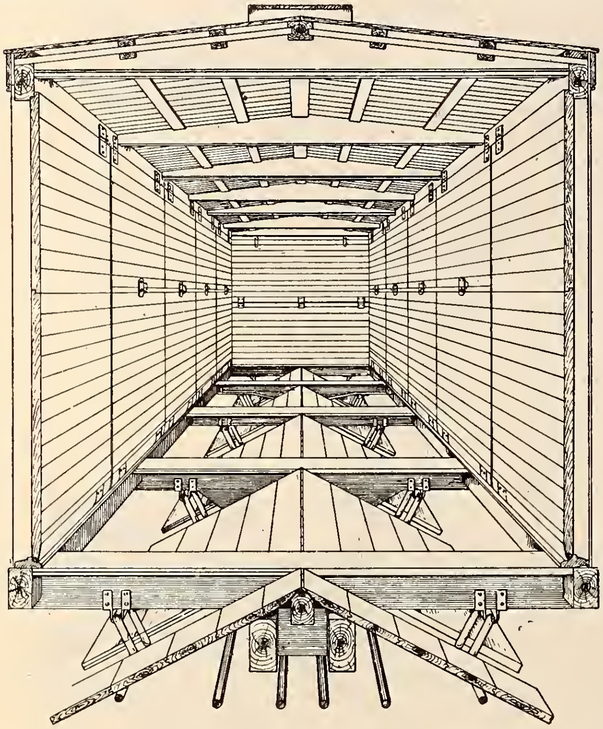
C. R. Williams, General Master Mechanic,

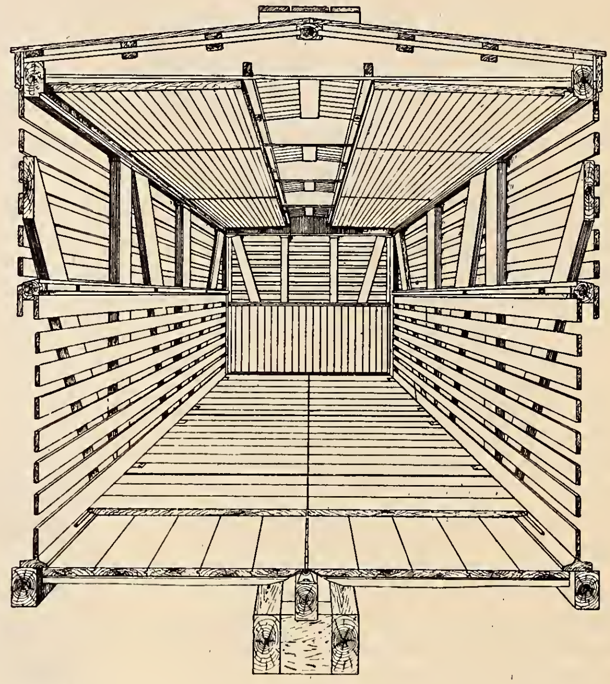
Buffalo & Susquehanna R. R.

Galeton, Pa., April 8th, 1904.

Combination Stock and Grain Car

The Ralston combination stock and grain car illustrated by the accompanying engravings, is designed for the purpose of obtaining the means to provide for the carrying of different kinds of ladings. For instance, live stock, grain, coal, etc., and also to provide for a bottom through which material can be dumped or shoveled, as the case may require. The ordinary live stock car with its open sides and ends can be used only for certain ladings, but when the car here described is converted into an enclosed car, which is easily and quickly done, it can then be used for all ladings, which are carried in a box car. The construction of the underframe consists of side sills, center sill, end sills and cross-bearers with a series of dumping doors on each side of its center. On top of this dumping floor is a secondary floor, made up in sections which swing up and enclose the lower portion of the car. The upper portion has also a series of doors which swing up and are securely fastened to the top of the car, so when used as a stock car the sides and ends are open and when used for other ladings the car is enclosed and the dirty sides of the doors and secondary floor will always be toward the outside of the car, leaving the inside clean.





Combination Stock and Grain Car.

The dumping doors are raised and lowered in four sections, each section is operated by a crank arm shaft, having its crank arms pivoted at the bottom of the cross-bearers. At the end of crank arms shaft outside of the end sill is a lever, a reversible ratchet and a reversible pawl. This lever, ratchet and pawl provide the means for revolving the crank arm shaft. A second reversible ratchet and pawl is placed close to the end sill to absolutely hold the crank arm shaft in its position when the doors are closed.

In order to securely lock the doors when up to the full line position, the crank arms supporting the doors have their tops inclined about one-half inch from the vertical towards the center of the car. This position will prevent the shaft from turning outward to the side of the car when the car is in motion, and will also serve to take up part of the stress that may come on ratchet and pawl at the end of the shaft outside of the end sill.

When the load is to be dumped, the operator disengages pawl, takes hold of lever, engages pawl into reversible ratchet and moves the lever towards the side of the car, thereby revolving the crank arms from their vertical position and allowing the doors to drop. By closing the doors this action is reversed. These cars can be built either with wood or steel underframe. The car is so constructed that grain can be carried without leakage.

Liquid Car Cleaner

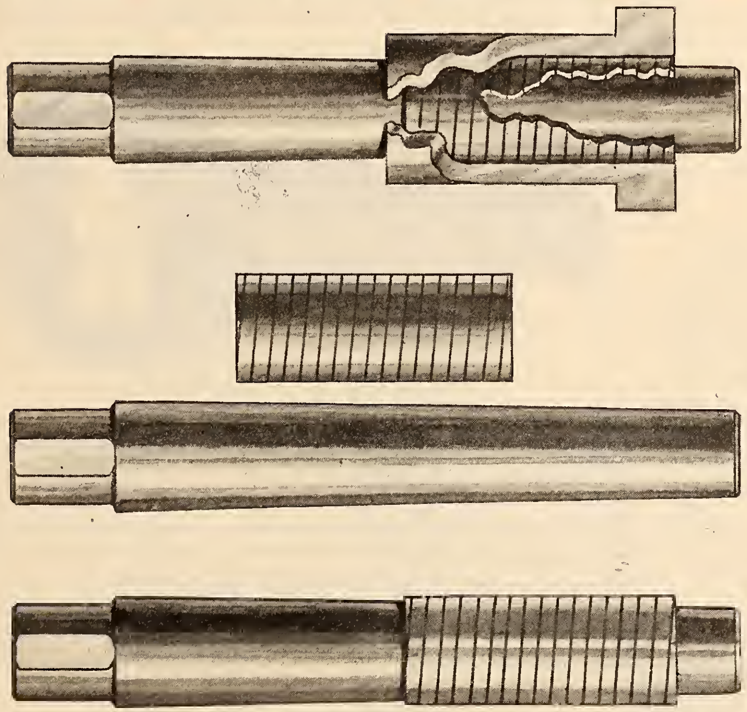
The pride which railroads take in the appearance of their rolling stock and equipment is well known. Hence the army of painters and cleaners employed by railroad companies throughout the country. A traveler feels much more comfortable in a clean car than in one which gives the appearance of lack of care and it is but natural that the journey is more comfortable when within clean surroundings.

With these facts in view the necessity of a good material for coach and locomotive cleaning is apparent. This need is largely met by a liquid cleaner manufactured by the Henry Roever Company. Besides being an excellent material for coach cleaning, this liquid is equally efficient in cleaning office furniture, especially where ink spots occur. The liquid is very easily handled. In cleaning a surface, the parts to be cleaned are rubbed with waste well saturated with the liquid and then the parts are rubbed dry with a piece of clean waste. If it is desired to substantiate these claims, a sample bottle of improved liquid car cleaner may be obtained from the Henry Roever Company, Chester, Pa.

Two Useful Shop Devices

The accompanying illustrations show the general appearance and details of a useful shop device designed by Mr. George R. Rich, of Chicago. There is shown an expanding mandrel which is quite simple in use and construction. The mandrel conists of a taper arbor of tool steel and a hardened spring bushing. In making this device the arbor is first turned in a lathe. It is then tempered and ground. The spring bushing is hardened and the inside of the bushing, or sleeve, is ground to fit the taper of the arbor. The outside of the sleeve is ground perfectly straight while on the arbor with which it is to be used. By twisting the bushing in the direction in which the spring is wound, it slips over the arbor very easily, so that there is no difficulty in adjusting or removing it. When in service the bushing cannot slip, for any force applied against the work tends to tighten the bushing against the arbor, clamping it more firmly. A set consists of 16 arbors and 32 bushings, varying in size from one inch to seven inches, inclusive.

He has also designed another device to give a machinist the advantage of air hardening tool steel for machine shop purposes, independent of the use of a tool dresser.



Expanding Mandrel.

It is especially suited for boring brass bushings, connecting rod brasses, combination bearings, gears, couplings, etc. The device consists of an arbor hardened, centered at both ends and slotted to allow for the travel of the outside sleeve. This sleeve is guided by the arbor and carries the tool. A projecting arm is attached to the sleeve by six small tap bolts. The arm is placed in the tool post of the lathe on which the boring bar is being used and by applying the feed in the usual manner, the tool is driven against the work. The tool is merely a small cutting edge of high speed tool steel secured in the sleeve. It fits into two slots of the sleeve and is secured by a round nut operated by a spanner wrench. Between the tool and the nut a soft steel washer is inserted and a bit of leather packing in the back of the nut prevents dust and grit from working its way over the threads.

These devices are manufactured by the George R. Rich Manufacturing Company, 171 and 173 South Canal street, Chicago, Ill.

The Columbia Lock Nut

There is a great and ever-increasing demand for a fastening or nut that will stay fastened and can be relied upon under all circumstances. A large number of accidents which are often charged against defective machinery, are really caused by loose nuts which fall off and release the parts which they are supposed to secure.

To meet this demand the nut illustrated by the accompanying engraving has been devised. Fig. 1 shows the nut in position on a bolt and Fig. 2 shows the nut assembled. As shown by the illustrations, the nut consists of an inner and an outer part, which when assembled are a unit. The inner nut, which is threaded to receive the bolt, is slotted throughout its length and is tapered from above downward to fit and correspond with the taper of the outer or binding nut. The device is a combination of three mechanical powers—although only in two parts—the wedge, the screw and the lever. It is a positive lock nut which will remain indefinitely where placed; it automatically fastens both bolt and nut absolutely.

This nut is manufactured by the Columbia Nut & Bolt Company, 304 East Washington avenue, Bridgeport, Conn.

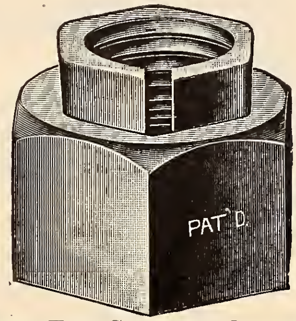


Fig. 2—The Columbia Lock Nut.

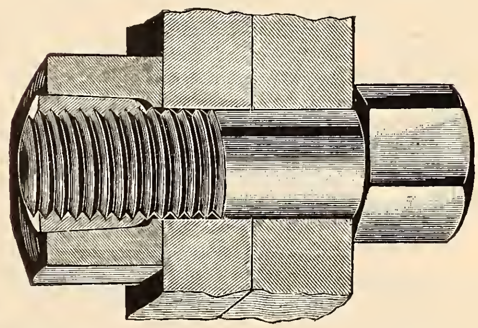


Fig. 1—The Columbia Lock Nut.

Farlow Draft Rigging

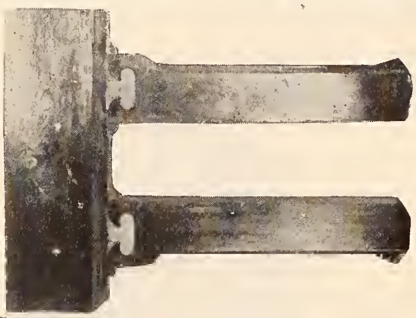
The Farlow Draft Gear Company, of Baltimore, Md., exhibited four types of draft gear at the recent conventions of the Master Car Builders' and American Railway Master Mechanics' Association. This company manufactures the following several types which they exhibited: Single, twin, tandem and friction, as applied to both wooden and metal cars, applicable to wooden or metal sills. It is interesting to note that one of the riggings shown is the same that was tested in the M. C. B. testing machine at Purdue University, wherein it received thirty-five blows, the capacity of the machine. After this test and as it appeared as a part of the exhibit, the gear was in good condition and still fit for service. This is the twin style as was arranged as applied to wooden sills.

The Farlow draft gear was illustrated in a recent issue of the Railway Master Mechanic and therefore requires no further description here. It is worthy of mention, however, to observe that the gear has been improved during the past year by putting a filler block between the end of the rigging and the bolster in order to give additional strength in preventing the gear from being driven back by buffing shocks.

There are six points in the gear which offer resistance to shocks, and the rigging is so designed that any part can be replaced by the removal of any of the keys. This can be done by one man wherever the car is located. All parts of the gear are furnished by the manufacturing company and no shop labor is necessary for its entire application.

Garrett Interlocking Draft Arm

The Garrett interlocking draft arm has been designed to attach the draft gear direct to the body bolster of the car. Its principal feature is in the arrangement by which the draft arms are so secured that pulling strains act directly against the bolster and are transmitted thereby to the several sills. The attachment of each arm is made by a lug of sufficient strength, which is cast to the bolster. This lug has a T-head and extends the full width of the draft arm. The arm is cored out at the end to enclose the lug, with which



Garrett Interlocking Draft Arm.

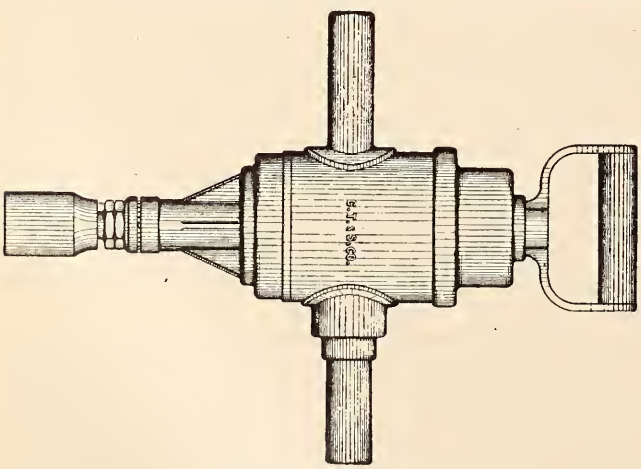
it makes a snug fit. A shoulder extending the width of the bolster is cast on each side of each draw arm to prevent the metal of the arm from expanding when under strain.

By this method the draw arms may be readily applied and replaced. Its design accomplishes the distribution of pulling and buffing strains among all the sills, preventing pull-outs and the breaking of center sills. The draft rigging is firmly secured to the framing immediately above the center pin and throughout the width of the car. This arrangement is the design of Mr. M. A. Garrett, of Chicago.

Chicago Tool & Supply Company

The accompanying cuts illustrate the "Green" pneumatic hammer, and "Hayes" electric drill, which have recently been placed on the market by the Chicago Tool & Supply Company.

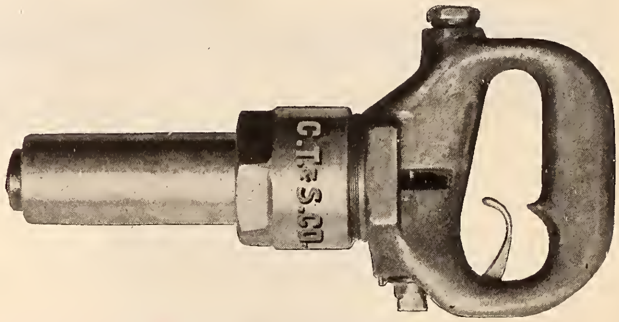
The "Green" pneumatic hammer is made in four sizes, viz., 2-inch and 3-inch stroke for chipping, calking, flue beading, etc., and 6-inch and 9-inch stroke for riveting purposes. It has a plain piston type valve, placed vertically in the handle at the rear of the cylinder. The throttle valve is parallel



Hayes Electric Drill.

to the main valve, and is directly behind it, allowing a direct flow of air through both valves to the cylinder. The position of the main valve does away with any valve block or casing, and permits the hammer to be taken apart without removing the handle. A very unique feature of this hammer is the fact that the piston can be moved backwards and forwards by simply blowing through the valve, which supports the manufacturer's claim that it is very powerful and economical in the use of air. The locking device fits over a pin placed in the cylinder, and being threaded and tapered, makes it absolutely impossible for the handle to work loose. Its simplicity in construction (only 14 distinct parts, including pins, screws, springs, etc.) will reduce the cost of repairs to a minimum. During a recent test with a No. 3 hammer, having 3-inch stroke, a ⅜-inch cut 3-feet long in ½-inch boiler plate was made in eight minutes.

The "Hayes" electric drill can be used with a breast plate, screw feed or grip handle, and is suitable for drilling holes up to ½-inch in metal and ¾-inch in wood. A circulating fan is mounted on the armature shaft, which forces a con-



Green Pneumatic Hammer.

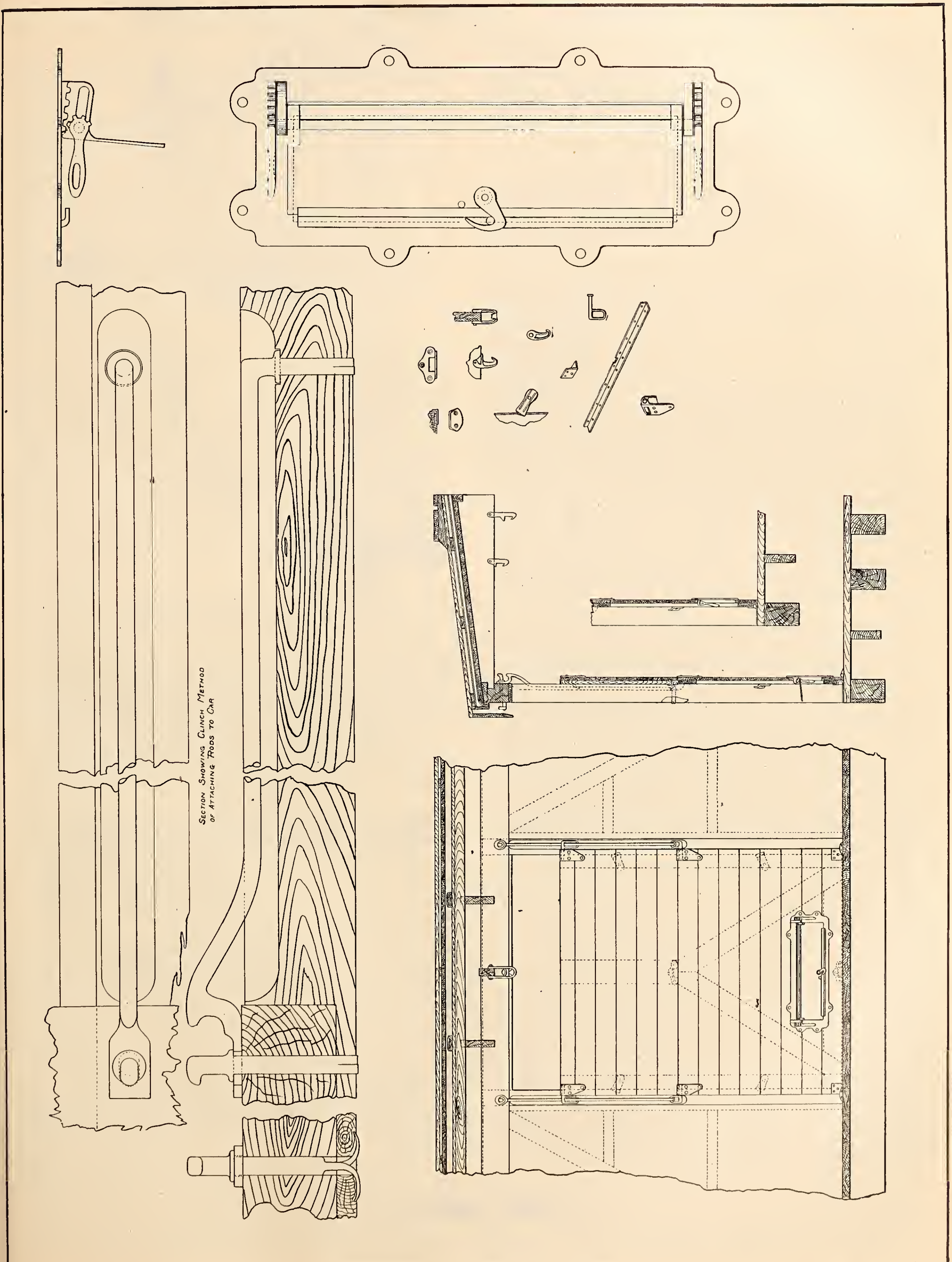
stant current of air through the motor casing, preventing over-heating of the motor. This machine is adapted to drilling in metal, marble, wood, etc., and will be found very desirable by shops having this class of work to perform, but whose requirements do not demand a complete pneumatic tool equipment, as it can be operated by attaching to any electric light socket of 110 or 220 volts direct current.

Complete information regarding these tools can be secured by writing the Chicago Tool & Supply Company, 1532 Monadnock Building, Chicago.

The McGuire-Cummings Grain Door

The accompanying line drawings illustrate a design of grain door which is cheap, simple and durable, embodying up-to-date improvements which make it practical and economical. An expensive part of the cost of the maintenance of grain doors has been overcome by the clinch method of fastening the rods to the door posts, by means of which the rods are held securely and cannot get loose. The ordinary manner of fastening the rods is by the lag screws and if, as in the case of poor workmanship, the lag screws are driven into place instead of being turned, the rods often become loose and are easily taken off. Where the fastenings are clinched this difficulty is removed. The increased size of the box cars demand a correspondingly high door. The old method of hinging the fold to the door made it too heavy for one man to handle. This difficulty is overcome by making the doors in two pieces and independent of each other, but both on the same rod, so that one man can readily handle them. The increased height of grain doors necessitated a simple and inexpensive release in the door, to relieve the pressure before unloading. This requirement is met by a safe and practical release, which is cheaply attached to any door; is even stronger than the balance of the door, and can be sealed if necessary. The rods on which both doors operate are put in a rabbet, so that the door fixtures take up no room in the body of the car. The doors when not in use are up under the roof, where they serve as a protection in a place where the roof is most liable to injury.

The McGuire-Cummings Manufacturing Company, Sangamon, Morgan and Kinzie streets, Chicago, Ill., the manufacturers of this door, guarantee it for five years.



McGuire-Cummings Grain Door.

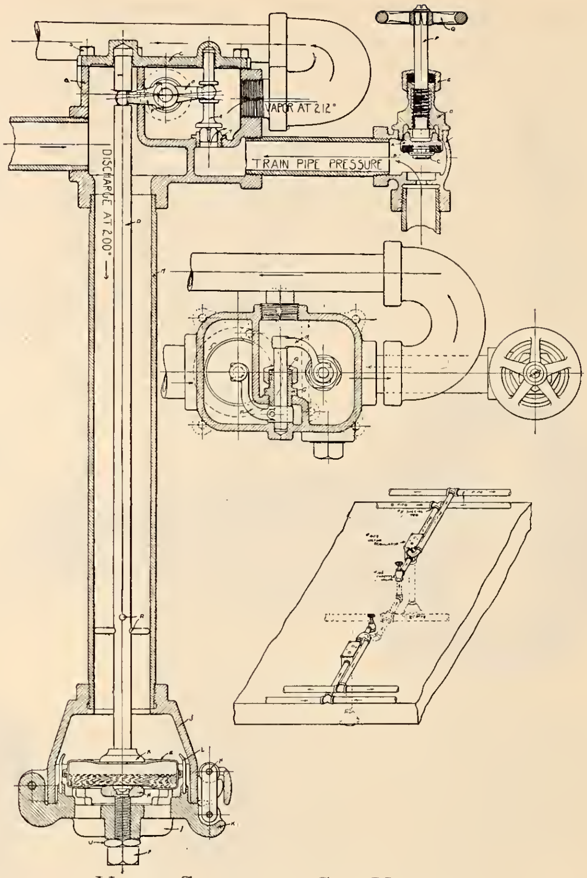
Vapor System of Car Heating

The vapor system of heating passenger cars by steam operates automatically and requires no pressure on the radiating pipes. All radiating pipes used in this system open freely to the atmosphere. As no traps or drip valves are required, the inconvenience resulting from the freezing of traps or drips is positively eliminated. A valuable feature claimed by the originators of this system is that every car in the train is heated exactly the same, regardless of variation of train pipe pressure, so that there is no overheating and a mild, agreeable heat exists instead of an intense or overheated condition. The system is said to put passenger car heating on a par with modern and up-to-date methods used in heating large buildings.

The operation of the system is evident from the accompanying line drawing illustrating the principal parts. An expansive diaphragm is used to open and close the supply valve and the passage for the discharge of condensation is left entirely open to the atmosphere. When steam entering from the train pipe has circulated through the radiating pipes and finally reached the outlet, it expands the diaphragm, which closes the supply. The diaphragm then instantly contracts enough to allow just sufficient steam to enter the radiating pipes to make up for what is being condensed. This condition of affairs continues indefinitely as long as steam is on the apparatus. The temperature of the outlet of the apparatus (which contains the diaphragm) is maintained at a temperature of about 200 degrees, and necessarily all the pipes between this outlet and the inlet are maintained at a temperature between 200 degrees at this outlet point and about 212 degrees at the inlet point. As the radiating pipes are open to the atmosphere it will be readily understood that their temperature can never exceed 212 degrees at the hottest point.

The details of operation are as follows: Steam leaves the train pipe at the strainer cross, passes through the throttle supply valve and through the automatically operated valve "A" in the intake chamber of the vapor regulator. Until the steam reaches the valve "A" it is, of course, under train pipe pressure. After passing through the automatic valve "A" it passes out of the vapor regulator and through the usual feed pipe and into the radiating pipes at the side of car. After passing through these pipes it finally reaches the outflow chamber of the vapor regulator, and passes down the tube "N" and around the expansive diaphragm and out to the atmosphere. Heating the diaphragm to about 200 degrees closes the automatic valve "A" but allows just enough steam to enter the heating pipes to maintain the temperature of 200 degrees at the outlet point.

The vapor regulator is divided by a partition into two parts, an "intake chamber" and an "outflow chamber," so that steam entering the device at valve "A" has to pass entirely through the radiating pipes before it reaches the outlet and comes in contact with the expansive diaphragm. Motion from the diaphragm at the outlet, to the automatic valve "A" at the inlet, is transmitted through the dividing partition by means of the lever "O" passing through the stuffing box "Q". As the pressure is inappreciable on either side of this stuffing box, and as the motion of the axis of the operating lever amounts to almost nothing, it will be evident that the wear of this packing is practically nothing, and need not be considered as a feature needing attention after the device is in service. The maximum movement of the valve "A" is one quarter of an inch. The weight of the



VAPOR SYSTEM OF CAR HEATING.

rod "D" will always keep the valve "A" open when the diaphragm is cold.

The average life of the expansion diaphragm is from three to five years. The strainer cross on the train pipe is used to prevent dirt, scale, pieces of rubber hose, etc., from passing out of the train pipe and getting into, or interfering with, the proper working of the automatic regulator valve "A".

This device is marketed by the Chicago Car Heating Company, Railway Exchange, Chicago.

Chicago Graphite Manufacturing Company

The Chicago Graphite Manufacturing Co., located at No. 649 the Railway Exchange building, Chicago, was organized July 1, 1904, as successor to the Copper Cliff Mining Co., of Chicago. The officers of the company are: Albert S. White, president; J. H. Macauley, vice-president; E. R. Lambkin, secrtary and treasurer.

This company is a candidate for railway patronage in the line of paint material. Mr. White, the president, was for thirty-three years in continuous railway and transportation service, having started in 1868. He has been connected with some of the leading railroads, being at one time general freight agent of the Big Four railroad. His experience and that of the other officers is such that they are in position to know what the railroads demand in the way of paint.

The company manufactures a general line of paints, but makes a specialty of graphite protective coatings, and they would be pleased to furnish further information on request at their office.

Master Car Builders' Association

Abstract of Reports

WHAT IS THE BEST PREVENTIVE OF RUST ON STEEL CARS?

Committee: H. S. Hayward, chairman; J. S. Lentz, W. T. Gorrell, T. H. Russum, C. E. Fuller.

In general, the methods pursued in the treatment of steel cars as determined from communications received from representatives of forty-five railroads. are as follows:

Inside of car—wire brushes, scraping, sand blast and hammering, and in one case, after cleaning, the car is blown off with compressed air.

Outside and underneath—wire brushes, scraping and sand blast, and in one instance, gasoline paint burner and scraping.

Character of paint used for first coat, varies fram graphite paint, carbon paint, red lead and lampblack and oil, to the various patented paints now on the market. For the second or succeeding coats practically the same character of paint is used, with the exception of a few roads, which use their standard freight car color.

The number of coats of paint applied varies from two to three.

The time between paintings varies from eighteen months to three years. The majority of answers indicate, however, that there is no specified time for painting, it being done whenever the condition of the car requires. One road states that it has discontinued the painting of steel cars, while another road follows up its cars very closely, and whenever rust appears it is removed and the spot repainted.

As regards the points where the greatest amount of corrosion is found, the general opinion of the roads operating steel cars is that it occurs at the seams and joints, slope sheets and hoppers. The sides also deteriorate very rapidly from the following abuses, such as loading of hot billets or hot cinders in the cars, also hammering the sides with mauls for the purpose of loosening load. The practice of allowing cars loaded with coal to stand on siding or in storage yard for an undue length of time is found to be detrimental to the cars, as the sulphur water from the coal destroys the sheets very rapidly.

The use of brush and air for applying paint is about equally divided among the different roads, some preferring the brush for the first coat and air for the succeeding coats, while one road uses air at the seams and a brush on flat surfaces.

Your committee feels that in consideration of the limited experience in the use of steel cars, and in view of the lack of definite results from experiments which have been made or are being made, that its knowledge of this subject is not complete enough to allow of positive recommendations being made as to the best methods of treating steel cars in order to prevent the formation of rust on same. It would, however, submit to the association the following suggestions:

First. For new cars.

The steel should be thoroughly cleaned of all rust and furnace scale before the car is assembled.

All joints before assembling should be thoroughly coated with coal tar.

After car is assembled, all grease should be thoroughly removed from the steel, and same given coat of carbon or graphite paint on the outside and underneath, and the inside a heavy coat of crude petroleum, coal tar applied hot, or some similar substance.

The outside to be given a second coat of graphite or carbon paint, as may be desired.

Second. For old cars:

All scale and rust should be removed wherever it appears on the car, by steel brushes or scrapers; and in the case of the inside of the car, by any of the above methods or by the use of pneumatic hammers or mauls.

After all scale and rust have been removed, the car should be thoroughly cleaned with steel scrapers or wire brushes, and blown out with air, in order to present a clean surface for the paint.

The methods of painting recommended for new cars should be followed out in the case of old cars, after a clean surface is obtained.

Third. As some of the most prolific causes of deterioration of steel cars are the loading of same with hot billets, the use of mauls, bars, etc., on the outside to assist in the unloading of cars, and the allowing of cars loaded with soft coal to stand a long time with the load in same, it is recommended that steps be taken to do away with these practices as much as possible.

Your committee believes that if the above recommendations are followed out, and if care is taken to repaint the outside of and underneath cars at least every eighteen months or two years, coating the inside with crude petroleum or coal tar about once a year, that excellent results will be obtained.

Your committee has refrained from going into the sand blast question in detail, as it is an open question as to whether the use of the sand blast is desirable for this class of work, on account of the hardships it imposes upon the men operating same, and also on account of the expense attached to its use, due to the very rapid deterioration of the hose and nozzles.

THE USE OF STEEL IN PASSENGAR CAR CONSTRUCTION.

An Individual Paper by Wm. Forsyth.

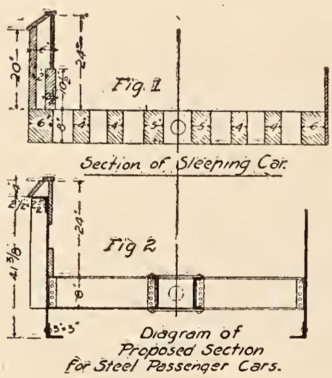
Greater capacity has made increased strength a necessity for the freight equipment of railroads and the attending economy of operation has made it desirable to build large numbers of high-capacity freight cars of steel construction. Larger capacity in passenger equipment has been obtained by increasing the length of the wooden car in many cases to 70 feet over end sills. The effect of this has been to weaken the car. While the strength of freight equipment has been enormously increased in recent years, no such improvement has been made in the ordinary passenger equipment of American railroads, such as coaches and baggage cars. Under these conditions we are constantly running the risk of the collision of strong steel freight cars with weak wooden passenger cars.

The use of steel underframes for passenger equipment has been quite general in foreign countries for many years and a large portion of the body of the best foreign passenger cars is made of steel. This construction not only contributes to greater strength and stiffness, but the fire risk is greatly reduced. In this country, while the value of steel in car construction is realized and has been so largely employed for freight cars, it has been applied to passenger cars to a surprisingly limited extent.

The steel platform became a necessity when full vestibules were introduced, as the wood construction would not carry the weight and endure the blows to which car ends are subjected. Steel plates ⅜ or ½ inch thick are used on the side of the longitudinal wooden sills in mail cars and steel angles and plates are introduced in the end framing, but all this is a half-hearted makeshift compared with the complete steel underframe which should be coming into use.

While it may be the proper thing to reinforce old equipment in this way, there seems to be no good reason why new passenger equipment should not be built with entire steel underframes. The large experience which has been obtained in the construction of steel freight cars should render it an easy matter to adapt this metal construction to passenger equipment, and it is difficult to understand why it has not been introduced at least in an experimental way. The Master Car Builders' Association has never had a committee or a report on steel construction for passenger cars, and, in fact, passenger car framing has not been discussed by the association since 1885—more than eighteen years ago.

The development of the modern passenger car has been worked out almost entirely by the car manufacturing companies and not by the railroad. More attention has been given to decoration and the creation of an attractive interior than to increased strength in construction which would contribute to greater safety. The higher speed of trains and a dense traffic, both freight and passenger, have increased the number of accidents, especially collisions, and the number of passengers killed and wounded by American railroads has increased to large proportions which is not at all creditable to the management. The great number of casualties in such accidents is due in a large measure to weakness of the equipment and the indications are that improvement in the strength of our passenger equipment has not kept pace with the faster schedules and more frequent trains which increase the liability to accident. The competition between the different lines has advertised itself by offering to the public luxurious trains of buffet, dining, parlor and sleeping cars, which are built by the contracting car companies, and each successive train has added greater weight to the fast express trains until the locomotives are scarcely equal to the task of delivering them at terminals on schedule time. The railroads have apparently placed no limitations on the weights of these cars, and as the length has been increased to 70 feet out to out end sills, the total section of wood sills and car sides has been increased to assist in supporting the wide space, and in this way the modern sleeper or dining-car, built almost entirely of wood, has become heavier until they now weigh sixty tons per car. The contracting passenger car builders have no interest in the cost of transporting this load and the railroad officers have not carefully considered it. The passenger agent and the public are chiefly concerned with the effect of the beautiful interior with its luxurious furnishing. The record of the past year should suggest to sober-minded railroad managers that the element of safety in the construction of passenger trains, as a whole, deserves some serious attention, and the question of the excessive weight of parlor and sleeping-cars must have a bad effect on the economy of operation. The parlor cars and sleepers are considered satisfactory in regard to strength in resisting wrecks and collisions, but they are not fireproof and their strength is obtained at the expense of great weight. They are thus a menace to the weaker cars, coaches, chair cars, baggage and mail cars in the front of the train. The average passenger train is not symmetrical in strength throughout its length and the weakest part is in the most vulnerable place. The problem, then, is how can this ordinary equipment, in which the larger part of the passengers are carried and in which most casualties occur, be made as safe as the sleeping cars which, in wrecks, now ram them like a battleship in collision with a ferryboat. The necessity for stronger passenger cars of the ordinary grade is not alone due to this fact nor to the high average speed of our trains but to another reason already mentioned which has been illustrated in a number of fatal wrecks in the past year and which is the increased risk due to the presence of loaded fifty-ton steel freight cars on the same or adjoining tracks. In collision with the old wooden freight cars the wooden coach had some chance of escape from total destruction, but, under present conditions, when engaged in a wreck with heavy steel freight cars the wooden passenger car has been cut to pieces and ground up with its contents of human beings. Some of the reasons which have made steel construction successful for high capacity freight cars will also apply to passenger equipment when the length of the span becomes the important element instead of carrying capacity in tons. A study of the comparative efficiency of wood and steel for a structure like a seventy-foot passenger car may be made by reference to the diagrams, Figs. 1 and 2, showing the usual construction in wood, and a proposed section for a steel passenger car frame. It is often claimed that for equal weight wood is as strong as iron or steel, and for ordinary rectangular beams this may be true, but it is not correct when steel is disposed in the shape of a deep plate girder with a thin web and heavy flanges. In this way a large moment of inertia and a high moment of resistance is obtained per unit of weight, which can not be secured in wood, as there is not room enough in the space available in car construction for the volume of wood



required. To illustrate this we may take the section of the side of a wooden car below window sills as equivalent to a solid beam 4 inches thick by 28 inches deep, and the weight of a cubic foot of Norway pine 40 pounds per cubic foot. The weight of steel being 480 pounds per cubic foot, the ratio of weight of pine to steel is 1 to 12. The ultimate strength of pine may be taken as 4,000 pounds per square inch, and of low carbon steel 50,000 pounds, the ratio being

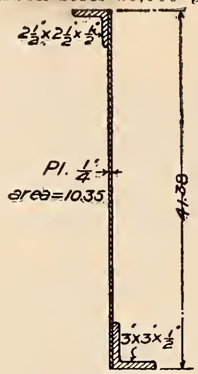


FIG. 3.

about the same. The strength of the sections will be proportional to their moments of resistance. Now—

$M = fs.$

f = safe unit load = 1,200 pounds for Norway pine.

S = Section modulus.

$$S = \frac{bh^2}{6} = \frac{4 \times 28^2}{6} = 523, \text{ for wood beam.}$$

$M = 1{,}200 \times 523 = 627{,}600$ inch pounds.

For the steel section, taking 16,000 pounds per square inch as outside fiber stress in tension at lower flange and 10,000 pounds unit stress in upper flange, the moment of resistance is found as follows:

Section modulus top flange $S_c = 162$.

Section modulus bottom flange $S_t = 170$.

$\therefore M_c = 162 \times 10{,}000 = 1{,}620{,}000$ inch pounds,

and $M_t = 170 \times 16{,}000 = 2{,}720{,}000$ inch pounds.

The top flange being the weaker, its value of M will govern and

$$\frac{1{,}620{,}000}{627{,}600} = 2.58$$

Which shows that this particular steel girder is about 2.6 times as strong as the assumed wooden one. The wood section one footlong weighs 31 pounds, and the steel sectios 52 pounds. The comparative strength for equal weight is therefore 1 to 1.55 in favor of steel.

In order to develop this idea into a complete plan for a coach of modern dimensions with steel underframe and much of the body of steel, I secured the co-operation of Mr. George I. King, general manager and vice-president of the Middletown (Pa.) car works, and who has had a large experience in the designing of steel freight cars and steel underframes for interborough electric cars. Mr. King's design is shown in general plan, Fig. 4, and details in Figs. 4a, 4b, 4c and 4d.

It will be seen that the side of the car below the windows is formed of a deep steel girder made of ¼-inch plate, 41⅜ inches deep with 2½ by ½-inch angles at the top and 3 by 3 inch by ½ inch at the bottom. The center sills are made of 12-inch channels, 25 pounds per foot, with lattice bracing and flange plates 6 inch x 1 inch on the bottom and

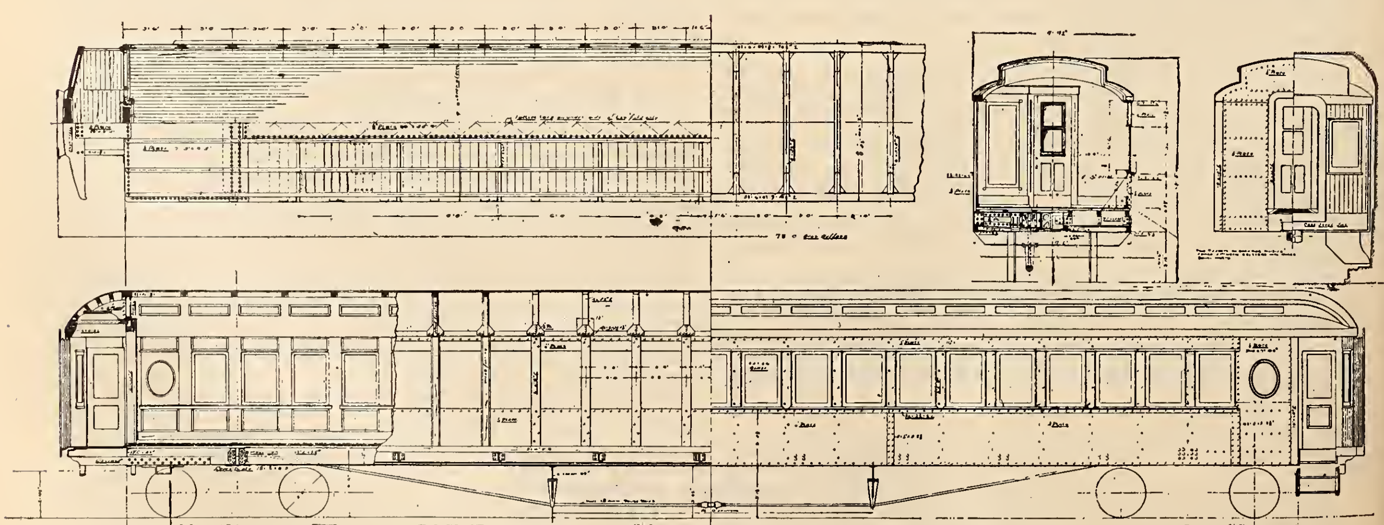


FIG. 4—PASSENGER CAR WITH STEEL UNDERFRAMES.

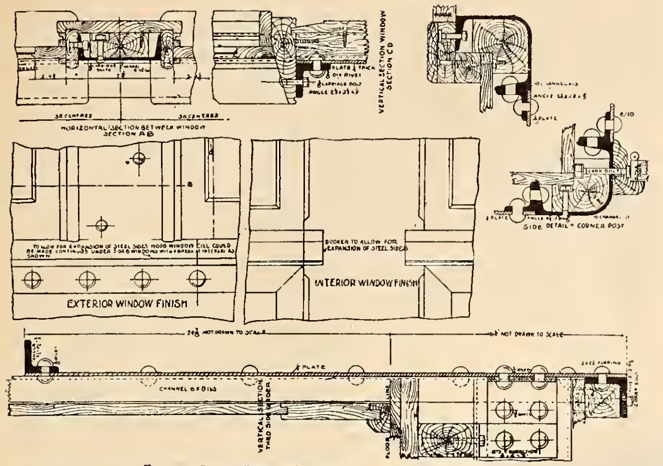


Fig. 4a. Plate Girder, Side Sill and Channel Iron Posts.

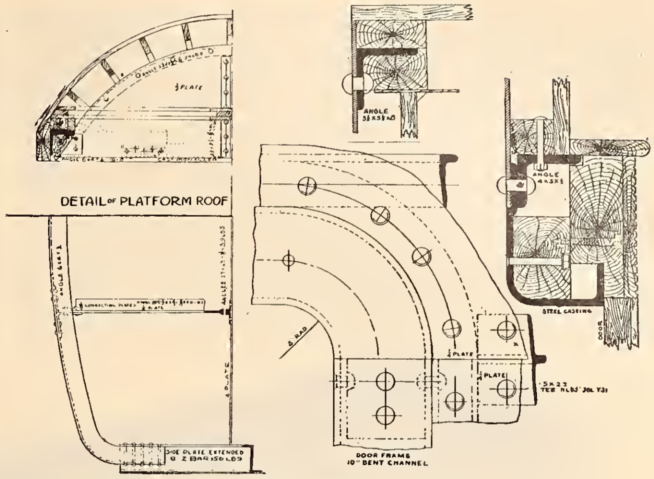


Fig. 4d. Platform Roof and Door Post.

½-inch plates 24 inches wide on top. The posts between the windows are made of 6-inch channels which extend from floor to roof. The longitudinal plates are 6-inch Z bars, 15.6 pounds per foot, and steel carlines connect these for the upper deck. The whole outside and ends of the car, except the windows and doors, are made of ¼-inch steel plates with rivet heads plainly showing. The center sills and side sills are connected by 7-inch channels 12¼ pounds per foot, and the body bolsters are quite similar to those used in steel freight car construction. The end corner posts and the end door posts are formed of 10-inch channels, 15 pounds per foot, bent to a quarter circle. Some of these features, in connection with the Z-bar plates and the end posts, have been patented by Mr. King. The whole side of the car is a compound steel girder made up of the deep plate girder below the windows, with numerous posts riveted to it, and a stiff side plate connecting them at the top, the whole construction being tightly bound together. It is probable that the first cost and the weight of a car of this design will be somewhat greater than the regular wooden coach, but from the experience gained in building such cars it is believed that with a steel car of somewhat similar construction, having the advantage of pressed steel forms wherever possible, and such improvements as are always developed in actual construction, a cheaper and lighter car can be built by the use of steel which will be stronger in resisting the force of collision and practically fireproof. The steel passenger car will thus be developed by experience in construction, by a display of ingenuity in designing efficient details, and the adaptation of fireproof materials to a simpler inside finish.

It will be seen that all the large timbers are removed and

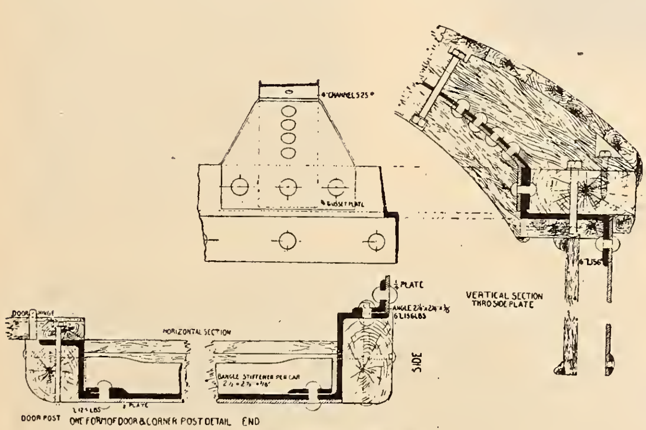


Fig. 4c. Side Plate and Corner Post.

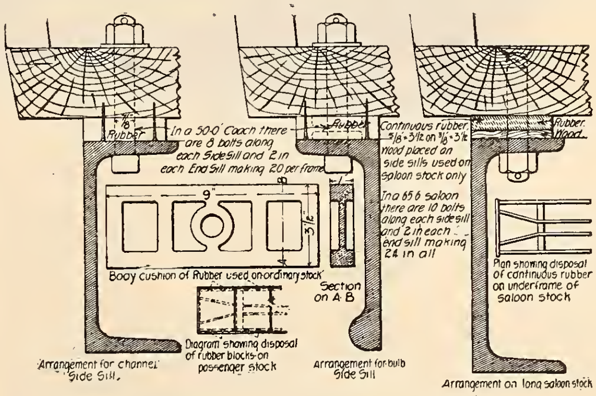


Fig. 5b. London & Northwestern Railway.
Rubber strips in attachment of car body to steel underframe.

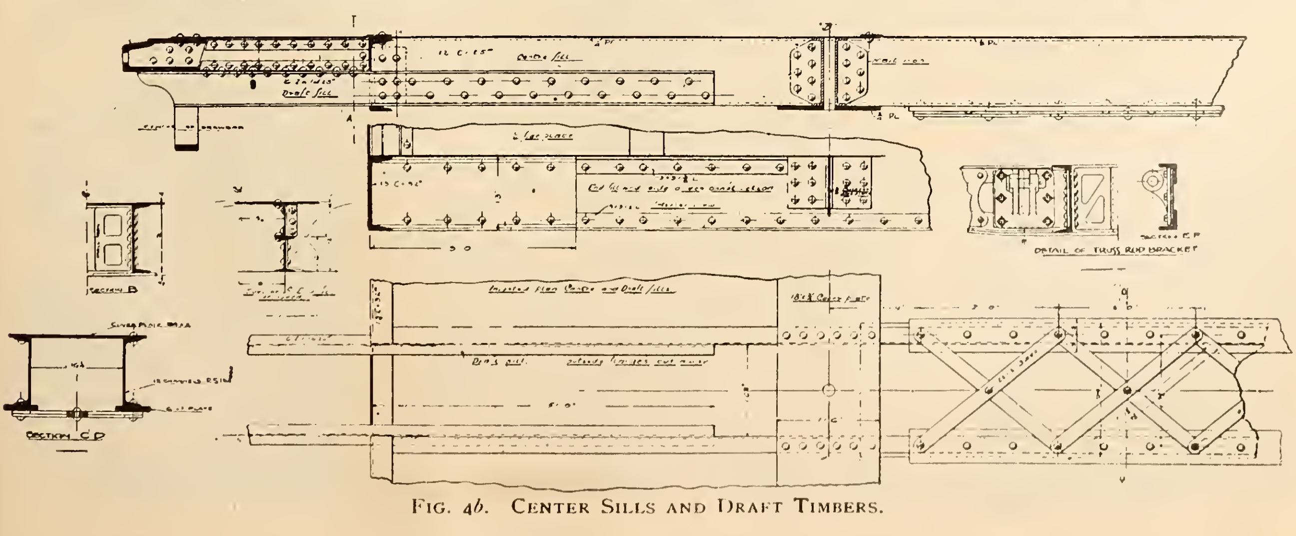


Fig. 4b. Center Sills and Draft Timbers.

the floor can be made entirely fireproof. The quantity of wood in the car body is very much reduced and the small sections could easily be made fireproof. It is desirable to have wood or an equivalent non-conductor on the inside of a steel car of this or almost any other construction, not only for inside finish but as a non-conductor in order to make the interior comfortable in hot or cold weather and to prevent noise. Steel underframes for sleeping and dining cars, 65½ feet long, have been built in England. In those built by the London & Northwestern Railway for the fast trains on the east coast route between London and Edinburgh the center sills are of 9¼ by ⅜ inch channels, and the side sills 10 by ⅝ inch channels. There are four truss rods, the outside one being 1½ inches in diameter, and the center ones are 1¼ inches in diameter. They are braced diagonally and the drawbars are continuous. In order to prevent noise and to make the car less rigid, the sills are covered with a thin strip of pine and on this a continuous line of rubber, and the car body is bolted to the sills as shown in the cut (Fig. 5b). The car body weighs 58,000 pounds, two trucks 32,000 pounds, total 90,000 pounds. A model of this car is now on exhibition at the St. Louis Exposition.

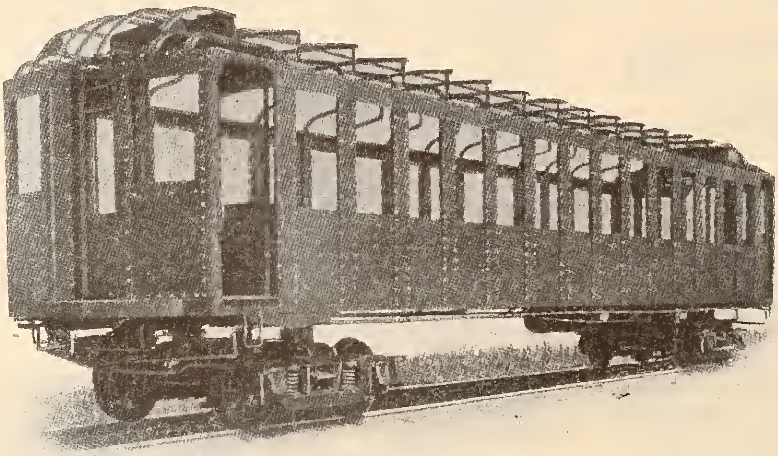


FIG. 6—INTERBOROUGH ALL-STEEL CAR.

The majority of the large cars for long distance electric lines are now built with steel underframes. The new cars for the Rapid Transit Company of New York are built almost entirely of steel and the exterior framework is shown in Fig. 6. These cars are 51 feet 2 inches over platform sills, and they are 8 feet 7 inches wide over sheathing. The cars have a capacity for fifty-four passengers. The Illinois Central railroad has designed and built at its own shops quite a number of large steel suburban cars, having one hundred seats. These cars are 64 feet long over end sills and 10 feet 4 inches wide. The underframe consists of four 9-inch 21-pound steel I beams, spaced nearly equal distances apart. The end sills are 9-inch 25-pound steel channels, set with the backs to the square ends of the longitudinal sills and riveted to them by double angle plates re-enforced by plate gussets. A steel floor ¼ inch thick is riveted to the sills, forming a continuous metal surface, extending the whole width and length of the car, thus insuring perfect rigidity of the underframe and completely protecting the car from fire underneath. The side posts are made of 3-inch 4-pound steel channels, and the side plate is 4½ by ½ inch iron. The construction of the car is shown in Fig. 7. The car body weighs 61,400 pounds, trucks 23,200 pounds, total 84,600 pounds. These steel cars have been in service more than a year, and one of them is on exhibition at the St. Louis Fair.

I am aware of the fact that this subject is not a popular one, that many car builders prefer to think that wood construction is good enough for passenger cars, but the use of steel for this purpose is gradually growing, and the conditions of our passenger service seem to indicate that before long it will be forced upon us. When the Interborough Company, of New York City, decided to use steel cars they found it impossible to interest any of the large car builders of this country, and the sample car was designed and built by the Pennsylvania Railroad Company as an accommodation. Even after the car was built many were skeptical as to its success in service, but the tests of the car have been so satisfactory that the Interborough Company has given the order for the construction of 200 steel passenger cars, and this is really the beginning of this industry in the United States. The Pressed Steel Car Company has been for some time working on plans for steel passenger cars and I understand they are prepared to make contracts for the steel frames of such equipment.

CAST-IRON WHEELS.

Committee: Wm. Garstang, Chairman; G. R. Henderson, E. D. Nelson, W. H. Lewis, Alex. Kearney, H. J. Small.

The designs of wheels are shown by complete drawings 1, 2, 3 and 4. Drawing No. 1 showing a 600-pound wheel recommended for cars of 60,000 pounds capacity. Drawing No. 2 showing a 650-pound wheel recommended for cars of 80,000 pounds capacity, Drawing No. 3 showing a 700-pound wheel recommended for cars of 100,000 pounds capacity, and Drawing No. 4 showing a composite drawing of the three wheels for reference purposes.

It is the opinion of your committee that the minimum weights allowed in interchange should be 585, 635 and 685 pounds for the three classes of wheels. The following specifications in connection with drawings Nos. 1, 2 and 3 will constitute the report.

SPECIFICATIONS.

For 33-inch Cast-iron Wheels Weighing 600, 650 and 700 Pounds.

For Cars of 60,000, 80,000 and 100,000 Pounds Capacity.

1. Chills must have the same inside profile as shown by M. C. B. drawings of wheel tread. The inside diameter of chill must be the M. C. B. standard of 33¼ inches, measured at a point 2 inches from outside of tread of wheel.

2. Wheels of the same normal diameter must not vary more than one-fourth (¼) of an inch above or below the main size measured on the circumference, and the same inch in diameter. The body of the wheel must be smooth and free from slag, shrinkage or blowholes. The tread must be free from deep and irregular wrinkles, slag, chill cracks and sweat or beads in throat, and swollen rims.

3. The wheels must show

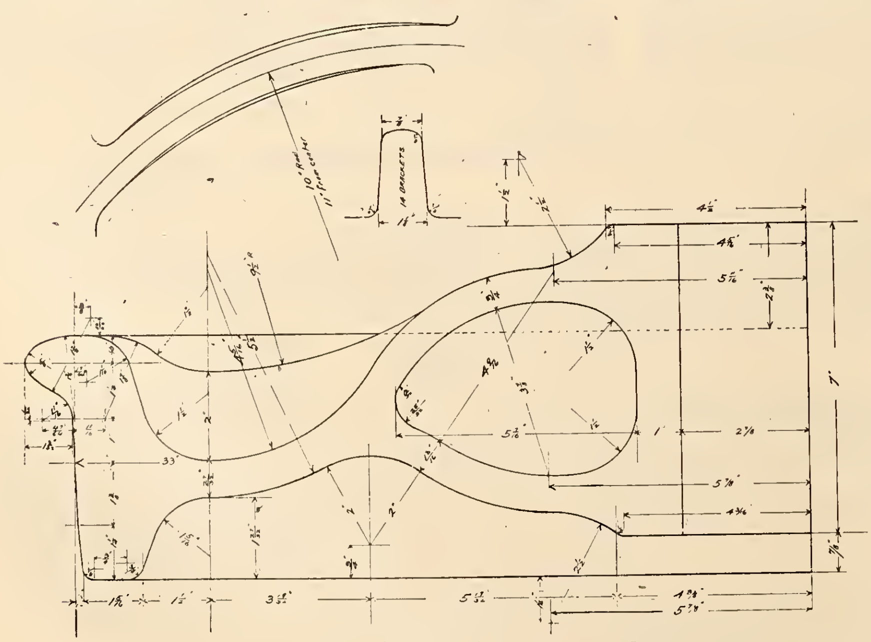


PLATE NO. 1—33-IN. 600-LB. CAST IRON WHEEL FOR 60,000-LB. CAPACITY CARS.

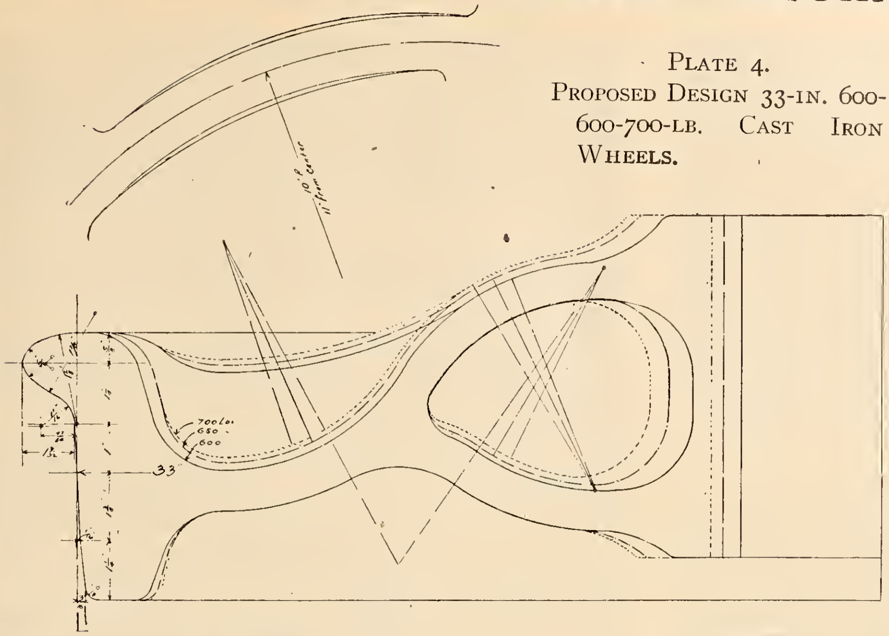


Plate 4.
Proposed Design 33-in. 600-600-700-lb. Cast Iron Wheels.

clean gray iron in the plates, except at chaplets, where mottling to not more than one-half (½) inch from same will be permitted. The depth of pure white iron must not exceed one (1) inch nor be less than one-half (½) inch in the middle of the tread, and shall not be less than three-eighths (⅜) inch in the throat, for wheels weighing six hundred (600) pounds. It shall not exceed one (1) inch in the middle of the tread nor be less than seven-sixteenths (7-16) inch in the throat for wheels weighing six hundred and fifty (650) pounds, and shall not exceed one (1) inch in the tread or be less than one-half (½) inch in the throat for wheels weighing seven hundred (700) pounds. The depth of white iron shall not vary more than one-fourth (¼) of an inch around the tread on the rail line in the same wheel.

4. For each hundred wheels which pass inspection and are ready for shipment, two representative wheels shall be taken at random, one of which shall be subjected to the following tests:

The wheel shall be placed flange downward on an anvil block, weighing not less than seventeen hundred (1,700) pounds, set on rubble masonry at least two (2) feet deep, and having three supports not more than five (5) inches wide to rest upon. It shall be struck centrally on the hub by a weight of two hundred (200) pounds. For six hundred (600) pound wheels, ten (10) blows falling from a height of nine (9) feet. For six hundred and fifty (650) pound wheels, twelve (12) blows falling from a height of ten (10) feet, and for seven hundred (700) pound wheels, twelve (12) blows falling from a height of twelve (12) feet. Should the test wheel stand the given number of blows without breaking in two or more pieces, the inspector will then subject the other wheel to the following test:

The wheel must be laid flange down in the sand and a channel way one and one-half (1½) inches wide and four (4) inches deep must be molded with green sand around the wheel. The clean tread of the wheel must form one side of the channel way, and the clean flange must form as much of the bottom as its width will cover. The channey way must then be filled up to the top with molten cast iron, which must be hot enough, when poured, so that the ring which is formed when metal is cold shall be solid or free from wrinkles or layers. The time when the pouring ceases must be noted, and two minutes later an examination of the wheel must be made. If the wheel is found broken in pieces, or if any crack in the plate extends through or into the tread, the one hundred wheels represented by the tests will be rejected.

5. In case of the drop tests, should the test wheel break in two or more pieces with less than the required number of blows, then the second wheel shall be taken from the same lot and similarly tested. If the second wheel stands the test it shall be optional with the in-

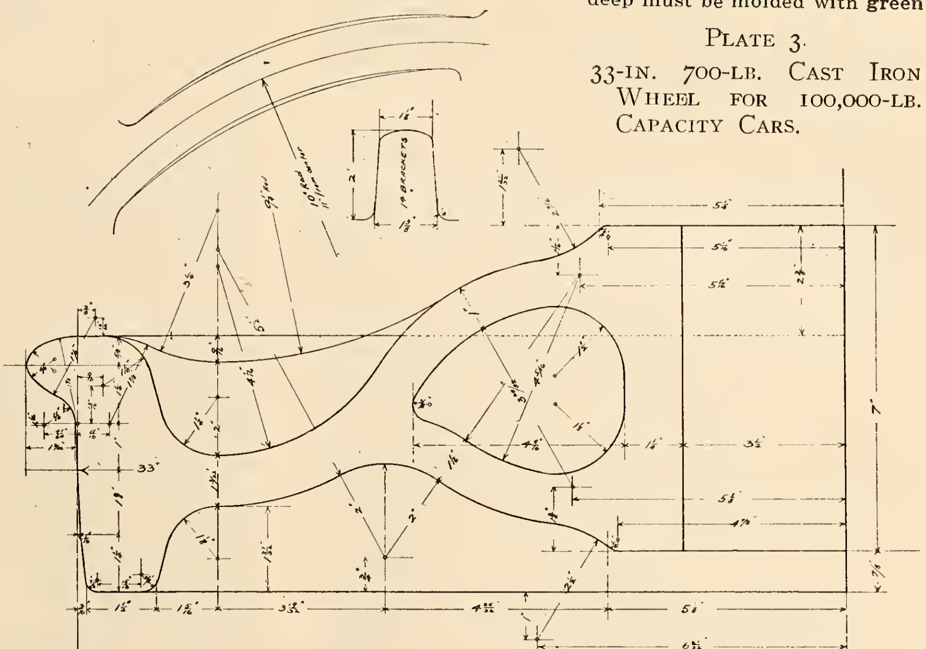


Plate 3.
33-in. 700-lb. Cast Iron Wheel for 100,000-lb. Capacity Cars.

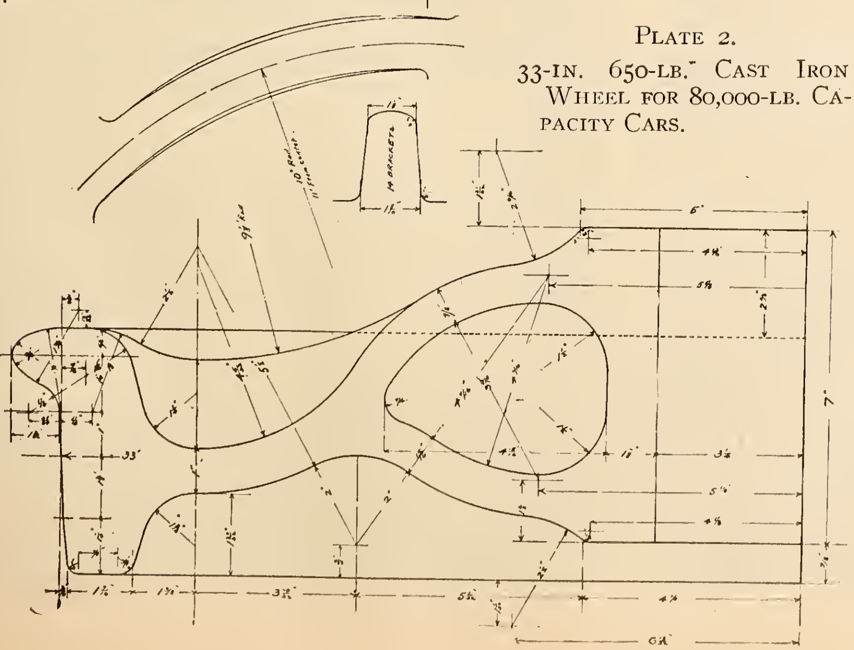


Plate 2.
33-in. 650-lb. Cast Iron Wheel for 80,000-lb. Capacity Cars.

spector whether he shall test the third wheel or not; if he does not do so, or if he does, and the third wheel stands the test, the hundred wheels shall be accepted as filling the requirements of the drop test.

6. The lower face of the weight of two hundred (200) pounds shall be eight (8) inches in diameter, and have a flat face.

7. Wheels shall not vary from the specified weight more than two per cent.

8. The thickness of the flange shall be regulated by the maximum and minimum flange thickness gauges adopted by the M. C. B. Association.

9. All wheels must be numbered consecutively in accordance with instructions from the railroad company purchasing them, and shall have the number, the normal weight of the wheel, also the day, month and year when made plainly formed on the inside plate in casting, and no two wheels shall have the same number. All wheels shall also have the name of the maker and place of manufacture plainly formed on the outside plate in casting.

10. Individual wheels will not be accepted which

(1) Do not conform to standard design and measurements.

(2) Are under or over weight.

(3) Have physical defects described in Section 2.

Any lot of one hundred wheels submitted to test will not be accepted

(1) If wheels broken do not meet the prescribed drop test.

(2) If the wheel tested does not stand the thermal tests.

(3) If the conditions prescribed in Section 3 are not complied with.

11. All wheels must be taped with M. C. B. standard design of wheel circumference tape having numbers 1, 2, 3, 4 and 5 stamped one-eighth (1/8) inch apart, the figure three (3) to represent the normal diameter, 103.67 inches circumference, the figure one (1) the smallest diameter and the figure five (5) the largest diameter.

PRICES FOR REPAIRS TO STEEL CARS.

Committee: T. H. Russum, Chairman; R. F. McKenna, I. N. Kalbaugh, G. N. Dow, E. B. Gilbert.

The cost or price of labor used for repairing steel cars should be based on a set price per rivet, including removing, fitting and replacing. Where the parts removed require straightening, this to be done and a separate price paid for the operation.

Basing the cost or price of repairs to steel cars on a fixed price per rivet is the only equitable basis that could be found. If it was attempted to pay for the work on a basis of per piece fitted and applied, every different design of steel cars and cars constructed with steel underframes would have to be taken into consideration, and of which there are a very large number, and each part or piece numbered or marked so that the proper price could be fixed for such operation.

Your committee would, therefore, recommend that the following price govern the removal and replacing of rivets, such price to include removing, fitting and replacing damaged part, less straightening or repairing: All rivets, 10 cents per rivet.

Where the parts or pieces removed from a damaged car require straightening or repairing, we would recommend that such straightening be charged for on the basis of per pound. If this work would be charged for on the basis of per piece, again the different design and construction of steel cars would have to be taken into consideration. We would, therefore, recommend that the following price govern such work: 60 cents per 100 pounds.

Where cars are damaged to such extent that the parts damaged do not have to be removed for repairs, but straightened on car, also any parts that require straightening, repairing or renewing, not included on the rivet basis, we would recommend that the present M. C. B. price for labor, covering repairs to wooden cars, namely, 20 cents per hour, govern in all such work.

The painting of steel cars, after receiving repairs, should be governed by the present M. C. B. practice for painting of wooden cars.

Your committee would further recommend that the splicing of sills on steel cars and cars constructed with steel underframe be permissible, the splice, except as otherwise herein stated, to be located not less than eight (8) inches from either side of the body bolster and to be not less than 24 inches long, consisting of butt joints. The butt joints to be reinforced by plates on both sides, not less than same thickness of web plate, with the one on the inside of channel to include flanges also, while the outside plate should only cover the web. The rivets to be spaced as may be necessary to obtain efficiency at the point of splicing, but each splice to have not less than eighteen (18) rivets.

In cases where cars are damaged to such extent that the center sills have to be cut off less than eight (8) inches from bolster, in such case a plate, with angle at each end not less than six (6) inches, to be used between end sill and bolster and to be full width of channel and not less than 5/8 of an inch thick. This to be applied on the outside, between end sill and bolster, between web of channel or I beam, as case may be.

The committee further recommends that where it is necessary to apply any new material to steel cars or cars constructed with steel underframe, that such material, where cars are constructed of structural steel shapes or material that can be purchased in the open market, be charged at market price. Where cars are constructed of pressed steel shapes or material that can not be purchased in the open market, such material to be charged at manufacturer's price.

Where any material is applied to a steel car, the name of the part renewed and the dimensions of same must be shown on bill.

The committee would recommend that scrap material removed from cars constructed of pressed or structural steel shapes be credited at three-quarters (3/4) of a cent per pound.

Where patching is done on steel cars, the committee would recommend that such patching be done in a mechanical manner. Where floor or interior patches are applied, the outside edges should be chamfered and patch riveted to place with thin flat head rivets.

The committee finds from the answers received that the oldest steel cars have been in service eight (8) years, and as yet no steel cars have been put out of service due to deterioration from age and we have nothing definite on which to base our report as to the depreciated value of steel cars and cars constructed with steel underframes. We would recommend, however, that a depreciation of 4 per cent upon the yearly depreciated value be used for the bodies of all steel cars and cars constructed with steel underframes, allowing the present 6 per cent per annum upon the yearly depreciated value of trucks to remain as at present in the rules, but no depreciation should exceed 60 per cent.

In the present rules there is no special provision for the settlement of destroyed steel cars, which are known to be of more expensive construction than the average wooden car of similar capacity, and we would recommend that a special committee be appointed to carefully consider the price for all steel cars of various classes, as well as cars constructed with steel underframes. In order to provide for an equitable way of settlement for the coming year, until the committee's report is received, we would recommend that all steel cars or steel underframe cars destroyed be treated on the same settlement arrangement as now in effect for "Special Constructed Cars," as covered by M. C. B. Rule No. 113 of the 1903 code.

ABSTRACT FROM ADDRESS OF MR. H. H. VREELAND.

In and about New York City there is now in progress of installation a practically new means of propulsion as applied to steam railroads, an incident of which will be the virtual combination of two heretofore separate and distinct activities, the maintenance and efficiency of which is to be in your charge. With the introduction of electricity at the New York terminal of the New York Central Railroad, and possibly the Pennsylvania Railroad, there will come into use a new class of vehicle each with individually contained power apparatus, and the intimate association between the vehicle and the mechanism of its propulsion is so close as to make the divorcing of them practically impossible. The day when the motive power was sent to a roundhouse and the inert rolling stock to a yard or shop is at an end. A young man who aspires to shop efficiency must in the very nature of things find himself equipped to handle both. In a single stroke many sacred old methods—as, for instance, of lighting and heating—are abolished; along with the engine that has now gone to the Eternal Roundhouse, they are no longer of interest. They are one with those other twin nuisances—smoke and cinders—and the safety and maintenance of the new appliances by which they are furnished have been suddenly thrown, as a new responsibility, on the craft of car-building.

From this it will be seen and appreciated how much higher is the demand that will be made upon you in the immediate future. When I say you I include the journeymen car builders, forming that valuable recruiting army from which men for important station can be graduated. This great revolution in motive power will not only tax you, but every man down the line. Tracks, switches, roundhouses and repair shops will need, under these new conditions, men with considerably more than the rudimentary knowledge that has heretofore sufficed, and it is the duty of all of us having the direction of those activities wherein our life is cast to drive this truth home in order that it may be fully appreciated and that those who are with us may recognize if they wish to progress the new necessity that is upon them.

To my way of thinking, not only for the benefit of the business as a business, but for the individuals engaged in it to the last number, that there is a revolution going on might be profitably insisted on with a slight note of alarm, in order to fully awaken the mind to the subject. Every other revolution—I use the term for the want of a better one—that has taken place in the matter of railway equipment has been, so to speak, a gradual one, and men have had time to slowly adapt themselves to altered conditions. The basis has been all along practically the same, and the successive revolutions (if we are to continue using the term as expressing an idea) have been at best mere modifications and improvements along a given line. This is not the case, as you will see if it is considered for a moment what the present change involves. There is an absolute annihilation, not only of the present means of power, but the substitute for that power instead of being centralized and capable of isolation, is so associated with the rolling stock as to make it, as I have said before, an integral part of it, which must, in the necessity of things, be given into your charge. There has been very little preparation for this change, which adds over night to the requirements of your craft the elements of an art that of itself none of us is any too familiar with.

All your roads, and practically those of these two great railway corporations that I have mentioned, as soon as they have installed electric traction in New York, will be handing over to their shops these new hybrid combinations, which are neither all cars nor all locomotives, but something of both, and it will take more than an expert carpenter or blacksmith to keep them together.

For proof that I have not overstated the magnitude of the change under discussion, I fix here, in tabulated form, the total present electric generating capacity located at New York, so divided as to show at a glance the amount in operation at the present moment and that contracted for for near future delivery.

Electric Generating Machinery in Operation or Contracted for to Take Place of Steam Locomotives in Vicinity of New York City.

	In Operation.		Contracted For.	
		Equivalent.		Equivalent.
	K. W.	H. P.	K. W.	H. P
Manhattan Railway......	48,000	72,000	6,000	9,000
Brooklyn elev. lines.*....	20,000	30,000		
Interborough (subway).			48,000	72,000
L. I. Railroad..........			16,500	24,750
N. Y. C. Railroad.......			40,000	60,000
Total	68,000	102,000	110,500	165,750

*Estimated.

It will be noticed from this table that it is proposed to substitute for steam on the Interborough, the Long Island and the New York Central roads 165,750 horsepower units, or 54,750 units more than the Brooklyn elevated lines and the Manhattan Railway are at present developing. This all shows that within the next two or three years you are to have turned over to your care much of the machinery by means of which this tremendous volume of energy is to be translated into work, for adjustment on the vehicles you make and repair.

All this brings me to what, after all, is the most interesting element in the change, relating, as it does, to the individual worker. Academic and scientific men have done their work. Their problem has been solved—yours is yet to be. As I look the field over, this seems to me to be, for the men involved in this trade, no small matter. Into your keeping is to be handed over the successful adjustment and disposition of the machinery the scientific men have invented and adapted, and on your efficiency depends the validity of the investment of millions of dollars and virtually the whole onus of reforming the method by which the most important part of the business of any civilized people—that of transportation—is conducted. It is well to bear in mind, too, in considering this subject, that the demand to be made upon you is very sudden. The changes which have resulted in standardization have been so gradual as to place no very serious handicap on the slow man. He could educate himself as he went along and easily keep abreast of the advance. Now there is to be made upon him a sudden demand affording smaller opportunity for the gradual acquirement of efficiency. The demand must be answered at once, or the man failing to answer must inevitably fall back. I have in mind to point out that what the situation needs is preliminary preparation, so that when the demand arises the men may be already equipped. Slowly, year by year, with the enlargement of the necessities of a great businesslike transportation, its demand upon the individuals employed becomes more and more exacting. As I look over the field and see the individual railroad employe virtually taken from his old employment and placed in the midst of an entirely new set of conditions, demanding qualities of mind and intelligence greater than that called for by a chief engineer fifty years ago, I am impressed.

There is at the present time in connection with this work of standardization going on in connection with the electric railway interests of the United States exactly the same line of development of standardization upon which this association has been working for so many years of its history.

This work of standardization has become necessary in the street railway field, for the reason that there has been a gradual consolidation and centralization of mileage and interests going on, paralleling the history of the steam railroad, in the past few years, until at the present time there are being operated all over the eastern section of the country many combinations under traffic arrangements, by which the cars of an individual company are being operated over four and five different properties. When I say cars, I am not talking of the locomotive being cut off at the terminal of the home road, and the car going on, but the motive power and all goes with the car. That interchange of equipment is rendering more and more necessary this work of standardization in the street railway field.

The work of education along the lines which I have indicated has been one that has been very, very serious for those representing the traction and the interurban interests of this country. You men have a history of 50 years, a development of 50 years, your employes have been of the same families, father and son, generation after generation have worked in the same line and have been fully equipped for their work either in the machine shop or in the car shop, but like a flash of lightning electricity came upon the scene and we have had to develop men to handle this hybrid combination. That has been one of the hardest tests in connection with the electrical development of this country, and is to-day. Acting in a consulting capacity for many systems in the country, I find the burning question is, "Where can we get a man who can go into a car house and take care of the electrical equipment of a car?" He has got to be a combination man, there can be no separation of forces.

The displacement of the engine for suburban service on steam roads will be absolute as from time to time electricity is developed and applied. There will be no change, from the car builder's standpoint, except the addition of the mechanical-electrical principles of electrical operation which will come under his supervision, and must necessarily come under his supervision, as there will be no other special features of the work connected with the car other than the special electrical motor work which will go to the central machine shop. Indeed, you must be prepared to take not only your car, but to take the intricate motive power and mechanical working parts of the car and care for it in the car shop and turn it out for service the following day.

The prophecy of 1896 was ridiculed, at home and abroad —the prophecy that the moment it became a practicable and commercial possibility to generate electricity at special centers, and the handling of it at very high voltages on long distance transmission lines was commercially feasible, that it would mean a revolution in the steam railroad business. I saw what that meant to the future of the steam railroad situation. That prophecy was based upon the idea that the moment it became possible to transmit electricity a long distance from the source of development—as is in evidence on the Pacific Coast to-day, where electricity is generated at 25,000 volts from water power 150 miles distant, and the current is carried to centers of population to do work in such localities—that it would not be long before such long distance transmission would be applied to the propulsion of passenger trains. The problem was solved, of the application of electricity to steam railroad uses, with the solution of that technical problem which covered the conduct of electricity safely at high voltages over long distances.

If these suggestions and generalizations of mine, gentlemen, shall have the effect of stimulating the ambition of any man, young or old, to follow up the subject so far as it is possible, and it is largely possible to do it with the technical literature that is at the command of every one, bearing on this subject, as well as the practical demonstrations in various parts of the country, I shall feel that not only have I been honored by being requested to speak at the opening of your convention, but that I have been well repaid for my trip to Saratoga.

Abstract from Adress of President Brazier

Our association in the past has done more to bring about harmony among the different railroads, through its rules of interchange, than has any other organization affiliated with railroading interests. To-day the interchange of freight cars is almost perfect between the different railroad companies. We have revised our rules each year, when, as a body, we have found that changes were necessary, until now I think we can safely say that the Rules of Interchange are very satisfactory. This interchange of equipment has affected the welfare of the nation in a vital way; that is, in helping to cheapen transportation.

It is interesting to look back and compare the improvements that have been made in the motive power and rolling stock in this country since the formation of this association. Thirty-five years ago the average coach would carry from 30 to 45 passengers and weighed about 14 tons; the cars were equipped with link and pin couplers; were carried on four-wheel trucks with journals 3½ by 6 inches; were lighted with oil lamps; had small windows; in some cases were without a clear story, and were heated with wood-burning stoves. The cost of a coach such as I have described was about $3,500.

To-day our standard coach is 72 feet long over end sills; weighs from 52 to 55 tons; has a seating capacity of 86 passengers; is carried on six-wheel trucks with journals 5 by 9 inches; has steel platforms and wide vestibules; is heated with steam heat and lighted with gas and electricity. To-day a wide vestibule coach is worth in the neighborhood of $10,000.

The same degree of progress that has taken place in the construction of passenger cars, and which I have just outlined, has also occurred in the finishing of the interiors of all classes of passenger equipment. The seats and the lighting of passenger cars are probably the two most important things in connection with the furnishing of the interiors, and you are all familiar with the great improvement that has been effected along these lines.

The question of electric lighting for passenger equipment has been receiving a great deal of attention during the past few years and it, of course, presents many attractive features. Electricity furnishes a method of securing beautiful illumination of cars and progress is being made in perfecting the application and cheapening the cost, but the question of its adoption for general use is still a debatable one. It is, however, in service on many of the "limited" trains, and, notwithstanding the expense, will continue to be employed in that service.

The lighting of passenger equipment is certainly a matter of great importance and the continual increase in the size of windows, which provides a better day-time light, and the substitution of gas for oil, represents two departments of the car builder's work in which the improvements that have been made are most gratefully appreciated by the traveling public.

Owing to competition and the desire to keep up with the times, the railroad companies have furnished to the traveling public all these improvements, and to-day the cost per mile to the passenger is less than it was 35 years ago. When we consider that a man can transact his business in New York City in the morning, take a train in the afternoon of the same day and reach Chicago the next morning in time to attend to his business, and while en route have all the advantages of a modern hotel, such as barber shop, bath room, stateroom, meals served at his bidding—I say, when we consider all these things, great credit is due the members of the Master Car Builders' and Master Mechanics' Associations, as well as the operating department, in bringing about these conditions.

In December, 1867, there were 289 locomotives, 386 passenger equipment and 5,530 freight equipment cars in the United States.

On June 30, 1902 (the latest figures compiled), there were 41,628 locomotives, 37,090 passenger equipment and 1,503,949 freight equipment cars in the United States.

In comparing the equipment in service on June 30, 1902, with that in service at the organization of the Master Car Builders' Association in 1867, it will be seen that the number of locomotives has increased 144 times, passenger cars 96 times and freight cars 272 times.

The expensive parts of freight and passenger equipment cars to maintain to-day are the draft rigging, couplers, uncoupling levers and running parts. As an association we have adopted many standards, some of which are being lived up to and some are not. I wish to impress on our members the importance of maintaining our adopted standards, and in building new equipment our members should insist that M. C. B. standard parts be used.

One of the greatest expenses we have to-day is the maintaining of so large a number of different makes of couplers, which each road is compelled to carry in stock, thus necessitating the carrying of many different kinds of knuckles and other parts of couplers to maintain cars running over its system. It would be desirable if we could have one standard M. C. B. steel coupler, which all the roads could adopt; or have the number reduced to at least three or four makes. It is, of course, unfortunate that railroads have to carry parts for so many different kinds of couplers, but it should be borne in mind that the automatic coupler has not been in use for very many years and that the railroads themselves, at the outset, did not undertake to provide a standard of their own, but rather encouraged outside development on the part of manufacturers, and it is not surprising that so large a number of different designs were developed and offered for sale. As a matter of fact ten years ago the number of different varieties that were being manufactured was in excess of what it is to-day. Since that time the experience of the railroads themselves and competition have very largely reduced the variety manufactured.

The whole subject of automatic couplers is so completely covered with patents—there being over 8,000 patents that have been issued—that it would probably be exceedingly difficult to get up a new coupler that would be acceptable to a majority of the railroads without incurring much trouble and inconvenience due to these patents.

I would suggest that a committee be appointed to report upon the desirability of having a coupler designed, if one is not already in existence, which our association could take as a standard; a coupler which would consist of the following parts: 1st, coupler body; 2d, knuckle, so designed that in the event of a knuckle pin breaking the knuckle will not pull out; 3d, a knuckle pin; 4th, a knuckle lock.

To-day we have a great deal of trouble with loaded cars on account of broken knuckles, and a railroad company not having the proper material in stock with which to make repairs is obliged to remove the entire coupler and apply a new coupler in order to get freight over its road. I think this question will appeal to all who are interested in the movement of freight and the expense of freight car repairs.

I would suggest that a committee be appointed to look into the desirability of having a standard practice relative to size of pivot pins, this same committee to report on the advisability of using the best material for the manufacture of pivot pins.

While on the question of couplers I desire to call the attention of the members to the importance of a closer inspection of couplers and attachments to prevent the large number of break in twos of freight trains which we have been having. Some roads have adopted the plan of having trains stretched at terminals and the couplers gauged with a small gauge which can be handily carried by inspectors. In case this gauge will slip in between the knuckle and the face of the coupler the car is set out and the trouble remedied. It is not always a worn knuckle that causes an uncoupling; sometimes other wearing parts become so worn that they allow the knuckle to open sufficiently to uncouple the train.

The suggestion has been made that new couplers should have a bushing in the pin hole, so constructed that it can be removed when worn too large, and a new bushing applied or some means provided to take up the wear. In some new couplers it has been found the pin hole was from ⅛ to ¼ inch too large, and in some cases the pins too small. Knuckles received from manufacturers should be gauged to see that they are made according to the standard contour lines. Many knuckles on the market to-day are not standard to the make of coupler in which they are intended to be used. When two knuckles not made according to the M. C. B. contour lines are placed in adjacent couplers it is found that trains will part without either of the knuckles opening. Consequently particular attention should be paid to see that all new knuckles are properly gauged when received.

I would suggest that the coupler committee, or some other committee which may be appointed, take up the question of coupler side clearance. With our long freight cars we should give more side play in our coupler yokes. The Northwest Railroad Club, at its February meeting, very ably discussed this subject, and I think it is one that should be investigated.

I would also suggest that a committee be appointed to report a formula for the mixture of journal bearings and linings. We should have a standard formula for journal bearings and linings which may reduce the number of hot boxes caused by inferior material. I am of the opinion that journal bearings should have a lining at least ¼ inch thick, of good lining metal. We should exert our influence toward the use of the best material for journal bearings; we should resist the tendency to buy cheap bearings as well as all other material.

Lubrication is another subject requiring attention. Oil boxes should be protected with a suitable tight cover, as well as a good dust guard, and a good quality of oil and waste should be used. I think it would be well for this association to have a recommended practice governing the quality of waste to be used in freight and passenger service. Most of the roads to-day are using good oil, but very little attention is being paid to the waste, which is very important. This is a subject which I think it would be well to refer to a committee.

Referring to the brake beams adopted as standard of the association in 1899. In view of the many failures on account of buckling at the center I would recommend that a test across the line of fulcrum be added. This I would suggest be referred to a committee for investigation and recommendation.

The steel car question is a live one and one that needs our careful attention. I would suggest the appointment of a committee to report on the standardizing of the steel car. There is no reason why we should not adopt a steel construction as standard as we have in wooden cars. The Master Car Builders' Association should at least make an effort to agree on the essential features of the steel car before we have too great a variety. It will be said that the steel car is undergoing a process of development, but I think we should take steps toward developing it. Thus far this association has not taken its proper part in steel car development.

While on the subject of steel cars I wish to call your attention to the construction of passenger cars. The technical press has been busy with the subject of a stronger passenger car. One of our leading western roads has recently built some all-steel suburban cars. I believe this to be a step in the right direction. While to-day many of our passenger car platforms have steel construction, I think the underframe, the sides below the window sills, platforms, etc., could also be built of steel. This is an important subject in which, no doubt, our members will take a great interest. It will be presented by an excellent paper at this convention.

There has been considerable discussion in the past year as to whether an 80,000 and 100,000 pounds capacity box car is an economical vehicle of transportation for merchandise. The average lading of even our 60,000 pounds capacity car is much less than its capacity, which would indicate that it is rather expensive to haul the additional weight of the larger cars. I presume, however, this is a question for the operating and traffic departments to determine, but there are features connected with it in which the car department is interested. As this subject has been well discussed in the papers and by the Western Railroad Club at its March meeting this year I will not take your time to-day, but I think it would be well to have it referred to a committee for suggestions.

Relative to the Interstate Commerce Commission's inspectors' reports on the condition of safety appliances. All of our members have, no doubt, seen these reports and have especially noted the trouble experienced on account of the uncoupling devices on couplers being so frequently out of order. I would recommend that the matter be referred to the coupler committee.

In this connection I also wish to add that the work done by the inspectors of the Interstate Commerce Commission, in looking over freight shipment, has been productive of great good in keeping the railroads alert to maintain the uncoupling, as well as the running parts of cars.

Since the adoption of the rule providing for the per diem charge on freight cars there is no question but that the extent of the repairs made to freight cars on foreign lines has greatly diminished, the tendency being to make only such repairs as are absolutely necessary to put the car in safe condition for movement over the road on which the repairs are made and get rid of the car as quickly as possible, in order to avoid the penalty prescribed by the per diem rule. The result is that in neglecting to make some slight repairs to a car very extensive repairs are often necessary by the time the car reaches its home road.

On the other hand, when cars were handled on the mileage basis (there being no penalty for holding a car the requisite time in which to make the necessary repairs), more repairs for which owners were responsible were made and the cost thereof billed against the owners.

While it is important that each railroad should release foreign cars which are held for repairs as promptly as possible, still many repairs are neglected which, if made at the time the defect is discovered, would possibly prevent subsequent damage and obviate the necessity of making heavier repairs.

I would like to call your attention to the recommendations of the committee on air brake hose specifications, as to its continuance in order that it may carry on at Purdue University a series of tests of hose taken at random from cars to determine the amount of friction in the hose after six or eight months' service. These tests will probably lead to an increase in the wear of the hose, with less trouble from bursting, tearing, etc. The two principal parts of the air brake system are the triple valve and hose. With the former kept cleaned and oiled, and the latter maintained in quality, a great many of our woes will be eliminated.

Also in this connection I desire to call your attention to the necessity of always adjusting the air brakes when the triple valves are cleaned. We have equipped our freight cars with air brakes and I am glad to say that most of the roads to-day are taking steps to install testing plants and are trying to look after the air brake equipment by cleaning the triples within the specified time. The air brake on our freight trains will be useless unless we keep it in good working order. This must be done in order to get good results.

I desire to call the attention of our members to the testing plant at Purdue University. On April 4, 1904, a circular was sent to all our members relative to a drop testing machine which had been completed and was ready for use. There are now three testing plants in operation at Purdue University as follows: Brake shoe testing apparatus, air brake testing plant and coupler testing apparatus, which are the property of the Master Car Builders' Association.

Another word on the subject of "standards": We now have standard journal boxes, journal bearings, journal bearing keys, springs, etc., for the four sizes of our standard M. C. B. axles. Would it not be desirable to also have a standard truck? I would suggest appointing a committee to report upon a standard archbar truck.

A majority of the executive committee the early part of this year thought it would be advisable to have a committee appointed to see what changes could be recommended in the rules for loading long material, and a very able committee was selected and its report is before you. This was brought about by an accident, due to long timbers falling from an open car because the load was not securely fastened, and rather than have it lay over another year the committee was appointed to report at this convention.

The labor situation constitutes a serious problem and one of the most important confronting railroad officials, as well as other large employers of labor. Employers should be ready and willing to pay to labor the highest wages the business in which they are engaged will warrant. This must be arranged by negotiation and an organization of the employes may be of assistance in negotiation and conference. A fair minded employer is the best friend of the working man and we should exert our influence to impress this fact upon our men and induce them to select representatives who will stand for the best permanent interests of the employes. We can do a great deal by encouraging the best elements in the labor organizations with which we have to deal, and by urging them to make membership therein stand for the highest standard of workmanship and service.

In all branches of mechanical activity there is great need for improving systems of apprenticeship. This is particularly true of car departments of railroads. We, as car builders, have been rather remiss in this matter and it is exceedingly important that we should encourage young men of the right sort to become apprentices in car building and to properly provide such apprentice regulations as are necessary to attract young men of the kind we need.

Gentlemen, we have talked about apprenticeship for years; let us now do something.

I wish to call attention to the careful and painstaking work of the committees, as shown by their reports, which I commend to the serious consideration of this association.

I also wish to commend the work of the various railway clubs. The members of the Master Car Builders' Association should take a more active interest in the papers read and discussions had at the club meetings in their locality. The Pittsburg Railway Club has appointed a permanent committee on the revision of the rules of interchange, which seems to be a step in the right direction, as it will result in keeping before the club questions which may come up during the year. The clubs should discuss more papers pertaining to car construction and the operation of car shops. All the clubs seem to have more papers on locomotive and locomotive repairs.

The railway clubs, the Association of Railway Air Brake Men, the Car Foremen's Association, the Car Inspectors' Association, the Master Car and Locomotive Painters' Association, and the National Railroad Master Blacksmiths' Association are preparatory schools for this association, as the topics which they discuss and the points they bring up are worthy of our best consideration, and these organizations should have our encouragement and assistance. They are in fact, now doing a great deal of work which formerly fell to the Master Car Builders' Association.

While this association is known as the Master Car Builders' Association, and was formed by officers in charge of car departments who bore the title "master car builder," to-day we find the title disappearing. In the development of consolidation of railroads the tendency has been to place the responsibility of both cars and locomotives in the hands of the superintendent of motive power. It behooves us to work in the line of progress, which is that of consolidation and concentration.

I am of the opinion that the Master Car Builders' and Master Mechanics' associations should be brought together as one organization. This would seem to be a step in progress. The work of the Master Mechanics' Association is largely educational, and as locomotives are not interchanged it has not the legislative function of the Master Car Builders' Association in the matter of interchange rules. I am aware of the fact, however, that representative membership in the Master Mechanics' Association is now being considered and it would seem that the interests of the two associations are not now sufficiently far apart to warrant maintaining separate organizations. Conventions may be arranged so that car and locomotive subjects will be grouped together and discussed at separate sessions, special days being set apart for the rules of interchange and other subjects especially pertaining to cars. It appears to me that the time for seriously considering this question has arrived.

American Railway Master Mechanics' Association

Abstract of Reports

BOILER DESIGN.

Committee: David Van Alstyne, Chairman; W. F. M. Goss, C. E. Fuller, H. T. Bentley, O. H. Reynolds.

To the Members of the American Railway Master Mechanics' Association:

With reference to the location of water glass and gauge cocks (questions 1 to 4, inclusive) we recommend that the lowest visible part of water glass and lowest gauge cock be not less than 3 inches above highest point of crown sheet for curved and flat crown sheets, and that water glass and gauge cocks be as near vertical center line of boiler as they can conveniently be located without having gauge cocks out of reach of engineer. We also recommend 8 inches exposed length of water glass and three gauge cocks with vertical spacing 3 inch centers.

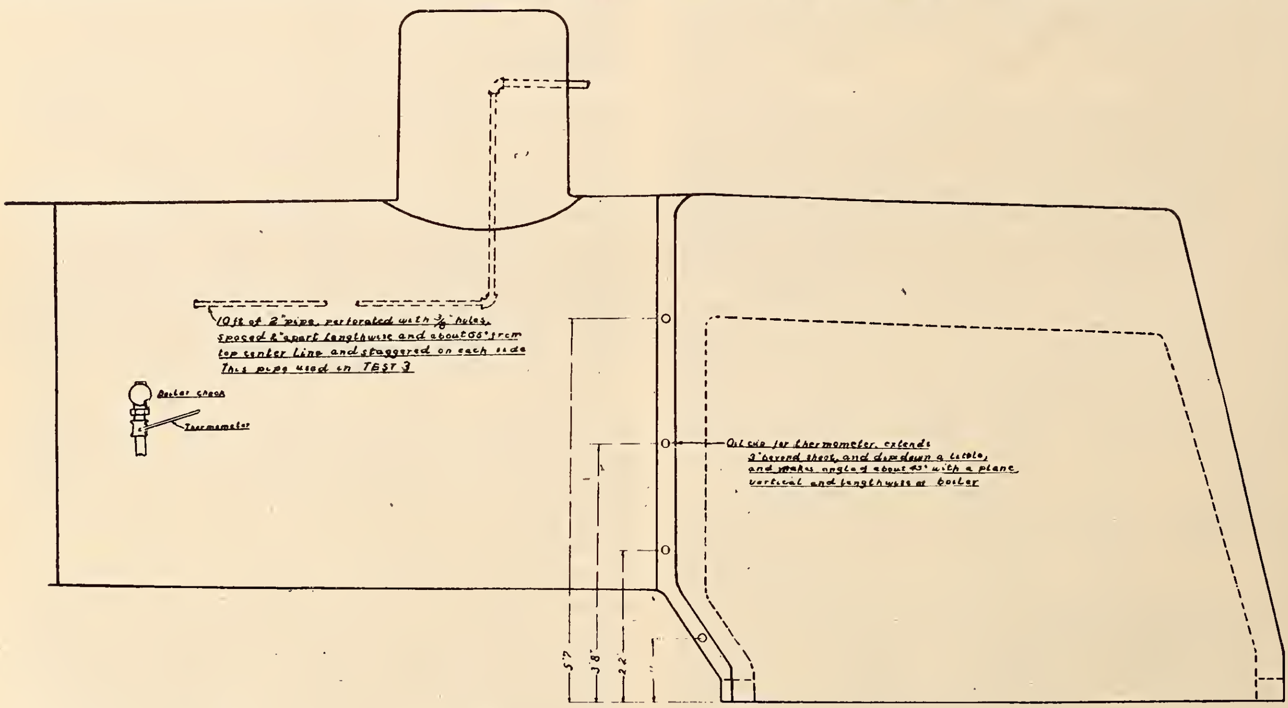
Crown sheets sloped ⅜ inch per foot represent very general practice and this slope has proved satisfactory.

For various reasons given an automatic low-water detector seems not to be a desirable attachment to locomotive boilers.

In order to obtain information as to the temperatures inside a boiler as related to leaky flues and burned side sheets, the committee made temperature tests with fusible metal in the water leg, between the flues and inside of flues plugged up. While the tests show temperatures considerably above saturated steam temperatures in most cases, the committee has concluded that the method of determining temperatures by means of fusible metal is not satisfactory and believes that temperatures should be determined by more delicate means, such as the thermopile, and that such determinations should be as numerous as possible in order to trace the direction of circulation in the boiler. On the other hand it is quite possible that the very high temperatures which are probably required to destroy sheets and cause leaky flues are confined to the sheets themselves, and that little if any higher temperatures exist in the water than have already been found by the fusible metal tests.

This point is one which, so far as we know, is definitely determined, although it has been proven that the temperature of the sheet approaches much more closely that of the water than that of the heated gases. It is essential that the circulation within the boiler shall follow such lines and proceed with such regularity that solid water may overlie all portions of the heating surface.

Since circulation is due to the excess of weight of a comparatively cool column of water over a hotter and lighter body or a mixture of hotter water and steam, the design of boiler which least impedes the flow due to this head will permit of the most rapid circulation, and hence, most rapid carrying away of heat from sheets. It would follow also that the greater the depth of boiler the greater the head to produce circulation at the point where most needed, namely, just above the fire line.



It would appear that for a given boiler there is a maximum allowable steam generation without injury to the sheets, determined by a maximum possible circulation in that particular boiler.

Through the courtesy of Mr. F. H. Clark, superintendent motive power, Chicago, Burlington & Quincy Railway, the committee is permitted to present the results of experiments made to determine the temperature of the water in various portions of the boiler when the locomotive is standing, no steam being used from the boiler excepting as required to supply the injector. The results of these experiments indicate that when the feed is delivered in the usual manner to the boiler, the water in the water-leg on the opposite side may have a temperature 100 degrees less than the normal temperature of the boiler, and that the intermixing is greatly improved by using a perforated pipe extending beyond the check within the boiler either longitudinally or transversely, and also, by the omission of a pipe but by means of an orifice which opens upward. In the progress of the tests it was found, also, that when the intermixing was most complete, the drop in steam pressure was greatest, so that it may almost be said that the degree of intermixing in any given boiler may be judged by noting the rapidity with which the steam pressure falls under the action of the injectors when the locomotive is at rest. The details of these tests and of the results obtained from them, are given herewith.

The following communications included in the committee report describe the temperature tests made on the Chicago, Burlington & Quincy Railroad.

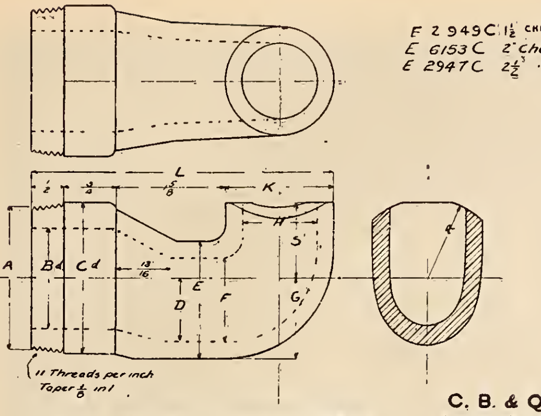
Mr. F. H. Clark, Supt. M. P., Chicago:

Dear Sir—We have been making some tests to determine whether water injected into a boiler while the engine is standing still does not tend to settle toward the bottom, instead of mixing properly with the rest of the water.

For this purpose we took Class R-3 Engine 1740, and inserted the thermometer oil cups in the boiler, as shown on attached blue-print. You will note these oil cups were inserted into the left front corner of the outside fire box sheet, one being put about on a level with the crown sheet, one being put 7 inches above the mud ring, and two applied in between. They were, as you will note, just a little ahead of the back flue sheet. One thermometer was also arranged in the delivery pipe, just below the boiler check, as shown on print.

The method of test was to get the water level at or near the bottom of the glass, get up steam pressure to 195 pounds, and take temperature readings. The injector was then applied, and boiler filled to the top of the glass, temperature readings being taken every one or two minutes. Results are shown on attached blue-print Lab. No. 621.133.7 T-2.

Test No. 1 was made by injecting the water through the boiler check in the ordinary manner, the thermometers all



Check	A	B	C	D	E	F	G	H	K	L	R	S
2	2 1/8	1 1/2	2 1/4	15/16	1 3/4	1 1/4	1 3/16	1 1/8	1 5/8	4 1/2	1 3/16	1 1/8
2 1/2	2 5/8	2	2 3/4	1 3/16	2 1/4	1 3/4	1 7/16	1 5/8	2 1/8	5	1 7/16	1 3/8
1 1/2	1 5/8	1	1 1/4	3/4	1 1/2	1	1	1	1 1/2	4 1/8	1 1/16	1 1/16

C. B. & Q. Ry. Elbow Extension to Boiler Checks

being also on the left side. You will note that the highest thermometer, which was on a level with the crown sheet, did not drop very much in temperature, but the lowest thermometer started to drop as soon as the injector was put on, and during the filling of the boiler dropped over 100 degrees.

Test No. 2 was made in the same way.

Test No. 3. We delivered the water through a pipe run for convenience through the whistle hole in the dome, then down to the flues and finally through 10 feet of two (2) inch pipe, placed lengthwise over the flues. This pipe was perforated with three-eighth (⅜) inch holes spaced two (2) inches apart, lengthwise about sixty-five (65) degrees from the top center line and staggered on each side. This pipe is also shown on the blue-print. You will note in this test, where the water was delivered through the perforated pipe, that the highest and lowest thermometers had about the same temperatures at all stages of the filling of the boiler showing that the injected water was well mixed with the water in the boiler.

I may say here, that before starting in on the tests, in order to determine the amount of water it takes to fill the boiler, we ran the water through a three-inch (3 in.) crown meter, and found that to fill the boiler to the bottom of the water glass took two hundred and eighty-nine (289) cubic feet, and to the top of the glass, fifty (50) cubic feet additional, or in round figures, this would be twenty-four hundred (2,400) and four hundred and fifteen (415) gallons respectively; in other words, if we have boiler full to the bottom of the glass, then fill it to the top of the glass, we add seventeen (17) per cent additional water.

Test No. 4 was made by delivering the water into the boiler on the right side in the ordinary manner, while the temperature readings were taken on the left side. You will note that the lowest thermometer dropped about forty-five (45) degrees below the highest, during the filling of the boiler from the bottom to the top of the glass.

In comparing tests Nos. 1 and 2 with test No. 3 there is one very interesting point, namely, much greater drop in steam pressure during test No. 3. The explanation for this is undoubtedly that in tests Nos. 1 and 2 the injected water did not get mixed very much with the upper layer of water, and therefore did not condense much steam, while in test No. 3, the mixture was very thorough and a correspondingly greater amount of steam was condensed.

Yours truly,
Max H. Wickhorst,
Engineer Tests.

Mr. F. H. Clark, Supt. M. P., Chicago:

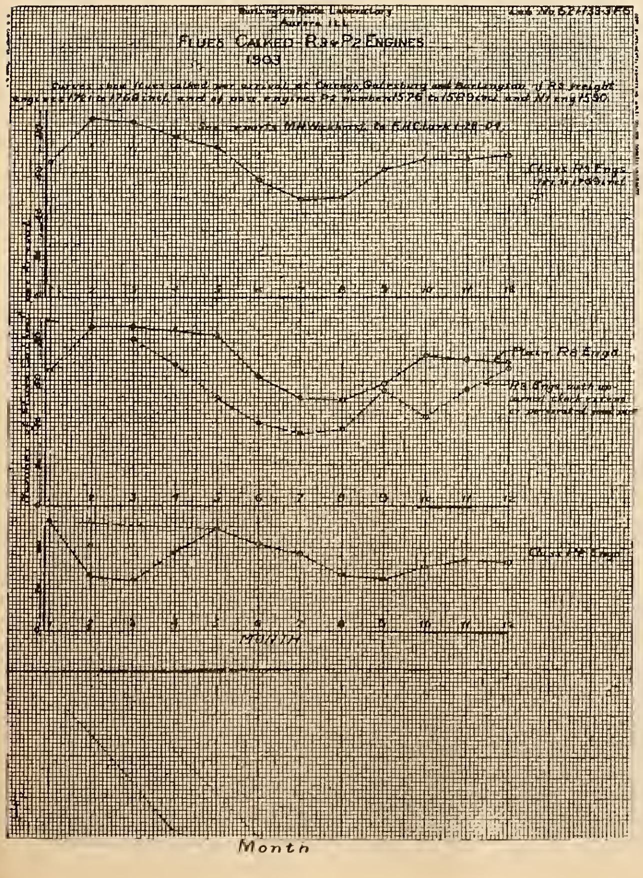
Dear Sir—On the 12th inst., I made a report to you covering results of four tests made at Galesburg showing the temperature of the water at different levels in the boiler during and after the application of the injector. The engine during the tests was standing still and no steam being drawn from the boiler. The four tests made were as follows:

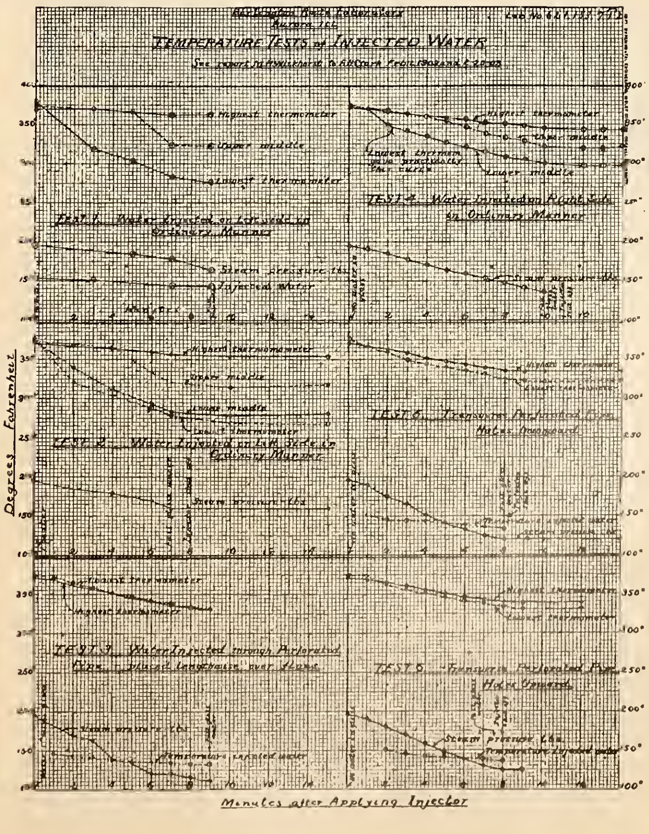
No. 1. Water injected on left side in ordinary manner.
No. 2. Same conditions.
No. 3. Water injected through perforated pipe placed lengthwise over the flues.
No. 4. Water injected on right side in ordinary manner.

Since then I have made four more tests which I will now describe.

No. 5. In this test the water was delivered into the boiler through a perforated pipe placed transversely over the flues, the pipe being an extension on the boiler check. To carry out this arrangement the boiler check was raised 15 inches above its present location, also 15 inches farther back. We made pattern for a flange that would fit the contour of the boiler at this point; we had brass casting made for same at Galesburg. The flange was fitted to the boiler and a bushing screwed into the flange, and pipe being previously screwed in the bushing, lastly the check was screwed into the bushing also. The pipe was 4 feet of 2-inch size perforated with ½-inch holes spaced 1¼ inches apart lengthwise about 65 degrees from the top center line, and staggered on each end side.

In test No. 5 the pipe was put in so that the holes faced downward. The results are shown on blue-print Lab. No.





621.133.7 T-2. You will note the mixing of the injected water with the water in the boiler was fairly satisfactory, although not quite as good as in test No. 3 where the longitudinal pipe was used. In plotting the results of this test only the readings of the highest and lowest thermometers are shown. As the two middle thermometers gave readings coming in between these two, their readings were not plotted, as this would cause confusion.

No. 6. This test was made the same as No. 5 except that the holes faced upward instead of downward. The results are also plotted on same blue-print, and shown about the same, except that the mixing was slightly better.

At this point in the course of our investigations it was thought desirable if possible to get some arrangement or extension attached to the check itself that would turn the water upward and get the mixing of the injected water with the water in the boiler. For this purpose we made the following tests.

No. 7. In this test we attached a sort of scoop extension on to the check, turned up at the end but open on top. A trial was made of this to see how it directed the course of the water by running hydrant water through the check with this attachment out into the open air and it was found that the water was turned upward but spread out fan-shaped. The results of this test are plotted on blue-print Lab. No. 621.133.7 T-3 and shows that this device did not accomplish the desired results.

No. 8. It seemed now what was necessary was to divert the water upward with more velocity and in a solid stream so the delivered water would get toward the top before resistance stopped its progress and turned it downward. For this purpose we made a brass extension screwed into the check extending almost to the flues, closed at the end, but with the 1⅛-inch hole bored into it and facing upward. Tests made of this with cold water, as before mentioned, shows that the water was directed upward with some force, but the stream was not a solid one, but was thought sufficiently satisfactory for making a test. The results are also shown on print Lab. No. 621.133.7 T-3. You will note the mixing was fairly satisfactory, but probably could be improved by having the water directed upward in a more solid stream. For this purpose we have gotten up the extension shown on print Lab. No. 621.133.7 C-1 and am now arranging to make castings and trying these on a number of engines running between Chicago and Burlington and hope to see results of the trial in the course of two or three weeks.

Yours truly,
Max H. Wickhorst,
Engineer Tests.

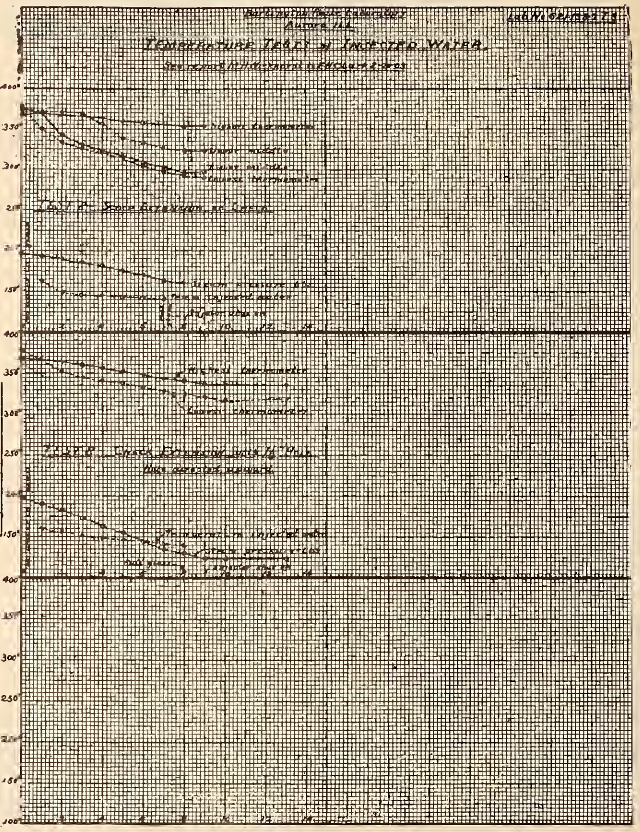
Record of Flues Calked for 1903.

Mr. F. H. Clark, Supt. M. P., Chicago:

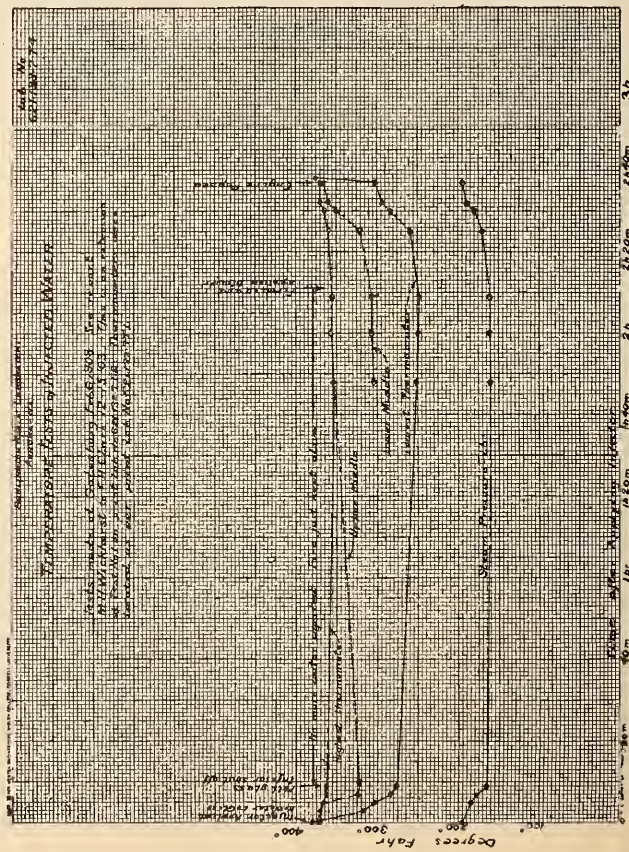
Dear Sir—During the year 1903 we have been keeping a record of the number of flues calked on all engines arriving at Chicago, Galesburg and Burlington. For each engine arrival, a card form is filled out giving the number of flues calked, together with some other information, which cards are sent to the laboratory for file and tabulation. For each of the R-3 engines and for the passenger engines running between Chicago and Burlington or Galesburg, we have been making a monthly statement showing the total number of flues calked, the number of arrivals and the flues calked per arrival. Some of the R-3 engines were fitted up last March with the upturned check extension. Somewhat later in the year, in October and November, we equipped some of the engines with the transverse perforated feed pipe. The comparison between the plain R-3 engines and those equipped with the special feed-water mixing device, is shown by the two middle curves. The R-3 engines are Galesburg division engines and do most of their running on double track, which is, of course, rather favorable to good engine performance. The comparison curves and figures, however, show that the feed-water mixing device, which mixes the injected water with the water already in the boiler at times when the engine is standing and there is no circulation, reduces the amount of flue leakages, reduction in the case of these engines being about twenty-three per cent as an average for the year.

Where engines work mostly on single track, it would seem that the difference ought to be greater, although we have no figures as to this. These results go to show that about one leaky flue in four is due to failure of proper mixing of injected water with the water in the boiler, allowing it to settle down and contract the lower flues and lower parts of the boiler. The other three leaky flues are due to other causes which in time we should try to overcome. The upper curve shows the record of all the Class R-3 engines. It will be noted the record for January, 1903, is low. This, I think, is explained by the fact that we obtained this lot of fifty engines new from the works along the latter part of 1902, and probably the flue record is somewhat lower for this reason during the first part of 1903 than would otherwise be the case. Along in March we equipped about one-fourth of the engines with the upturned check extension which has resulted in somewhat improving the record.

In August our Mendota Water Softener was put into operation giving treated water to all engines, and in the latter part of October the Aurora Water Softener and pipe line were completed, so as to furnish treated water to all



engines. The lower curve shows the record of the Class P-2 engines, running between Chicago and Burlington or Galesburg. This record also includes Class N-1 engine 1590. You will note the record is very low for February and March, which is due to receiving six new Class P-2 simple



engines during these months from the Rogers Locomotive Works. The normal record, I believe, would be about as I have shown with the dotted line.

In the latter part of May the Aurora Water Softener was put into operation and furnished treated water to the cranes at the depot from which the passenger engines are supplied, and as stated above, in August the Mendota Softener was put into operation.

The things we have done in 1903 for the purpose of bettering flue performance, and which should bear fruit in the present year are as follows:

First. We have studied washing of boilers, formulated a code of rules for same and appointed a boiler washer inspector.

Second. We have studied the question of properly mixing injected feed-water with the water in the boiler, and I believe it is your intention to now equip all engines with the upturned check extension. We have a few engines fitted with the transverse perforated feed pipe, but they have not been in service long enough to arrive at definite conclusions, the records so far indicating that they probably have no advantage over the upturned extension on the check. This latter can be applied to an engine when cast iron extension is used for not over 50 cents per engine, including both sides, while the perforated feed pipe, including necessary brass castings, labor, etc., for both sides would probably cost $15 per engine. If further record shows no advantage over the more expensive method, probably the plain upturned extension is all that we need.

Third. We have put into operation water-softening plants at Aurora and Mendota, and we already had one in operation at Buda. As to the good results we are obtaining from the treated water in cleaning out the Aurora shop boilers, I wrote you a short time ago.

We now have under construction water-softening plants at Burlington and Savanna, which I hope will get into operation this spring. The use of treated water at Burlington should still further tend to better the flue performance in the passenger engines on our Illinois main line, and I believe we should then be able to line up the terminal care of these engines so as to do away with most of the washing of their boilers.

Yours truly,
Max H. Wickhorst.

TECHNICAL SCHOOL GRADUATES.

An individual paper by R. D. Smith, S. M. P., B. & M. R. R. R.

The particular aim of the technical graduate course is to teach the application of principles with which the special apprentice is already familiar to the particular cases as they occur in the shops as concerns the construction and repairs of rolling stock, and on the road as concerns its operation; to enable him to learn the details of shop operation and management, and, in fact, to familiarize him generally with all things which concern the Motive Power Department

It has been a noticeable fact that a great many special apprentices never complete their service as such, or, if they do complete it, they do not remain with the railroad very long after having done so.

The causes of this condition are various. It is very often the case that a special apprentice finds the work is not to his liking. There is nothing very unusual about this. A technical graduate is usually twenty-two or twenty-three years old and at this age may not have definitely decided upon the line of work he intends to follow. Upon trying railroad work he may not find it to his liking and gives it up. This is as it should be, and is best for all concerned. There should be no effort made to hold men at work which they do not like.

The wages received during their special apprenticeship are in some cases immeasurably low. Some railroads start these men at the rate of 10 cents an hour. Such a rate is not very much of an inducement when we compare it with the rates paid in other lines of work.

The majority of technical graduates have been educated at their parents' expense, and when they leave school they feel that they do not want to be dependent any longer. They feel that they should earn at least enough to support themselves. This is hard to do at the rate of 10 cents an hour. It is true this is more than the regular apprentice receives, but we must remember that the regular apprentice usually lives at home, or if he does not, he receives help for a year or two. Then, again, the special apprentice is older, and his needs are greater. If he succeeds in supporting himself he does so at a considerable sacrifice. After the first year his wages are increased and the struggle for existence is not so hard. However, there are a great many who do not consider the experience worth the sacrifice which it entails.

After the term of apprenticeship has been served the idea is that the man's theoretical and practical knowledge should be so blended that the combination will be of more value than either of these attributes taken separately. Consequently, upon the completion of his special apprenticeship course the technical graduate should be paid at least a full-paid mechanic's wages. I believe that investigation will show that in a great many cases this is not done. When it is not done it indicates either that the man has not developed the properties which he was expected to develop by taking a special apprentice course, or else that the railroad is trying to retain him for less than his services are actually worth. If the former is the case, it were charity to inform him of the fact and advise him to seek other fields; if the latter is the case, he is liable to seek other fields of his own accord or have others seek him.

If the apprentice has served four years, he has reached properties which he was expected to develop by taking a the age where he wants a little more tangible remuneration than experience. He wants to feel that he is worth at least as much as anothr man who has served the same length of time as a regular apprentice. As a matter of fact, if he is not worth as much as a full-paid mechanic, the railroad has failed to obtain the results it aimed at.

All through his special apprenticeship the man has been looking forward to obtaining a position of some kind upon the completion of his course. Unless he does receive such a position he is likely to go elsewhere. He cannot be blamed for this, because for four years he has been neither one thing nor the other in the shop or on the road. He has been a sort of supernumerary. He begins to feel that he wants a position of some kind, no matter what it is, which he will know that if he is not filling some one else must; in fact, a vital place in the organization. As a matter of fact, he has spent four years with this as his aim. His intention has been to fit himself for an executive position on the railroad. The railroad company on its part has implied that it would be in need of him if he proved capable. Consequently, if at the end of his special apprenticeship he does not secure a vital position of some kind he is liable to seek work elsewhere. I recall to mind the case of a special apprentice whom I knew, who had this complaint to make. Whenever he was asked what he was doing he could never give a satisfactory answer. He was neither apprentice nor mechanic nor boss. He did not fill any particular place. He was just working for the railroad. I believe that this is the principal cause of the special apprentice leaving railroad service. He has been expecting something which has not materialized, and consequently he leaves the service.

The question arises, Why has not the expected position been forthcoming? Evidently it is due to one of two reasons. Either there is no place for him, or else there are better men for the place.

Let us consider the last reason first, and see how well the special apprentice is qualified to hold a position as foreman.

In all probability he has not spent more than six months in any one department. This has been only long enough to give him a general idea of the running of the department. It has not been in it long enough to become thoroughly familiar with its workings. He must be rather an exceptional man in order that his superior will have enough confidence in his abilities to believe that he can run a department successfully when he has had but six months' experience in that kind of work.

Whenever a vacancy occurs there are usually some men in the ranks who are eligible to the position on account of their long experience in the department. As before stated, the superior officer is assuming considerable responsibility when he fills such a vacancy with a special apprentice rather than taking a man whose knowledge and experience in the work would make him the logical man for the place.

I believe this is one of the chief reasons why promotions are not forthcoming when the special apprentice expects them. Unless he has shown exceptional ability there is some hesitancy about promoting him to an executive position. In other words, he is not exactly the kind of a man he was expected to be at the end of four years.

The object of the special apprentice course is to make the man a specialist in railroad work. The indications are, however, that we have not gone far enough. His instruction has covered the whole mechanical field and at the end of his apprenticeship we have not the specialist we desire. Have we not been trying to do too much when we try to familiarize the man with half a dozen or more trades, the operation of car and locomotive shops and of engines on the road in four years' time? I believe that the result is that at the end of four years the man is still far from being a specialist. He has a general idea of these things, but he has not been in any one department long enough to become thoroughly familiar with it. The field he has been trying to cover is too large to be covered in the required time. I believe that better results would be obtained by not trying to do so much, but doing what was done more thoroughly, so that at the end of the four years the man would be a specialist. This could be done by offering different courses, each covering a separate field. By offering three courses the work would be subdivided enough that a man would be come more of a specialist. These courses should be arranged to cover the following work:

First. Car building and repairs: The four years' work could be divided as follows: Six months in the freight car shop on truck and body work; six months in the passenger car shop; four months in the paint shop; four months in the wood mill; four months in the car blacksmith shop; six months in the car machine shop; four months in the yard; four months in the drawing room; four months in the test room, and the last six months at large.

Second. Locomotive building and repairs: The four years' work could be divided as follows: Ten months in the machine shop; six months on the floor; nine months in the boiler shop; nine months in the blacksmith shop; four months in the drawing room; four months in the test room, and the last six months at large.

Third: Locomotive operation: The four years' work could be divided as follows: Three months in the roundhouse as helper; two months in truck gang; one year as fireman; three months as boiler washer; six months with boilermaker; eight months with machinist; four months in drawing room; four months in test room, and six months at large.

The last six months of each course could be devoted to such work as the master mechanic saw fit. For instance, there might be one department in which he intended to place the man at the completion of his course. The last six months could very profitably be spent in that department.

By confining the special apprentice to one of these three lines of work he would doubtless be of more value at the end of his appreticeship than he is under the present system. He would be a specialist in the particular line of work he has followed. There would not be the hesitancy there is at present about placing him in a position. He would surely be more competent under this system than he is under the present one. It is true he would not have had experience in all the departments, but at the same time he will not be entirely ignorant concerning them. If he has been at all observant he will have a general idea of the work in the other departments. At any rate, he will in all probability have a better idea of the work outside of the departments in which he has worked than will a master mechanic who has risen to his position from a mechanic.

The latter man will probably have, on account of his having risen from the ranks, one decided advantage over the special apprentice. He will understand his men better. He has worked by their sides and lived with them. He will appreciate their likes and dislikes and anticipate their ways of thinking and looking at things.

The better an officer is acquainted with the men under him the more successfully will he be able to deal with them. This is a fact which is lost sight of to a great extent in the special apprentice course.

Very often it is the case that where two or more of these men are employed in the same shop they will live together and practically ostracize themselves from the other men. This condition should not exist. The special apprentice should live the same as the regular apprentice. He should associate with them, and, in fact, become one of them. By so doing he will learn to know them better. He will know their ways of thinking and of looking at things. He will know how they will be apt to receive any order or innovation which is introduced in the shop.

It will enable him to look at all questions of shop manage-
will not be nearly so liable, when the time comes, to give orders to do things which will antagonize the men in the
ment from two diametrically opposite points of view. He
shop if he knows and understands them thoroughly.

It is a notable fact that, as a rule, men who have come up from the ranks are more successful in the handling of men than the technical graduate. This, we believe, is due to their better knowledge of the persons whom they have to deal.

The successful man is not so much the man who can do a great deal himself, but rather the one who can manage and direct the other men to concerted action and thus quickly attain the desired result.

So long as we insist on having a special apprentice system I believe that better results can be obtained by following the course as outlined above. To my mind, however, the special apprentice system is, at least, a poor one. The technical graduate is put in the shop and is given the best of opportunities to learn. He is given a great deal more attention than the ordinary apprentice. He is favored, and what is worse he expects it. On this account I am afraid that in a great many cases we turn out men who would have been a great deal better off if they had been given to understand that their advancement depended entirely on their own exertions. We favor them and turn out a hothouse plant, which, when finally transplanted, can not stand the cold blast of competition. At the same time that the special apprentice is being favored, the general effect on the shop is not good. When the other men in the shop see the technical graduate rushed ahead they are not liable to be nearly so energetic as when they see that all men are being treated alike. The more you take away from a man his prospect for promotion, the less valuable he becomes. If every man in the service feels that his chance for promotion is as good as that of any one else, you will have an organization which will do business and be free from discord.

Technical men are needed in railroad work and the need becomes greater every day.

In the meantime the railroads are feeling the need of technical men, and the question is how to get them and keep them. If it is possible to hire these men without offering them any special inducement or making any promises, I believe it would be the best way. This can frequently be done where a man is wanted for special work. He should be paid what he is worth, the same as any other man. By doing this the apprentices' and journeymen's ambitions are not stifled, and at the same time the technical man is put on his mettle, because any advancement which he receives will be due solely to his own efforts. If this can not be done and it is absolutely necessary to have special apprentices, let us not attempt to do so much with one man. Let us make a specialist of him and a specialist who can be used.

COST OF LOCOMOTIVE REPAIR SHOPS.

Committee: R. H. Soule, Chairman; L. R. Pomeroy, T. H. Curtis, S. F. Prince, Jr., A. E. Manchester.

In selecting units on which to base cost figures the square foot and the cubic foot have generally been used for buildings; in power plants the engine horse power, boiler horse power and generator kilowatts have also been used; in roundhouses the stall has been taken as the proper unit.

In computing the square feet of buildings, the outside dimensions have been used (giving the ground area covered); in computing the cubic feet of buildings, the average external height has been taken (giving the total volume occupied).

In the figures which follow, the different items are identified by reference numbers only, with such explanatory notes added as will aid in interpreting the unit prices; shops built prior to 1895 are designated as "old," those built since 1895, as "modern"; in a few cases the notes are based on uncertain information and are followed by an interrogation mark (?).

It is believed that in most cases the cost of a proposed shop will be asked for as soon as the layout plan has been completed, and that the following is the best basis for making an estimate:

List up all the buildings, with their ground area in square feet, all the miscellaneous structures, either on the square foot, the lineal foot, or the unit basis (as may appear best), all the track on the lineal foot basis, the turnouts on the unit basis, etc.; assign a unit price to each item, as determined by the special local conditions, carry out the cost extensions, and totalize; to the total thus obtained add a percentage to cover incidentals and items not shown by the layout plan; this percentage may vary from a minimum of 10 per cent to a maximum of 25 per cent, according to the completeness of the layout plan and the degree of confidence which may be felt in the unit prices assumed; the grand total should represent the approximate cost of the plant, exclusive of the cost of land and grading, which should be estimated separately, these two items not being susceptible of reduction to a unit basis.

If the buildings have been designed in detail their cost may be checked upon the cubic foot basis.

POWER PLANTS—BUILDINGS ONLY (WITHOUT CONTENTS)

ITEM.	Cost per Sq. Ft.	Cost per Cu. Ft.	NOTES.
1	2.14	076	Far West, modern; brick and concrete, with steel frame roof.
2	2.25	.057	Middle West, modern; brick and steel, fireproof, basement under engine room. masonry coal bunkers below ground alongside of building.
3	2.45	.060	East, modern; brick and steel with roof of tile and cement, the whole thoroughly fireproof, a very fine and somewhat ornate building.
4.	1.71	.064	Middle West, old; brick and steel with shingle roof.
5	3.50	......	Southeast, modern; brick and steel, building relatively long and narrow, increasing ratio of wall area to floor area; very deep and heavy foundations, coal trestle inside of boiler room. (These figures should be used with caution as they are not official, but were taken from a published statement).
6	4.20	.130	Middle West, modern; brick and steel, a very large plant, has two small wings which increase the ratio of wall area to floor area; basement under whole of engine room and about half of boiler room; interior finish highly ornamental.
7	2 42	.071	Middle West, modern; brick and steel, low (on account of locomotive boilers), no basement, only pits.
8	6.48	.138	Middle West, modern; brick and steel, basement throughout, overhead coal bunkers, fireproof, considerable architectural ornamentation.
9	3.32	083	Middle West, modern; brick and steel, fireproof.
10	2.83	157	East, modern; concrete construction including the roof, low building, basement under the engine room only.
11	2.85	084	MiddleWest, modern; brick and steel, basement under part of engine room only.
12	3.15	120	West, modern; brick and steel.

POWER PLANTS—BOILERS.

With Settings (except where noted).

ITEM.	Cost per B. H. P.	NOTES
13	11.70	Marine type internally fired.
14	13.64	Horizontal tubular, bricked in.
15	10.64	Water tube.
16	11.02	Water tube.
17	20.40	Vertical water tube, bricked in and including automatic stokers, stoker engines, stoker engine piping, fan engine and piping, feed pumps and piping.
18	13.09	Horizontal water tube with superheater.
19	12.00	Horizontal return tube, boilers in units of 100 horse-power.
20	17.39	Horizontal water tube boilers in 300 horse-power units; automatic stokers included.
21	12.84	Horizontal fire tube.
22	8.44	Horizontal water tube; without settings.
23	15.35	Water tube, including automatic stokers.
24	19.25	Horizontal water tube; closed ash pit for forced draft.
25	13.25	Horizontal water tube in 275 horse-power units.
26	14.45	Horizontal water tube, includes feed-water heater and feed pumps.
27	6.50	Plain horizontal, brick set.
28	11.87	Vertical water tube in 300 horse-power units.

POWER PLANTS—MECHANICAL STOKERS.

ITEM.	Cost per B. H. P.	NOTES.
29	4 48	Chain grate.
30	3 09	

POWER PLANTS—COAL AND ASH HANDLING APPARATUS.

ITEM.	Cost per B. H. P.	NOTES.
31	4.46	Wooden trestle 12 feet high, with sloping bottom (for shooting coal into boiler room), and necessary incline approach.
32	4.75	Power conveyor for coal and ashes.
33	2.14	Coal handling apparatus, simply gravity hoppers and push cars; ash handling apparatus, buckets handled by electric telpher.
34	6.16	Includes coal conveyor from basement to roof, and separate ash conveyor; also a separate ash house with connecting tunnel, elevator, bin, etc.
35	5 30	Based on ultimate boiler horse-power capacity of the plant.
36	3.42	Includes crusher, conveyors, elevators, etc.
37	1.73	Designed large enough to take care of an eventual one-third increase in boiler capacity.

POWER PLANTS—MECHANICAL DRAFT APPARATUS.

ITEM.	Cost per B. H. P.	NOTES.
38	1.30	Based on ultimate boiler horse-power capacity of the plant; includes stack 7 feet 8 inches diameter, by 60 feet high.
39	1.45	Includes small sheet-iron stack 5 feet diameter and 25 feet high.
40	2.74	Induced draft, stack extends five feet above roof.
41	1.50	

POWER PLANTS—ECONOMIZERS.

ITEM.	Cost per B. H. P.	NOTES.
42	2.33	Based on ultimate boiler horse-power capacity of plant; includes setting, bricking in, etc., complete.
43	3 75	Quoted by E. B. Katte (Electrical Engineer N. Y. C. & H. R. R. R.), in paper entitled "An Economizer Discussion," read at the November, 1903, meeting of the New York Railroad Club, as representing cost of economizers completely erected in New York city; this estimate is based on 3.25 square feet of economizer tube heating surface to each boiler horse-power.
44	5 40	Quoted by Henry C. Meyer, Jr., in his book "Steam Power Plants," Chap. VIII, p. 118, as representing cost of economizers (for plants of 1,000 boiler horse-power or over) erected, bricked in and connected, ready for use; this estimate is based on 4.8 square feet of economizer tube heating surface to each boiler horse-power.

POWER PLANTS—FEED PUMPS

ITEM.	Cost per B. H. P.	NOTES.
45	1.96	Outside central packed, double plunger.
46	2.66	

POWER PLANTS—FEED-WATER HEATERS.

ITEM.	Cost per B. H. P.	NOTES.
47	1.28	Open type.
48	.96	Vertical, 48 inches diameter by 9 feet 10 inches high.
49	.50	Open type.
50	.60	Vertical,

POWER PLANTS—ENGINES DRIVING GENERATORS ONLY.

ITEM.	Cost per H. P.	NOTES.
51	24.80	Horizontal, simple.
52	12.90	Horizontal cross compound, in 300 horse-power units.
53	15 00	One large horizontal Corliss, and one small high-speed, both simple.
54	19.34	Horizontal cross compound in 600 horse-power units.
55	6.66	Horizontal, simple. (?)
56	12.00	Horizontal cross-compound in several units of different sizes.
57	17.62	Average quotations of twenty-six bidders on 350 horse-power compound engines, and nineteen bidders on 225 kilowatts generators for municipal electric light plant at Jamestown, New York, see Engineering News (Supplement), of February 11, 1904.
58	10.49	Horizontal cross-compound, in units of 650 horse-power and less.
59	21.45	Vertical compound non-condensing engines in units of 250 horse-power.
60	16.40	Extra strong frames and parts, to stand when necessary very heavy load, in units of 175 horse-power.
61	16.00	Vertical compound non-condensing, in 250 horse-power units.
62	13.60	Part horizontal cross-compound condensing, part vertical compound condensing
63	11.70	Horizontal tandem compound.

POWER PLANTS—ENGINES NOT DRIVING GENERATORS.

ITEM.	Cost per H. P.	NOTES.
64	12.80	Horizontal, simple.
65	8.25	Horizontal Corliss in a 350 horse-power unit.
66	8.28	Plain horizontal engine without refinements.

POWER PLANTS—ENGINES AND GENERATORS DIRECT CONNECTED.

ITEM	Cost per H. P.	Cost per K. W.	NOTES.
67	36.28	60.64	Simple vertical 250 horse-power engines with engine type 150 kilowatts generators.

POWER PLANTS—CONDENSERS.

ITEM.	Cost per Engine H. P.	NOTES.
68	5.70	
69	2.26	Surface condenser; includes air pump.

POWER PLANTS—GENERATORS.

ITEM.	Cost per K. W.	NOTES.
70	28.00	Direct current.
71	20.21	Direct current in 200 kilowatts and 110 kilowatts units.
72	22.89	Direct current in 200 kilowatts and 100 kilowatts units.
73	32.58	Generators in 400 horse-power units; includes also switchboard and station wiring.
74	17.04	Very small generators.
75	17.33	Direct current in 500 kilowatts and 250 kilowatts units.
76	30.48	Average quotations of twenty-six bidders on 350 horse-power compound engines, and nineteen bidders on 225 kilowatts generators for municipal electric light plant at Jamestown, New York, see *Engineering News* (Supplement), of February 11, 1904.
77	17.71	Direct current in 400 kilowatts and 75 kilowatts units.
78	22.61	Generators in 75 kilowatts units.
79	19.20	Units of 100 kilowatts direct current at 240 volts.
80	17.40	Units of 150 kilowatts direct current.
81	21.10	Units of 200 kilowatts direct current at 220 volts.
82	20.30	Direct current at 220 volts

POWER PLANTS—SWITCHBOARDS.

ITEM.	Cost per Generator K. W.	NOTES.
83	11.30	One small generator, 50 kilowatts capacity.
84	5.20	Direct current only.
85	3.65	Small and simple.
86	7.08	Direct current only.
87	5.33	Direct current only.
88	4.45	In place, but not connected.
89	8.33	Direct current only.
90	2.50	Simple and plain, direct current only.
91	3.50	Direct current 220 volts.
92	4.00	Direct current only.

POWER PLANTS—AIR COMPRESSORS.

ITEM.	Cost per 100 cu. ft. Free Air per Min	NOTES.
93	508 47	Steam end simple, air end two stage
94	507 53	Simple steam cylinder, compound air cylinders with inter-cooler
95	385 00	One large and one small duplex cross-compound.
96	647 00	Steam end cross-compound, air end two-stage, units, 1,500 cubic teet free air per minute.
97	412 03	Duplex, steam end compound, air end two-stage, capacity 1,000 cubic feet free air per minute.
98	271 00	Duplex, steam end compound, air end two-stage. (?)
99	400 00	Steam end cross-compound, air end two-stage.
100	290 46	Steam end simple, air end two-stage with inter-cooler, capacity 1,200 cubic feet free air per minute.
101	372 53	Steam end compound, air end two-stage.
102	866 66	Steam end compound, air end two-stage; very elaborate valve gear with refinements in cut-off, etc., capacity 1,500 cubic feet free air per minute
103	338.20	Single stage air compressor subdivided into two units.
104	370 00	Duplex, steam end simple, air end compound with inter-cooler
105	682 00	Duplex, steam end compound, air end two-stage.
106	533 00	Steam end simple, air end two-stage.

POWER PLANTS—PIPING.

ITEM.	Cost per Engine H. P.	NOTES.
107	1.64	Connections close and short.
108	11.67	Includes the Holly automatic return system.
109	7.60	An average installation.
110	7 75	A most complete and well arranged installation, plant has 2,000 horse-power of boilers and 2,250 horse-power of engines; boilers are vertical, requiring a maximum amount of piping.
111	1.94	Small plant, with boilers, feed-water heater, engine and air compressor close together.
112	10.93	Plant includes economizer, induced draft apparatus, hydraulic pumps and accumulator, etc.
113	10.88	A very complete installation, based on rigid specifications.
114	10 72	Designed with a view to an eventual increase of one-third present engine horse-power
115	4.00	Simple and direct.
116	8.20	Includes hydraulic system.
117	.88	Short, simple and direct.
118	3.78	Simple and direct.

POWER PLANTS—CHIMNEYS.

ITEM	Cost per B. H. P.	NOTES.
119	1.12	Steel, 3 feet 8 inch diameter, by 80 feet high.
120	12.62	Hollow brick, 7 feet diameter inside, by 175 feet high.
121	4.93	Common brick, fire brick lining, 7 feet 3 inches inside diameter, and 140 feet high.
122	3.19	Hollow brick, 10 feet inside diameter and 125 feet high, supplemented by undergrate forced draft.
123	2.47	Square brick base 25 feet high, surmounted by steel stack 4 feet 6 inches diameter, and 75 feet high, total height 100 feet.
124	4.25	Circular brick chimney, diameter inside, 6 feet; height, 120 feet.
125	6.74	Hollow brick, 4 feet diameter and 80 feet high.
126	3.33	Steel, brick-lined part way up.
127	4.51	Designed of sufficient size to take care of one-third increase of boiler capacity
128	9.50	Brick, 9 feet diameter and 188 feet 6 inches high.
129	5.00	Steel, 4 feet diameter and 150 feet high.
130	4.16	Brick.

POWER PLANTS—TOTAL COST.

ITEM.	Cost per Engine H. P.	Cost per Generator K. W.	Cost per Sq. Ft.	Cost per Cu. Ft.	NOTES.
131	131.33	219.00	11.40	.40	Far West, modern; a substantial, effective plant devoid of ornamentation or refinements; coal dumped from trestle and shoveled, ashes shoveled.
132	140.27	210.00	7.00	.18	Middle West, modern; building has considerable ornamentation inside and out, but the equipment auxiliaries are simple, overhead crane in engine room.
133	115.00	167.00	12.20	.28	East, modern; building has considerable ornamentation inside and out; principally alternating current apparatus with auxiliary direct current equipment.
134	185.06	278.00	11.50	.36	Middle West, modern; includes (besides boilers, engine generators and air compressors), induced draft apparatus, coal and ash handling apparatus, hydraulic plant, etc.
135	129.28	210.60	14.62	.33	Middle West, modern; a very complete plant both mechanically and architecturally.
136	123.00	191.00	14.30	.36	Middle West, modern; large enough to allow for a one-third increase in capacity of the plant.
137	129.00	225.00	10.40	.58	East, modern; fireproof construction throughout.
138	90.90	151.50	10.40	.24	West, modern; a simple but effective plant limited to direct current, no coal or ash handling apparatus.
139	128.60	211.00	10.55	.31	Middle West, modern; condensing equipment.

ERECTING AND MACHINE SHOPS.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
140	3.50	1.08	.71	5.34	.076	.115
141	1.03	2.49	.187	3.70	.034	.123
142	.706	1.78			.029	
143	1.67	2.05	.086	3.79	.051	.118
144	2.43	.81			.051	
145	1.65	2.69			.041	
146	1.80	1.65			.046	
147	1.82				.050	
148	3.08	1.63			.073	

NOTES.

140. East, modern; brick and steel, transverse shop, erecting shop has both heavy and light cranes; machine shop has crane service throughout, saw tooth roof.
141. Middle West, old; brick and wood, transverse shop in two parts, one part one story with slate roof, the other part two stories with gravel roof.
142. Middle West, old; stone and wood, transverse shop, gravel roof supported by posts.
143. Middle West, old; brick with wood and iron roof trussing and shingle roof, longitudinal shop, machine shop on one side, traveling cranes in erecting shop.
144. Middle West, modern; brick and steel, transverse shop, high for two-thirds of width with heavy crane, the remaining one-third being low, with saw-tooth roof.
145. Middle West, three-fourths old, one-fourth new, brick and steel, transverse shop, new part two stories; no traveling cranes.
146. Pacific Northwest, modern; brick and steel, overhead crane.
147. Pacific Southwest, modern; brick and steel, overhead crane.
148. Far West, modern; brick and steel, overhead crane.

ERECTING, MACHINE, BOILER AND TANK SHOPS.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
149	1.35	.966	.336		.033	
150	2.20					
151	1.91					
152	2.42	1.50	.866	4.79	.051	.101
153	1.63			2.00	.017	.021
154	.58	1.48	.246	2.31	.033	.182

NOTES.

149. Middle West, modern; steel and brick, longitudinal shop, machine shop on one side, boiler shop on other side, crane runways throughout.
150. East, modern; brick and steel, longitudinal shop, machine shop on one side, boiler and tank shop on other side; crane runways.
(These figures should be used with caution, as they are not official, but were taken from a published statement.)
151. Middle West, modern; brick and steel, longitudinal shop, machine shop on each side (one side two stories), wings have saw tooth roof, boiler and tank shop is a continuation of erecting and machine shop; crane runways throughout.
152. Middle West, modern; brick and steel, transverse shop, erecting shop has both heavy and light crane, machine shop has partial crane service and boiler shop full crane service.
153. East, modern; brick and steel, longitudinal shop, heavy cranes in erecting shop, crane over one bay of machine shop; boiler and tank shop is a continuation of erecting and machine shops, with joint crane service
154. Middle West, old; wood, transverse shop, no overhead cranes.

ERECTING, MACHINE, BOILER, SMITH AND WHEEL SHOP.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
155	2.60	1.33	.475	4.42	.046	.079

NOTES.

155. Far West, modern; transverse shop, concrete, brick and steel, three fire walls, gravel roof, cranes in both erecting and machine shop.

ERECTING, MACHINE, BOILER, SMITH SHOP AND POWER PLANT.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
156	2.20	1.39	1.38	4.97	.050	.114

NOTES.

156. West, modern; brick and steel, transverse shop, gravel roof; erecting and machine shop, also boiler shop, same cross section, power plant and smith shop same width but lower; crane equipment, erecting and machine shop.

MACHINE SHOP.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
157	.952				.038	

NOTES.

157. Middle West, old; brick and wood, gravel roof supported by posts.

BOILER AND TANK SHOPS.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total
158	2.98	.72	.84	4.54	.083	.127
159	1.58	.40			.049	
160	.84	.94	.076	1.87	.033	.075
161	1.66	.48	.083	2.24	.059	.080
162	.99				.025	
163	1.53	.96			.095	

NOTES.

158. East, modern; brick and steel, cranes cover entire floor, saw tooth roof.
159. Middle West, modern; briek and steel, one half of width high for crane service, the other half lower and without cranes.
160. Middle West, old; brick and wood with slate roof.
161. Middle West, old; brick and wood, shingle roof, gallery along one side, cranes over part of floor space.
162. Pacific Southwest, modern; brick and steel, overhead crane, smith shop in one end.
163. Middle West, two-thirds old, one-third new; brick and wood, new part two stories, no overhead cranes. (?)

SMITH SHOPS.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Tools.	Building Only.	Total.
164		.734	.110			
165	2.63	.982	.171	3.78	.080	.115
166	1.79	1.44			.049	
167	.432	2.26	.086	2.77	.019	.126
168	1.06	1.09	.050	2.22	.035	.074
169	2.25					
170	1.43	.665	.435		.042	
171	1.50					
172	2.37	1.96	.348	4.68	.052	.104
173	1.21				.041	.055
174	1.38					
175	.91	.60			.031	

NOTES.

164. Middle West, old.
165. East, modern; brick and steel, high and light, thoroughly equipped.
166. Middle West, modern; brick and steel, one bundred feet wide, hip roof without posts.
167. Middle West, old; brick and wood with slate roof.
168. Middle West, old; brick and wood, shingle roof.
169. Southeast, modern; brick and steel, unusually bigb (tbirty-tbree feet from floor to lower chord of roof truss). (These figures should be used with caution, as tbey are not official, but were taken from a published statement.)
170. Middle West; modern; brick and steel.
171. Middle West, modern; brick and steel, tile and gravel roof.
172. Middle West, modern; briok and steel, brass foundry and car machine shop under same roof, equipment very complete.
173. East, modern; concrete and steel, 80 foot span, no posts.
174. Northeast, modern; brick and wood, 60 foot span, no posts, simple construction.
175. Middle West, two-thirds old; one-third new; brick and wood. (?)

IRON FOUNDRY.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
176	3.18					

NOTE.

176. Brick and steel, modern; U. S. Navy Yard, Bremerton, Wash.

IRON AND WHEEL FOUNDRY.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
177	.711		.432		.024	

NOTE.

177. Middle West, old; wooden building, cost includes several annexes. (?)

PATTERN AND UPHOLSTERY SHOP

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only	Total.
178	.857		.131	.988	.043	.050

NOTE.

178. Middle West, old; wooden building, two stories.

PASSENGER CAR REPAIR SHOPS.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
179	1.24		.016	1.25	042	.043
180	1.20					
181	2.64	044	.096	2.78	.099	.105
182	1.34		.015	1.35	.056	.057
183	.68	.003	.057	.74	.026	.028
184	.83				.029	

NOTES.

179. Middle West, modern; longitudinal shop, brick and wood.
180. Southeast, modern; transverse shop, brick and wood, has upholstery and cabinet shops under same roof. (These figures should be used with caution, as they are not official, but were taken from a published statement.)
181. Middle West, modern; transverse shop, brick and steel, includes upholstery and trimming shop and hot-air heating.
182. East, modern; transverse shop, brick and steel with cement foundations, saw tooth wooden roof.
183. Southeast, modern; transverse shop, brick up to window sills, corrugated galvanized iron sheathing on wooden frame above, gravel roof, granolithic floor, used also for painting and varnishing. (Identical with Passenger Car Paint Shop No. 193.)
184. Middle West, old; brick and wood. (?)

PASSENGER CAR PAINT SHOPS

ITEM.	COST PER SQ. FT. OF GROUND AREA				COST PER CU. FT	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
185	1.24		.004	1.24	.04	.04
186	1.94	.055	.092	2.09	.072	.078
187	1.02				.033	
188	1.20					
189	1.01		.039	1.05	.035	.036
190	.35					
191	2.36	.009	.056	2.43	.081	.084
192	1 13		.009	1.14	.051	.052
193	68	.003	.057	.74	.026	.028
194	.89				.032	

NOTES.

185. Middle West, modern; longitudinal shop, brick and wood.
186. East, modern; longitudinal shop, brick and steel, saw tooth roof, hot-air heating.
187 Pacific Southwest, modern; transverse shop, brick and steel.
188. Southeast, modern; transverse shop, brick and wood, has varnish room and pipe shop under same roof (These figures should be used with caution, as they are not official, but were taken from a published statement.)
189 Northeast, modern; longitudinal shop, brick and steel, includes small paint, varnish and boiler rooms at one end.
190. South, old; wooden structure.
191 Middle West, modern; transverse shop, brick and steel, includes cleaning room, varnish room and hot-air heating.
192. East, modern; transverse shop, brick and steel with cement foundations, saw tooth wooden roof.
193 Southeast, modern; transverse shop, brick up to window sills, corrugated galvanized iron sheathing on wooden frame above; gravel roof, granolithic floor, used also for coach repairs. (Identical with passenger car repair shop No. 183)
194 Middle West old, brick and wood. (?)

FREIGHT CAR REPAIR SHOPS.

ITEM	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only	Tools.	Misc. Eqpt.	Total.	Building Only	Total.
195	.40		016	415	022	023
196	2 12	123	047	2 29	.075	.080
197	.29			.29	.015	.015

NOTES.

195. Middle West, old; wooden building, longitudinal, entirely enclosed.
196. Middle West, modern; brick and steel, longitudinal, includes cabinet shop and hot-air heating.
197. Middle West, old; large shop, longitudinal, construction not known, but probably wood with partly open sides

CAR SHOP, PAINT SHOP, PLANING MILL, CABINET SHOP. UPHOLSTERY SHOP.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
198	1.48	.302	.216	2.00	.071	.095

NOTE.

198. West, modern; brick and steel, transverse shop, gravel roof with central posts; car shop (for both passenger and freight) and paint shop, one story, remainder of building two-story, with cabinet shop and upholstery shop over planing mill.

CAR SMITH AND CAR MACHINE SHOP.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST. PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
199	.77	1.06			.028	

NOTE.

199. Middle West, old; brick and wood. (?)

WHEEL AND AXLE SHOP.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
200	4.03	2.16	.72	6.91	.16	.276

NOTE.

200. West, modern; brick and steel, for car work only.

CAR REPAIR SHOP AND PLANING MILL.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
201	.975				.031	

NOTE.

201. Pacific Southwest, modern; brick and steel, has intermediate two-story section for sub-departments.

PLANING MILLS.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
202	.487	.54	.010	1.04	.026	.056
203	1.15	1.18	.25	2.58	.045	.102
204	.76	1.21	.292	2.26	.033	.098
205	1.85					
206	.37					
207	2.54	1.44	.082	4.06	.095	.153
208	2.53	.558			.057	
209	.39	.50			.014	
210	.74	.485	.239	1.47	.037	.073

NOTES.

202. Middle West, old; wooden building, tools and equipment very light.
203. Southeast, modern; brick up to floor line, then corrugated galvanized iron on insulated wooden frame, basement and one story, gravel roof, mechanical power plant in annex, cabinet shop in wing.
204. Middle West, old; brick and wood, slate roof.
205. Southeast, modern; steel and brick. (These figures should be used with caution, as they are not official, but were taken from a published statement.)
206. South, old; wooden structure.
207. Middle West, modern; brick and steel, does not include cabinet shop, which is separate.
208. Middle West, old; brick and wood, includes pattern shop. (?)
209. Middle West, old; wooden building. (?)
210. West, modern; wooden. (?)

STOREHOUSES.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
211	1.142		.168	1.31	.044	.050
212	3.60					
213	3.05		.67	3.72	.073	.089
214	2.40			2.72	.110	.124
215	2.00				.050	

NOTES.

211. Southeast, modern, brick up to window sills, then corrugated galvanized iron on unsheathed wooden frame, two stories, gravel roof, platform, bins, shelves, etc., complete.
212. Southeast, modern; brick and steel, two stories and basement, extensive offices in one end on both floors. (These figures should be used with caution, as they are not official, but were taken from a published statement.)
213. Middle West, modern; brick and wood, three stories.
214. East, modern; concrete construction, one end two stories, upper floor used for offices.
215. Middle West, old; brick and wood, two stories. (?)

OIL HOUSES.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
216	5.41		1.43	6.84	.208	.263
217	3.52		1.55	5.07	.196	.302
218	1.33				.089	
219	2.15		1.34	3.49	.097	.159

NOTES.

216. Middle West, modern; brick and steel, basement and one story, full equipment of tanks, etc.
217. East, modern; concrete walls and roof, one story with deep basement.
219. West, modern; brick and steel, tile roof, two stories.

ROUNDHOUSES.

ITEM.	Number of Stalls.	COST PER STALL.			
		Building Only.	Tools.	Misc. Eqpt.	Total.
220	18	1,388.88			
221	46	1,155.00			
222	10	2,400.00			
223	10	1,757.70			2,090.60
224	30				1,500.00
225	13	1,040.00			
226	8	2 750.00			
227	7	1,033.00			
228	33				2,200.00
229					1,845.00
230	44	1,998.00	133.00	328.00	2,459.00
231	30	4,150.00			
232	25	1,950.00			2,455.00
233	48	2,480.00			
234	25	1,719.00			
235	18	1,011.00			
236	23	1,065.00			
237	44	1,740.00			
238	40	1,875.00	87.50	787.50	2,750.00

NOTES.

220. Middle West, old; 63 feet span, brick and wood, slate roof, trussed (no posts).
221. Pacific Southwest, modern; 80 feet span, brick and wood, roof supported by posts.
222. Far West, modern; part 75 foot span, part 85 foot span, brick and wood, gravel roof, supported by posts.
223. Far West, modern; 85 foot span, brick and wood, gravel root, supported by posts.
224. Middle West, old; 65 foot span, brick and wood, gravel roof, supported by posts.
225. Middle West, old; 78 foot span, brick and wood, gravel roof, supported by posts.
226. Middle West, modern; 89 foot span, brick and wood, gravel roof, supported by posts.
227. Middle West, old; 80 foot span, brick and wood, gravel roof, supported by posts.
228. East, modern; 81 foot span, brick and steel, gravel roof, supported by flat truss (no posts), rolling steel doors, cost does not include heating equipment.
229. Northwest, modern; 84 foot span, brick and wood, gravel roof, supported by posts, cost does not include heating equipment.
230. Northeast, modern; 80 foot span, brick and wood, gravel roof, supported by posts, annex with boilers, heating apparatus (hot air), and air compressor.
231. East, modern; 90 foot span, brick and steel, slag roof, with crane runway covering outer half of span, has very heavy pile and stone foundations.
232. East, modern; 80 foot span, concrete and wood, gravel ronf, supported by posts.
233. Northeast, modern; 75 foot span, brick and wood, gravel roof, supported by posts.
234. Northeast, modern; 75 foot span, brick and wood, gravel roof, supported by posts.
235. Northeast, modern; 72 foot span, brick and wood, gravel roof, supported by posts.
236. West, modern; 80 foot span, brick and wood, gravel roof, supported by posts.
237. Middle West, part old, part modern; 70 foot and 85 foot span, gravel roof, supported by posts. (?)

LAVATORY.

ITEM.	COST PER SQ. FT. OF GROUND AREA.				COST PER CU. FT.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
239				2.55		

NOTE.

239. Middle West, modern; average of three large lavatories (including water closets, urinals, wash room and locker rooms); buildings of concrete and brick with tile roofs on wooden trusses; cement floors, complete with contents, ready to use.

OFFICE BUILDINGS.

ITEM.	Cost per Sq. Ft. of Ground Area.				Cost per Cu. Ft.	
	Building Only.	Tools.	Misc. Eqpt.	Total.	Building Only.	Total.
240	.306	......	......	......	.030	......
241	8.01	.557	.295	8.86	.167	.187
242	1.04	......	......	......	.034	......

NOTES.

240. Middle West, old; frame building with brick foundation, includes M. M. store department, steam heat.
241. Middle West, modern; brick and wood, basement, two stories and attic, ornamental architecture.
242. Middle West, old; wooden, two stories and basement. (?)

TRACK.

ITEM.	Cost per Lin. Ft.	Add. For Each Switch.	NOTES.
243	0.70	170.00	Based on use of "fit" (second-hand), 67 lb. rail.
244	1.00	180.00	Based on use of "fit" (second-hand), 85 lb. rail.
245	1.00 to 1.25	75.00 to 125.00	Based on use of new rail, according to weight.

TURNTABLES.

ITEM.	Diameter.	Cost.	NOTES.
246	70′	$3,000	Exclusive of pit.
247	70′	5,091	Including pit. (?)

TRANSFER PITS AND TABLES.

ITEM.	Cost per Sq. Ft. of Pit.			NOTES.
	Pit.	Table.	Total.	
248	.31	.17	.48	Far West, modern; to handle the heaviest class of engines.
249	.43	.16	.59	East, modern; pit of concrete throughout; capacity of the table, 200 tons.

MISCELLANEOUS STRUCTURES.

ITEM.	NAME.	COST.	NOTES.
250	Ash pit	$30.20 per lineal foot.	
251	Coal chute	.65 per square foot.	Two sided with trestle approach. (?)
252	Water tank......	1,900.00 total	50,000 gal. capacity on timber trestle. (?)
253	Water pipe, underground laid.	1.43 per lineal foot......	Large system, pipes from 12 in. down to 4 inch.
254	Sewer pipe, underground laid	2.88 per lineal foot	Large system, pipes from 24 in. down to 12 inch.
255	Long lines of wrought iron pipe (for air gas or water), with usual proportion of valves, fittings, etc., in place	25.00 per 100 lineal foot .... 45.00 per 100 lineal feet. .... 85.00 per 100 lineal feet. .... 130.00 per 100 lineal feet.	1 in. dia. 2 in. dia. 3 in. dia. 4 in. dia. } Given by a large pipe contracting firm of Pittsburgh.

MINOR BUILDINGS.

ITEM.	NAME.	Cost per Sq. Ft.	Cost per Cu. Ft.	NOTES.
256	Iron storehouse......	.24	.011	Old, wooden. (?)
257	Brass foundry	1.96	.098	Old, brick and wood. (?)
258	Upholstery shop	.58	.029	Old, brick and wood. (?)
259	Paint mixing shop......	.58	.029	Old, brick and wood. (?)
260	Paint storehouse......	1.75	.087	Old, brick and wood. (?)
261	Freight repair shed. .	.11	......	New, wooden, open sides. (?)
262	Dry kiln	.79	.039	Old, wooden. (?)
263	Lumber shed	.21	......	Old, wooden, open sides. (?)
264	Storehouse shed.	.31	.015	Old, wooden. (?)
265	Coal shed	.24	.020	Old, wooden. (?)
266	Coal shed	.25	.021	Old, wooden. (?)
267	Charcoal shed	.21	.017	Old, wooden. (?)
268	Ice house	.57	.028	Old, wooden. (?)
269	Ice house	.60	.030	Old, wooden. (?)
270	Crematory	2.52	.210	
271	Small office building .	.50	......	Old, wooden, one story.

LOCOMOTIVE FRAMES.

Committee: T. S. Lloyd, Chairman; S. M. Vauclain, J. E. Sague, R. Wells, S. Higgins, A. Lovell.

The scope of the work laid out for the committee is shown by the following outline:

"To consider (first) the question of large locomotives with reference to a study of the causes of breakage?

"Second: How shall distortions, both vertical and horizontal, be provided for, and which deflection is most necessary to provide for, or prevent?

"Third: Which is the better material, cast steel or wrought iron?"

A careful scrutiny of the material received in response to the circular of inquiry sent out by the committee conveys no information as to why the particular frames in question break; nothing to indicate, per se, that the material from which the frames were made had anything to do with the fractures. The breakages reported are not confined to any particular locality; they show cracks in and about all pedestal jaws, in fact, as many fractures back of leading axle as in front and about same; also that the fractures occur just as frequently in the solid parts as through the bolt holes.

The preference of the members as to whether wrought iron or cast steel should be used is given in the following summary:

Total number of replies......41
Roads favoring steel frames......18
Roads favoring hammered iron......15
Roads expressing no preference...... 8
Based on the number of locomotives:
In favor of steel, representing...11,512 locomotives
In favor of iron, representing.... 5,613 locomotives
Non-committal, representing .... 4,015 locomotives

Total locomotives 21,140
Percentages by locomotives:
In favor of cast steel......55 per cent
In favor of wrought iron......26 per cent
Non-committal ......19 per cent

100 per cent

The total number of locomotives in the country is about 44,000. Percentage of total number of locomotives covered by the replies is forty-eight per cent.

The causes of fracture may be classified as follows:

(a) Design.

(b) Imperfect welds and faulty material.

(c) Inertia of the boiler with reference to the frames, augmented by high cylinder saddles and accompanying high center of gravity of the boiler; the initial cause, the inertia of the boiler, when front bumpers strike an obstruction or when brakes are suddenly applied. The fractures showing mainly between the cylinders and front driver.

All are not in agreement as to this, however, and attribute the class of breakage located between the cylinders and front driver to

(d) Presence of water in cylinders, when accompanied by such arrangement of valves that prevents the water getting away quickly and freely.

A discussion, bearing mainly on point (c), furnished by one of the members, is as follows:

"There seems to be no question but that the fractures are usually located between the cylinder saddle and the rear of the first pedestal, but it should be further determined whether or not the cracks start from the bottom of the rail. If they do, then the bending moment due to the inertia of the boiler when the motion of the frame is suddenly arrested can not be a cause of failure, because the bending moment induced by such force would put the top of the rail in tension and the bottom in compression, and the crack would therefore start from the top, as previously explained, except when coupling. If they start from the corner of the pedestal it is reasonably certain that the failure is caused by a loose bolt or light design of pedestal binder. It is very probable that the binder bolt will show a very much larger percentage of failures extending in the corner of the pedestal to the top of the rail than the clip pedestal brace, because of the diffiulty of securing a bolt sufficiently large to prevent it stretching in service. Those failures which occur in the front of the pedestal can not be assigned to this cause (unless the pound would strain the frame in a place of weaker section), and in failures of this nature the design of cylinder fastening and keys should be thoroughly examined. It might be well to point out that the bending moment induced by the pull of the drawbar would be at a maximum at a point between the front pedestal and the front cylinder. A stress from such a cause would start a crack from the bottom of the rail. If the frames break from a definite load or fiber stress, then a good grade of cast steel should give equal if not better results than wrought iron, and the steel should be of a moderately stiff grade. If, on the other hand, the frames break by a definite amount of distortion or bending, then wrought iron or soft steel would give better results, inasmuch as it would take a smaller force to bend this material a certain amount and the fiber stress induced would therefore be considerably less in the case in which the stiff steel is used."

Professor Lanza has fully discussed the static loads and stresses on frames; these show that the frame is amply strong to resist any such stresses.

The inertia of the boiler in accelerating or retarding the train has also been given as a possible cause of breakage. Since frames never start to break from the top but always from the bottom of the rail, it is evident that the inertia of the boiler while the train is being retarded can not be a cause of fracture, but the bottom of the rail is put in tension in overcoming the inertia of the boiler while the train is being accelerated. The stress produced by this force is as follows:

Weight of boiler=57,000 lbs......=W
Acceleration=5.655 feet per second......=a

$$\text{Force } \frac{57{,}000 \times 5.655}{32\ 2} = 10.010 \text{......} = F$$

Center of gravity of boiler also center of frame 56 inches..=d
Bending moment = 56 x 10,010 = 560,560 inch lbs......=M
Moment of resistance = 103.5,

$$\text{Fiber stress} = \frac{560{,}560}{103.5} = 5{,}416 \text{ lbs. per sq. inch......} = F$$

This is well within safe limits and is not sufficient to cause the frame to break. When the train is being retarded by application of brakes the top of the rail is being strained in tension by this amount, but when the train is being accelerated the bottom of the rail is being strained, and other forces also turn to increase the stress due to the force necessary to accelerate the boiler.

Second. Water in cylinders.

(a) Upward bending.

Assume that the frame is deflected by force of blow.

Deflection = a = $^1/_{10}''$

Length = e = 41″ from center of cylinder to fillet in front of front pedestal.

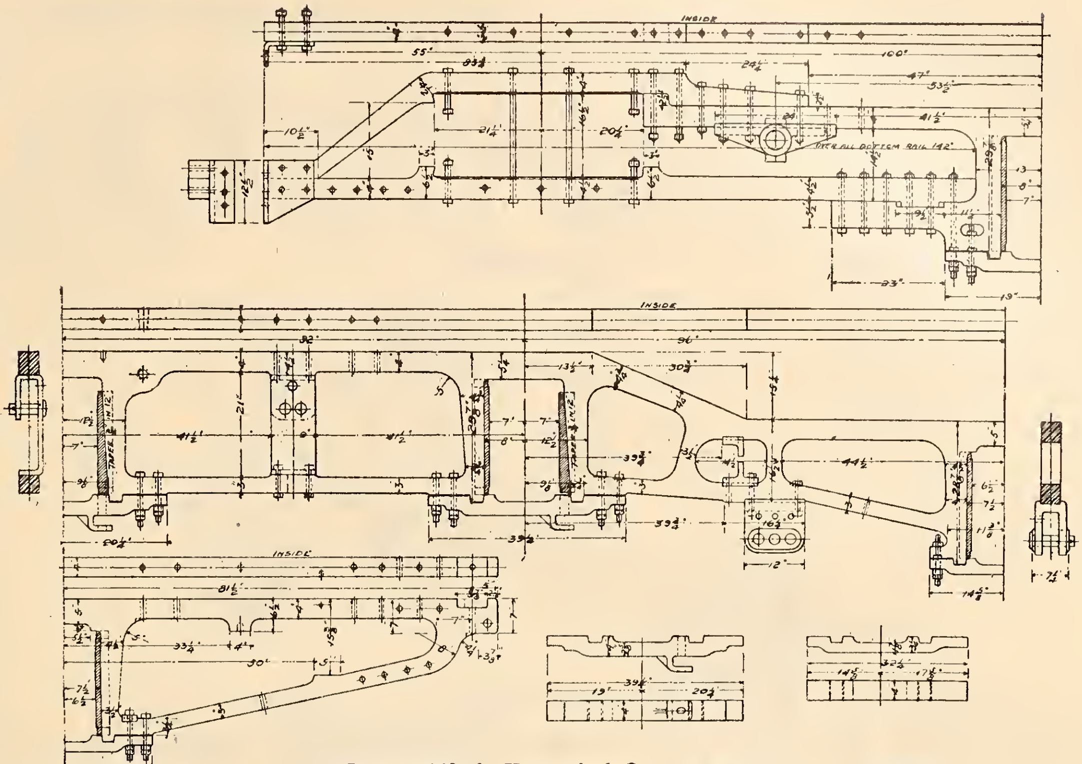


PLATE No 4. TYPE 4-4-2. BALDWIN LOC. WORKS.

$$f = \frac{3d\,Ea}{e^2} = \frac{3 \times .10 \times 30000000 \times 3625}{41^2} = 19{,}600 \text{ lbs. per sq. inch.}$$

(b) Side bending.

Compression increased by steam pressure on other side:

350 lbs. per sq. in. compression.

200 lbs. per sq. inch, steam on other side.

550 lbs. per sq. in. equal 308,000 pounds total pressure.

23.5 lbs. — moment arm.

308,000 x 23.5 = 7.238000 inch lbs. = Bending moment.

1650 = Moment of rupture through section of smoke box and frames.

4,390 lbs. per sq. in. = Fiber stress.

Third. Effect of rounding curves.

The centrifugal force of the weight carried by the front drivers:

16 degree curve = 358′ radius.

Speed 30 M. P. H. = 44 feet per second.

Weight on journals = 41,000.

$$F = \frac{W\,V^2}{g\,v} = \frac{41{,}000 \times 44^2}{32.2 \times 358} = 6{,}888 \text{ pounds.}$$

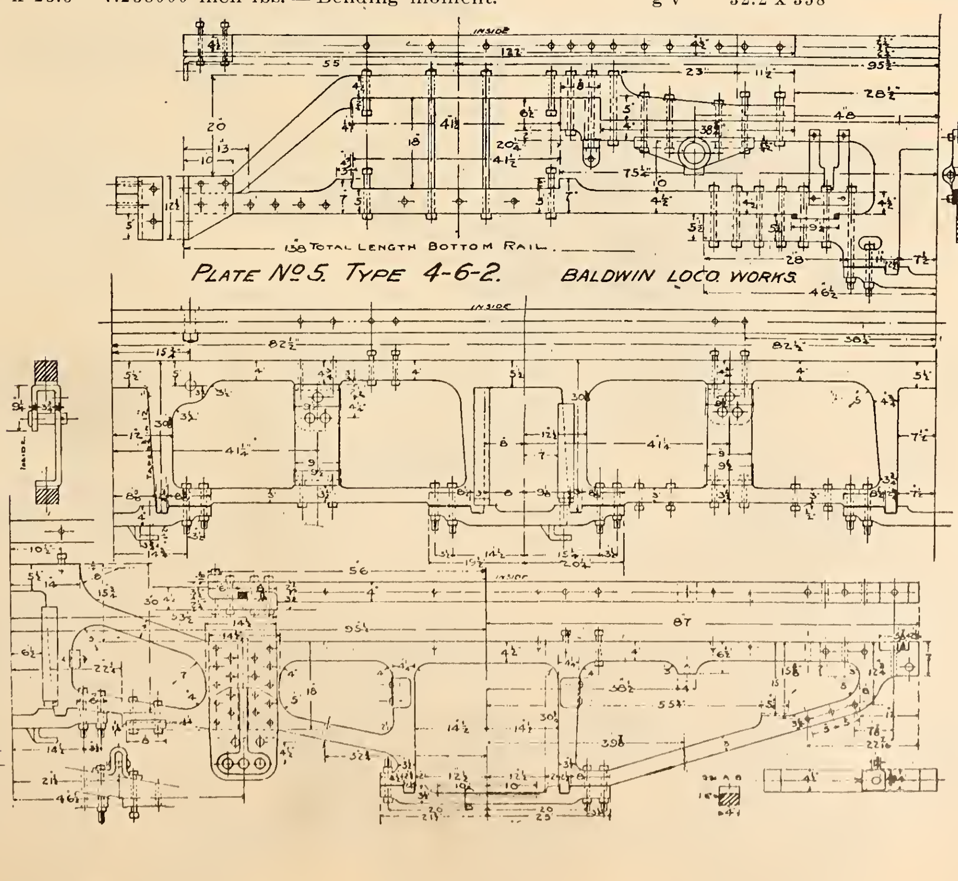


PLATE No 5. TYPE 4-6-2. BALDWIN LOCO. WORKS.

Moment arm = center of pedestal to first bolt in cylinder connection = 37.75.

Bending moment = 6888 x 37.75 = 260,000 inch lbs.

Moment of rupture = 37.675.

Fiber stress = 7,960 lbs. per sq. in.

From the above calculations the following conclusions may be drawn:

First. The inertia of the boiler following the sudden application of brakes can not produce a sufficient force to break the frame.

Second. The inertia of the boiler due to the acceleration of the train by acting with other forces such as those produced by water in the cylinders, may bring about fracture.

Third. The dynamic effect of the compression of water in the cylinders is the only force which, unaided, can cause failure of the frames by fatigue.

It may be well to point out that when the right side leads, the right side always

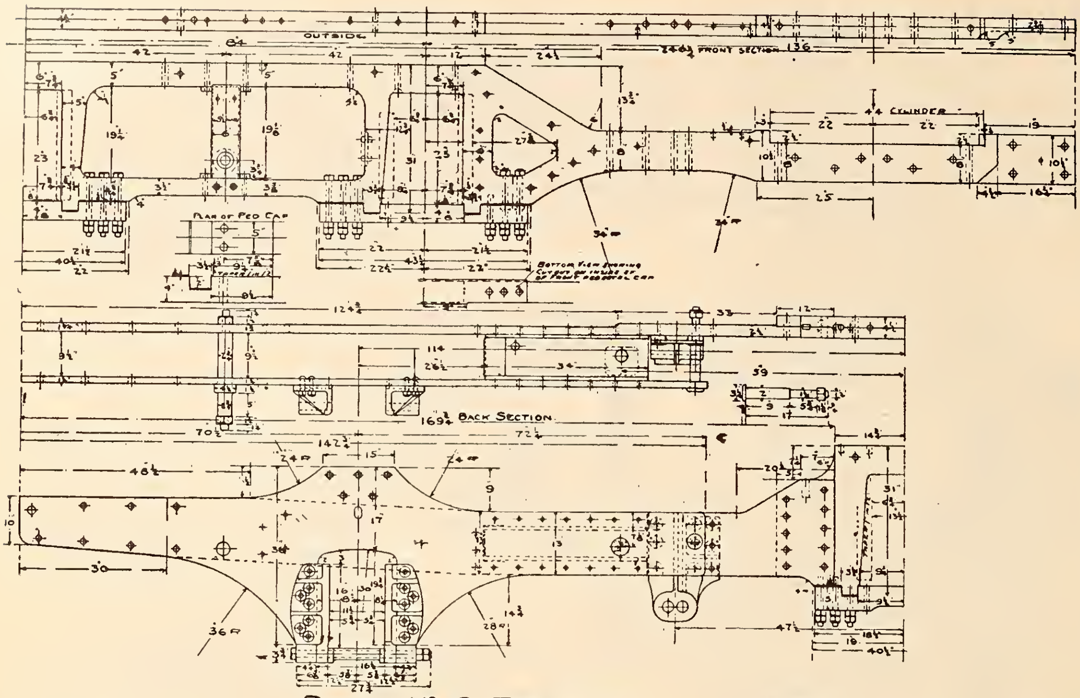


PLATE No 6. TYPE 4-4-2. AMERICAN LOC. CO.

pounds harder than the left. This is due to the fact that when the right crank passes the forward dead center the left cylinder is pulling forward so that it aids the right cylinder in throwing the right box forward against the back jaw of the pedestal. The same is true on passing the back dead center, but when the left crank passes the forward center the right cylinder is pushing on the pin, thus subtracting from the left cylinder in pushing the left box against the back jaw of the pedestal. This should result in breaking more right than left frames when the right side leads and vice versa when the left side leads.

The discussion of piston valves is not within the scope of this report, and the subject is alluded to only on account of the apparent difficulty of providing adequate relief from the presence of water. It is, therefore, thought pertinent to suggest that perhaps this side of the question should be given more careful care and attention than it has received heretofore.

The experience of two large roads, as reported to your committee, is quite significant. Each refers to a class of locomotive similar in every particular, except that a portion of each class have double front rails and slide valves, while the balance are equipped with single front rails and piston valves, the fractures located between the cylinder and front axle.

While it is true that no one cause for frame breakage can be given, it is safe to say that all the reasons assigned are, at least, contributory causes, and should be taken into the account.

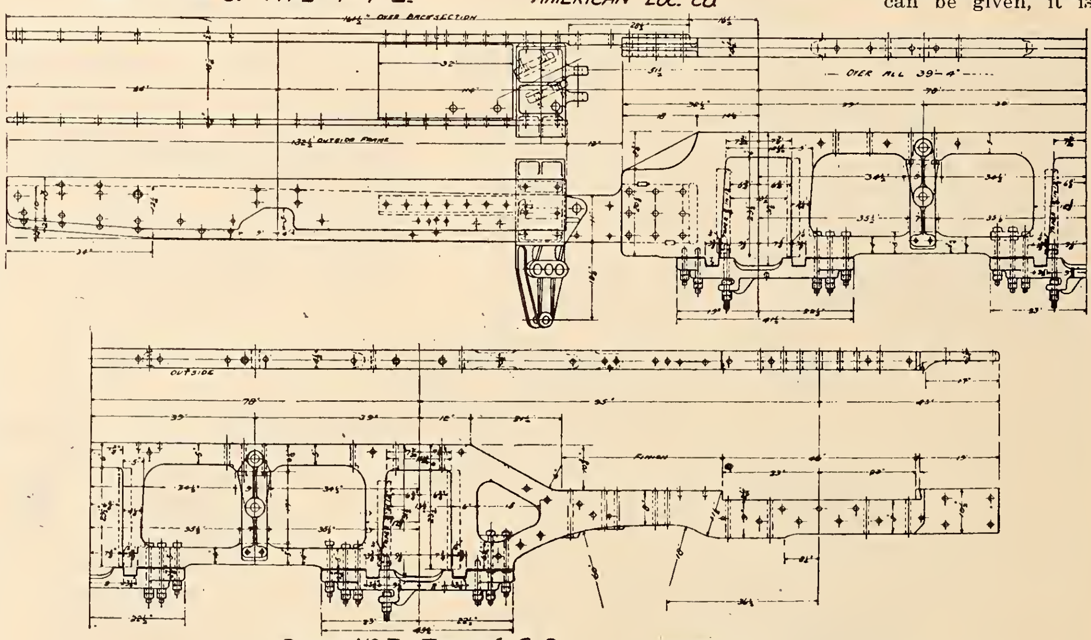


PLATE No 7. TYPE 4-6-2. AMERICAN LOC. CO.

Relating to the method of manufacture, a member contributes as follows:

"It may be well to determine whether or not the cast-steel manufacturers are all casting their frames in a manner to secure the best possible results. The method of casting, location of gates and headers, all have a very important part upon the life of the frame. It is the usual practice to cast the frame on an incline, the front end of the frame being at the top, the metal being poured into a riser

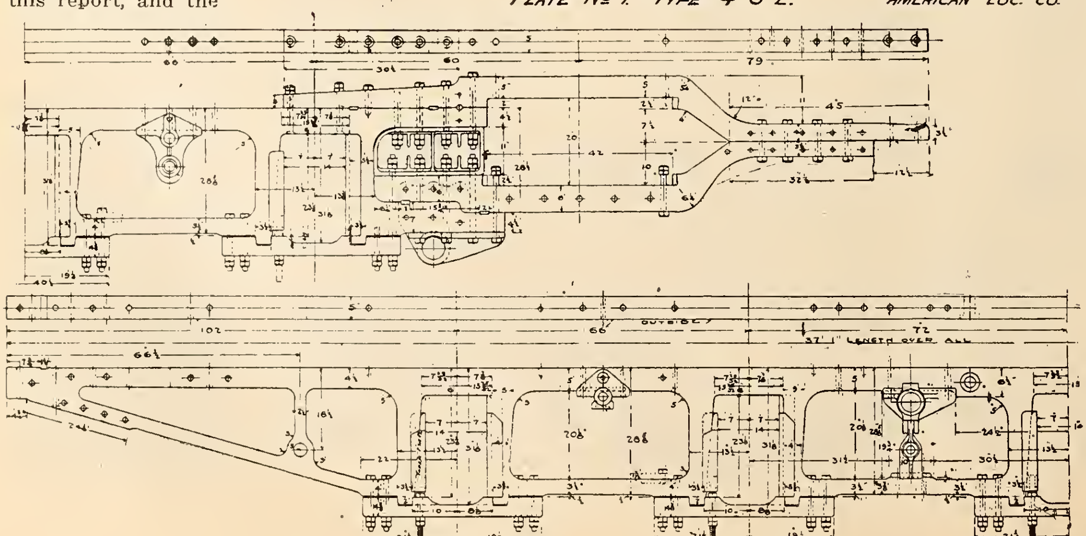


PLATE No 8. TYPE 2-8-0. AMERICAN LOC. CO.

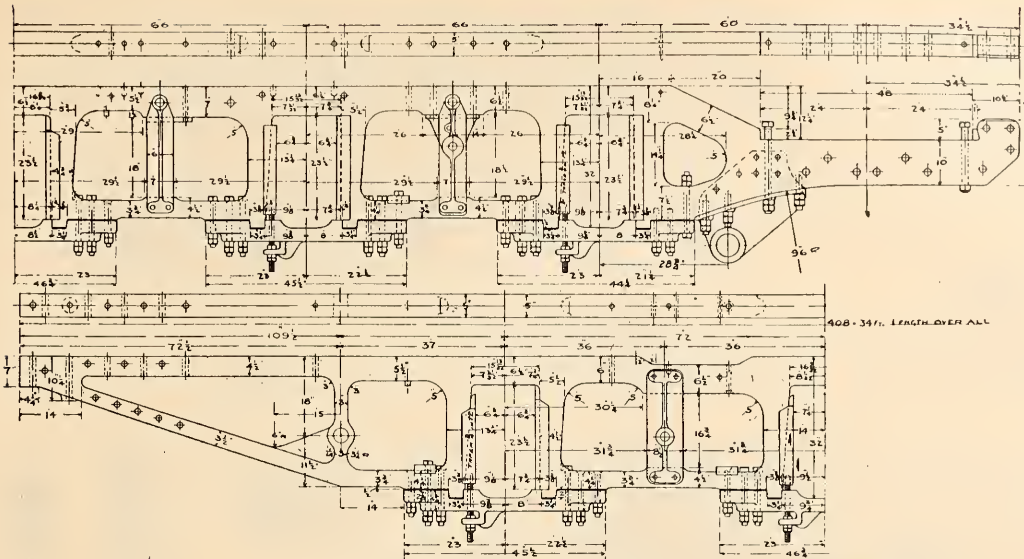


PLATE NO 9. TYPE 2-8-0. AMERICAN LOC. CO.

at the back end of the frame which is at the lowest point. This method results in washing the dirt and gases to the front end of the frame, and we have defective metal at the point at which the frames are most prone to break. It would therefore seem desirable to reverse this method and mold the frame so that the front end is at the lowest point and pour them through a gate leading to the front rails. It would also seem inadvisable to reverse this method and mold the frame so that the front end is at the lowest point and pour them through a gate leading into the front rails. It would also seem inadvisable to place the riser at the point of the juncture of the pedestal leg to the top rail, so as avoid any impurities separating at this point and prevent shrinkage cracks due to the different rates of cooling of the risers and of the frame section proper. It would no doubt be an improvement to locate the riser on the pedestal at a point between the tip and bottom rail.

"It seems that these points have as much bearing upon the life of the frame as the care that all the steel foundries exercise in using a high grade of material and in carefully annealing their castings.

"Relative cost of iron and steel frames: It may be advisable to state the relative cost of a finished iron or steel

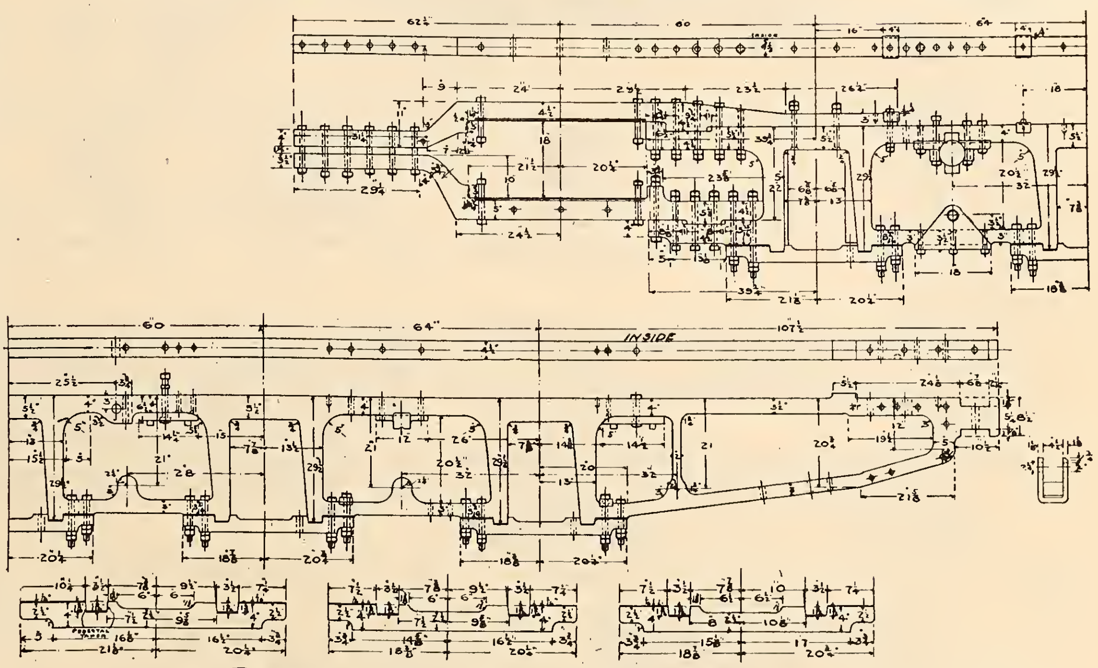


PLATE NO 10. TYPE 2-8-0. BALDWIN LOC. WORKS.

frame. In addition to the first cost there is a certain amount of smith-shop work that must be done upon a steel frame before it can be bolted to the planer. By care in the steel foundries this can no doubt be reduced to a very low figure, but at present they do not exercise sufficient care to keep this expense within reasonable bounds.

"The cost of machinery is also higher for steel frames, so that there is less difference between the final cost of the iron and the steel frame than the first cost would lead one to suspect."

The committee considers cast steel a better material for locomotive frames

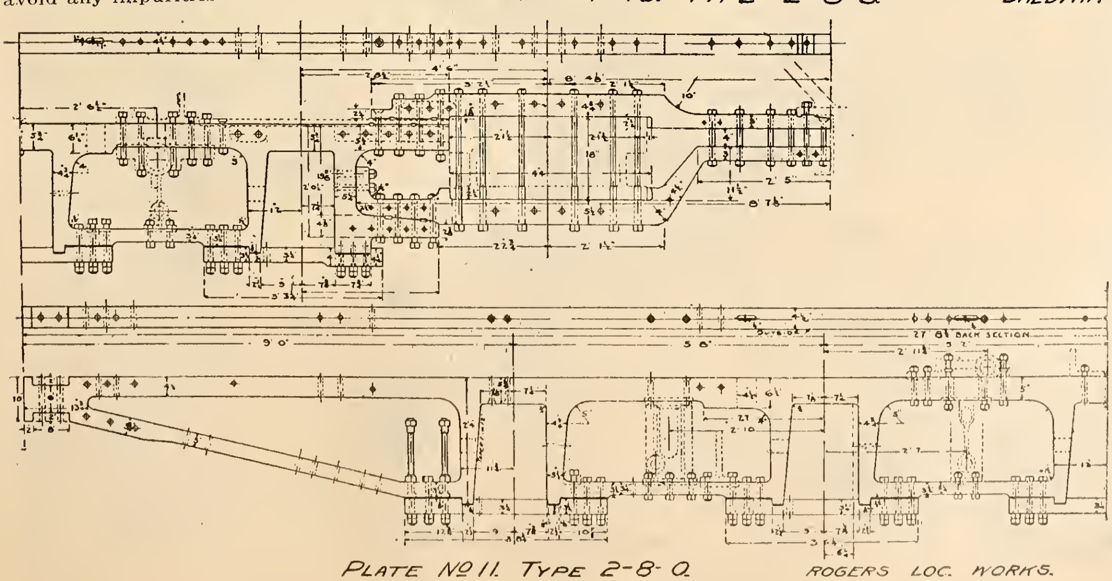


PLATE NO 11. TYPE 2-8-0. ROGERS LOC. WORKS.

than wrought iron.

The tensile strength of the steel, suitable for frames, is about 75,000 pounds per square inch, as compared with 53,000 to 54,000 pounds per square inch for the best hammered iron.

The cast-steel frame is practically homogeneous, that is to say, there are no welds, and it is of a uniform texture throughout its entire length.

The number of projections required for the reception of brake work, tumbling shafts, rocker pins, etc., seriously complicates the production of modern frames in hammered iron, whereas the reverse is true in the manufacture of cast-steel frames.

Generally speaking, steel is intrinsically superior to wrought iron, and all the difficulties perienced with cast steel are mainly chargeable to either design or method of manufacture and not to the steel per se.

To abandon steel for such reasons is a reflection on our engineering skill and manufacturing abilities. Therefore, we should devote our time and skill to the improvement of the art and thereby approximate more nearly the possible theoretical advantages.

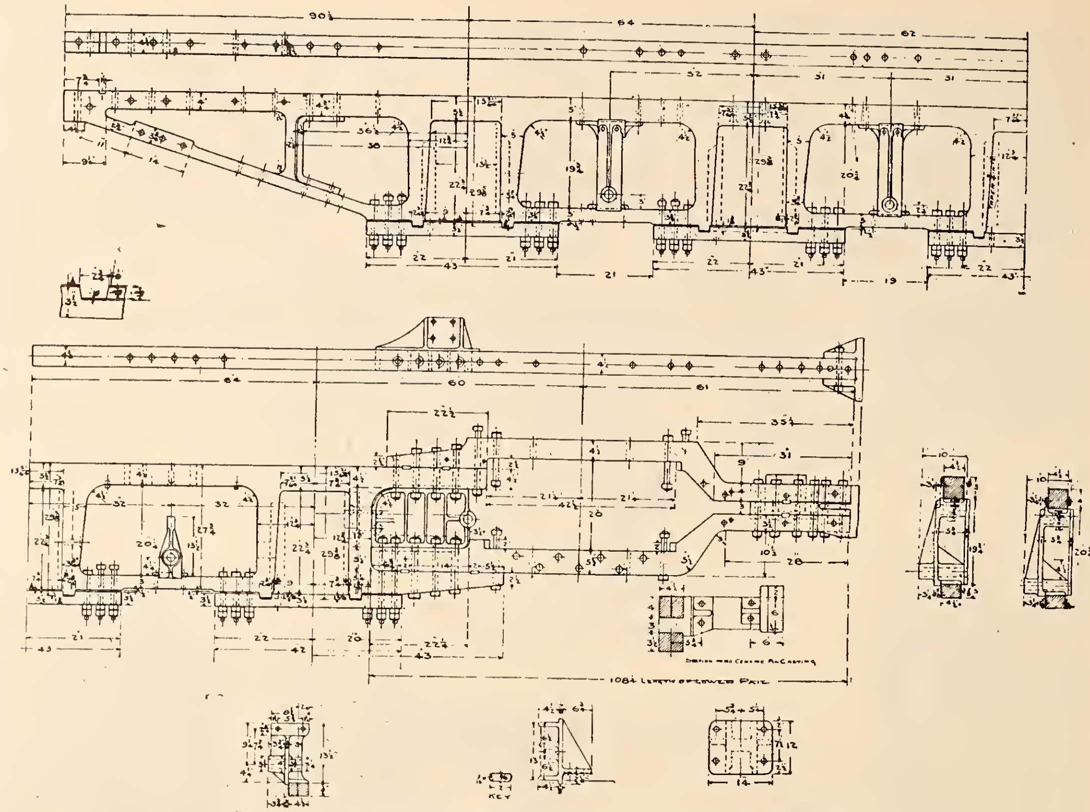


PLATE NO 12. TYPE 2-8-0. D. L. & W. R. R.

The following points are offered, the observation of which your committee hopes will go a great ways toward mitigating the evil.

1. Sensible design.
2. Material, cast steel, made to a rational specification, careful foundry manipulation, adequate and suitable annealing.
3. Provide such form of bracing as will prevent "weaving." By weaving is meant a movement of one side independently of the other, or of the separate parts or joints, with reference to each other locally, as per contra, a movement of the frames as a whole, in unison. The bracing should be so designed that the bending, if any, should be synchronous, as referred to the connected parts.
4. The clip form of pedestal binder preferred to the thimble and bolt type.
5. Provision for quickly and adequately draining cylinders. This point is just as important with slide as with piston valves.

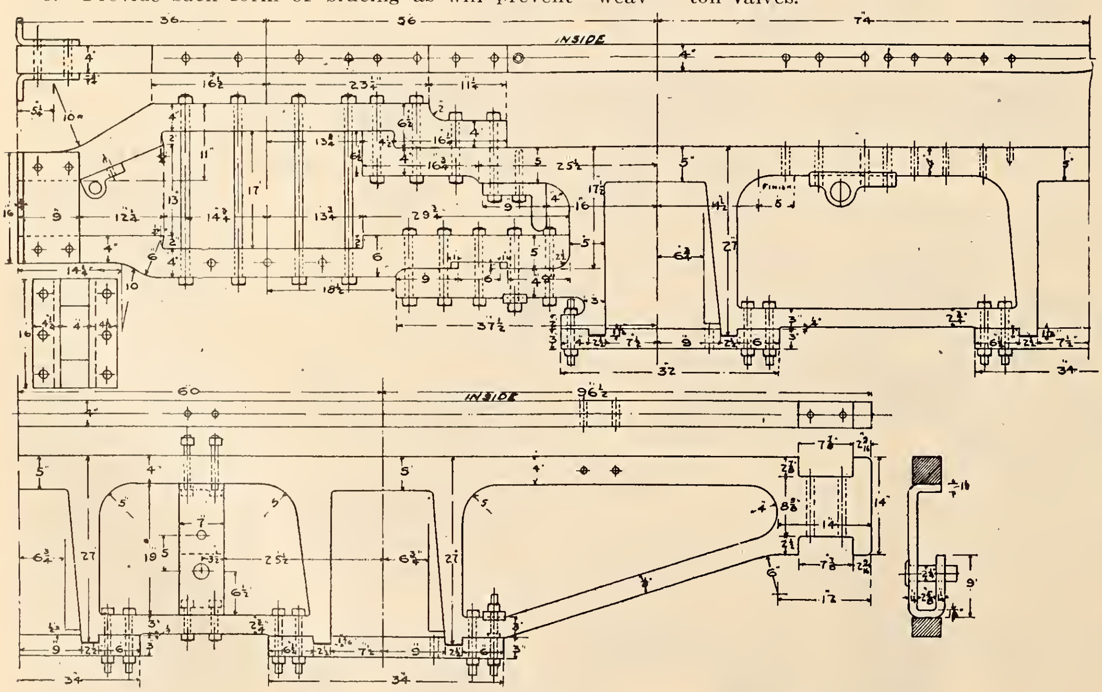


PLATE NO 13. TYPE 0-6-0. BALDWIN LOC. WORKS.

Frames with single front rails should be made stronger and means provided to stiffen same back of cylinders or between cylinders and front driver.

It would seem from a study of the replies that, for the present at least, there is an intimation that the double front rail type is stronger, per se, and stiffer in a vertical direction, and yet as flexible longitudinally as the single front rail form, yet this conclusion is offered with hesitation, owing to the obscurity of the evidence; it is given, however, with the hope of provoking discussion or leading to special investigation.

The great success and satisfaction foreign roads are having with the so-called plate or girder form of frame, considered in the light of their conditions—and they have used both bar and plate frames—gives us just a hint or suggestion that perhaps we may have something to gain by looking into this design a bit when scheming on future improvements.

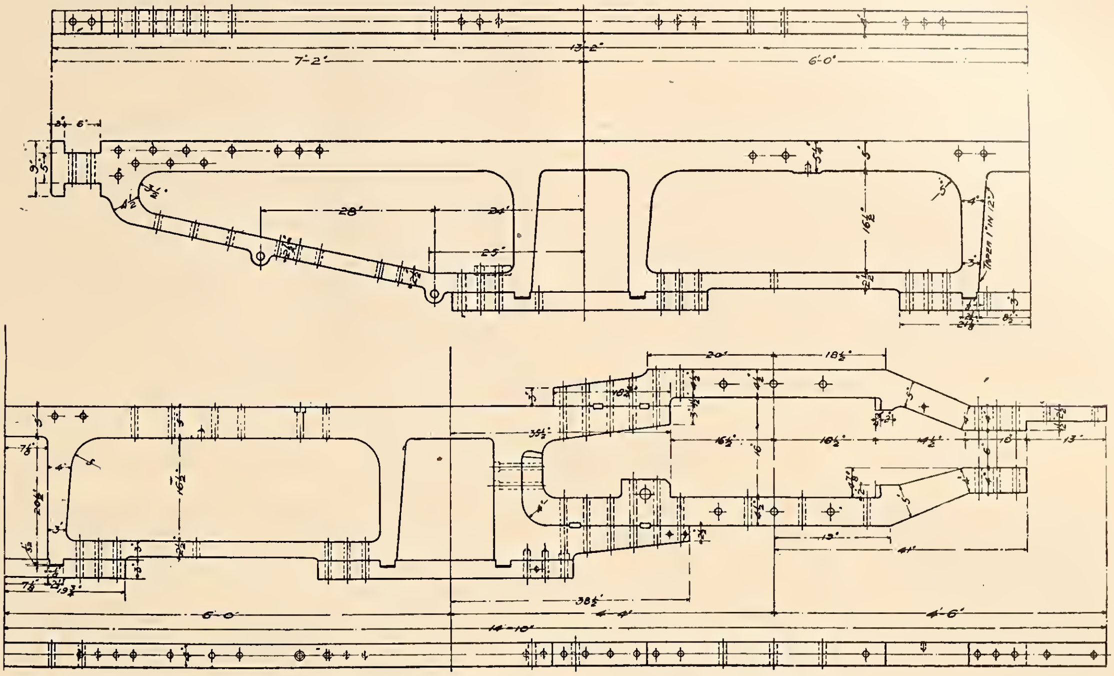


PLATE NO 14 TYPE 0-6-0. D.L.& W.R.R.

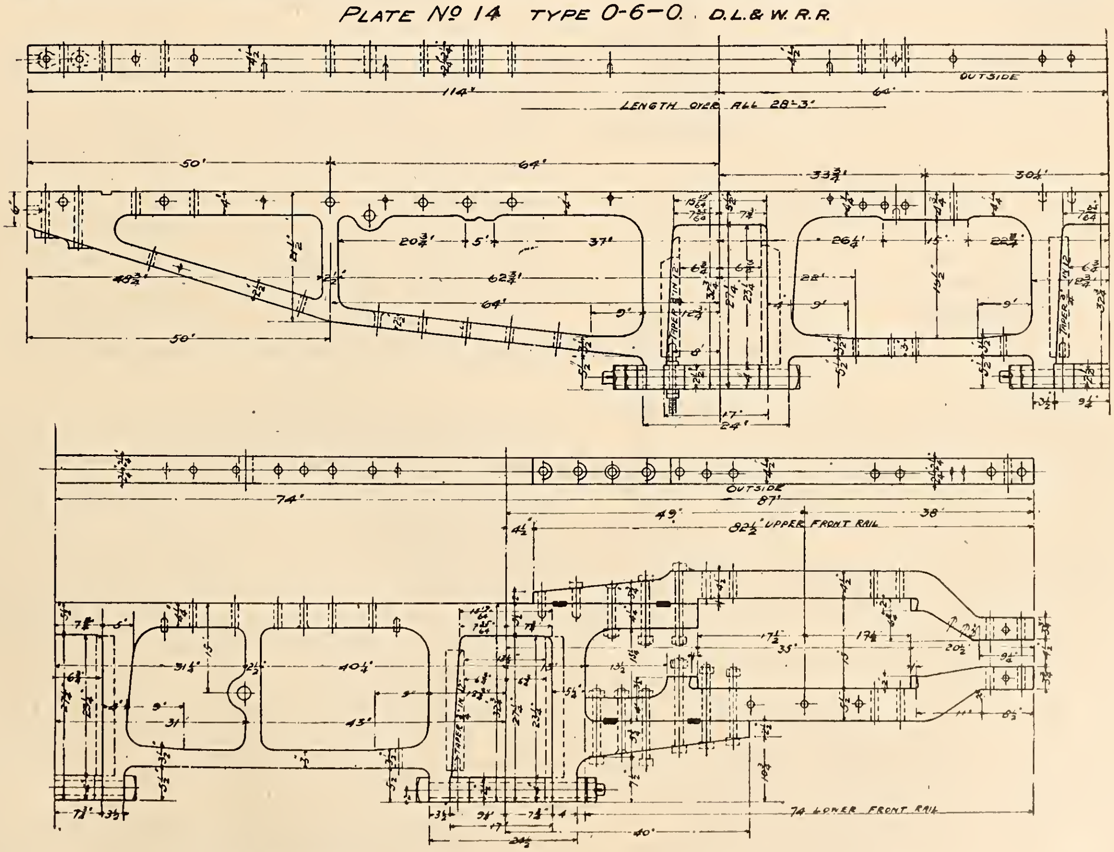


PLATE NO 15. TYPE 0-6-0. AMERICAN LOC. CO.

Class 4-4-2	Plate 4 Double front rail.	Plate 6. Single front rail.
Weight on drivers	96,280 lbs.	108 000 lbs
Cylinders	20 x 28	21 x 26
Boiler pressure	200 lbs.	200 lbs.

Class 4-6-2	Plate 5. Double front rail.	Plate 7. Single front rail
Weight on drivers	134,900 lbs.	131,200 lbs.
Cylinders	22 x 28	21 x 28
Boiler pressure	220 lbs.	200 lbs.

Class 2-8-0	Plate 8. Double front rail.	Plate 9. Single front rail.	Plate 10. Double front rail.	Plate 11. Double front rail	Plate 12. Double front rail.
Weight on drivers	179,000	196,000	184,500	180,000	162,000
Cylinders	22 x 32	23 x 32	22 x 30	20 x 32	21 x 26
Boiler pressure	200 lbs.	200 lbs.	200 lbs.	210 lbs.	200 lbs.

Class 0-6-0	Plate 13. Double front rail.	Plate 14. Double front rail.	Plate 15 Double front rail.
Weight on drivers	138,430	132,000	144,000
Cylinders	20 x 26	19 x 24	20 x 26
Boiler pressure.	180 lbs.	180 lbs.	180 lbs.

IMPROVED TOOL STEELS.

What They Have Done for Railroad Shop Output. What Is the Relation Between Tool Steels, Motor Driving and Machine Tools?

An individual paper by W. R. McKeen, Jr., S. M. P. & M. Union Pacific R. R.

The following tests of tool steels were not made on specially devised castings or forgings, nor were any machines arranged in special reference to these tests.

All observations were made on work going through the shop during regular working hours and on actual locomotive parts being put through the shop; these same parts being afterward applied to locomotives. The tests were conducted according to the directions of the chemist and engineer of tests, and under the supervision of the general shop demonstrator; the electrical readings were taken by the local electrician, and the machines were handled in their regular course by the mechanics assigned to each class of work. Turning and planing tools were forged and tempered by the regular toolsmith, and the twist drill and milling cutters were made in the local tool room.

Under these conditions a much fairer comparison as to the actual benefits obtained from alloy tool steel in regular shop practice can be made than where special test conditions are followed.

Three lines of comparison were taken, namely: First, the speed, cut and feed; second, the durability of the tools; third, the amount of power expended in keeping a tool up to its proper capacity. The first depends upon the volume of output; the second on the quality of steel and manufacturer's and toolmaker's skill; the third being closely related to the first and dependent on it.

Throughout these tests we have compared the new alloy steels with the old carbon variety. In Tests 1 to 6 it is well to bear in mind that the air hardening tools have been in the market for a number of years, and, roughly speaking, are a mean between the carbon steel and the alloy steel.

Tests 1 and 2. Roughing out side rods on planer; channel 1 by 4 inches by 4 feet 6 inches. The time of test indicates the cutting time of tool only, neglecting the reverse of planer, as well as the setting of work—the latter a factor practically constant for both steels. See Table 1.

The alloy tool kept its edge throughout the tests and was in condition or do two or three hours more work without regrinding, as shown in equivalent performances at other times. The regrinding was due, not to the cutting edge being destroyed, but to the hollowing out of top of nose of tool by surface friction of the metal removed. The time given as "time of test" was the actual cutting time required to rough out one channel of one side rod.

The carbon tool, on the other hand, had its cutting edge completely burnt off at the end of three-quarters of a minute (two strokes of the planer), destroying the nose for half an inch, making any further cutting action impossible. Previous experience with the same kind of carbon tools on this class of work has demonstrated that in order to keep up the cutting edge of a tool (without regrinding, as with alloy steels) only one-half of the depth of cut should be maintained, as was taken in Test 2, removing then only one-half as much metal per hour as shown in that test, and increasing the actual cutting time to about twenty-five minutes.

Comparing the time required by each tool for actual cutting, and for reverse of planer in each case, we find that the alloy steel tool will finish up one rod channel in 7½ minutes and the carbon steel tool in 40 minutes, a difference of over half an hour for each rod turned out. Two rods are ordinarily turned out at the same time; therefore, the difference in time is about 16 minutes in favor of the high-speed tool for each channel cut.

Tests 3 and 4. Turning old and badly worn standard driver tires, 70 inch diameter: The table following shows that when considering the grinding of tools or interest on plant, the new steels are money-savers.

Grinding: A carbon roughing tool will require 15 minutes (walking to and from emery wheel, etc.), and each tool will ordinarily be ground three times; whereas the high-speed tool will last throughout the job with one grinding.

In this table, showing comparative cost of output, it will be seen that there is not a single operation in which the new tools do not directly or indirectly effect a saving in setting and grinding tools, varying from 50 per cent to 98 per cent of time originally taken with carbon steels. These savings are real gains and not mere statements on paper.

COMPARATIVE COST OF OUTPUT FOR ONE PAIR OF DRIVING WHEELS.

OPERATION.	Carbon. Hrs.Min.	Air Hardening. Hrs.Min.	High Speed. Hrs.Min.	High Speed. Hrs.Min.	Carbon.	Air Hardening.	High Speed.	High Speed.
Setting tool, etc., throughout job	1:30	1	:45	**:36**	$0.50	$0.33	$0.25	**$0.20**
Grinding roughing tool	1:30	1	:20	**:20**	.50	.33	.11	**.11**
Grinding flanging tool	1:30	1	:04	**:04**	.50	.33	.02	**02**
Roughing cut	8	5	1:15	**1:00**	2.65	.65	.41	**.33**
Finishing cut	5	2:30	:30	**:30**	1.65	.83	.17	**.17**
Flanging cut	2:30	1:30	:30	**:30**	.85	.50	.17	**.17**
Total labor	20:00	12:00	3:24	**3:00**	6.65	3.97	1.13	**1.00**

	Carbon.	Air Hardening.	High Speed.	High Speed.
Interest, depreciation, repairs, etc., figured at 15% on first cost, per hour	(.13)	(.40)	(.40)	....
per job	2.60	1.60	1.30	**1.20**
Power, at 3 cents per horse-power, hour ... per hour	(.07)	(.12)	(.18)	....
per job	1.00	1.00	.50	**.50**
Total fixed charges	3.60	2.60	1.80	**1.70**
Total of all items	10.25	6.57	2.93	**2.70**

NOTE.—Since test was completed the average time of turning drivers has been somewhat lowered, as shown in heavy black figures.

To take up the table part by part: The first line shows time consumed in setting tools; where these tools have been taken out of the holder frequently for regrinding, etc., more time will be so occupied than when practically no resetting occurs. The grinding shows up clearly the comparative durability of the tools; the old steel requiring much more frequent grinding than the high speed or alloy steels. While the flanging tool does not have such severe usage as the roughing tool, it requires much greater care in grinding. With the alloy tool one grinding of same will answer for about fifteen wheels, or an average of four minutes for each pair of wheels. In the tests the flanging tool was of special design, being quickly ground to standard by tool room; the average time occupied for grinding per each pair of wheels being two minutes.

The next three items—roughing, finishing and flanging cuts—are the main economical features, and are entirely due to the high speed capacity of the new tools. It will be seen that the labor cost in the case of the high speed is only half that with the ordinary air hardening steel, and less than one-third as much as with the old carbon steel tools.

The interest, depreciation, repairs and renewals to machine and electrical equipment have been estimated at 15 per cent on $6,000 for the modern lathe, or 40 cents per hour, and at 10 per cent on $3,000 on old-style lathe, which would be sufficiently fast for the speed capacity of the old carbon steel tools. It must be remembered, in this connection, that there has as yet been no driving wheel lathe built expressly for high-speed alloy steels.

The power (delivered to work) has been taken in all cases at 3 cents per horse power hour, a conservative figure for conditions in the Middle West, and considering the many transmission losses.

Planer Tests 1 and 2: Alloy steel necessitated 20.9 horse power removing 780 pounds of metal per hour, as against 15.9 horse power with carbon steel and only 288 pounds metal removed per hour.

Wheel Lathe Tests 3 and 4: Alloy steel necessitated 6.4 horse power with 96 pounds metal removed, as against 2.3 horse power with carbon steel and 15 pounds metal removed.

Lathe Tests 5 and 6 (Cylinder Bushing:) Alloy steel necessitated 11.6 horse power and 180 pounds of metal removed, as against 10 horse power with carbon steel and 54 pounds metal removed.

Milling Machine Tests 7 and 8 (Locomotive Shoe): Alloy steel necessitated 4.4 horse power and 195 pounds metal removed, as against 3.1 horse power with carbon steel and 82 pounds metal removed.

Radial Drill Tests 9 and 10 (Cast Iron Blocks): Alloy steel necessitated 5.6 horse power and 88 pounds metal removed, as against 2.6 horse power with carbon steel and 51 pounds metal removed.

Improved, or alloy, tool steel has increased the output of railroad shop machines from 25 per cent to 100 per cent, and in certain cases as much as 200 per cent, and while, with increased output, the horse power required to turn out work has increased, the increase of horse power absorbed is not in proportion to the increase in output. The use of alloy steel, where machines have been driven by motors already worked up to capacity, will necessitate 25 per cent to 50 per cent larger motors, as has been evidenced by our own experience.

The strength and capacity of our present machines are almost universally overtaxed, for the reason that they were not designed for the new conditions. Our experience has shown conclusively the necessity for heavier and more substantial design of all machines; steel pinions instead of cast iron; longer bearings for shafts and increased diameter of same, etc. Furthermore, it clearly demonstrates beyond the credulity of any one the economy of scrapping old-style machinery.

Our best record on locomotive driving wheels is a 56-inch pair in 1 hour and 27 minutes. Steel tired car wheels formerly required from 5 hours up to turn and true to size; the present minimum time in our shops is 55 minutes, the average being about two hours. While these reductions in time are largely due to the alloy steel, I must mention that our improved shop methods and system have also entered largely into the economies mentioned.

GRATES FOR BITUMINOUS COAL.

Abstract From an Individual Paper by Mr. J. A. Carney.

It has been demonstrated that the cheapest fuel for locomotive use is that which can be bought for the lowest price per ton, and it rests with the railroad mechanical engineer to so design his engine to burn this cheap fuel with the least inconvenience. The ash pan is so closely related to the grate that it is discussed in this paper in connection with grates.

There are probably as many designs of locomotive grates used as there are grades of coal, and each one has its advantage with certain coals, and some coal is unsatisfactory with any kind of grate. In designing a grate the first object is to properly support the fire; the second, to admit air enough to the fire to properly burn it; the third, to easily and effectually stir the coals and shake down the ashes, and the fourth to be able to quickly remove the fire at end of a run; a fifth and most important feature to be able to quickly and easily clean the fire on the road. With good coal the last feature is not necessary, but there are so many roads forced to use an inferior grade of coal that cleaning fires on freight engines on the road is an important item of time, and there is hardly a road in the Middle West that does not have its share of freight delays due to cleaning fires on the road.

In connection with grates, and of nearly as much importance, is the ash pan. This must be tight at all times to prevent loss of hot ashes, and yet have enough openings to admit air freely to the under side of the grates. It must have sufficient volume to carry ashes made during a trip of many hours, and should dump easily and clean itself with a minimum amount of labor. There should be no flat places where ash can collect and fill up the grates.

With the large fire boxes and restricted space under them, the design of a satisfactory ash pan is no small undertaking. While the air openings, according to theory, need be very small, they should in practice be as large as possible and allow the passage of sufficient air to not only burn the fire, but cool the grates and accumulation of ash on them as much as possible. Theoretically the air openings in the grates should be of just enough area to admit, without undue friction, a quantity of air needed to replace the hot gases drawn from the fire box.

Estimating the temperature of the products of combustion in the fire box at 3,500 degrees F., the volume of the gases passing out of the fire box will be about seven times as great as the air passing through the grates, due to the expansion caused by the high temperature. As all of the gases have to pass through the flues, the openings in the grates and the ash pan need be one-seventh of the combined area of the flue openings.

According to the above figures, an engine having 44 square feet of grate area and 792 square inches of flue openings, the total area of grate opening should be 114 square inches, with 114 square inches opening in the ash pan.

In per cent, with grate area 100 per cent, this equals:

Grate area	100 per cent.
Flue area	12.5 "
Grate opening	1.8 "
Ash pan opening	1.8 "

COMPARATIVE PERFORMANCE OF ALLOY AND CARBON STEEL.

Machine and Equipment.	Metal Machined.		Feed per Revolution. (Inches.)	Depth of Cut. (Inches.)	Speed. (Ft. per min.)	Power to Run Machine. Light. Volt.	Light. Amp.	Light. H. P.	Under Load. Volt.	Under Load. Amp.	Under Load. H. P.	Effective Horse-power for Cutting. H.-P.	Effective Horse-power for Cutting. % of Total.	Metal Removed. (Pounds.) Per Hour.	Metal Removed. Per H. P. Hour.	Tool. Size. Height-Wdth (Inches)	Tool. Angle. Top.	Tool. Angle. Front.	Tool. Angle. Side.	Kind of Steel.	Total Longitudinal Feed. (Inches)	Time of Test (Minutes.)	Condition of Tool after Test.	Remarks.
Planer, 60"x 60"x 30' .... 20 horse-power Westinghouse motor ...	Soft steel side rods 4' 8" long cut.	1	¼	1	16	219	43.8	12.9	219.4	71.1	20.9	8	38	780	97.5	2½ x 1½	60°	80°	80°	Alloy	4	4¾	Very good.	Limit of machine.
		2	3-16	½	16	219	43.8	12.9	212	56	15.9	3	19	288	92	2½ x 1½	60°	80°	80°	Carbon	⅜	¾	Burnt ½"	
Wheel lathe, 100" swing.......... 15 horse-power Westinghouse motor Gear driven.	Old and badly worn Standard driving wheel tires, 70" dia.	3	3-16	5-16	23	228	12	3.7	226	21.2	6.4	2.7	42	96	36	2½ x 1½	82°	78°	88°	Alloy	4	17	Very good.	
		4	3-32	3-16	6	226	6	1.8	228	7.6	2.3	.5	22	15	30	2 x 1	82°	78°	88°	Carbon	⅝	27½	Burnt up.	
Pond engine lathe. 42"........ 20 horse-power Westinghouse motor. Countershaft.	Hard cast iron Cylinder. Bushing, 28" dia	5	¼	5-16	22	227	25	7.6	228	38	11.6	4	34	180	45	2 x 1	60°	80°	80°	Alloy	6	8	Good.	
		6	3-16	5-16	11	228	24.5	7.4	228	32.6	10	2.6	26	54	20.7	2 x 1	60°	80°	80°	Carbon	4	14	Burnt up.	
Vertical milling machine. 10 horse-power Westinghouse motor.	Cast iron locomotive shoe.	7	00674	....	45	222	6	1.8	222	15	4.4	2.6	59	195	75	4⅛" dia. x 3½" face	......	......	......	Alloy	20	6	Very good.	
		8	.00275	....	45	222	6	1.8	219	10.7	3.1	1.3	42	82	63	4⅛" dia x 3½" face	......	......	......	Carbon	20	14½	Burnt.	
Radial drill. 3 horse-power Vertical Westinghouse motor.	Medium hard cast iron blocks, 5" deep hole.	9	.012	Mean 23-64	100	230	4.5	1.4	228.6	16.6	5.6	4.2	75	88	21	1 7-16"dia.	......	......	......	Alloy	6	1.50 sec.	Very good.	Limit of machine.
		10	.007	Mean 23-64	64	230	4.5	1.2	228.3	8.5	2.6	1.4	54	51	36.4	1 7-16"dia.	......	......	......	Carbon	6	2.55 sec.	Burnt.	
Radial drill. 3 horse-power Vertical Westinghouse motor.	Soft steel cutter blanks, 4" deep hole.	11	.012	Mean 23-64	100	230	4.5	1.4	222.9	16.1	4.7	3.3	70	88	26.7	1 7-16"dia.	......	......	......	Alloy	6	6	Very good.	Limit of machine.
		12	.007	Mean 23-64	64	230	4	1.2	227	10.9	3.3	2.1	63	51	24.3	1 7-16"dia.	......	......	......	Carbon	2	14½	Burnt ¼"	

In practice, openings of the theoretical size are absurd.

In connection with grate and ash pan air openings a series of tests were made to determine the vacuum in the ash pan, fire box and front end. These tests were made on one class of narrow fire-box and two classes of wide fire-box engines. The results obtained are as follows:

Type of Fire Box	Mogul narrow.	Atlantic wide.	Prairie wide.
Grate area	30 sq. ft	44 sq. ft.	42 sq. ft.
Grate air opening	12 7	17.	16.25
Per cent air opening	42.3	38 8	38 7
Ash pan air opening	4 7	7.	4.4
Per cent air opening	15 6	16.9	10.5

VACUUM IN INCHES OF WATER.

Speed M. P. H.	Mogul Narrow.			Atlantic Wide.			Prairie Wide.		
	Front End.	Fire Box.	Ash Pan.	Front End.	Fire Box.	Ash Pan.	Front End.	Fire Box.	Ash Pan.
10	4.5	1.0	.1	3.0	1 0	.0	5.5	1.7	3
20	9.0	3.0	.3	3 5	1.2	.05	3.5	1.5	.2
30	10.	4 0	.4	6.0	1.6	05	4.5	1.0	.2
40	10.	4.0	.4	4.0	1 0	0	5.5	1.7	.4
50	10.	4 0	.4	5 7	2 0	.05	4 5	1 9	.3
60	11.	4 0	.4	5.0	1 4	0	6 0	2.2	.3

It will be noted that the vacuum readings show a regular increase with the narrow fire box, but with the two types of wide fire box there is no regularity. This was due to the wind, and it was observed that the readings in the cuts showed much lower than when the wind had a free sweep at the engine.

There should be no vacuum in the ash pan. The tests show as high as .4 inches in the narrow fire box and practically none in the wide fire box with greatest air opening. There is also a marked increase in vacuum in the front end and fire box in the wide fire box design. These results bear out the statement that as large air openings as is consistent with good design should be given both the grates and the ash pan.

Grates should have as large a per cent of opening as is consistent with the coal used, furnishing as much air in as many places as possible, with the hope that some of it will get through the fire. It is not the grates that clog the draft, but the bed of fire on the grates; consequently the farther we get from the theoretical air opening and within the limit of good design, the better.

A circular of inquiry with reference to the practice of railroads using bituminous coal received twenty-four replies; the information received is given in tabulated form below:

GRATES—FINGER AND BOX.

The use of the finger grate is somewhat more common than the box construction. The box construction is used in good-coal districts, and while roads report some trouble where the coal is fairly good, others who are using poor coal report an endless amount of trouble. The finger grate has the advantage of breaking up as well as stirring the fire, while the box grate can only lift and lower the fire, without breaking it up. The only objection to the finger grate is the possibility of burning the ends of the fingers if they are not kept level. This can be entirely overcome by care on the part of the fireman and the shaking mechanism kept in repair. The long-fingered grate is better adapted for poor coal than the short finger. It has a more violent action on the fire, breaks it up better, shakes down ashes faster and gives a larger opening through which the fire can be dumped in the least possible time. Grate fingers less than 5 inches long do not give as good results with coal which clinkers or which fills up the box as those longer than 5 inches, although the general practice is to run under 4⅞ inches.

Road	Moisture	Volatile	Fixed Carbon	Ash	Fill Up	Melt	Finger or Box Grate
1		No	analysis		Badly	Yes	Finger
2	10 - 15	35-40	45-30	10-15	Some	Some	Box
3	7 - 11.5	29.5-39	40-47	5.9-15	No	Yes	Finger
4	1.1 - 6	21.3-39.8	44.4-63	10.4-13.9	Yes	No	Box
5	.7 - 7.5	16.4-33.5	46-64.9	10.2-17.6	Yes	Yes	Box
6					Some	Some	Box
7							Finger
8	8.9	39.6	39.	12.6	Yes	Yes	Finger
9	3.1	38.6	50.4	7.8	No	No	Finger
10					No	No	Box
11	7.6	37.5	50.4	3.8	Some	No	Finger
12	10.7	37	45.7	6.6	No	Yes	Finger
13					Yes	Yes	Finger
14	6.3-8.1	37.7-38.6	46.2-51.7	3.3-7.9	Yes	Yes	Box
15							Finger
16	.7	21.7	72.7	4.8	No	Yes	Finger
17	1.8	41.7	50.2	6.3	Yes	Yes	Box
18					Some	Some	Finger
19	6.2	37.9	47.9	7.9	Yes	Yes	Box
20	1.3	25.2-33.7	58.5-65.	6.6-7.9	Some	No	Box
21					No	Some	Finger
22	7.9	37.8	43.7	8.	Some	No	Finger
23	.31	20.05	71.98	7.66	No	Slight	Finger

Road	Grate Area	% Free Opening	% Free Opening in Ash Pan	Length of Finger	No of Shaking Sections	Area of each Section	No of Dump Grates	Area of Dump Grates	Location of Dump Grates	Area of Dead Grates	Type of Engine—
1	42.5	47.8	14 7	4½					Back		
2	46.3	40	7 2	Box	4	10.4	2	4.6	Back		Wide Fire Box.
3	42	37	10.3	4½	4	10.5					" " " Prairie
4	47.2	43	16.5	Box	4	10.5	2	5.2	Back		" " "
5	59.2	47	7.3	Box	4	2-10.3 2-4.9				5	" " "
6	54.3	48.8	8.3	Box	4	2-12.8 2-14.8					" " "
7	46	40		2¾	4	16.7 22.2	2	7	Back		" " " Chautauqua
8	31.6	40	4	7½	2	14	2	7.2	Back		Narrow "
9	28	24.3	10.7	6	2	12.7	1	1.5	Back	1.5	" "
10	50.2	36	15.2	Box	4	2-16.3 2-24.5	2	7.3	Back		Wide " " Comp. Con.
11	41.7	28.3	4	5¼	4	9.6				3.4	" " " Atlantic
12	31.5	43.8	23.8	2¾	2	13	1	5.5	Front		Narrow "
13	53.3	41.1		7½	4	10.8	2	5.5	Back	4.6	Wide " Freight
14	51.2	42.2	11.9	Box	4	2-7.8 2-11.9	4	2-3.4 2-2.3	Front Back		" " 10 Wheel
15	43.9	58.7	18.2	4½	4	2-10.4 2-9.8	2	6.4	Front		" " "
16	44.4	36	4.7	4	4	2-7.8 2-12.7				4	" " "
17	42.8	43.9		Box	4	2-8.7 2-11.7					" " "
18	33.3	43.8	20	3½	2	13.6	2	6	Front Back		Narrow
19	54.	40		Box	4	2-13.8 2-10.6	2	4.9	Front	2	Wide " "
20 a	50	48	10	Box	4	10.5	2	7.8	Back		" " " Atlantic
b	54.8	48	8.6	Box	4	2-16.6 2-12.8	2	7.8	Back		" " " Frt. Con.
21	49.5	27	12.1	5	4						" " "
22 a	26.3	50.9		4½	2	10.4	2	5.5	Front		" " " Switch
b	50.1	41.9		4½	4	11.1	2	5.5	Front		" " " Consol
23	45	39.3		4½	1	39.8	1	6.2	Front	3.1	" " "
24 a	54.1	43.4	19.	7½	4	13.5	8	41.6	Combined		" " " Consol.
b	44.6	38.5	17.1	6½	8	2-13.4 2-9.8	10	44.6	Combined		" " " Atlantic
c	30	42.3	16.7	6½	4	1-12 1-18	5	30	Combined		Narrow " Mogul

DEAD GRATES.

Dead grates are used by seven of the roads making replies. These roads use a better grade of coal than that found in the Middle West. As a general proposition, a dead grate is not advisable, especially in the front end of the fire box where there is most need of a good fire, especially with wide, shallow fire boxes. It is easy to accumulate ashes in the front, and if the fire dies and cold air gets next to the flue sheet, it is difficult to make an engine steam.

DUMP GRATES.

Most roads have special dumping grates, both in the front and in the back end of the fire box, and the idea has a great deal of merit, especially when it is necessary to clean a fire on the road. These grates should be shaking as well as dumping grates.

SHAKING GRATES, AREA.

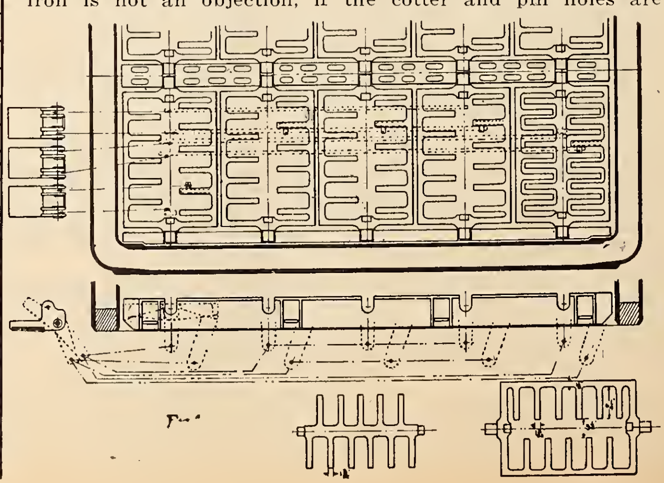
Grates should be designed so that the entire grate surface may be shaken. If it is desirable to stir up the fire in the middle of the box, why not on the sides and especially the ends. The area shaken by one lever may vary with the quality of the coal, and if the ash melts and cements the grates tight, the shaking feature is out of the question and all designs are equally bad. The grate area shaken by one lever ranges from 7.2 square feet to 29.8 square feet. The grates with the last named area are used with West Virginia coal and practically no shaking is required. Generally speaking, the grate area to be shaken by one lever should not exceed 12 square feet. Some recently built engines have the grate lever fulcrum attached to the back of the boiler head with studs. These studs are liable to pull out and it is safer to attach the fulcrum to the deck or tail board.

GRATE SUPPORTS IN WIDE FIRE BOXES.

It is impracticable to make grate bars wide enough to extend from one side of a fire box to the other without a central support. This support prevents air from circulating under the fire in the middle line of the box, and there is a dead space a few inches wide from the front to the back of the fire which will clinker badly if great care is not taken in firing.

MATERIAL.

Grates should be made of as cheap a grade of cast iron as can be bought and have the required strength. Hard iron is not an objection, if the cotter and pin holes are



properly cored. Patterns should be accurately made and the foundry required to furnish castings that do not require any machine work. Many roads are following the practice of coring all cotter and pin holes, with excellent results, and a great deal of labor and many small drills are saved thereby.

PROPOSED GRATE.

A grate should be capable of dumping the front section and the back section independently of each other and the balance of the grate sections, and in addition all sections of the grates should be capable of dumping. Dead grates are not desirable, although they are the practice on many roads. All sections of the grate should be capable of being shaken, and the sections so divided up that not more than 12 square feet of grate surface is shaken by one lever.

Grates should be supported by bars on the sides of the fire box only, and these bars should be blocked away from the side sheets at least ½ inch, to prevent corrosion of the side sheets.

The fingers should be from 6 inches to 7 inches long, depending on the length of the fire box and the number of sections into which the grates are divided.

The air openings in the grates should be at least 40 per cent of the grate area and 50 per cent, if possible. A drawing of a grate arrangement as outlined is shown in Fig. 1.

PROPOSED ASH PAN.

The ash pan should be self-cleaning and have a free air opening of at least 25 per cent of the grate area, divided equally on the four sides of the pan. No design of pan is suggested, because its form is so dependent upon the frame construction and location of back driving-wheel axle or trailer axle that a satisfactory pan on one engine would be impossible on one of different design.

The use of netting over air openings in the pan is objectionable, and so far as possible should be avoided and inclined slats used.

ABSTRACT OF PRESIDENT'S ADDRESS.

In 1868 we had locomotives with cylinders 16x24, with 60-inch driving wheels, with tractive power of 8,000 pounds; boilers 46 inches in diameter, with 15 square feet of grate area and 900 square feet of heating surface, and weighing approximately 60,000 pounds, with 38,000 pounds on the drivers. Engines of these dimensions were considered large. In comparison with this take our passenger locomotives, with cylinders 22x28 inches, 80-inch driving wheels, developing tractive power of 32,000 pounds, with boilers 70 inches in diameter, carrying 220 pounds of steam, with 54 square feet of grate area and 4,000 square feet of heating surface, weighing 219,000 pounds, with 141,000 pounds on the driving wheels; or our latest freight locomotives of the Mallett articulated type, with cylinders 20 inches and 32 inches diameter by 32-inch stroke, with 12 driving wheels 56 inches in diameter, boiler 84 inches, carrying 235 pounds of steam, with 72.2 square feet of grate surface, developing a tractive power of 70,000 pounds when working compound, or 80,000 pounds while working simple; the weight of such an engine in working order being 334,500 pounds.

Comparing the engines of 1868 with standard modern freight engines, we find that the boiler pressure has increased 120 per cent, tractive power has increased 296 per cent, boiler diameter 52 per cent, grate area 260 per cent, weight on drivers 272 per cent, total weight 259 per cent. As an example of the increase during the past seven years, I take the liberty of quoting the increase of the engines on the Norfolk & Western Railway Company, which, I believe, will serve to indicate the general increase on most of the roads in this country. The increase in the number of locomotives during the past seven years has been 37 per cent, total increase in tractive power 79 per cent. Increase in tractive power per engine, 30.7 per cent. During this time freight ton mileage has increased 86.7 per cent and freight ton miles per engine has increased 35.2 per cent. The freight ton miles per pound of tractive force has increased 4.23 per cent, and freight engine mileage has increased 55 per cent, the increase in average miles per engine being 13.18 per cent. The total tons of coal per 1,000 ton miles, 4.09 per cent. The average cost of repairs, expressed in terms of "freight engine miles," has increased but 2.03 per cent and repairs in terms of "tons one mile of freight," has decreased 14.96 per cent. Freight train mileage has increased 23.6 per cent, the average weight per train has increased 50.9 per cent, and average number of tons hauled per engine has increased 21 per cent. From these figures you will see that while the average tons per train has increased 50.9 per cent, the cost of repairs to locomotives, expressed in terms of "ton mile of freight hauled," has decreased 14.96 per cent. The great significance of these comparisons justifies the presentation of these statistics, which will not be easily comprehended unless one has an opportunity to analyze them at his leisure. These figures will be found in detail in the committee's report on coal consumption in locomotives, a duplicate of which appears in the June issue of the American Engineer and Railroad Journal, in comparison with some data other than that of our own.

"What are the practices underlying the proper lading of locomotives on the basis of conducting transportation with the greatest efficiency and at the least cost, considering all the factors individually?"

I have given the question of the heavy locomotive and tonnage rating a prominent place in my address, as I consider it a question of the most vital importance, not only to the motive power department, but also to the operating and engineering department at the present time.

We find that the past year has brought remarkable progress also in another direction, being that of improved machinery, tools, and shop equipment. This has found its greatest development in commercial establishments, but we have been busy in applying the improved practices in our locomotive and car shops. We are, however, only beginning to develop in this direction, and there is much to be gained by applying methods of increasing production and improved shop methods.

Much is being said and written concerning the conflict between electricity and steam. Electricity is said to be about to drive steam out of the field. I see no conflict whatever. I recognize that electricity can do certain things better than steam and that it will gradually extend its field to meet new requirements which steam cannot reach. There is no occasion, however, for any anxiety or any fear of conflict, but rather we should receive it with open arms. In shop practice it has worked wonders and bids fair to revolutionize some of our present methods and equipment. The days of long line shafting, isolated steam engines and boiler plants are fast disappearing, and their places are being taken by central power plants, central electrical plant and systems of power distribution, which are full of promise. This has brought our power cranes within reach of all departments, serving as an ally to the wonderful labor saving methods by the use of compressed air, and opening up an entire new field in machine tools. Machine tool builders are trying to meet the advanced methods of designing and bringing their products up to sufficient capacity of various variable speed motors and resulting in increased production. These tools in combination of high speed steel are rapidly changing shop conditions and practices. Years will pass, however, before the steam locomotive will give place to electricity, but that it may do so in the future is not beyond the range of possibility, as indicated by the rapid advance which has been made in New York City and other places in the subways and tunnels in their suburban traffic. The extension of its use will be gradual, and many new problems will appear in connection with electricity, and they are being slowly worked out. They can best be met by men of experience. It behooves us, therefore, to look out that the development does not pass into other hands, or some one some day may write of the "passing of the master mechanic."

I wish to impress upon the younger men who are before me to-day these opportunities, which they must not lose. The members of this association must look deeply into electricity as we now have it, for there is surely more to come in the future. This was admirably presented in the excellent address of Mr. H. H. Vreeland at the opening of the convention of the Master Car Builders' Association last week, in which he called attention to the fact that the development in electricity was not like that of the locomotive, an evolution, but that the rapid development constituted rather a revolution which found the average mechanic of to-day totally unprepared to meet it, and that the demands of the future would require a knowledge other than that possessed by the locomotive and car builder of to-day; would require a combination man, not only capable of meeting the demands upon him for construction and maintenance of cars and locomotives, but a full knowledge of electricity as a motive power.

As stated before, I see no reason for fear of a conflict between electricity and steam, but rather an inducement for the mechanical man to familiarize himself with the principles of electricity as a motive power, and thereby fit himself to become the combination man. Opportunities are not beyond the reach of the present mechanic to acquire this knowledge.

I desire to call attention to the apprenticeship question. There is no lack of good advice from the association as to the proper methods for the advancement of the apprentice, with a view of recruiting from their ranks. Little if anything, however, has been done in a practical way. It is all very well to provide facilities for intellectual and educational advancement, and a progressive system of instruction through the various branches of mechanical work, but we should also impress upon them the understanding that their employer is their friend, and that the surest road to advancement lies in the path of loyalty and industry, by drawing from the ranks of the worthy employes to fill positions of trust and responsibility. We can assure these young men that their opportunities for advancement from the ranks to official positions are greater to-day than ever before.

The president of the Master Car Builders' Association, in his annual address, offered a suggestion which merits our attention. He proposed the consolidation of the two associations, and while this has for a number of years been a subject of discussion, it has never before been brought forward with the official report of the Master Car Builders Association.

There are many good reasons for a consolidation, and I can see no objection. I would recommend that the executive committee of this association be instructed to confer with the executive committee of the Master Car Builders' Association with a view of treating in a spirit of cordial co-operation the proposal of consolidation of the two associations.

Variable Speed Motors

An Individual Paper by C. A. Seley.

During the convention of 1903, in the discussion of the committee report of electrically driven shops, the matter of varying speed of motors by field control was debated, but left in a somewhat uncertain state by reason of lack of data.

The writer promised, if given the opportunity, to present to this association the results of tests made on machines driven by individual motors on a two and three wire direct-current system as developed at the East Moline shop of the Rock Island System. Very complete tests of all motors and controllers have been made at these shops and certain typical ones are selected for this report.

The tests were made by Mr. S. B. Seaman, of the G. E. Co., and Mr. C. H. True, Assistant Superintendent of Shops, to whom I am indebted for the data. The variable-speed motors at these shops may be subdivided into four types, namely:

I. Varible-speed motors having a controller to operate on a three-wire system, enabling the machine-hand to operate the motor on either of the two voltages. Further speed variation is obtained on each voltage by introducing or cutting out resistance coils in series with the motor field. This motor field is always across the outside wires of the three-wire system, and therefore, on the maximum obtainable voltage. The rheostat governing the field current is operated through the controller.

II. Variable-speed motors having a controller to operate on a two-wire system. Speed variation is obtained by means of a bank of resistance coils in series with the motor field, and operated through the controller.

III. Variable-speed motors having separated starting boxes with an auxiliary rheostat in the field circuit and operated by a hand wheel.

IV. Variable-speed motors having a reversible controller similar to those in use in street-car service and to reverse the direction of motion of the motor when desired.

Type I is used on boring mills, slotters, driving wheel and engine lathes.

Type II is used on car-wheel borer and car and truck-wheel tire-turning lathes.

Type III is used on planers and cylinder-boring machines.

Type IV is used on bending rolls.

The following tests were made on motors on the various tools mentioned above, each being tabulated, giving the kind of machine, class of work and the electrical horse-power.

Tests 1 to 6 were made on motors of Type I. Column 1 shows the position of the rheostat arm. There are for each voltage sixteen successive steps giving sixteen different speeds on each voltage. These positions are given by numbers indicating the number of contacts from the O point to where the rheostat arm is set. Column 2 gives the field current and column 3 the armature current. Column 4 gives the armature voltage, which is about 115 volts over the first range of speed, and 230 volts over the second. Column 5 gives the electrical horse-power delivered to the motor. Column 6 gives the cutting speed in feet per minute.

In the headings are given the maker's classification and the speed range of the motors. Intermediate speeds between the limits given are obtainable by operation of the controller handle.

Tests 7 and 8 are of motors of Type II, and tests 9 to 11 are of motors of Type III.

Test 12 is of a group of tools on a motor-driven line shaft.

TEST 1.—69-inch Driving Wheel Lathe, Turning 62½-inch Tires; Motor, Type CK. 8-15-150/600.

Rheostat.	Field Amps.	Armature.		Elec. H. P.	Cutting Speed. F. P. M.	REMARKS.
		Amps.	Volts.			
00	5.55	5	118	1.6	....	
0	4.70	22	104	......	7.5	
3	4.00	23	116	4.0	8.0	
4	3.90	23	116	.....	....	
5	3 30	26	116	.....	....	
6	3.10	25	116	.....	....	
7	2.90	27	116	5.1	....	Motor running light. Two chips, 3/16 x ¼ deep x .089 per rev.
9	2.90	25	116	.....	....	
10	2.45	26	116	.....	....	
11	2.20	30	116	5.3	....	
12	1.95	30	116	.....	11.45	
14	1.95	30	115	.....	....	
16	1.50	38	113	6.3	12.90	
0	4.60	36	230	12.5	14.60	

TEST 2.—Speed Variation, Wheel Lathe Without Load.

Rheostat.	Field Amps.	Volts.	R. P. M.	REMARKS.
Off.	3.00	114	0	
1	5.55	114	150	
2	4.80	113	158	
3	4.15	113	165	
4	3 75	113	170	
5	3.25	113	175	
6	3.00	112	185	
7	2 75	111	195	
8	2 50	114	205	
9	2.30	113	215	
10	2.15	114	225	
11	2.00	113	230	
12	1.90	113	240	
13	1 80	113	250	
14	1.70	113	265	
15	1.60	114	275	
16	1.55	114	295	
1	5.45	227	290	
16	1.55	227	630	

TEST 3.—18-inch Slotter; Motor, Type CK. 8-15-150/600.

Rheostat.	Amperes.	Volts.	El. H. P.	REMARKS.
3	1 to 10	115	1.4	Chip 5-16 x 3-64.
8	1 to 24	115	3.7	Chip 5-8 x 3-64.
8	1 to 30	115	4.6	Chip ¾ x 3-64.
12	1 to 28	115	4.3	Chip ½ x 3-64.
16	4 to 10	115	1 4	Chip 1-16 x 3 64.

Slotter was making 22 cycles on the 12th point of rheostat on work about 5 inches deep.

TEST 4.—72-inch Boring Mill, Boring Steel Tire, 52 Inches Inside Diameter; Motor, Type CK. 6-10-275/1000.

Amperes.	Volts.	El. H. P.	Cut F. P. M.	REMARKS.
17	115	2.6	17.7	
23	115	3.1	18.5	
26	115	3.5	18.5	
30	115	4.0	19.4	One chip ¼ x 3-64.
33	115	4 4	20.4	
39	115	5.2	22.2	One chip 3-16 x 3 64. Chips of dark blue.

The following readings were taken at intervals of approximately three seconds:

44	115	....	22	
48	115	4.8	22	Two chips, ¼ x 3-32 each. Cutting tools would not stand up under this work. Although there was an excessive ampere overload there was no sparking or heating at any point about the motor.
37	115	....	22	
39	115	....	22	
38	115	....	22	
52	115	....	22	
50	115	....	22	
50	115	....	22	
48	115	....	22	
49	115	....	22	

TEST 5.—Driving Axle Lathe; Motor, Type CK. 8-15-150/600,

Rheostat.	Field Amps.	Arm. Amps.	Volts.	El. H. P.	Cut F. P. M.	REMARKS.
0	5	29	114	5.9	17	Two cuts on 8-inch axle, 3-16 x 5-64.
2	....	31	112	....	....	
3	4	32	111	....	....	
4	3 9	33	112	6 15	....	
5	3.3	35	112	....	....	
6	3.1	36	112	....	18 7	
7	2.9	39	112	6.85	....	
8	2.8	42	112	....	....	
9	2.6	44	112	....	21 9	
10	2.4	47	114	8.0	....	
11	2.2	48	116	....	....	
12	1.9	52	118	8.7	25	

Did not get over on to 230-volt side.

TEST 6.—36-inch Triple-geared Lathe; Motor, Type CE. 8-5-400/1600.

Rheostat.	Arm. Amps.	Volts.	El. H. P.	Cut F. P. M.	REMARKS.
0	1	117	.5	....	Motor light.
0	10	117	1.5	42	Back gear in with heavy cut, cast iron, 11 inches dia.
0	22	117	3.5	42	
4	1 5	118	.7	48	Back gear in, light.
4	8	118	1.3	48	Back gear in with heavy cut, cast iron, 11 inches dia.
4	23	118	3.7	48	
4	30	118	4.9	48	
4	40	117	6.3	48	

Test 7.—42-inch Steel-tire Lathe; Motor, Type CE. 6-10-550/1100.

Rheostat.	Field Amps.	Arm. Amps.	Volts.	El. H. P.	Cut in F. P. M.	REMARKS.
0	3	7	236	3.1	....	Lathe running light
0	3	12	229	4.7	9.6	Starting 2 cuts 30-inch wheels, 3-32-inch feed,
4	1.9	13	231	4 6	15	2 cuts, 3-32 x 3-32.
5	1.75	23	231	5.5	15.2	2 cuts, 3-16 x 3-32.
6	1.42	30	230	9.7	15.7	2 cuts, 3-16 x 3-32.
8	1	34	230	10.7	16.1	2 cuts, ¼ x 3-32.
10	1	36	229	11.3	17.2	2 cuts, ¼ x 3-32.
12	1	38	230	12	21.8	2 cuts, ¼ x 3-32.

Test 8.—Speed Variation, 42-inch Steel-tire Lathe Without Load.

Rheostat.	Field Amps.	Volts	Spindle R. P. M.	REMARKS.
1	3	230	1 22	
2	2.55	230	1.33	
3	2.20	230	1.43	
4	1.95	230	1.53	
5	1.75	230	1.62	
6	1.62	230	1.62	
7	1.45	230	1 66	
8	1.35	230	1.71	
9	1.25	230	1 81	
10	1.25	230	1 87	
11	1.15	230	1.93	
12	1.12	230	2.00	
13	1.05	230	2.20	
14	1.00	230	2.40	
15	.95	230	2.50	

Test 9.—Special Rod Planer; Motor, Type CK. 8-15-275/550.

Rheostat.	Field Amps.	Arm. Amps.	Volts.	El. H. P.	Cut in F. P. M.	REMARKS.
0	4.8	5	227	3	....	Planer running light
0	4.8	20	225	7.5	17	2 cuts, 3-16 x .083.
2	3.1	21	224	7 2	20	Cutting.
2	3 1	.6	224	....	....	Returning.
3	2.2	25	225	8 2	24	Cutting.
3	2.2	5	225	....	....	Returning.
4	1.8	30	228	9.7	28	Cutting.
4	1 8	6	228	....	....	Returning.
5	1.5	32	226	10.1	32	Cutting.
5	1.5	9	226	....	....	Returning.
6	1.2	36	225	11.2	35	Cutting.
6	1.2	10	225	....	....	Returning.
7	1.1	36	226	11.2	38	Cutting.
7	1.1	11	226	....	....	Returning.
8	1.	36	224	11.1	40	Cutting.
8	1.	12	224	....	....	Returning.
9	.85	44	225	13 5	45	Cutting.
9	.85	16	225	....	....	Returning.

This planer has done work on Babbitt metal at the rate of 70 feet per minute, the motor running cool and sparkless at 1300 R.P.M., although the maximum rated R.P.M. is but 550.

Test 10.—48 by 48 by 6 Planer; Motor, Type CK. 8-15-275/550.

Rheostat.	Field Amps.	Arm Amps.	Volts.	El H. P.	Cut in F. P. M.	REMARKS.
0	4.8	12	224	5	....	Cutting 7-16 x 1-32 C. I.
0	4.8	14	224	5.7	....	Returning.
6	1.2	12	224	....	18	Cutting.
6	1.2	14	224	....	....	Returning.
10	1	13	224	....	22 5	Cutting.
10	1	14	224	....	....	Returning.
14	.8	18	224	5.7	....	Cutting.
14	......	20	224	6.3	....	Returning.
15	.8	20	224	....	....	Cutting.
15	......	21	224	....	....	Returning.
16	.75	26	224	7.9	....	Cutting.
16	......	28	224	8.5	....	Returning.

In order to show the variation in load on the motor, the following readings were taken on one point of the rheostat:

0	....	12	224	5	....	Bed returning.
......	......	32	224	9.6	....	Reversing to cut.
......	......	14.5	224	5.7	....	Cutting.
......	......	54	224	15.6	....	Reversing from cut.
......	......	12	224	5	....	Returning.

Test 11.—54 by 54 by 34 Frame Planer; Motor, Type CL. 6-20-375/750.

Rheostat.	Field Amps.	Arm. Amps.	Volts.	El. H. P.	Cut in F. P. M.	REMARKS.
0	5.6	12	230	5 4	12.8	Planer running light.
0	5 6	18	228	7 2	....	Returning.
4	2.7	12	230	....	16.75	Two cuts 3-8 x 5-32 C I.
4	......	18	232	....	....	
8	1.6	14	230	....	22.66	
8	......	20	232	....	....	
12	1.1	18	230	....	28	
12	......	24	232	....	....	
16	.82	22	230	7	31.4	
16	......	28	230	8.9	....	

In order to show the variation in load on the motor, the following readings were taken on the 12th point of the rheostat:

12	1 1	24	230	7.7	28	Cutting.
......	1.1	56	230	17.6	....	At reverse from cut.
......	1.1	22	230	....	....	Returning.
......	1.1	30	230	9 5	....	Reversing to cut.

Test 12.—The following test was made on a motor driving a group of machines in a tool room. These tools were added one at a time after readings had been taken on the power required for the motor alone, motor and line shaft, and also with the countershafting. The final reading is the total power required, but it is not generally the case that all of the tools of a group are running full at one time:

Motor, 15 Horse-power; Semi-enclosed, Constant Speed, Shunt Wound, Silent Chain Drive, Short Centers.

Reading.	Amps.	Volts	El. H. P.	REMARKS.
1	5	235	1.6	Motor running light.
2	6	238	1.9	Motor running line shaft.
3	11	226	3.3	Motor, line and counters of following tools.
4	12	226	3.6	No. 3 B-B milling machine, fluting tap.
5	13	227	3.95	No. 3 LeB milling machine fluting reamer.
6	18	226	5.4	24 x 24 Planer at reversing point.
7	20	227	6.1	14-inch lathe, boring 1⅜-inch hole.
8	26	228	7.0	10-inch lathe, 1-16 cut.
9	26	229	7 9	14-inch lathe running to capacity.
10	30	229	9.2	21-inch drill press drilling 1-inch hole in steel.
11	37	228	11 3	Tool dresser.
12	38	228	11.6	Power hack saw.
13	44	227	13.4	Two aut. tool grinders.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

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Official Organ of the Master Car and Locomotive Painters' Association.

Official Program

The following program has been prepared for the next annual meeting of the M. C. & L. P. Association to be held at Hotel Rudolf, Atlantic City, N. J., Sept. 13-16, 1904:

1. Report of Committee on Tests: J. H. Pitard, Mobile & Ohio R. R., Whistler, Ala.; A. P. Dane, Boston & Maine R. R., Boston, Mass.; C. E. Mance, N. Y., O. & W. R. R., Middletown, N. Y.; W. H. Dutton, Lehigh Valley R. R., Sayre, Pa.; Alfred Hunnicke, Missouri, Kansas & Texas Ry, Sedalia, Mo.

2. What improvements have we made in the painting of steel cars in the past year? Robert Shore, L. S. & M. S. Ry., Cleveland, O.; W. O. Quest, Pittsburg & Lake Erie R. R., McKees Rocks, Pa.; B. F. Wynn, Pennsylvania R. R., Pitcairn, Pa.; F. A. Weis, Central of N. J. R. R., Elizabeth, N. J.

3. What is the best material and treatment for locomotive front ends? A. R. Lynch, P., C., C. & St. L. Ry., Dennison, O.; C. S. Denny, Atlantic Coast Line R. R., Wilmington, N. C.; Eugene Laing, Northern Central R. R., Elmira, N. Y.

4. What is the best construction of sand blast and method of operating same in preparing metal for painting? J. H. Kahler, Erie R. R., Meadville, Pa.; H. G. McMasters, Southern Pacific Ry., Sacramento, Cal.

5. Which is the best method for removing cracked varnish on the interior of passenger cars? Chris. Clark, N. Y., C. & St. L. Ry., Chicago, Ill.; A. A. Nicoll, Northern Central Ry., Baltimore, Md.; Wm. Vogel, Mo. Pacific Ry., St. Louis, Mo.

6. Essay—The treatment of an ideal passenger car from a painter's view. J. A. Gohen, C., C., C. & St. L. Ry., Indianapolis, Ind.

7. Passenger car roofs: treatment and attention of same. T. J. Hutchinson, Grand Trunk Ry., London, Ont.; C. E. Copp, Boston & Maine R. R., Lawrence, Mass.; W. J. Russell, Grand Rapids & Ind. Ry., Grand Rapids, Mich.

8. Paint shop records and accounts. H. M. Butts, N. Y., C. & H. R. R. R., Albany, N. Y.; C. A. Cook, P., B. & W. R. R., Wilmington, Del.; Geo. Warlick, Chi., Rock Island & Pacific Ry., Chicago, Ill.

9. What causes the bulging of putty in the nail holes of new work? J. H. Whittington, Chicago & Alton R. R., Bloomington, Ill.; J. W. Siday, Atlantic Coast Line R. R., Savannah, Ga.

Robert McKeon, Secy.

M. C. & L. P. A. Portrait Gallery--E. T. Congd

We insert with pleasure in this issue the photo and sketch of Mr Congdon of the Special Committee on Locomotive Painting, whose report appears elsewhere. In view of the fact that he was too far away to meet the committee personally, we thought it would be the next best thing to have him meet in this way, and wrote him for his photo and written sketch of his career, from which we present the following, in his own words:

"I was born at Nelson, Tioga county, Pennsylvania, July 9, 1850. My father being a furniture manufacturer, I was at an early age put in the paint shop to learn the trade. At 15 years of age I left home to make my way in the world, accepting a job in a large furniture factory in Addison, N. Y. By strict attention to my work, was soon made foreman, which position I held for about two years.

"Feeling the need of more education, I gave one year to school and in March, 1872, I struck out for the then far west, St. Paul, Minn., and obtained work in the St. Paul & Pacific shops (what is now the Great Northern) under Mr. Taylor, foreman painter. In June of same year was transferred to Brainerd, Minn., to work for the Northern Pacific, under Mr. J. C. Congdon, my cousin. In fall of same year I returned to Pennsylvania and went into the furniture business, continuing it for five years.

"In the spring of 1878 I returned to Brainerd, again to work for the Northern Pacific. In 1884 J. C. Congdon left the service of the company and I was made foreman. In 1886 the coach shops burned and all coach work was taken to St.

E. T. Congdon.

Paul. I was transferred there as assistant foreman under E. E. Arle. In 1894 I was transferred to Tacoma, Wash. (So. Tacoma shops), as foreman painter, which position I now hold, having been twenty-six years in the service of the Northern Pacific.

"At Brainerd and So. Tacoma had charge of engine, coach and freight work. I have kept in touch with the Master Car and Locomotive Painters' Association from its beginning, but never joined until last fall at the Chicago convention, and I can assure you I was well pleased with the kind reception and the right hand of fellowship my fellow craftsmen extended to me. Being so far away, I fear I cannot make the trip this fall, but hope to meet with you another year."

Our Next Convention

We have recently received a personal letter from President Cook from which we venture to make some extracts "for the good of the order." He says: "No doubt you think it about time to hear from me about something or other. Well, here is a picture of our hotel for next convention in September. What do you think of it? Do you think it will be large enough, or near enough to the beach? I think the committee has made an excellent selection; one which will give general satisfaction. There is a fine room for our meetings, in fact there seems to be nothing wanting. I went to Atlantic City with Mr. Kuhn, chairman of the hotel committee, and thus speak from personal observation. All it needs is a good attendance of our members. And on that point I have my doubts. I have heard that some are cutting it out for the fair. Still, when the time comes they may prove loyal to the association. Let us hope for a convention that will strengthen us as an organization. The hotel management offered to furnish enough of their booklets (as per sample enclosed), with envelopes containing printed matter announcing our convention date, etc., on the outside. They will be sent to Mr. McKeon and he will place our association circular in with the booklet and mail both to the membership. How does it strike you? I thought it a good scheme to let the "boys" see their hotel and surroundings."

In explanation and comment on Mr. Cook's letter will say that he sent us one of the booklets, with a picture of the hotel thereon and we were much pleased with the appearance of our headquarters for our next convention. We replied to him that we thought his plan to send the booklets in envelopes to the secretary to receive the official programs of the convention, and thus be remailed to all members, was a good one, and should be carried out as soon as convenient. One thing is pretty sure: There will be room enough for all this year in the hotel chosen for official headquarters, which has seldom been the case in cities chosen as our meeting place, and we ought therefore to have a profitable meeting and a most excellent time.

Allow us to say here that we hope that no one will cut out our convention to attend the World's Fair at St. Louis. Attend both if you can and can afford it, but if it comes to a matter of choice between the two you will make a most serious mistake to take in the fair and shut out the convention, one you will kick yourself the remainder of the year for making. There is nothing that so "fills the bill" in general satisfaction for the year round as meeting with "the boys" (and "girls") in convention and talking the situation over again, with its new trials and perplexities, and incidentally having a good time together well mixed in with it. To one accustomed to attend these annual meetings from year to year it would prove such a loss to miss one that he would not soon forget it. Of course it would be very nice to have it so arranged as to take in both the convention and the fair, but have we not done that twice already? And have we not done so at a great sacrifice of comfort, if not of pleasure, after all, by having to put up with second class accommodations, and trying to cram so much into such a short space of time as to make it wearisome to the flesh? We are of the opinion that no one who goes to Atlantic City and has the time there that he will surely have will regret much that he did not go to St. Louis. On the other hand, if any one goes to St. Louis and does not go to the convention he will be regretfully mentioning it to every "supply man" who calls on him throughout the year, to say nothing of his own feelings, or of anyone else.

Furthermore, there is another light to look at it in. We owe something in loyalty to that association which meets this year for the thirty-fifth time. Has it not helped us? Yes. Then let us stand by it. "Stand by your guns." Stand by your officers, especially your worthy president. Of course you will; what are we writing all this about anyway? We almost forget what we were doing in our zeal to build up the association and have as good a meeting as ever this year.

Air Painting at the Northern Pacific Shop

Editor "Railroad Paint Shop."

Thinking you would accept an item for the "Railroad Paint Shop," and as some are skeptical as to the practical use of a paint sprayer, I inclose you a photo of ours. Would say that during the month of May at South Tacoma, we turned out 200 new Lidgerwood cars, and painted them with sprayer. They were run out in line of 25 or 30 cars. Cars were all piped, so we could make connection with air at any point.

Air Painting at the Northern Pacific Shop.

Used two machines, one on either side. Our sprayers hold about seven gallons of paint, and, counting time for filling and making connection, they went down the line at the rate of 12 per hour. Mr. Moir, our shop superintendent, and Mr. Cook, general car foreman, were satisfied that they did good, practical work. The nozzle used was same as one I had for inspection at Chicago convention last September. I believe that paint sprayers have come to stay with those who desire to make it a success. We use it with equally as good results on passenger car and engine tank trucks.

E. T. Congdon, Foreman Painter,
Northern Pacific Shops, So. Tacoma, Wash.

Report of Special Committee on Locomotive Painting

Subject.

"What is the best practice for painting locomotives and tenders, cost, durability and appearance all being considered, especially to bring out any economical appliances which have been utilized to assist in the work?"

The above question was submitted by the executive committee of the American Railway Master Mechanics' Association to the Master Car and Locomotive Painters' Association for its consideration, but owing to a misunderstanding on the part of the latter the subject was not presented at the 1903 convention. To rectify this mistake, the Master Painters' Association elected by ballot a committee of five members to prepare and submit a report on the matter with instructions that it finally be presented before the Master Mechanics' Association at their meeting in June, 1904.

In submitting this authorized report the committee does so with the understanding that there will be some criticism by those interested in locomotive painting. The committee also reasons that the views of all railroad motive power officials are not alike, but, it is encouraged with the belief that much of the information offered herewith will be kindly received, if not endorsed, by the progressive officials, who are in this manner seeking the views and experience of this association on locomotive painting. It also hopes the report will be received without undue prejudice, notwithstanding the fact that there may be some conflicting details when compared with individual ideas and shop practices.

To illustrate: We will suppose that the head of the motive power department on one railroad believes that to paint a locomotive other than in the cheapest manner possible is a waste of time and money. As a strong contrast to this, we have the official who has an eye for neatness in connection with durability, and demands that the best materials be used and allows a reasonable time for the performance of the work. We believe the latter can prove the economy of his position.

Years ago when railroads were in their infancy, the painting of locomotives and tenders was quite an important feature of railroading. The machines in those days were highly ornamental, the artistic skill of the ironworker and the woodworker, as well as the artist of the brush, was brought fully into play, and expense was not spared. But that type of machine with its ornamental features has done its duty, and has given way to the more practical and serviceable locomotive in general use today.

The first point brought to our notice in the proposition under consideration is the cost. This is in line with modern ideas. In recent years railroads have been run primarily to earn dividends on the capital invested, and, as the painting affects the cost of operation it necessarily affects the earnings. For this reason the cost must be considered and, from the manner in which this subject is brought up at times, we are led to believe it is of great importance.

If cost were the only consideration the question would be solved by the application of the fewest coats of the cheapest paint by the lowest priced labor procurable. But we are to consider durability and appearance in connection with the cost and this throws the cheapest methods and materials out of the question.

In looking into the question of expense we are confronted with the fact that there is a wide difference in the earning power of railroads; some companies can well afford to spend more money in painting locomotives than others. Again, there is a difference in surroundings and locality. These facts make the question as to what is the best practice for painting locomotives an exceedingly difficult one to answer so far as cost is concerned.

In regard to the methods of painting. A system which is considered ideal on one railroad may prove more or less unsatisfactory and inadequate on another owing to a difference in climatic conditions, shopping facilities and other causes too numerous to mention.

Comparatively few locomotive repair shop officials are now willing to concede a little additional time to the painter for the proper completion of his work, after it has been turned over to him, by the machinists. He is expected to finish up with them or practically so; nor is it to be wondered at when one considers the fact that to a busy railroad, hard pressed for power, a locomotive in good working condition means a great deal. There are instances, however, when time can be conceded without detriment to the service and this can frequently be used to advantage by the painter.

Experience teaches that for iron and steel the kind, and amount, of paint and varnish that will cover, protect and give a presentable finished appearance should be used. It also teaches that, in everything purchasable, the best is the cheapest and paints and varnishes are no exception to this true old adage; in fact there are no products more easily adulterated, the injurious effects of which can only be detected by the lapse of time. For this reason, when materials, which by long trial and usage, have been found to fulfill the requirements, it is not true economy to discard them for practically unknown products.

The durability of the painting is, without doubt, its most essential point. Without it the painting is a failure, no matter how well it looks or how much it costs. Durable painting can be done at moderate cost if good appearance is not desired, but the maximum amount of durability cannot be secured by applying one coat upon another in quick succession in an endeavor to get enough paint material on rough parts to give them a smooth and level finish. The necessity of plastering and puttying rough iron and woodwork is the curse of locomotive painting, as the necessity of this practice lessens the durability of the work.

So far as appearances are concerned, we should judge the limit in the direction of simplicity has been reached in the painting of locomotives. In reaching this limit many operations, which formerly were hought valuable and necessary, have been omitted. For the reason it is most just to contend that it is of vital importance that the operations which have been retained, and which pertain to the durability and the protection, should be performed with the very best material obtainable and by the best methods.

In painting, a good appearance is much more difficult to obtain than a cheap or a durable job; more time and money is required to secure a smooth and level surface than is the case when this is not essential. From this it can be readily seen that the appearance directly affects the cost.

In touching upon the subject of labor-saving devices, too much cannot be said in favor of the sand blast. Not only does its use insure a surface perfect for the reception of paint, but as a labor-saving adjunct to the paint shop it is invaluable. Small shops may not find in it sufficient advantage to warrant the installation of an apparatus of this kind, but to the larger plant, overhauling a dozen or more locomotives per month, its presence is little short of a necessity. Aside from its use in cleaning off rust, flash scale, old paint and varnish, it is also useful for cleaning rough castings.

The paint sprayer (under favorable conditions), may be employed as a labor-saving appliance in painting underneath parts, frames, etc. It is doubtful, however, as to whether or not there is practical economy in its use as the material wasted by the use of most machines offsets in value the gain made in labor.

A dipping tank containing a solution of caustic soda, or potash, heated by a system of steam pipes, will be found of great value in removing paint and grease from dismantled parts such as drivers, dome casings, dome covers, front ends, steam chest casings and covers, number plates, grab irons, etc. The tank should be sufficiently large to hold the detached parts and admit of submersion. It should be placed underground conveniently near a hoisting crane with which to handle the work.

In the matter of equipment, where shops are provided for painting of tanks, stationary scaffolds are a great convenience. All shops should be equipped with suitable mixing benches and facilities for the proper care of tools and materials, and wherever the force warrants, a stock room with a custodian in charge is in the line of economy.

We desire in this connection to submit the following suggestions:

First: As the passenger locomotives run in connection with passenger equipment cars they should be treated in the manner of finish in all respects equal to the cars.

Second: Freight locomotives should be painted mainly for durability. From this we would not like to be understood as stating that any kind of painting is good enough for the freight locomotive, and no attention paid to surfacing, for we consider a certain amount of filling on the rough parts in the line of economy because it facilitates the cleaning when locomotives are in service.

Third: Castings and woodwork, on which a good surface is desired, should be made as smooth as possible before the application of paint material.

Fourth: We discourage the painting of locomotives in roundhouses and would recommend that whenever possible they be run into the paint shop for the finishing coat of varnish.

Fifth: For painting new parts we consider the following good practice:

First day: Sand blast and apply the priming coat of paint.
Second day: Drying.
Third day: Second coat.
Fourth day: Putty and fill rough places with knifing surfacer.
Fifth day: First coat of rough stuff.
Sixth day: Second coat of rough stuff.
Seventh day: Guide coat and rub.
Eighth day: Two coats of color.
Ninth day: Stripe and letter.
Tenth day: Varnish with finishing varnish.
Eleventh day: Drying.
Twelfth day: Varnish with finishing varnish.

When absolutely necessary the above practice can be shortened two days by applying two coats of rough stuff in one day and applying the second coat of varnish on the following day, by eliminating the day allowed for drying.

Sixth: For repainting locomotives undergoing repairs we submit the following schedule which can be varied as conditions and circumstances may require:

First day: Prepare and apply priming coat where necessary.
Second day: Putty and knifing surfacer.
Third day: Color.
Fourth day: Stripe and letter.
Fifth day: Finishing varnish.
Sixth day: Finishing varnish.

On account of the difference in the condition of the paint and varnish on locomotives when they are returned to the shops for repairs we believe that much should be left to the judgment of the foreman painter as to what operations can be added or omitted in order to expedite the work without detriment to its durability and appearance. These schedules are based on the time required for cab and tank, it being understood that the other parts are being coated by the same method as rapidly as the machinist's work will permit.

Seventh: We would like to emphasize the importance of having locomotives properly cleaned while they are in service, not only to make them more pleasing to the eye, but in order to obtain the best results from the paint material which has been applied.

Eighth: In the way of labor-saving appliances and facilities we would recommend:

The sand blast.
The material saving paint sprayer.
The potash vat.
The stationary scaffold.
Suitable mixing benches.
Paint stock room (where conditions warrant it.)

On account of our inability to describe quality of work, the difference in facilities of handling parts and the wide variation in labor conditions, it is impossible to give definite data as to cost; we believe, however, that the allowance should be sufficient to secure work equal to that on passenger cars, and the freight locomotive should have a smooth surface in order to facilitate cleaning.

In conclusion we have to acknowledge that no particular system of painting can be furnished which will be suitable for every railroad and shop. Even in the matter of painting locomotives we are governed by the earning power of the railroad, by its locality and also by sentiment.

Respectfully submitted,

A. P. Dane, chairman, Boston & Maine R. R., B. E. Miller, Delaware, Lackawanna & Western R. R., J. D. Wright, Baltimore & Ohio R. R., W. O. Quest, Pittsburg & Lake Erie R. R., E. T. Condon, Northern Pacific R. R., committee.

Notes and Comments

Wm. R. Knapp, a former Pullman Car Co. employe at Wilmington, Del., has been appointed foreman painter at the Buffalo shop of the Erie R. R., vice D. B. Vail resigned.

W. H. Payne, formerly foreman painter of the New Castle, Pa., Traction Co., has been appointed master painter of the Pennsylvania & Mahoning Valley R. R., with headquarters at New Castle.

With this number we complete eleven years as editor of a department devoted to car and locomotive painting, ten years the official organ of the M. C. & L. P. A., about three years in this paper and the balance with the Railroad Car Journal and the Railroad Digest.

It costs just as much to apply a poor material as it does a good one, therefore apply the good one and save both the labor of application and removal. Good material plus good labor makes the best job; but poor material well applied does not make a good piece of work.

H. C. Lafferty, late Pittsburg manager of the American Graphite Company, of Cleveland, O., has recently been appointed foreman painter of the American Car & Foundry Co.'s Berwick, Pa., shop. This plant is engaged in getting out 500 steel passenger cars for the Interboro Underground Ry. Co., of New York.

With the official program Secretary McKeon sends us the following note that is of interest to members: "I inclose program for next meeting. I have just got it filled; expected to hear from one more on subject No. 4, but will wait no longer. Will send circular when it is printed. Hoping we may have a good convention, I remain, fraternally yours, Robert McKeon, Secy."

The main shops of the "Frisco System" (St. Louis & San Francisco), are located at Springfield, Mo., where Mr. I. H. Price is master painter and has his hands full constantly. The capacity of his shop is not large enough for turning out all the equipment desired, we are told, and the company intends to greatly enlarge the paint shop. All patterns and designs for shops on the entire system are supplied from these shops.

Geo. Paullis, a well-known member of the M. C. & L. P. A., and formerly with the Lake Erie & Western at Lima, O., likes the change from the north to the south, we are informed, where some time ago he was located with the Southern Pacific at their Houston, Tex., shops. These shops turn out 12 cars per month and employ 34 painters. They use the Pullman scroll and gold stripe on all first-class cars and aluminum on engines. The entire shops employ 1,500 men. Mr. Paullis also has a line of boats for the Morgan Steamship Co. to care for in the painting line.

Another score in favor of the lead and oil system in car painting. A combination smoking and baggage car is in the B. & M.'s Lawrence shop being varnished (May, 1904), which was built in that shop and painted straw color in May, 1888, and some eight years ago was painted Pullman color over the straw color and all its accumulations of varnish, and it has not been burned off yet and looks as well as the majority of cars painted seven or eight years from the wood by modern systems of car painting. Here's 16 years of service without burning off, with more to follow!

The International & Great Northern, at Palestine, Tex., John Roscoe, master painter, is one of the roads in Texas that believes in good painting. A fair amount of ornamentation is still being used on the exterior of the coaches. Oil is largely used on this system for fuel so that the painter does not find his battens and front ends of mail and baggage cars all eaten up by the sparks and cinders from the engine. Mr. Roscoe is a thorough mechanic, we are told, having succeeded his brother, A. W. Roscoe, who died about two years ago.

At the Burlington & Missouri River Ry. shops at Plattsmouth, Neb., where Daniel B. Smith is master painter, things are moving slow at present, as only about one-half their former force is employed. Mr. Smith, who takes interest in the upholstering department, has perfected a machine for cleaning cushions and seat-backs. It works like a syphon, sucking out the dust and conveying it to outside of building through a long rubber hose, instead of blowing it into the cloth or plush or elsewhere in the car, as is the case with the ordinary air-cleaning processes. It thoroughly cleans the plush and leaves it in fine shape, says our informant.

In his personal letter quoted elsewhere, President Cook writes: "I have been looking for a newspaper clipping I intended to send you but can't find it. It announced my election to the presidency of the Church Club of Delaware, and gave a description of the semi-annual dinner at which it was my privilege to preside, with a bishop on my right and a Philadelphia judge on my left. I felt you would be interested." So it will be seen that we have a sort of two-barrelled president, as it were. First, he fires at us in our convention and then shoots into the Church Club. We have written him admonishing him that "no man can serve two masters." Pleasantry aside, we thought we knew the worth of Chas. A. Cook, when the M. C. & L. P. A. chose him as its president. We hereby nominate him for another term.

Mr. Wm. B. Getchell, formerly assistant to the late Geo. H. Worrall, has been appointed foreman painter at the Somerville shops of the Boston & Maine. Mr. Getchell is an old experienced hand at the business. At the time the M. C. & L. P. A. was organized in Boston in November, 1870, he was in charge of engine painting at East Boston for the Eastern R. R. and was present at that convention. At about that time he was offered the foremanship of the car paint shop at Salem, but refusing it, Mr. Worrall was appointed, and in course of time Mr. Getchell went to the N. Y., N. H. & H. R. R. at New Haven in that capacity, where he remained three years, and later went to the Worcester, Nashua & Rochester at Worcester, and when the B. & M. leased that road he was afterward transferred to the East Cambridge shop (formerly Boston & Lowell), and on the demolition of that shop to extend the Union station yards he was made the late Mr. Worrall's assistant at Somerville, the latter having been transferred there from Salem some years previously.

About once in so often the frost of hard times strikes the railroads. Usually a "presidential year" has something to do with it, but it would seem that lessened freight business from labor troubles has as much to do with it as anything this time. In a letter from a foreman painter on one of the largest railroad systems in the country, he says, under date of May 24: "We are in bad shape at the shops just now, as you no doubt know. Our force has been largely reduced and we are working but four days a week, a total of 39 hours. What is coming? It seems to be general among the railroads. I am afraid there is more to come." And now what was expected has arrived "down east." Orders have been promulgated to look over the shop force in order to see if possible what retrenchments in the way of labor can be made. Requisitions for material are also scanned very closely to see what can be struck out. Of course, as is usual at this time of year, in this section where beach and mountain travel sets in, men are usually laid off from the paint shops, as passenger equipment cannot be spared for painting or varnishing. Let us hope that business will not be marred next fall by a presidential election.

Mr. D. B. Vail, late foreman painter Erie Ry., Buffalo shops, announces that he is the railway representative of Buffalo Oil, Paint and Varnish Company and of the McDougall Varnish Company, that he is out for the railway trade and will be around to see "the boys" soon. Here's hoping he will succeed, but the railway trade is a dry bone to the old hands at the present time and will be until fall.

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A DESIGN of locomotive boiler was presented in the May issue of the Railway Master Mechanic, which elicited the discussion concerning wide versus narrow grates, published in our columns the following month. The consensus of opinion as expressed therein is that the wide firebox is proving more satisfactory and economical and is giving better results in present day practice than the long narrow box. In this connection we wish to refer to a communication by Mr. E. W. Fitt, appearing on another page of this issue, in which he refers to the discussion in the June number and presents a design of locomotive boiler for fast passenger service in the west, having a wide firebox and designed to burn lignite or bituminous coal.

THE Chicago, Milwaukee & St. Paul Railway, which operates its own sleeping car service, has recently shown its regard for the comfort and welfare of its patrons by substituting for the germ-filled blanket a clean white spread. Such a departure not only adds greatly to the comfort of mind of the average person who uses the sleeping car, but it is something of a guarantee to the passenger that he is sleeping in a bed that is hygienically clean. The blanket is stored in the car during the summer months so that it may be used on the berth if needed. A company which has a monopoly of anything, such as has the Pullman company, is sometimes apt to overlook these little things, which add so much to the comfort of its patrons. We understand that as yet the C., M. & St. P. has installed this new departure on their Chicago-Kansas City trains only.

IT is interesting to note the success attained by men trained in railroad service who have turned their attentions to other fields, and to forecast what the effect will be upon men now railroading and the inducements necessary to retain them. The railroad man learns early in his career that difficulties are made to be overcome and his schooling is of necessity one which perpares him for emergencies. If the foundation of a man's training has been in the roundhouse, he has learned to bear up under a great deal of grief, coming from many directions; he has learned to maintain his composure and coolly meet difficulties under all circumstances.

The continued wrangling with obstacles and the careful solution of problems so prepares him that it requires but little additional digging to specialize along other lines and meet the requirements therein demanded.

Many supply and manufacturing establishments are making up their forces from the ranks of railway men. They find such men valuable acquisitions because of their ability to give close attention to business, handle details without getting lost in the maze of minor affairs and because of an intelligent appreciation of the value of organization.

With such an attraction for the more efficient railway men it is incumbent upon the railway companies to arrange desirable salaries in order to hold the best talent now in the profession or be dependent upon the supply companies to provide engineering ability for railway interests. This would lead to costly experiments on the part of the railway in many cases.

The head of one of the largest establishments in the country catering to railway trade remarked some time ago, "I have no better men, no kindlier men, no men who are anxious to do what is proper and right, than the very men we have secured from the railways."

Railways need well trained men now more than ever before, and the necessity for them will continue to increase indefinitely. Moreover, if a man is worth a large salary to a supply house he is worth more to the company who has trained him. The inevitable is here and the railroads should realize that they must pay their officers salaries somewhere near what they ought to be, instead of a ridiculous pittance.

THE best method of handling firemen with regard to shop training is a question which deeply concerns their familiarity with the operation and principle of the locomotive and therefore their ultimate efficiency as engineers. The training of firemen varies on different roads and depends to a certain extent upon the organization, that is, whether the engine crews report to the master mechanic or to the road foreman of engines. Where the former case obtains, a very successful method, and probably the oldest, is the employment as wipers and helpers of candidates for road work. After a period of from six months to a year, the best and most likely men are given a simple preliminary examination and put on engines in yard service. When the men are trained in this way, the master mechanic or general foreman is given an opportunity to become somewhat acquainted with their capabilities.

On some railroads, the road foreman hires his firemen and puts them to firing as inexperienced men without previous training around a locomotive. In many cases these men come from the surrounding farms and have only that superficial knowledge of a locomotive which comes to them from gazing. After their duties as firemen have commenced, opportunities for learning the interior and working parts of the engines are limited for the reason that they are kept too busy with routine work to make frequent visits to the shop. Where this lack of knowledge is thoroughly appreciated by those in authority, an opportunity for the men to familiarize themselves with the construction of the locomotive is provided by placing them in the erecting shop or engine house for a period of time, varying from three to six months, just prior to their examinations for promotion.

This shop training is very essential, if not absolutely necessary, and the question arises, would it not be better to select firemen from the ranks of helpers who have learned something of the boilers and machinery? If this is done, a new fireman has a good idea of the working parts of the engine and its construction, as he has seen it in all stages of repair, noticed the parts which are most affected by service and has assisted in its rebuilding. Such a selection, however, is objected to by some road foremen because they prefer to hire their own men. Why should this be the case? If things are as they should be, the road foreman and the shop management are working hand in hand, and there should be no reason why the former should hesitate to accept men upon the recommendation of the general foreman or master mechanic.

MR. N. D. MOHER.

GENERAL MANAGER OF THE NORFOLK & WESTERN RAILWAY.

Mr. Maher was born April 29, 1854, at Blairsville, Pa., and was educated at Mount St. Mary's College at Emmitsburg, Md. He entered railway service in 1871 and was for two years engaged on surveys and construction of the Pittsburg, Virginia and Charleston Railway. Then for one year he was clerk in the office of the superintendent of transportation of the Pennsylvania Railroad at Altoona, Pa. From 1874 to 1883 he was clerk in the office of the general superintendent of the same road and in 1883 was made chief clerk to the general manager of the Norfolk and Western Railroad which position he held until August 1, 1889, when he was appointed trainmaster of the Flat Top division of the same road. He was made superintendent of the Pocahontas and Clinch Valley division, August 2, 1890, resigning this position in June, 1901, to go to the Seaboard Air Line as general superintendent. In January, 1903, he returned to the Norfolk and Western as general superintendent, which position he held until his appointment as general manager.

An objection to placing firemen in the shop as helpers for a time prior to their promotion and after they have seen active road work, lies in the fact that it is likely to demoralize the shop organization, to some extent. It is very possible that there may be no vacancies in the shop just at the time that it is desired to place such men. Therefore it would be necessary to lay off capable men to make room for those who are practically green. Then, when the firemen are set up and put back on the road, the vacancies so made would again have to be filled with green men. Another point which may be raised is that if engineers were much needed, the firemen would be promoted in the emergency, omitting the shop training altogether.

IN view of the practical ideas contained in the paper presented at the last convention of the Master Mechanics' Association by Mr. R. D. Smith, concerning the technical graduate, we wish to direct attention to the fair-minded manner in which the technical graduate is judged and the courses which are offered for developing such men to usefulness. The writer makes the plain statement "technical men are needed in railroad work and the need becomes greater every day." Evidently with this thought in view as prompting his arguments, he discusses the inducements offered in railroad work as compared with other lines in the mechanical field, touches on the advantages gained by a combination of theoretical and practical knowledge, presents a number of instances likely to affect a young man during his training, and then offers three distinct courses, each one of which is intended to cover a specific field. The writer believes that there is much weakness in past methods of training technical graduates and suggests that instead of giving a man a superficial knowledge of a wide field it would be better to narrow his scope, specialize to a certain extent and turn out a valuable man who, though having less general knowledge, has been given a foundation on which to build a position of responsibility.

The arguments offered by Mr. Smith are well taken and the courses outlined appear practical, conveying the impression that they are arranged with the idea in view of giving a man such training that upon its completion those in authority can have confidence in his ability and it would be with some feeling of certainty that he might be entrusted with a position as foreman in the department in which he had been trained.

Danville Shops of the Chicago & Eastern Illinois Railway

(Continued from page 194.)

Power House.

As mentioned in the fore part of this article, the power house is so located that when the car department has been arranged, power will be derived from a plant which will be centrally disposed. The power house presents rather an artistic appearance, it is well constructed and fireproof and the machines, appurtenances, etc., installed therein are particularly well arranged. The walls of the building are of brick, the tile roof is carried on steel roof trusses supported by the walls, and the cement floors are laid on brick arches supported by I beams. The outside dimensions of the building are 90 by 100 ft. The house is divided by a brick wall 15 ins. thick, into two rooms, a boiler room 41 by 97 ft. inside dimensions, with a clear height to the roof trusses of about 30 ft., and an engine room 41 by 97 ft. inside. Beneath the engine room floor is a basement 8 ft. 10 ins. head room, in which the pumps, heaters, etc., are located.

The floor of the boiler room is on the ground level and along one wall of this room the coal bunkers have been arranged. They are at such height that coal may be shoveled by hand from cars run alongside. The bottoms of the bunkers are hopper shaped and the delivery of coal from them is controlled by gates operated by a shaft and hand wheel, the latter being arranged in the boiler room within reach of the fireman. Coal from the bunkers is delivered into hand cars which may be drawn forward to positions accessible to the firing doors. From the cars coal is fed to the grates by hand. Provision has been made in the construction of the bunkers that when coal can be delivered to the plant in hopper cars, tracks will be arranged above the bunkers and coal dumped directly from the cars.

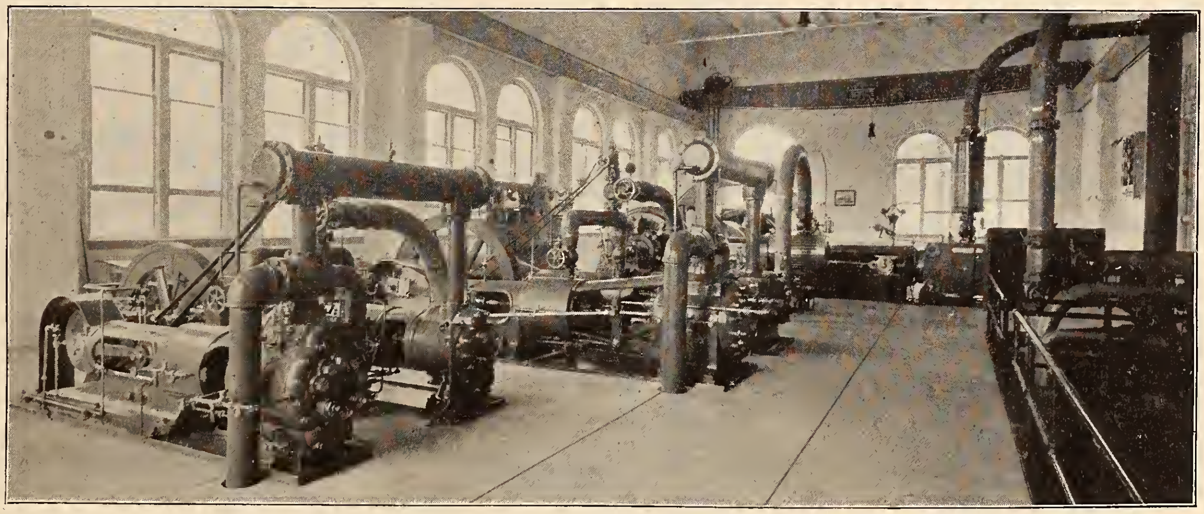


Fig. 1—General View of Engine Room—C. & E. I. R. R.

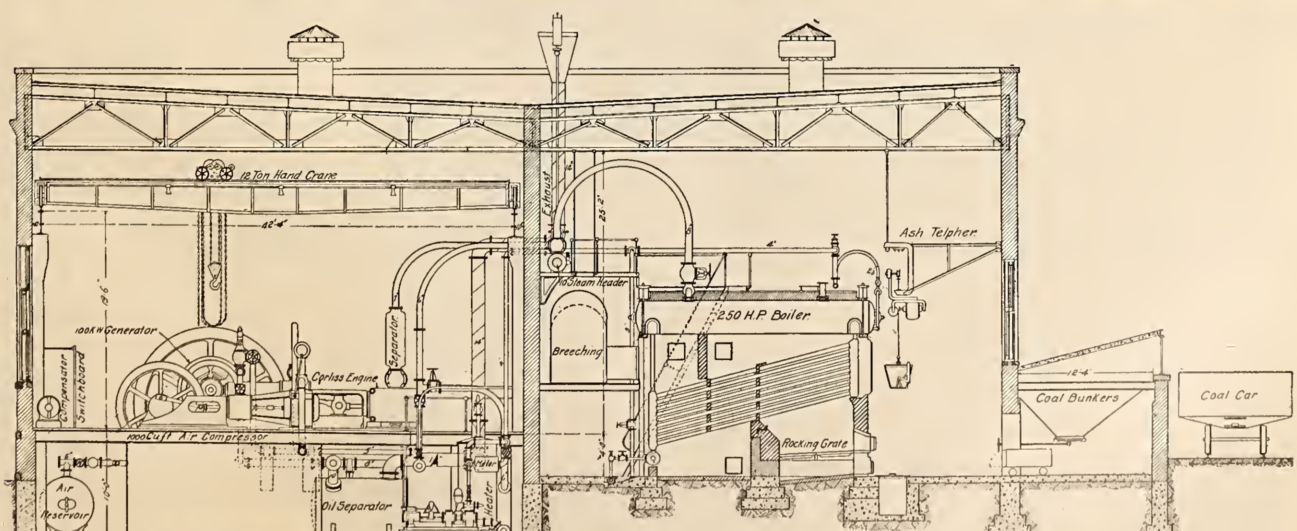


Fig. 2—Cross Section of Power House—C. & E. I. R. R.

Ash is handled by a telpher system. Directly in front of the ash doors is a trench of such width as to accommodate a specially designed bucket. When this bucket is lowered into the trench ashes are drawn from the ash pits to the bucket. When filled the bucket is drawn up by a motor and conveyed along the overhead track through a door in the wall of the boiler house and dumped directly into a car switched there for that purpose.

In the boiler room are installed four 264 h. p. Cahall horizontal sectional water-tube boilers, furnished by the Aultman & Taylor Machinery Co., set in two batteries of two boilers each. Each boiler is provided with two 4-in. safety valves set for 100 lbs. pressure, water columns, three gauge cocks, two horizontal blow-off valves and a Kirchner high and low-water alarm. The total capacity of the boiler plant is about 1000 h. p. and space has been left in the boiler room for the installation of another 500 h. p. battery as soon as the increased size of the shops makes it necessary. The grates under the boilers are the Martin rocking and shaking design, furnished by the Martin Grate Co., Chicago. They have an

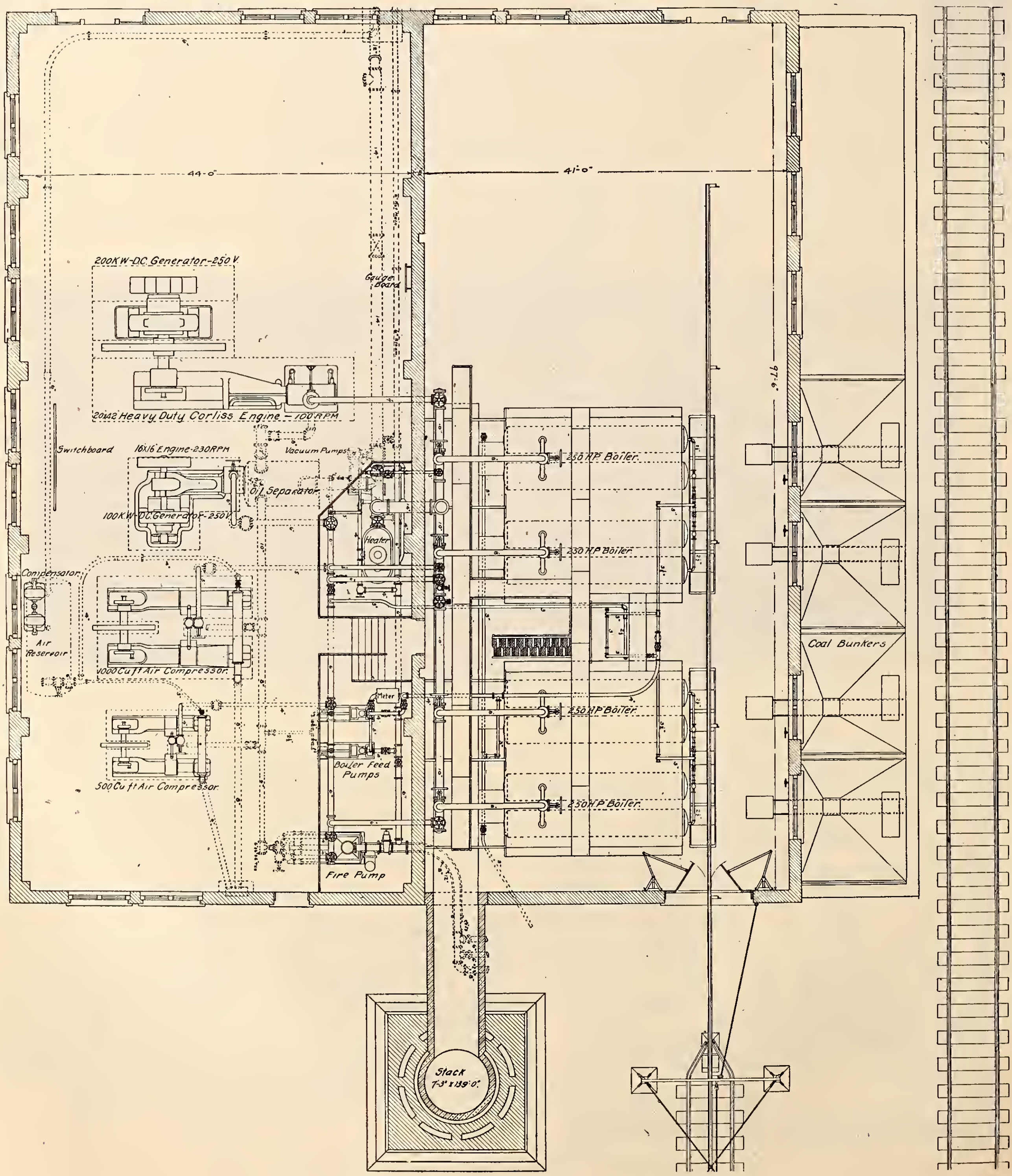


Fig. 3—Plan of Power House—C. & E. I. R. R.

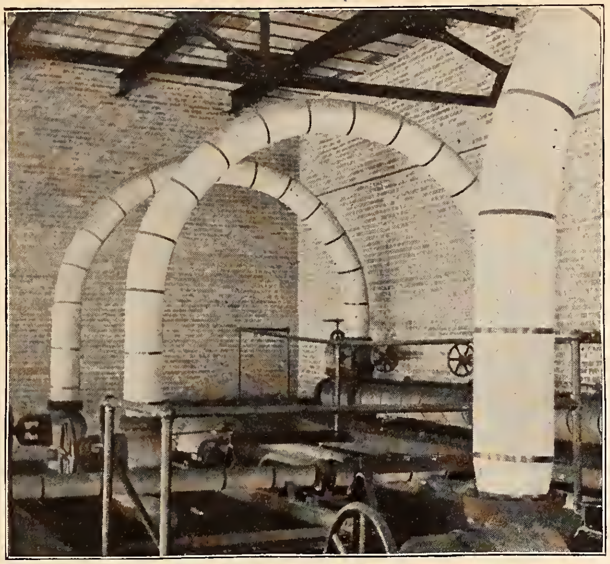


Fig. 4—Showing the Long Bends in Boiler Feeder—C. & E. I. R. R.

area of 55¼ sq. ft. per boiler, and are designed to normally burn about 22 lbs. of coal per sq. ft. per hour. The gases pass from the furnaces to a breeching made of 3-16 inch steel, furnished by E. M. Burr, of Champaign, Ill. This breeching is 5 ft. wide by 7 ft. high at the smaller end, and 10 ft. high at the larger end, the cross-section being rectangular with an arching top. The draft is obtained from a chimney 150 ft. high, just outside the power house. This stack is built of brick with a limestone base, resting on a concrete foundation.

The boiler-feed pumps, of which there are two, are each 7 x 4½ x 10 ins. duplex plunger pumps having a capacity each of 68 gallons at 25 revolutions. They are located in the basement below the engine room. The feed-water heater is a No. 4 Stillwell cast iron open heater and is designed to heat 30,000 lbs. of water from an initial temperature of 65 degs. to 210 degs. F. when supplied with steam at atmospheric pressure. It is equipped with a Mason balance valve controlled by a copper float in such a manner that the water line in the heater is automatically regulated, and can be varied at will by the engineer. It is also equipped with an overflow valve controlled by a float which insures the heater against flooding. This valve has a deep water seal and can be used as a skimmer or surface blow-off for removing particles from the water when desired. There is also provided an oil separator which extracts the oil from the exhaust steam before it comes in contact with the water. The feed water, after passing over the trays of the heater, collects at the bottom of the settling chamber where the heavier particles will be separated out by gravity. From this chamber it passes upward through the filtering chamber which will further remove any floating impurities. The settling chamber and filterer are provided with blow-off cocks for cleaning.

The steam is led from the boilers by 8-in. extra heavy piping with long bends directly into the top of a 10-in. steam header. Automatic valves are placed in the feeders which will cut out any boiler in case its pressure falls below a stated amount. The main header runs along the boiler room wall and the feed pipes to the engine are tapped into it opposite each unit.

The engine room is of ample size to accommodate all machinery now installed, together with future extension, allowing necessary space for repairs on machinery, yet without waste room. The large engine now installed is a 300 h. p. heavy duty type horizontal simple Corliss engine, with shafting extended for mounting the 200 kilowatt direct current generator. The cylinder is 20 ins. in diameter, with 42-in. stroke. The engine is designed to develop 300 h. p. when running at 100 revolutions per minute, taking steam at 100 lbs. pressure and ¼ cut off. It will carry continuously an overload of 50 per cent without undue heating or wearing of the operating parts and will regulate within 2 per cent each way from its normal speed under variations from no load to full load. This engine is furnished by the Filer & Stowell Co., of Milwaukee, Wis.

The smaller engine is a 150 h. p. Ideal high-speed engine, furnished by A. L. Ide & Sons, of Springfield, Ill. This also is a single cylinder engine, arranged to be direct connected to a 100 kilowatt generator. The shaft for the generator armature is flanged coupled to the engine shaft, instead of being built in one solid piece. This engine will develop 15 h. p.

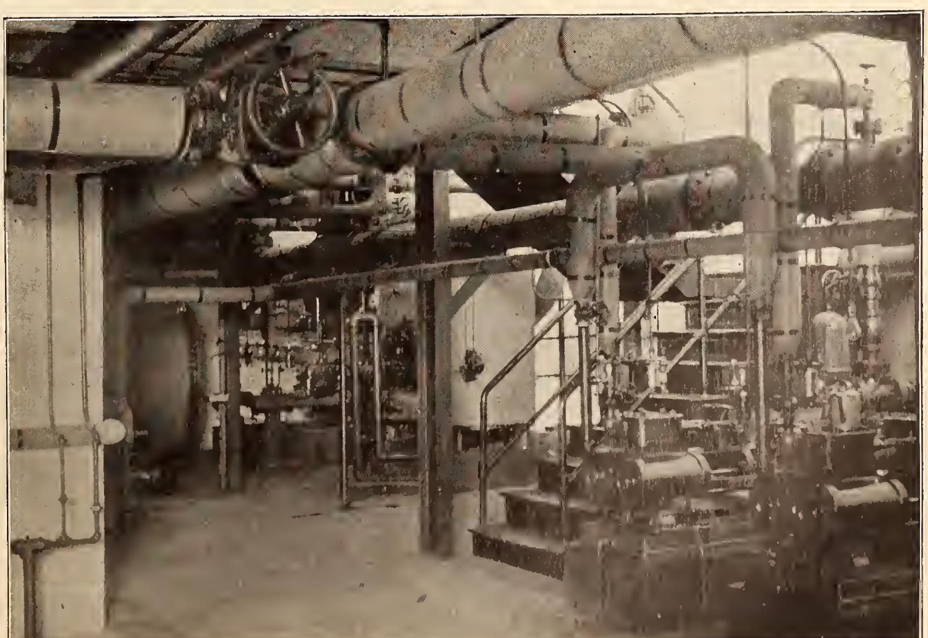


Fig. 5—View in Basement Beneath Engine Room—C. & E. I. R. R.

when running at 230 revolutions per minute, taking steam at 100 lbs. pressure and ¼ cut off. The diameter of the cylinder is 16 ins. and the stroke 16 ins.

The generators are both furnished by the Western Electric Co., of Chicago, and are compound wound multi-polar 250-volt direct current machines. The 200-kilowatt generator is designed to run at 100 revolutions per minute, while the smaller runs at 230 revolutions per minute. Both of these machines are designed to furnish 250 volts at full load, and 245 volts at no load. They are each capable of operating continuously, delivering their full rated output at 250 volts without an increase of temperature in the field coils of more than 40 degrees Centigrade and in the armature of more than 45 degrees above the temperature of the surrounding air, and they will, moreover, carry a 50 per cent overload for a period of two hours without excessive heating of the coils or armature. Momentary overloads of 100 per cent will be safely carried by either of these machines. The efficiency of the machines at full load is 92½ per cent for the 200 kilowatt and 91 per cent for the 100 kilowatt, while efficiencies for less than full loads, of course, are slightly below these figures.

The large generator is designed to carry the normal load of the entire plant during the daytime. On winter afternoons, when the lighting load is thrown on in conjunction with the motor load, it may be necessary to use the smaller unit in connection with the larger one. In case of injury to the large unit, the smaller unit will be able to operate the entire plant for a limited time with possibly a decreased output. The night load will ordinarily be carried by the smaller unit.

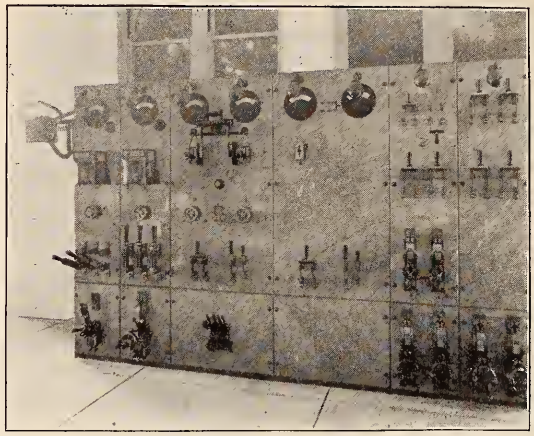


Fig. 6—Main Switchboard in Power House—C. & E. I. R. R.

The compensator set for the lighting circuit is of 20-kilowatt capacity and is installed on the engine room floor along the side wall at the end of the switchboard. This set is furnished by the Western Electric Co., and is guaranteed when running at the approximate speed of 900 revolutions per minute to maintain a voltage of within 2 per cent of 125 volts, 250 volts being maintained between the two outside wires. The same guarantees as to heating and overloads are made for the compensator set as for the generator sets.

There are installed two air compressors, made by the Stilwell-Bierce & Smith-Vale Co., of Dayton, O. The larger of these, a Smith-Vale duplex steam cross-compound compresser, has a nominal capacity of 1,000 cubic feet per minute, the air to be compressed to 100 lbs. per square inch, using a steam pressure of 100 lbs.

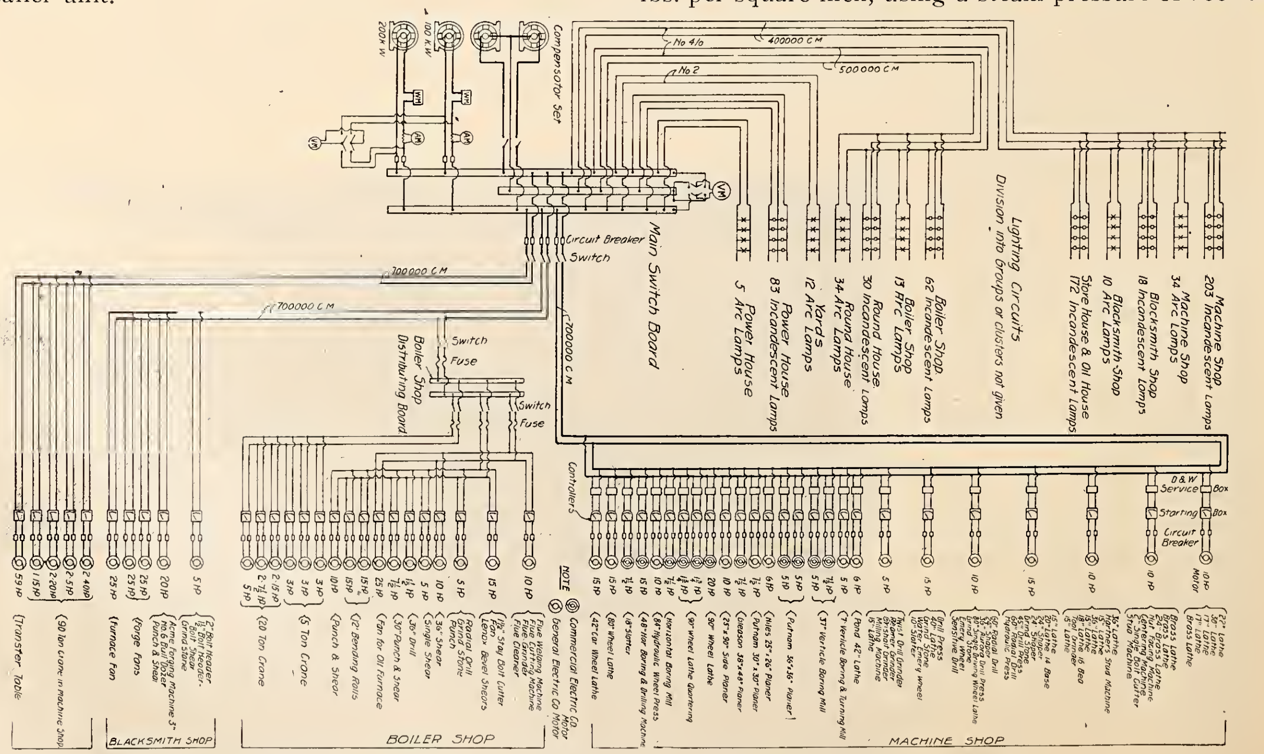


Fig. 7—Diagram Showing Distribution of Power—C. & E. I. R. R.

per square inch. The high-pressure steam cylinder is 16 ins. in diameter and low-pressure air cylinder 24 ins. in diameter and high-pressure air cylinder 14 ins. in diameter, all 18 ins. stroke. The smaller Smith-Vale duplex steam actuated compressor has a capacity of 400 to 500 cubic feet per minute, compressed to 100 pounds, with an available steam pressure of 100 pounds per square inch. This compressor has steam cylinders 12 inches in diameter, with a low-pressure air cylinder 18 inches in diameter, and high-pressure cylinder 12 inches in diameter, all 12 inches stroke. Both of these compressors are to be provided with the Meyers expansive steam valves. The inlet valve of the low-pressure cylinders will be mechanically actuated, and the discharge valves are of the poppet type. These compressors are provided with the latest improved compound speed and pressure regulator, whereby the speed of the compressor is controlled by the air pressure in the reservoir.

The engine room is served by a hand power chain sprocket traveling crane of 12 tons capacity, 42 ft. span, with a lift of 18 ft. 6 ins. The crane was furnished by the Whiting Foundry Equipment Company. It travels the entire length of the room, making it possible to handle all the machinery on the engine room floor and also to reach through the pit to handle practically all of the auxiliaries in the basement.

As explained in the previous portion of this article describing the shops, the distribution of electrical power is by a 250 volt direct current system using the two wire system of distribution for motors and the three wire system for lighting. The arrangement of machines, etc., was also described in the previous issue and it is interesting to trace the connections from the generators to the several machines as outlined in the diagram, Fig. 7. The generators are connected to the switchboard through measuring instruments, switches and resistance in the usual way. The average distance of transmission not being over 800 ft., makes the use of this voltage feasible and provides a most satisfactory arrangement of distribution for the power and lighting service.

The transmission lines from the power house consist of three pairs of 700,000 cms., feeders for power circuits and two pairs of lighting feeders, one of 500,00 cms. and the other of 400,000 cms. Apair of No. 2 wires are used for the outside arc lamps, which are on a separate circuit. A No. 4-0 neutral wire is carried from the power house, with branches running to all lighting cabinets.

These feeders are of rubber covered lead encased cable from the switchboard to a point 2 ft. outside the power house wall, where they are connected to the triple braided weather-proof insulated wire used on the pole line. The poles are of wrought iron, 25 ft. in height, with malleable iron cross-arms and iron pins. They are set in concrete blocks 5 in depth and about 3 ft. square.

For the power distribution service leads are carried from the feeder line to a distributing panel provided with fused main switch and fused branches. The motor leads are tapped from the branch mains and are protected by service boxes which serve the purpose of both fuse and switch. The motors are further protected by circuit breakers mounted in the starting boxes.

The service wires for the lighting circuit lead to panel boards installed in wooden cabinets. These panels are arranged for the three to two wire system of distribution and are provided with a main fused three-pole switch and the requisite number of fused two-pole switches. For mechanical reasons, nothing smaller than 35-ampere switches are used on these panels.

There are 12 distributing panels for lighting circuits and two for power circuits, located at convenient centers of distribution in the various shops. The wiring from the cabinets to lamps is open work where possible, and in conduit where lines run under floor or on iron columns and along walls from the floor to a point 7 ft. above floor level.

The Roundhouse.

The present roundhouse is in two sections containing 36 stalls, separated by an entrance, through which passes three tracks leading to the turntable. Seventeen additional stalls are to be built opposite to the entrance so that the roundhouse will ultimately contain 53 stalls. This roundhouse is disposed with its inner wall 124.84 feet from the center of the 75-foot turntable. While its outer wall is 210.17 feet from the center of the turntable, thus giving the house a depth of 85.33 feet. The outer wall is of brick with three windows 4 by 13 feet in each pit segment. The inner wall consists of a sash transom resting upon cast iron columns, and the engine doors which constitute a large portion of this wall are largely of glass. It is seen, therefore, that the roundhouse is very well lighted. The roof is flat with a slope of 39 inches from the inner to the outer wall. The roof framing is of wooden construction supported upon cast iron columns disposed as shown in the cross section practically

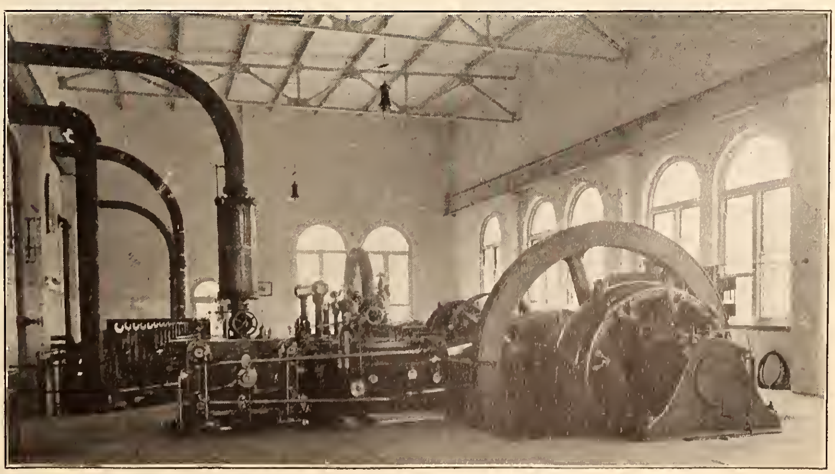


Fig. 8—View in Engine Room, 200 K. W. Generator—C. & E. I. R. R.

dividing the roof transversely into three sections. Roof ventilation is provided for by an individual ventilating hood between each pair of pits and a smoke jack over each pit. The pit drainage is accomplished as shown in the longitudinal section of the pit, Fig. 12.

There are two incoming and two outgoing tracks. The former pass over the cinder pit and one of them is adjacent to a water plug. Disposed in each outgoing track is an ash pan cleaning pit 25 feet long and both of these tracks are served by water plugs and lead past the coal chute and sand house. The ash cleaning pits here referred to may be used to a certain extent when making light repairs to switch engines which it is not always desirable to run into the roundhouse.

It will be noticed by referring to the general layout that one track leads directly from the turn-table to the transfer table and another track from the transfer table to the general trackage connection.

It is interesting to note that convenient arrangements are to be made in the fan room for storing the oil cans, etc., used by each engine crew, while not on the road. The walls of this room are to be arranged with racks of such size as to accommodate a box, oil cans, lanterns, etc. Each crew will be provided with a box in which to keep their tools, and this box together with the other material will be given a number, by which each crew's material will be identified. When going out on the road a check

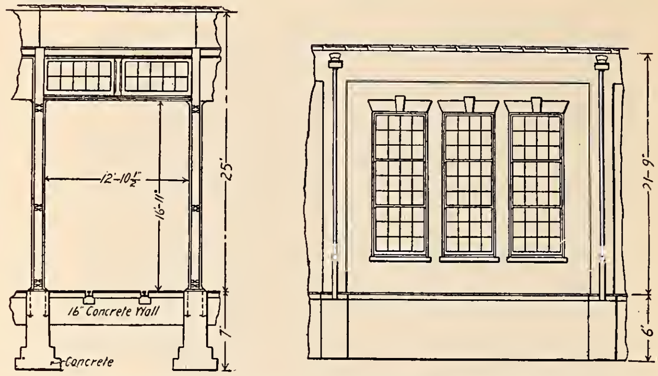


Fig. 9—Elevation of Roundhouse—C. & E. I. R. R.

of the corresponding number will be given when the engine appurtenances are delivered, so that material of this kind will be handled in a manner similar to the tool room system. A special man will be placed in charge of this room whose duty will be to keep the system in order and each crew is responsible for material represented by their check number.

The roundhouse is heated by the Sturtevant system; the heating apparatus is located in a lean-to about 30 feet square adjacent to the outer wall of the roundhouse. The fan is capable of handling 87,000 cubic feet of air per minute when working normally. This fan is 11 feet by 5½ feet, and is driven by a 10-inch by 12-inch hori-

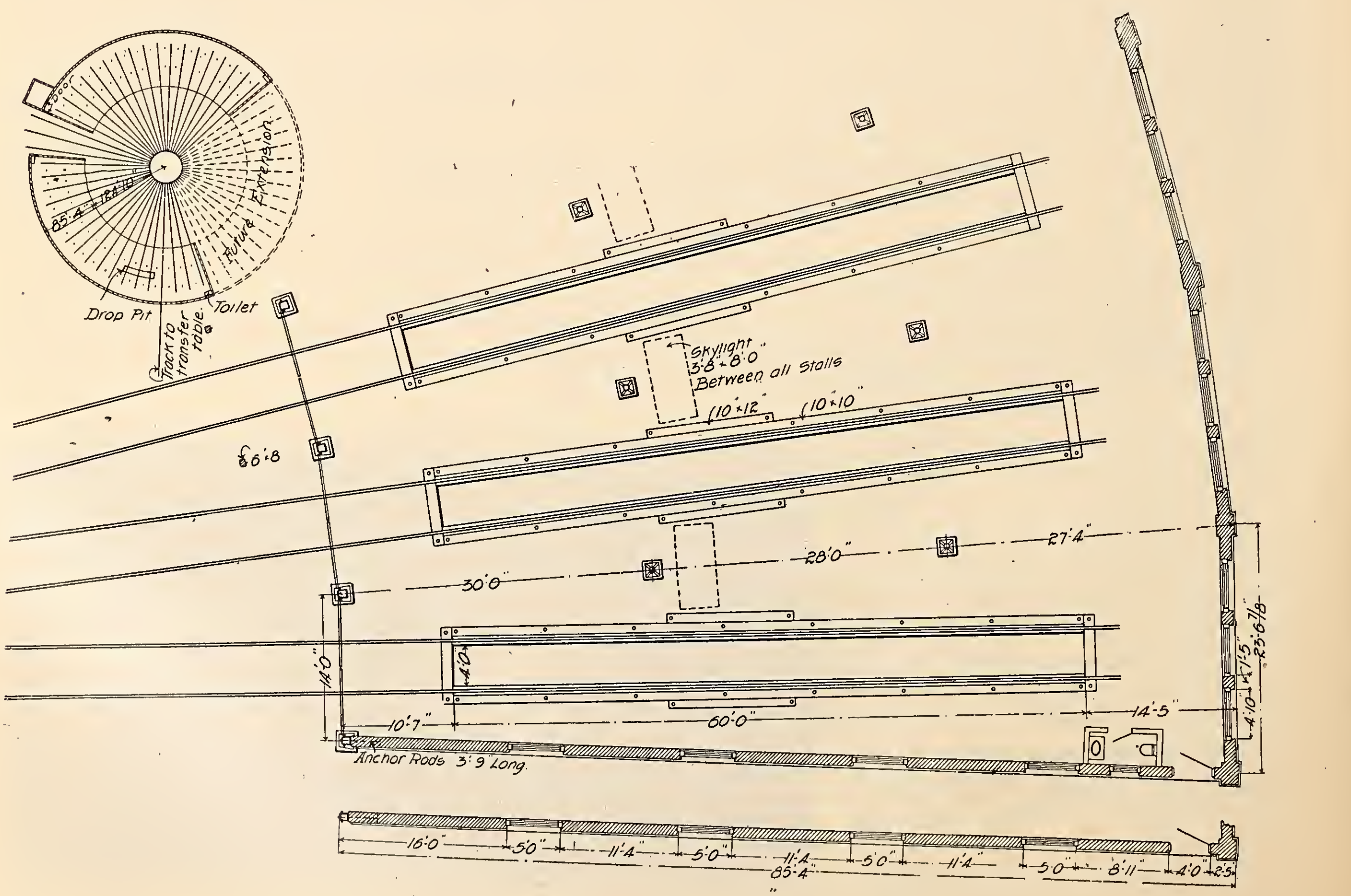


Fig. 10— Plan of Roundhouse—C. & E. I. R. R.

zontal center crank engine. The heating coils consist of 12,240 feet of 1-inch pipe and air drawn into the fan passes over these coils. From the fan hot air is delivered to a main heating duct extending entirely around the roundhouse just within the outer wall. This duct is 4 feet 6 inches wide by 5 feet high where it leaves the fan and decreases uniformly to 3 feet in height at each end. This duct is of concrete and made with 3-inch floor.

The outer foundation wall of the building serves as the outer wall of the duct while its inner wall is 10 inches thick. The top of this duct is level with the floor and constitutes a walk and truckway around the house. Lines of vitrified tile 18 ins. in diameter lead from the main duct between each engine stall where they divide into 15 in. lines and are led to the sides of the engine pit. Dampers are located at the point where the ducts open into the pits. A number of registers are installed at intervals along the outer wall, and these take their air supply directly from the main heating duct.

The arrangement of wires for lighting the roundhouse was made with special care to protect the wires from the effect of gases and to provide against the use of conduits which would be affected by steam and gases. The mains are, therefore, arranged along the roof on cross-arms supported on hollow wooden masts which extend through the roof and rest on the top of the iron columns supporting the roof trusses. The branch circuits on leaving the mains pass directly to a service box installed on the mast. From the service box twin wires, carefully encased in lead, pass into the wooden mast and continue down through the inside of the iron column to a point about six feet above the level of the floor. At this point a wood box containing fuse blocks and switch is bolted to the side of the column. A hole drilled in the column permits the wires to be led into the box and to the fuse. From the fuse they pass to a switch then back into the column and from the top of the same they are arranged along the roof support and down a one-inch iron pipe to an arc lamp. The lamp is provided with a special top allowing the wires to pass di-

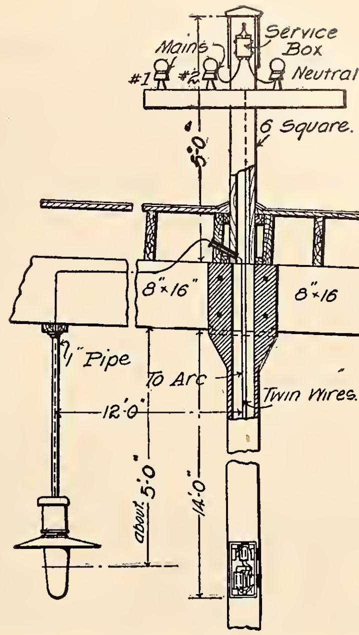


Fig. 11—Arrangement of Lighting Wires in Roundhouse—C. & E. I. R. R.

recently to the terminal inside the lamp case. By this arrangement it will be seen that all wiring is thoroughly protected from the effect of gases.

In the side of the box containing the fuse block is mounted the flush switch, controlling the lamp in that section of the roundhouse, and two plug receptacles for lamp extensions. The receptacles and plugs used in the roundhouse are of special design, so constructed as to pull out from any direction before a strain sufficient to break the extension wire can be brought to bear. This feature is particularly valuable in the roundhouse where it often happens that the extension lamp is left in an engine through carelessness after use and when the latter is run out of the stall either the extension cord is broken or the wiring torn out.

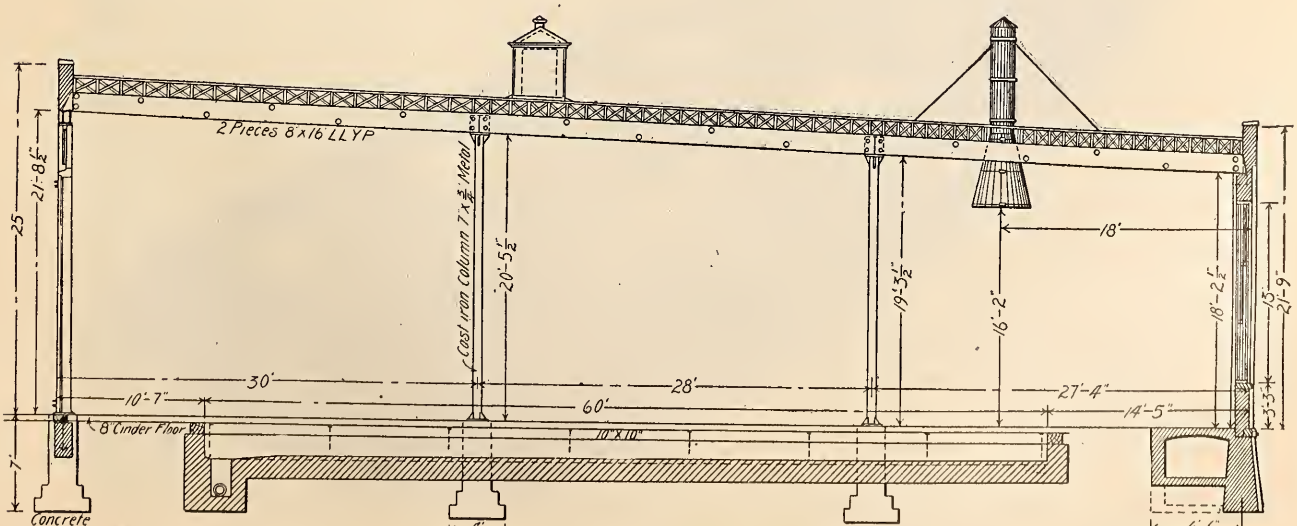


Fig. 12—Cross Section of Roundhouse—C. & E. I. R. R.

Some Interesting Examples of Steel Construction in Car Design

THE accompanying line drawings and photo-engravings illustrate several designs of cars embodying steel structural shapes in their construction. The adoption of commercial shapes renders practical a car which is easily repaired and maintained, as standard sections may be readily secured in the market and repair work may be done in the shop of any railway company.

The first car presented herewith to which attention is directed is the design of 100,000 lbs. capacity box car built of wood upon an underframing of steel. There are two steel center sills 41 ft. 3 ins. long of 15-in. channel section, weighing 33 lbs. per foot, and two side sills of the same material. These sills are supported by bolsters of bent plate construction, consisting of an upper member 12 ins. by ¾ in. and a lower member 12 ins. by 1 in. The lower member is braced against buckling by an angle iron 3 ins. by 2½ ins. by ¼ in. riveted to the same, as shown in the cross section drawing illustrating the construction of the bolster. Each side sill is riveted to the end of the bolster plate, which is bent to facilitate such an arrangement. Suitable malleable iron castings are riveted between the center sills at the bolsters for the purpose of transferring the weight from the sills to the center plates. To add stiffness to the construction a gusset plate of the form shown in the plan drawing is interposed between the top member of the bolster and the upper flanges of the center sills and is securely riveted to both sill flanges and bolster plate. Each body side bearing is a malleable casting bracket riveted to the lower bolster bar and to provide against strains in this member imposed by side bearing shocks a brace 6 ins. by ¾ in. is riveted at one end to the upper flange of the center sill and at the other end to the bolster bar immediately above the side bearing bracket. The sills are assisted in carrying the load by two 2-in. truss rods which extend

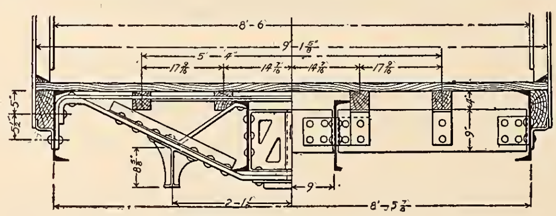


FIG. 1—SECTION UNDER BOX CAR.

between the body bolsters and are not continued to the end sills. The truss rods are secured at each end by two wrought iron straps which are riveted to the under side of the guesset plate previously mentioned and the rivets pass through the upper member of the bolster plate. The end of the rod straps are anchored through the gusset plates and bear against the bolster. The needle beams, supported by the truss rod bearing struts, are 10-in. I beams weighing 25 lbs. per foot and bear against L-shaped pieces which are riveted to the webs of the sills. As the principal horizontal strain imposed by the truss rods comes on the top flanges of the center sills, they are

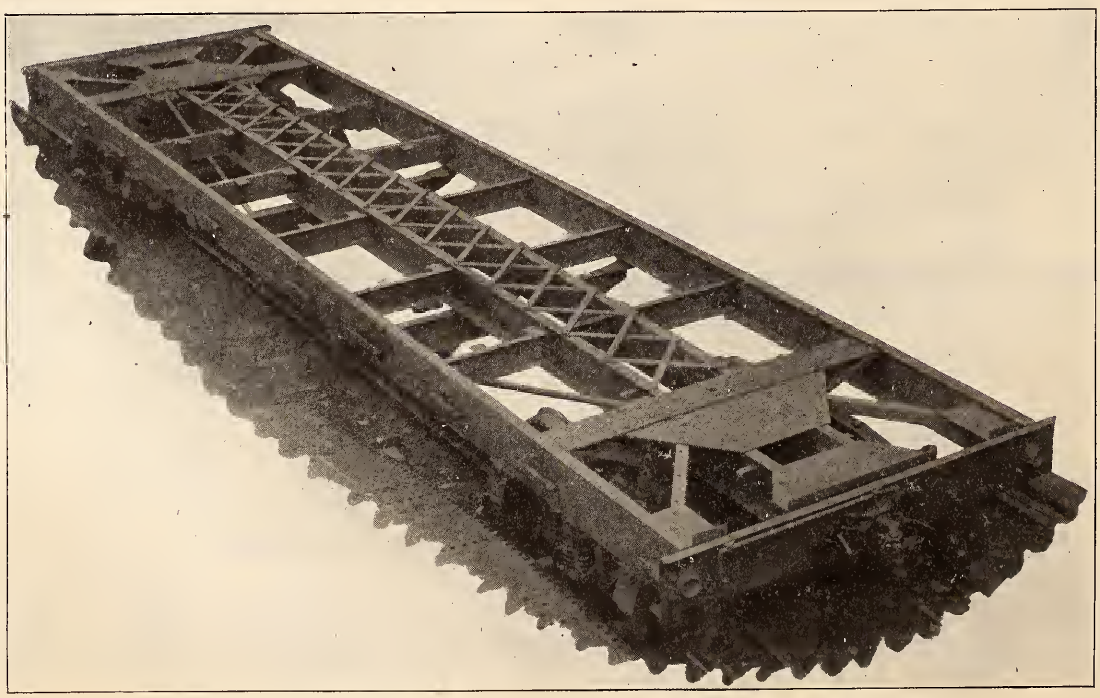


FIG. 2—STEEL UNDERFRAMING OF 100,000-LBS. CAPACITY BOX CAR.

latticed by a double system of lattice bars 2½ in. by ½ in.

The steel sills are trussed laterally by five 9 in. channels weighing 13.25 lbs. per ft., spaced equally between the bolsters. These channels are secured by angle irons riveted to the sills and constitute floor beams for carrying nailing strips for the car flooring. The center sills are arranged two inches lower than the side sills to provide against cutting away the flooring on account of the interference of rivet heads.

The end sill arrangement is a design of more than passing interest inasmuch as it is so secured to the remainder of the framing as to be readily removed and replaced in case of injury. It is secured by angle irons to the four sills only and consists of a ¼ in. plate bent to Z shape which may be formed in any blacksmith shop. As before mentioned the truss rods do not extend to the end sill and therefore it is unnecessary to loosen or readjust them when making repairs to end sills. The corner braces are riveted at one end to the gusset plate heretofore mentioned as stiffening the construction between bolster and center sills and at the other end to a plate secured to the side sill. It is seen, therefore, that this brace is not attached to the end sill in any manner. A striking bracket of cast steel is secured to the face of the end sill and a 4 in. by 1 in. carry-iron for the draw bar is bolted to the bottom of this bracket.

The side sub sills are secured in an interesting and practical manner. They are carried by a series of plates bent to Z form, one flange of the Z being riveted to the web of the channel while the other flange encloses the sill. Additional security for the sub sills is provided by passing the frame rods through the sills and the Z iron.

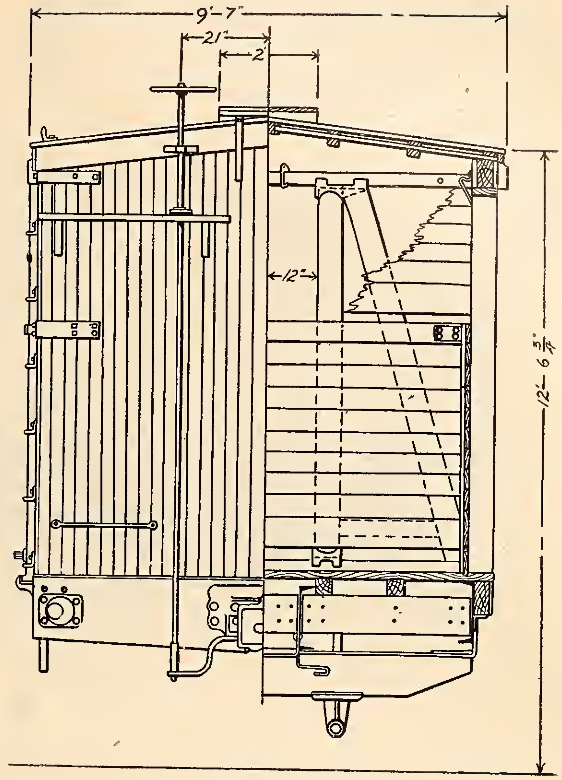


Fig. 3—End Elevation of 100,000-lbs. Capacity Box Car With Steel Underframing.

Between the center and side sills are two wooden nailing strips, carried by floor beams as heretofore mentioned, which extend between the bolsters. Between the bolsters

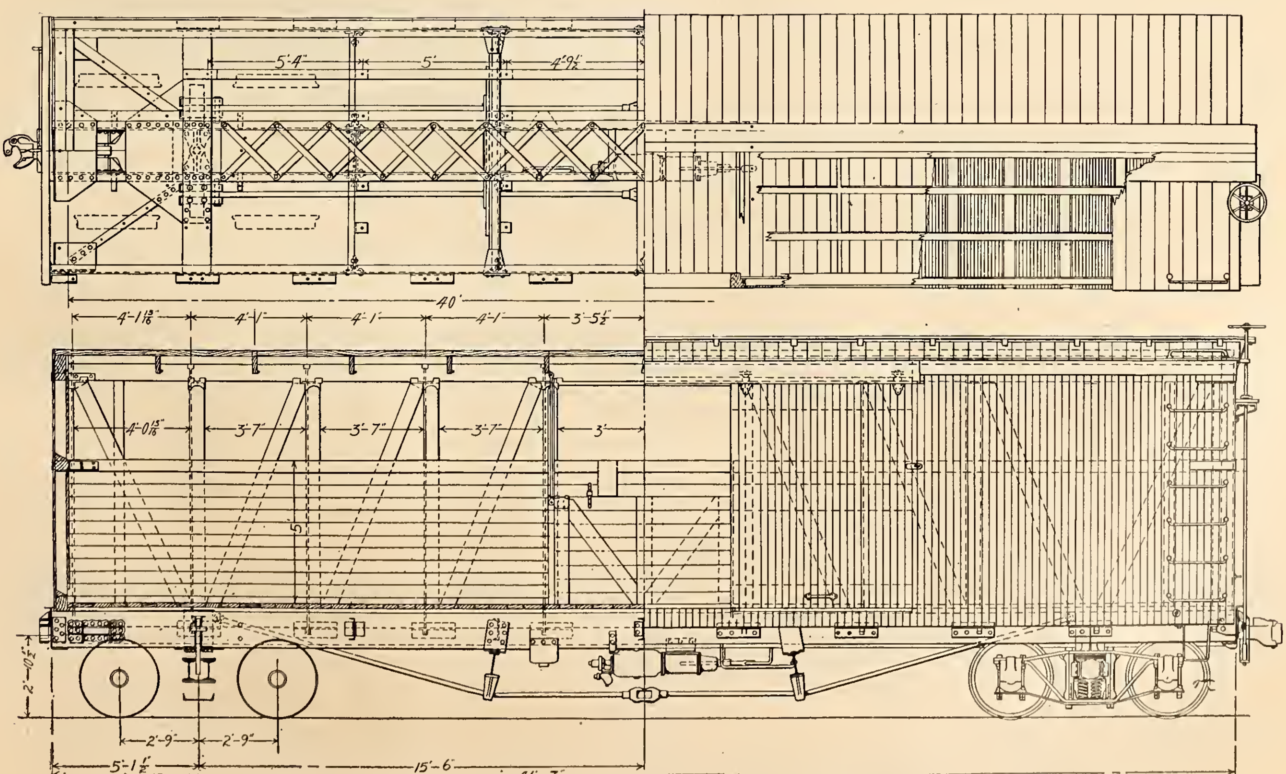


Fig. 4—Plan and Elevation of 100,000-lbs. Capacity Box Car With Steel Underframing.

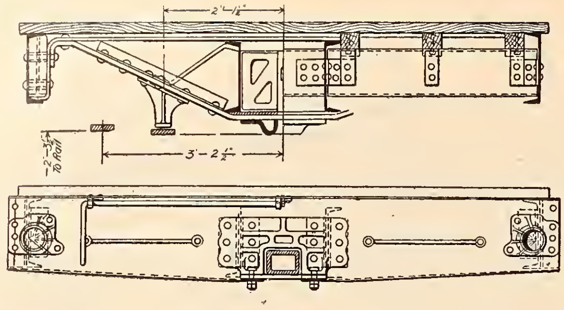


Fig. 5—End Elevation and Sections of Flat Car With Steel Underframing.

and the end sills the flooring is nailed to strips carried by the corner braces.

The super structure presents an extremely strong construction and was designed to support a body for carrying grain. The inside length of car is 40 ft., the inside clear width is 8 ft. 6 ins. and height from floor to underside of carlines is 8 ft. The height of car from top of rail is 12 ft. 6¾ ins. and the width at eaves is 9 ft. 7 ins. Its weight is 48,000 lbs. This car was made extra heavy above the floor to handle 50 tons of grain constantly.

Figs. 5 and 6 illustrate a similar design of underframing applied to a 100,000 lbs. capacity flat car. With this design there are three truss rods, secured in the same manner as in the framing of the box car, and arranged near the center of the car one of them being immediately under the center line. The nailing strips are carried on floor beams as in the previous design and are arranged between the side sills and center sills, three on each side of the center. The length of car from back to back of end sills is 40 ft., width over flooring 9 ft. 5 ins., height from top of rail to top of floor 4 ft. 2⅛ ins., distance center to center of trucks 30 ft., wheel base of truck 5 ft. 6 ins., weight of car 37,840 lbs.

The hopper car illustrated by Fig. 8 and the attached detail drawings, represents a design of car having a wooden body to retain the load, carried on an underframing of steel and embodying a side framing of steel which constitutes a truss to assist the underframe in carrying the load, presenting an efficient structure and doing away with the necessity of truss rods. The center sills are 15 ins. channels weighing 33 lbs. per foot and 28 ft. 6 ins. long from back to back of end sills. The side sills are 10 ins. channels weighing 20 lbs. per foot and of the same length as the side sills. The load is carried principally by the center sills and the trusses formed by the side framing. The 15 in. channels provide comparatively heavy members to resist the pulling and buffing strains.

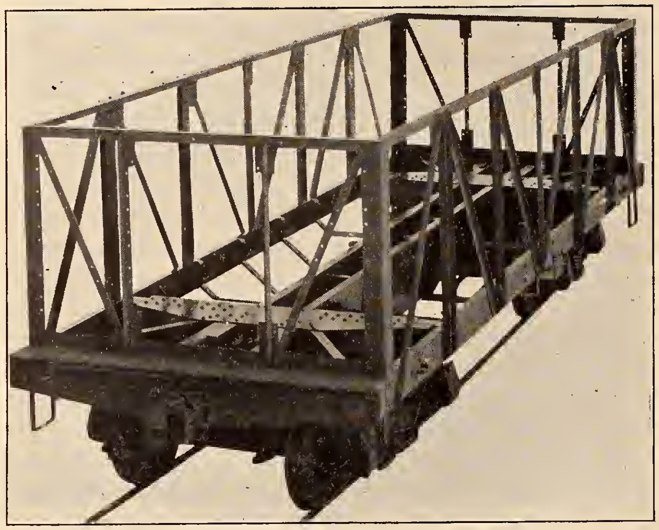


Fig. 7—Steel Framing of Hopper Car.

The sills are supported by a built-up body bolster. Each side sill and center sill is secured by an angle iron to a vertical plate which is reinforced at the top by a 3½ by 3½ by ⅜ in. angle iron riveted on each side and at the bottom by a 5 by 3 by ½ in. angle iron riveted on each side. The two members on each side of the center sills are tied together by a plate riveted to the lower angle irons and passing beneath the center casting. A

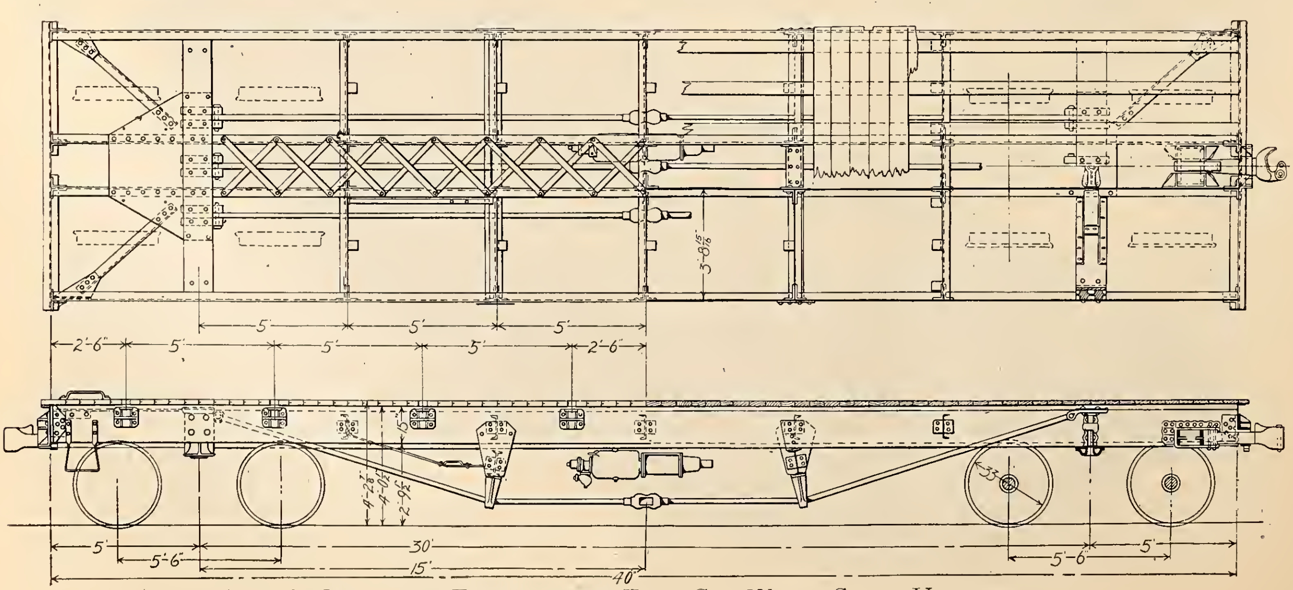


Fig. 6—Plan and Elevation of Flat Car With Steel Underframing.

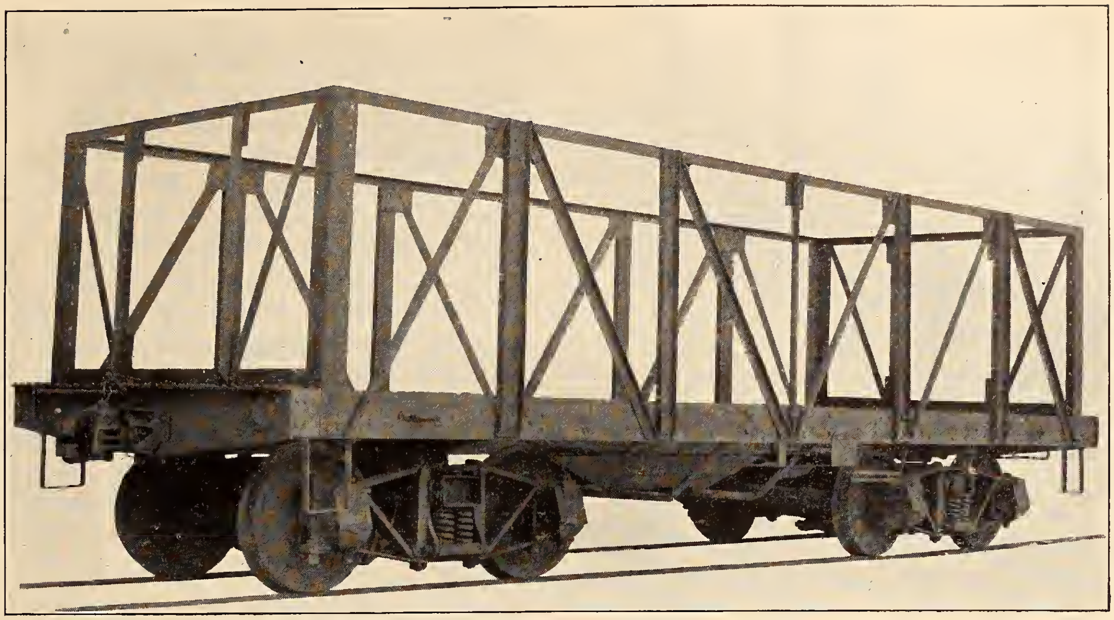


Fig. 8—Steel Framing of Hopper Car.

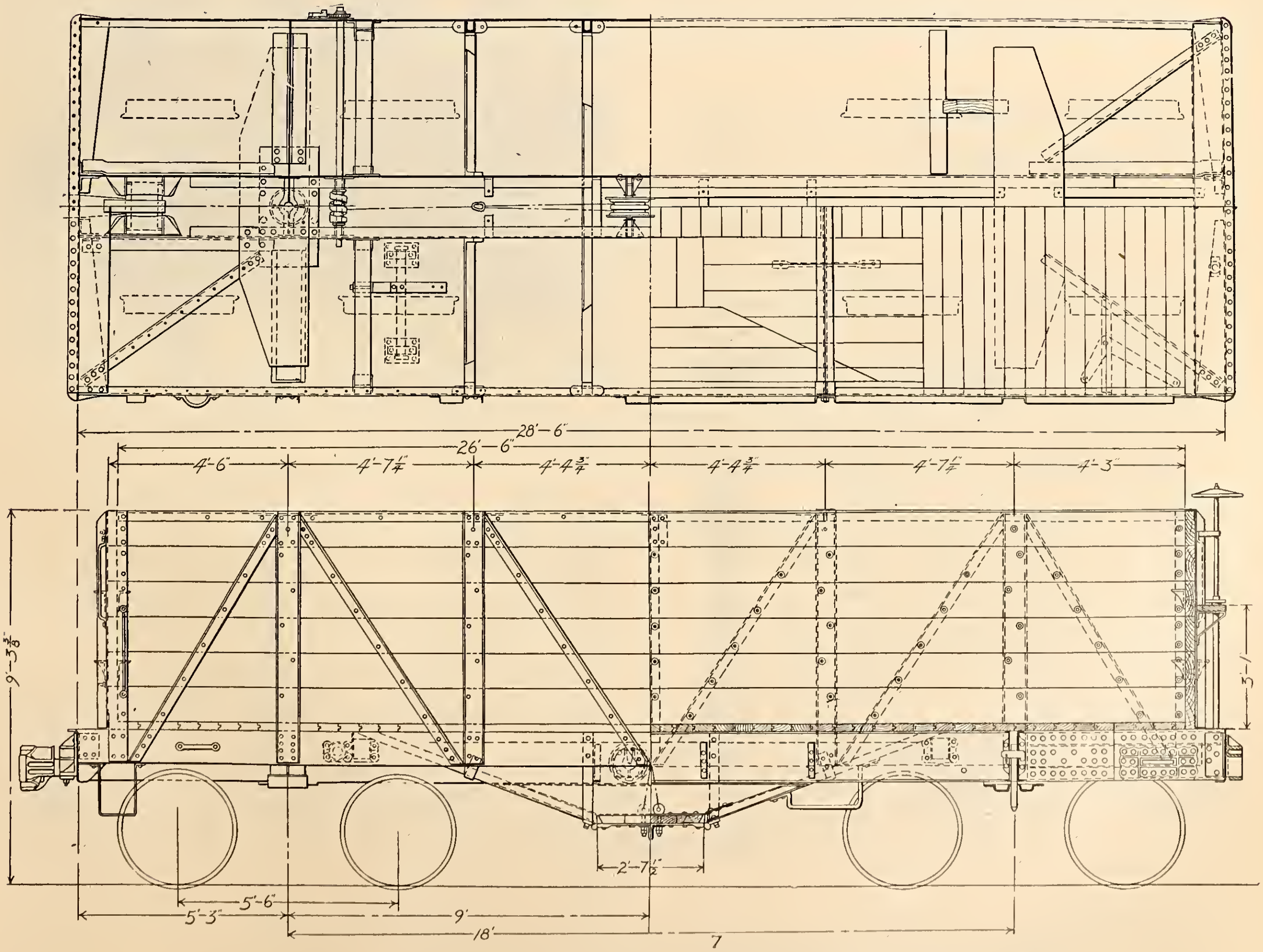


Fig. 9—Plan and Elevation of Hopper Car With Steel Underframing.

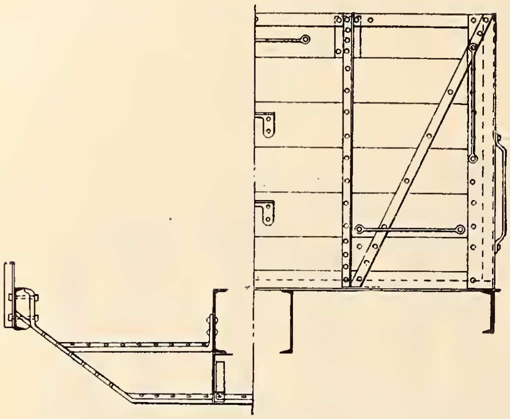


FIG. 10—PARTIAL END ELEVATION AND HOPPER BRACING OF HOPPER CAR WITH STEEL UNDERFRAMING.

gusset plate of the form shown in the plan drawing is securely riveted to the upper flanges of the bolster members and to the upper flanges of the center sills, stiffening the structure at this point and securing the center sills and bolster firmly together. The shape of the gusset plate is such as to provide for the diagonal braces being riveted thereto and concentrating the strength of the structure. The center sills have spliced ends to facilitate repairs. The sills proper do not extend to end sills, but have built up extensions riveted thereto. In case of a damaged end, it would not be necessary to remove the center sills, as might otherwise be required.

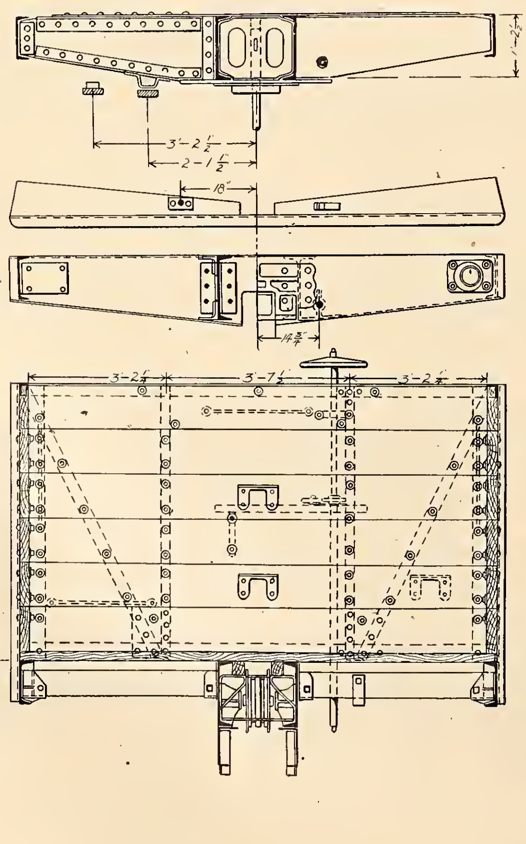


FIG. 11—END ELEVATION, END SILL AND BOLSTER OF HOPPER CAR WITH STEEL UNDERFRAMING.

The end sill is a flat plate bent to Z shape and reinforced by a plate of the form shown in the plan drawing of the car and in the detail drawing of the sill. This upper plate is riveted to the top flange of the Z and to the top flanges of the side sills. The diagonal braces are riveted at one end to this plate and at the other end to the bolster gusset as before mentioned.

The posts forming the vertical members of the side framing are 6 ins. channels weighing 10.5 lbs. per foot, and 7 ins. channels weighing 14.75 lbs. per foot, 6 ft. 3 ins. long, and the angle braces are 3 by 2 by ⅜ in. angle irons 7 ft. 6 ins. long. The arrangement of the structural parts constituting the side framing is clearly shown in the drawing, and by the half-tone engravings.

The length from back to back of end sills, as previously given, is 28 ft. 6 ins.; width over side sills 9 ft. 5 ins.;

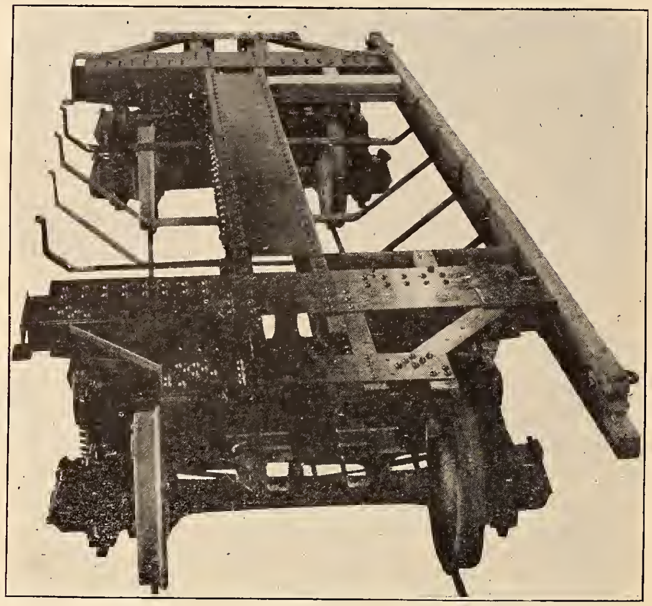


FIG. 12—UNDERFRAMING OF HOPPER CAR WITH STEEL CENTER SILLS.

length inside is 26 ft. 6 ins.; width inside 9 ft.; height from top of rail to top of sills is 3 ft. 10 ins.; distance center to center of trucks is 18 ft., and truck wheel base is 5 ft. 6 ins.

A design of 80,000 lbs. capacity hopper bottom car with steel center sills is shown by the drawings in Figs. 13 and 14. These sills are 15 ins. channels weighing 33 lbs. per foot. The upper flanges are reinforced by a plate ¼ in. thick and 15 ft. long secured by rivets which constitutes a compression member to aid in resisting the strains imposed by the load. The body bolster is built up in a manner similar to that described in connection with the previous hopper bottom car. The wooden side sills are supported at each bolster by two bent plates riveted to each bolster plate and one leg of each angle plate so formed is of sufficient length to be bent up under the sill and form a support for the same. The flanges of the channels are cut away to accommodate the draft castings and the webs are reinforced similar to the manner described for the hopper car with entire steel underframing. The end sills are of wood and are attached to the side sills in the usual manner. The center extensions are cut away at the ends to accommodate the form of the end sill and extend beneath the sill so as to support it. The wooden framing is sufficiently stiff at the corners to withstand strains imposed when poling so that the diagonal brace is not required to strengthen the corner. The ends of the center sills of this car are spliced and arranged as described for the hopper car with all steel underframing, a desirable feature from the repair standpoint. Both cars are equipped with 50-ton trucks with a view to reducing wheel failures, which have been quite serious in some cases under coal cars of 100,000 lbs. capacity.

The length of car over end sills is 28 ft. 4¼ ins.; width over side sills, 9 ft. 5½ ins.; length inside, 26 ft. 6ins.; truck wheel base, 5 ft. 6 ins., and distance center to center of trucks, 18 ft.

In presenting these drawings we acknowledge the courtesy of Mr. George I. King, vice-president and general manager of the Middletown Car Works.

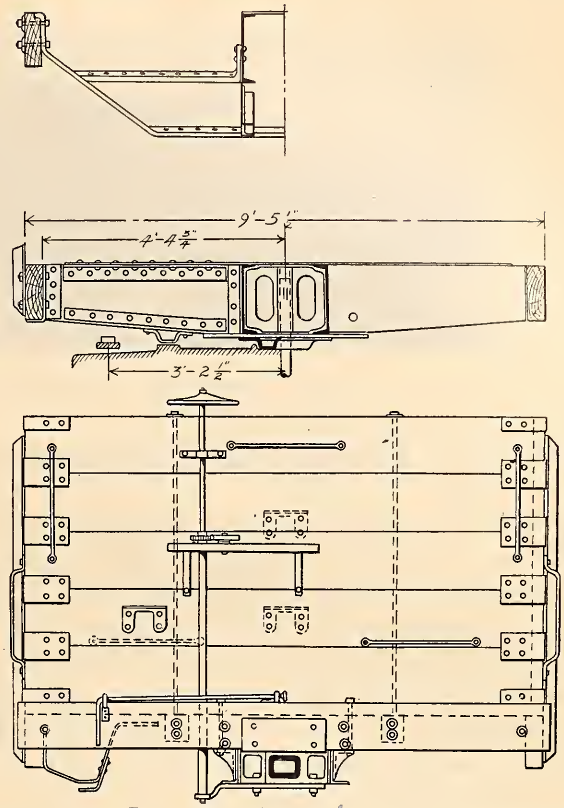


Fig. 13—End Elevation, Bolster and Hopper Bracing of Hopper Car with Steel Center Sills.

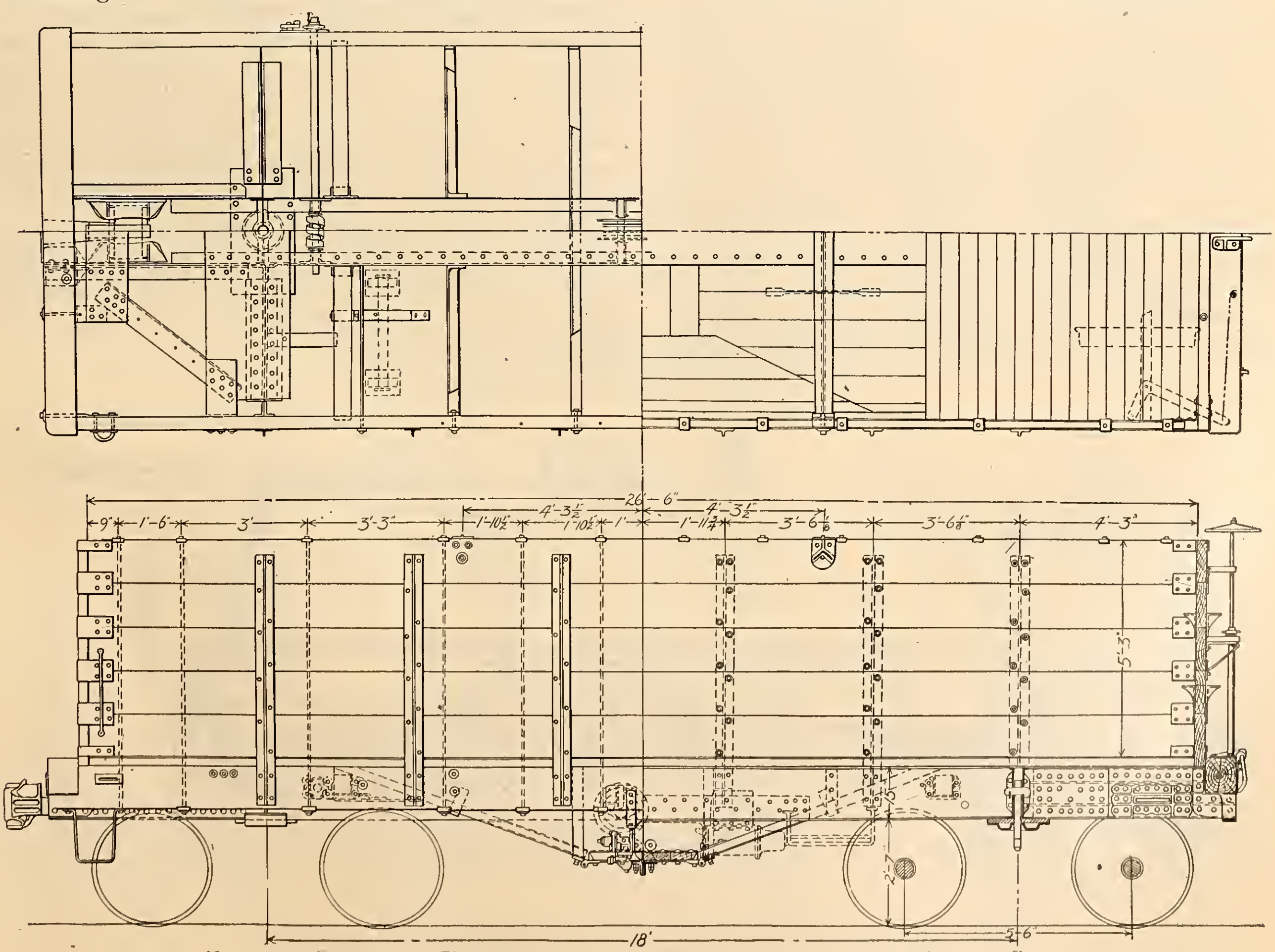
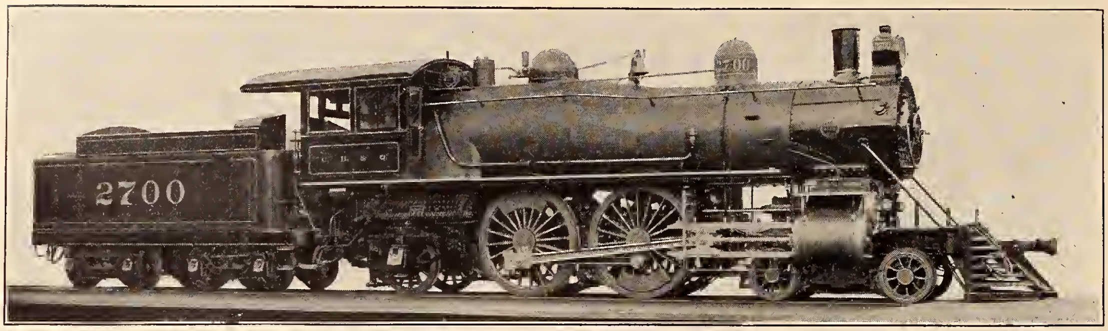


Fig. 14—Plan and Elevation of Hopper Car with Steel Center Sills.



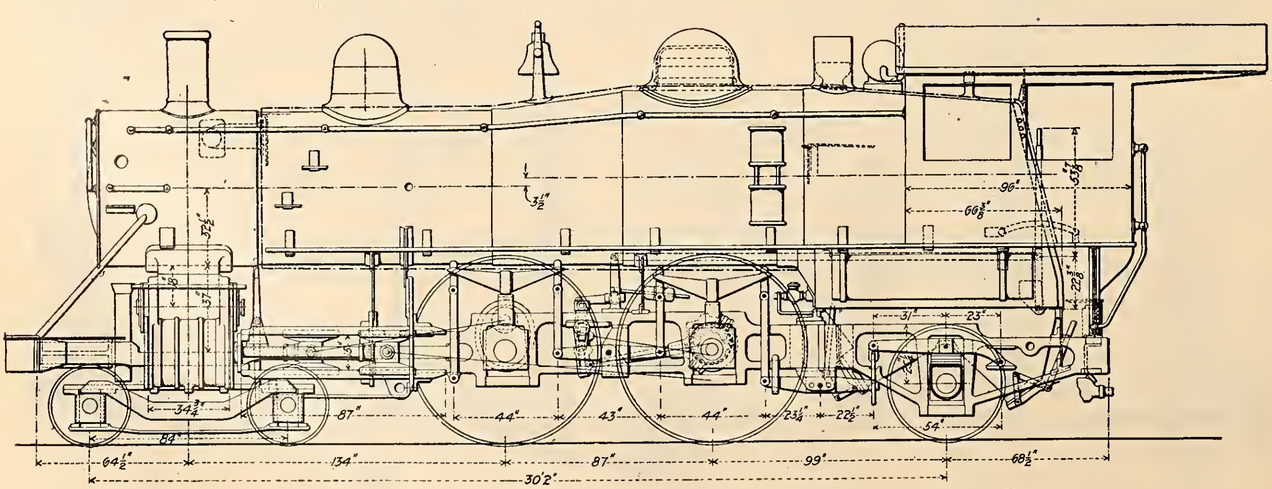
Balanced Compound Locomotive—C., B. & Q. Ry.

Balanced Compound Locomotive---Chicago, Burlington & Quincy R'y

EARLY in 1902 the Baldwin Locomotive Works built a balanced compound locomotive for the Plant system, embodying the Vauclain system of compounding wherein the high pressure cylinders were located between the frames, then recently patented by Mr. S. M. Vauclain. This engine was of the 4-6-0 type, having cylinders 15 and 25 ins. in diameter by 26 ins. stroke, with the forward axle cranked and connected to both the high and low pressure cylinders.

A little more than a year ago the Baldwin Works built several locomotives for the Atchison, Topeka & Santa Fe Railway, embodying the same cylinder arrangement. These engines were of the 4-4-2 type, having cylinders 15 and 25 ins. in diameter by 26 ins. stroke, having the forward axle cranked and connected to both the high and low pressure cylinders. After nearly a year's trial with these engines over different divisions of the Santa Fe, another order was placed for others of the same type and the later engines have been recently received.

The accompanying illustrations represent an engine of the same general type recently delivered to the Chicago, Burlington & Quincy Railway by the Baldwin Works. The cylinder arrangement is similar to that of the Santa Fe, having the high pressure cylinders between the frames, and their center lines in the same horizontal plane with the low pressure cylinders. The design is that of the Gurlington's P_2 compound lengthened out and arranged with the Vauclain balanced compound system. The principal feature in this engine differing from that of the Santa Fe is the arrangement of main rods and provision for strengthening the crank axle. The forward axle is cranked and is connected with the high pressure cylinders, while the low pressure cylinders are connected with the rear axle. In order to accommodate a main rod of normal length in coupling to the rear axle an unusually long piston rod is used with each low pressure piston. Each web of the crank axle is strengthened by a band of steel rolled from the ingot, which is finished all over, heated, bent to shape and shrunk on the web. This band is 4 ins. wide and 2 ins. thick. To strengthen the axle against breaking through the journal a pin 4½ ins. in diameter is forced through the wrist pin and riveted over at its ends. The face of the crank is counter-sunk at each end of the hole through the wrist pin to provide for the head made by riveting.

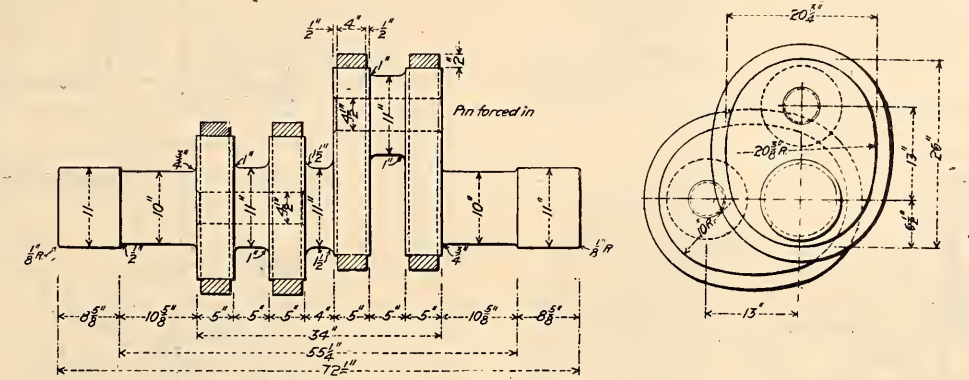


Balanced Compound Locomotive—C., B. & Q. Ry.—Elevation.

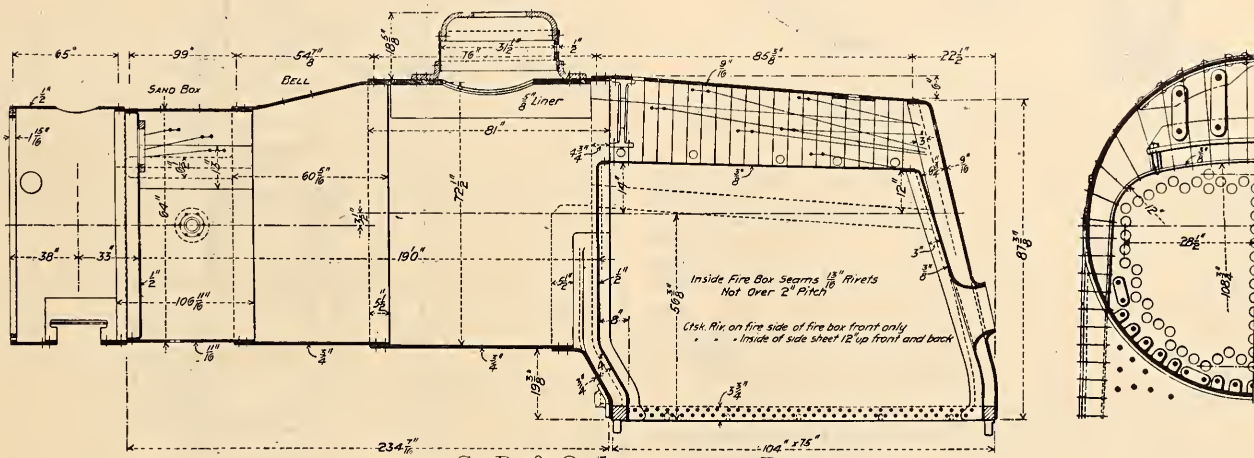
The cylinders are 15 and 25 ins. in diameter by 26 ins. stroke; the valves are of the balanced piston type, having double ports, with internal admission; the grates are designed to burn soft coal and the boiler working pressure is 210 lbs. The trailing wheels have outside bearings. There is no radial attachment, lateral motion of the trailer being provided for by rollers between the equalizer seat and the journal box. The tractive effort determined from the given dimensions is 21,400 lbs.

The principal dimensions are given in the following table:

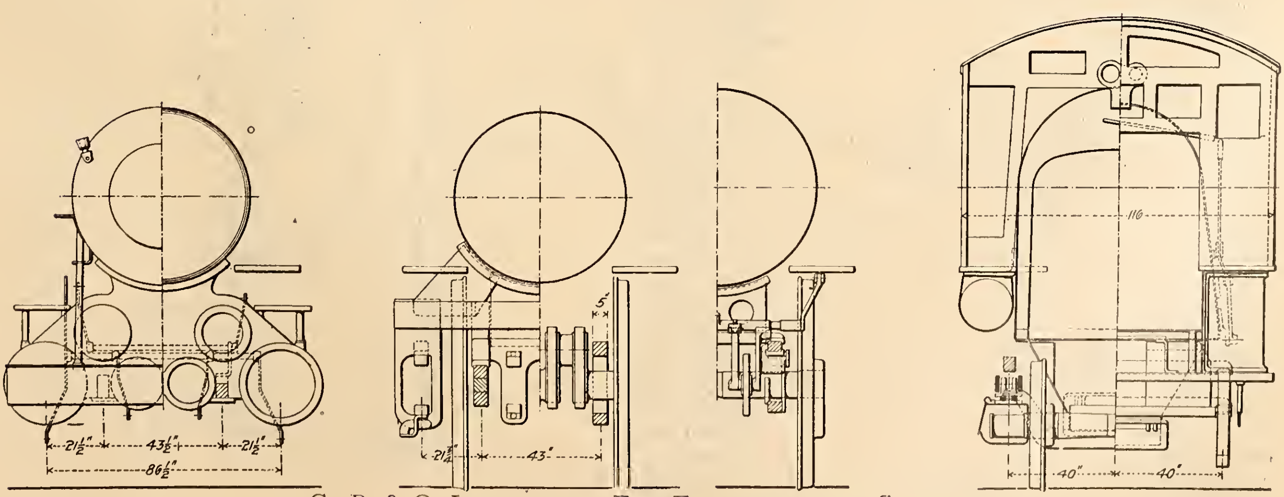
Gauge	4 ft. 8½ ins.
Cylinder	15 and 25 ins. by 26 ins.
Valve	Balanced piston



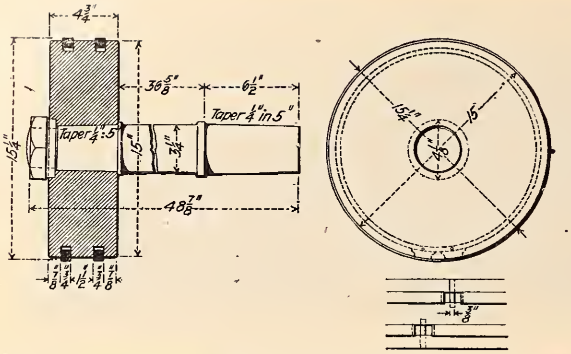
C., B. & Q. Locomotive—Cranked Axle.



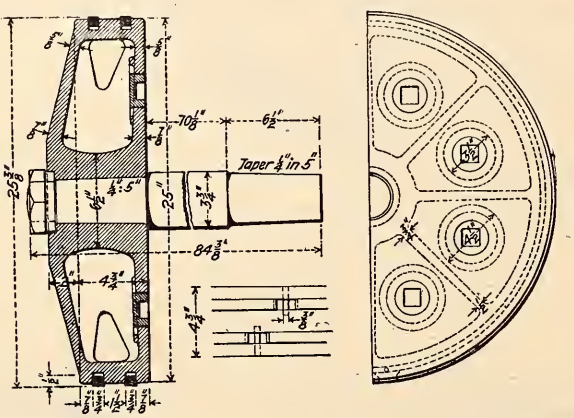
C., B. & Q. Locomotive—Boiler.



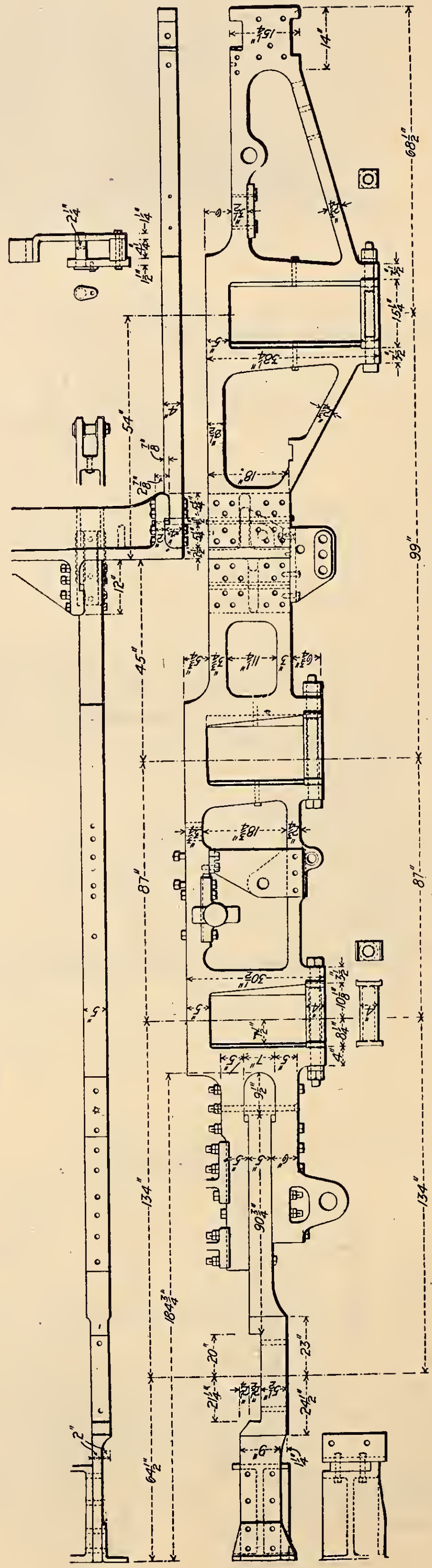
C., B. & Q. Locomotive—End Elevations and Sections.



HIGH PRESSURE PISTON—C., B. & Q. LOCOMOTIVE.



LOW PRESSURE PISTON—C., B. & Q. LOCOMOTIVE.



FRAME—C., B. & Q. LOCOMOTIVE.

Boiler—Type	Wagon top; Mtd. steel
Diameter	64 ins.
Thickness of Sheets	11-16 ins. and ¾ ins.
Working Pressure	210 lbs.
Fuel	Soft coal
Staying	Radial
Firebox—Material	Steel
Length	96⅛ ins.
Width	66¼ ins.
Depth	Front, 70⅜ ins.; back, 68¾ ins.
Thickness of Sheets ..... sides ⅜ ins.; back, ⅜ ins.; crown, ⅜ ins.; tube, ½ in.	
Water Space	Front, 4 ins.; sides, 4 ins.; back 3 ins.
Tubes—Material	Iron; wire gauge No. 11
Number	274; Diameter, 2¼ ins.; Length, 19 ft.
Heating Surface—Firebox	166.4 sq. ft.
Tubes	30,505 sq. ft.
Firebrick Tubes	6.27 sq. ft.
Total	3223.17 sq. ft.
Grate Area	44.14 sq. ft.
Driving Wheels—Diameter Outside	78 ins.
Diameter of Center	70 ins.
Journals	Main, 10 by 10½ ins; others, 9½ by 12 ins.
Engine Truck Wheels (front)—Diameter	33 ins.
Journals	6 by 10 ins.
Trailing Wheels—Diameter	48 ins.
Journals	8 by 12 ins.
Wheel Base—Driving	7 ft. 3 ins.
Rigid	15 ft. 6 ins.
Total Engine	30 ft. 2 ins.
Total Engine and Tender	57 ft. 7½ ins.
Weight—On Driving Wheels	101,210 lbs.
On Truck, front	52,630 lbs.
On Trailing Wheels	49,200 lbs.
Total Engine	203,040 lbs.
Total Engine and Tender	318,000 lbs.
Tank—Capacity	6,000 gals.
Tender—Wheels, No. 8; diameter	37¼ ins.
Journals	5 by 9 ins.
Service	Passenger

Concerning Boiler Design

Editor, Railway Master Mechanic:

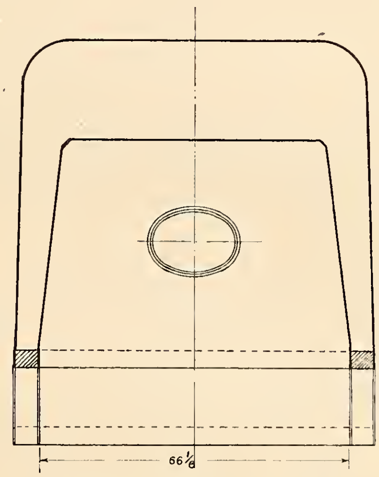
The comments in the June number of the Railway Master Mechanic on a proposed design of locomotive boiler with deep narrow firebox and short tubes for fast passenger service, have been read with a great deal of interest, and it is evident that the consensus of opinion is adverse to the proposed design.

It appears to us that to adopt a boiler of this design instead of being a step forward, would be in the reverse direction, and will result in failure for steaming qualities in fast passenger service, when the requirements of the service today are considered. We have been using wide fire box engines with different lengths of flues for about three years and our experience has led us to believe that the wide fire box boilers with a fairly long flue are an absolute necessity for burning western coals economically, and at the same time give plenty of steam for the work to be performed.

Since the advent of the wide fire box, with all its minor defects, we have more nearly approached perfect combustion than ever was obtained with the long narrow fire box. Our grades of fuel range from pure lignite to bituminous, and at the present time we are using all grades on the same grate area (with different designs of grates, of course) on both wide and narrow fire boxes. The saving in fuel made by the wide over the narrow fire box engines of the same class and under nearly the same condition amounted to 3,000 lbs. per 100 miles.

When the proportions of the new boiler are considered, it is noticed that the length of the box is greater than can be handled by one fireman on a long run in passenger service. We have engines with fire boxes of this length in heavy freight and pushing service, but experience has shown that eight feet is about the limit in length for good economical firing in passenger service, and nine feet for heavy freight service.

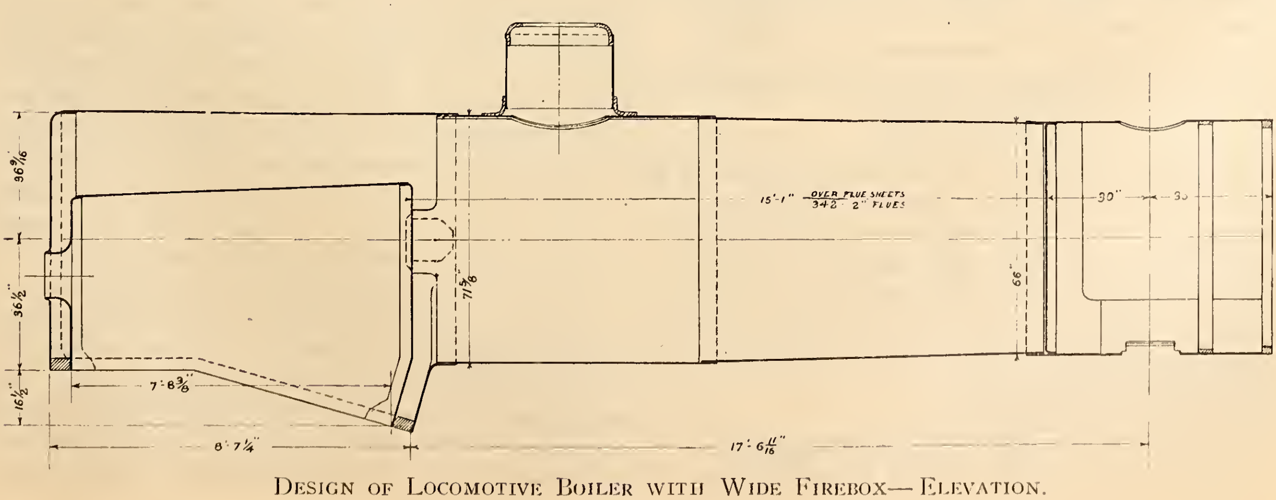
Again, in order to obtain the necessary heat units from a fire box of this size, combustion would have to be very rapid and would necessitate small exhaust tip and consequent back pressure in the cylinders, and it is not believed that this boiler would supply steam for cylinders larger than 20x26 inches at an average speed of 45 miles per hour, as the evaporation would largely depend on the amount of fuel the fireman could shovel.



Design of Locomotive Boiler with Wide Firebox—Cross Section of Firebox.

We have not had any more trouble from leaking flues on wide fire box engines with long flues than we formerly had with narrow fire boxes and short flues. The whole flue situation seems to depend on the amount of intelligent handling displayed by the roundhouse boilermakers.

It is noted in the comments of Mr. F. F. Gaines, referring to the value of heating surface, that in the new boiler this feature is expanded at the expense of the grate area, the designer having evidently overlooked the fact that the number of heat units to be developed depends on the size of the grate area and



Design of Locomotive Boiler with Wide Firebox—Elevation.

the amount of fuel which can be consumed per square foot.

Mr. A. M. Waitt calls attention to another item which has to be carefully considered, i. e., the depth of the fire box. Long narrow fire boxes are necessarily deep, which, with poor fuel, rapidly fill up and the portion of the box below the fire line becomes a detriment instead of a benefit, resulting in cracked side sheets and leaky stay bolts caused from the unequal temperatures of the cooler strata of water below the fire line.

This subject is particularly interesting to us at present, as we have just completed a boiler design for burning either lignite or bituminous coal on fast passenger engines. This boiler will be used on 4-6-0 type of engine, and as will be noted from the diagram herewith, has a medium wide fire box, flues 15 ft. 1 in. long and a maximum steam pressure of 210 lbs. to supply cylinders 19 x 26 inches. The proportions are as follows:

Ratio of grate area to cylinder volume.........	10.3
Ratio of heating surface to cylinder volumne......	666.3
Ratio of square feet heating surface to weight in lbs. of one cylinder full of steam	1456.3
Ratio of heating surface to grate area..........	64.5

Though this design may not meet with approval from many persons, even as the one illustrated in the May number, still it will be noticed that it embodies several of the ideas expressed by your correspondents in the June number.

Referring again to the remarks of Mr. A. M. Waitt, and more particularly to that part where he refers to the tendency to load engines up to maximum capacity, and also to the size of the cylinders which are to be supplied with steam, it will be noticed that this boiler comes well within his ideas, as it is to supply steam for cylinders 19 inches diameter and 26-inch stroke. This is a matter which does not seem to be given proper attention by the superior officers of our railways. It seems to be the opinion that because a few inches have been added to the diameter of the boiler and a few more flues, that we ought also add a proportionate amount to the cylinders, forgetting entirely that the engine the new one is to replace was worked up to its maximum capacity and had no reserve to draw on in time of emergency.

The design submitted has 44 sq. ft. of grate area, 344 flues 2 ins. O. D. and 15 ft. 1 in. long; heating surface, fire box 151.44 sq. ft. and flues 2,717.94 sq. ft., total 2,869.38 sq. ft., and replaces a narrow fire box engine with 30 sq. ft. grate area, 289 flues 2 ins. O. D. 15 ft. 1 in. long; heating surface, firebox 146.2 sq. ft. and tubes 2,283.9 sq. ft., total 2,430.1 sq. ft. We expect this engine will do good work, be economical in fuel and a good steaming boiler.

Yours truly,
E. W. Fitt, Chief Draftsman,
B. & M. R. R. R.

FROM A MECHANICAL ENGINEER.

Editor, Railway Master Mechanic:

In your issue of May, 1904, there is an article entitled "Interesting Design of Locomotive Boiler" and an editorial commenting thereon in which the conclusions are reached that long flues and wide fire boxes are incorrect in principle and produce incorrect ratios of grate area, heating surface and cylinder volume. Furthermore, that they are the source of many troubles in leaky flues, etc., which, while it is not stated, yet is distinctly implied are not present in other locomotive construction.

A very little investigation would have shown the writer of the article that his conclusions as to heating surface and grate ratio could not be sustained by American locomotive practice of a few years ago.

With the increase of size and capacity of locomotives the horse power has also increased proportionately, requiring the combustion of a certain amount of coal for its production. That the rate of combustion per square foot of grate per hour should be kept within certain limits to produce economical results is too well known to require discussion here. Therefore, in order to do this economically a certain size of grate is required. It seems to me the size of grate should be determined for all sizes of engines, first, by the horse power required; secondly, by the quality of fuel; and thirdly, the economical rate of combustion at which the coal should be burned.

It is not well to assume that a shallow fire box is a necessary accompaniment of a wide fire box, as this question is governed entirely by the permissible diameter of boiler, clearance limits, size of wheels, etc., and probably as many shallow fire boxes of moderate width, equal to the spacing between the wheels, can be found as in the wide fire box construction. With the Atlantic and Pacific types of engines there is no difficulty in obtaining any reasonable depth of fire box. It is usually considered much better design to obtain the required grate area by the use of a wide fire box than it is to make them abnormally long. It is also a well known fact that boilers giving the greatest amount of trouble from broken staybolts are those with long narrow fire boxes. If the elevation of the boiler illustrated on page 155 in your May issue be compared with the elevation of the ordinary depth of wide fire box in Atlantic or Pacific type boiler, the difference would be scarcely noticeable and except in the length of the fire box the argument then would be the shape in cross section, narrow vs. wide, as the same depth of throat can be obtained in either construction.

It seems to me the conclusions as to the ratio of grate area to heating surface, 91.18, is entirely erroneous and cannot be sustained by reference to what is known as first-class practice. Speaking roughly the proportion of 1 in 60 to 70 is considered a good ratio and some of the most successful wide fire box engines have 3,500 feet of heating surface and 50 feet of grate area, making the ratio 1 in 70 and if the records of engines built before the introduction of wide fire boxes are looked into it will be found that this makes a very satisfactory proportion.

Furthermore, an inferior grade of fuel can be, and is burned successfully in wide fire boxes, which results in considerable economy in cost of fuel.

FROM A SUPERINTENDENT OF MOTIVE POWER.

Editor, Railway Master Mechanic:

Referring to the May issue of the Railway Master Mechanic, which embodies the design of locomotive boiler. It would be of more interest and admit of better comparison if the type of engine had been mentioned in the article, so that we might know about what service the engine is expected to perform.

For the purpose of this article our experience with four Atlantic type engines will afford the best comparison. These engines have the following general dimensions:

Cylinders	21 ins. dia.
Cylinders	26 ins. stroke.
Drivers	78 ins. dia.
Weight on engine truck	40,000 lbs.
Weight on first pair of drivers	52,500 lbs.
Weight on second pair of drivers	55,500 lbs.
Weight on trailers	36,000 lbs.
Total in working order	184,000 lbs.
Tractive power	23,216 lbs.
Boiler—minimum internal diameter	70⅝ ins.
Number of tubes	351
Outside diameter of tubes	2 ins.
Length of tubes	16 ft. 0 ins.
Fire area through tubes	6.06 sq. ft.
Size of firebox inside	96⅛ ins. long, 75¼ ins. wide.
Fire grate area	50.2 sq. ft.
External heating surface, tubes	2923.2 sq. ft.
External heating surface, firebox	177.1 sq. ft.
Total heating surface, boiler	3100.3 sq. ft.
Steam pressure lbs	200 lbs.

The flues on this engine (16 ft. long) are the longest which we have in service, and since engines wire first operated five months ago have given no serious trouble. Sixteen-foot tubes in another class of engine which have been in service 21 months have only given trouble, which can be traced to bad water, the worst of which carries mud and scale material to the extent of 55 grains per gallon. Comparing these tubes with the next longest which we use, viz., 12 ft. 4 in., there has been no increase in trouble except what we would anticipate from the proportionate increase in expansion and amount of water evaporated, while increase in efficiency is very pronounced with the longer tubes.

Our experience with long narrow fire boxes has been unsatisfactory, largely due to bad water. I see no valid objection to a deep box limited, of course, in case of Atlantic type engine to diameter of trailer wheels. Sufficient depth and width of fire box are, I believe, strong points in the design of any modern locomotive boiler. Extreme length of firebox should, in my opinion, be avoided on the principle that while a large combustion chamber is desirable it should be reasonably wide instead of extreme width; by this means a large grate area can still be maintained which is an important factor for large combustion chamber to properly consume coal gases in a locomotive. Another important feature, although not always practicable, is the brick arch which not only helps to accomplish perfect combustion but tends to protect the tubes and flue sheet.

We object to the long fire box, as it gives us most trouble. It is in the firebox side sheets which have proven the most vulnerable and expensive parts of the modern locomotive. For a locomotive receiving general repairs it means at least new side sheets and in many cases new fire box complete.

The present chief cause of trouble is the accumulation of mud and scale requiring boiler washing for every 700 miles. The side sheets corrugate and crack vertically owing partly to excessive contraction and expansion and partly to design of fire box.

While the wide shallow fire box has many questionable points its design was a justifiable one, more in the direction of getting results and its weak points as they are anticipated or developed can be modified and improved. At the same time other conditions must be improved, one of the most important of which is water purification to enable passenger locomotives to run 5,000 miles between boiler washings.

The subject is one prolific in problems which must be solved by experiment and re-design of faulty details.

The attached table gives comparison of boiler mentioned in Railway Master Mechanic May issue and the one referred to in this article.

	Ry. M. M.	Van. Line.
Total Heating Surface to Grate Area	91.18	61.76
Total Heating Surface to Tube Heating Surface	1.075	1.06
Total Heating Surface to Firebox Heating Surface	15.42	17.51
Tube Heating Surface to Firebox Heating Surface	14.33	16.51
Tube Heating Surface to Grate Area	84.76	58.23
Firebox Heating Surface to Grate Area	5.91	3.53
Total Heating Surface to Volume of Both Cylinders	269.9	297.50

Dynamometer Car of the International Correspondence Schools

THE railway department of the International Correspondence Schools of Scranton, Pa., have just put into service a new dynamometer car to be used on the lines of the railroads where the schools have contracts. The car is 45 feet long over sills, 8 feet 4⅜ inches wide inside, and 7 feet 7½ inches high from floor to ceiling. The room for the recording machinery is 24 feet 6¾ inches long and has a cupola 10 feet long over it; this cupola is 7 feet wide across the top and as wide as the car plates where it joins the body, with seats along the sides for observers and lookouts.

Dynamometer Car of the International Correspondence Schools—Exterior.

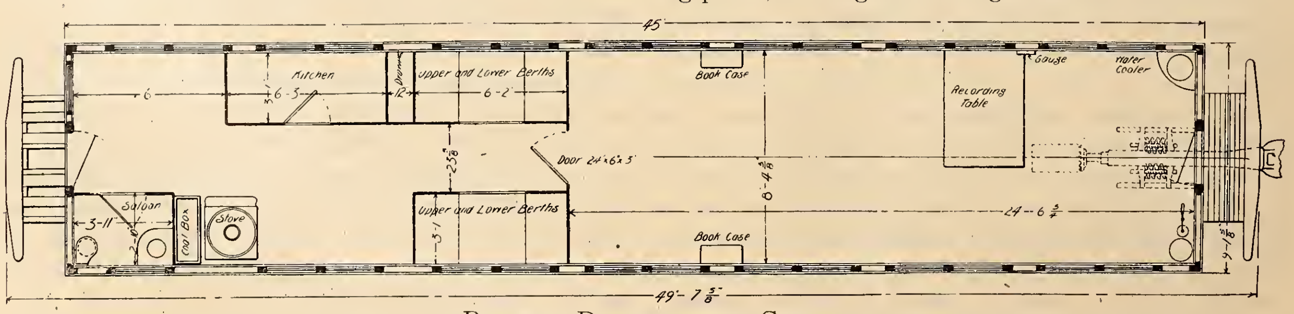
In the operating room are the recording machines, registering gauges, oil pipe connections and tanks, in fact, all the apparatus for recording the work of the dynamometer car, together with book cases, cupboards and desks. Next to this room near the middle of the car are two sleeping sections having two upper and two lower berths. Next is the dining room, with kitchen opposite. In the end of the car, on one side, is a lavatory; on the other an observation room which has a place for one man to sleep.

The accompanying illustration of the car from a photograph gives a good idea of its outside appearance. There are 16 side windows in the operating room which give a large supply of light as well as ventilation. The car is to be heated with a Baker heater which will warm the front end next to the engine, something which is not always done with dynamometer cars having stoves for heating apparatus. The hot water circulation will also be utilized to keep the oil warm in the dynamometer cylinder and in the pipes under the car.

The dynamometer machinery consists of a thick cast iron cylinder of 10-inch bore and 15-inch stroke, substantially fastened to the center sills of the car, in which operates a piston 5 inches thick. The piston rod is 2½ inches in diameter and fastened to the back end of the drawbar yoke with nuts. The piston has a ground fit in the cylinder, and the piston rod has a gland ground to a fit which sets against the ball joint in the forward cylinder head. These joints are so tight that with a steady pressure of 400 pounds per square inch only one pint of oil passed the surfaces in one hour.

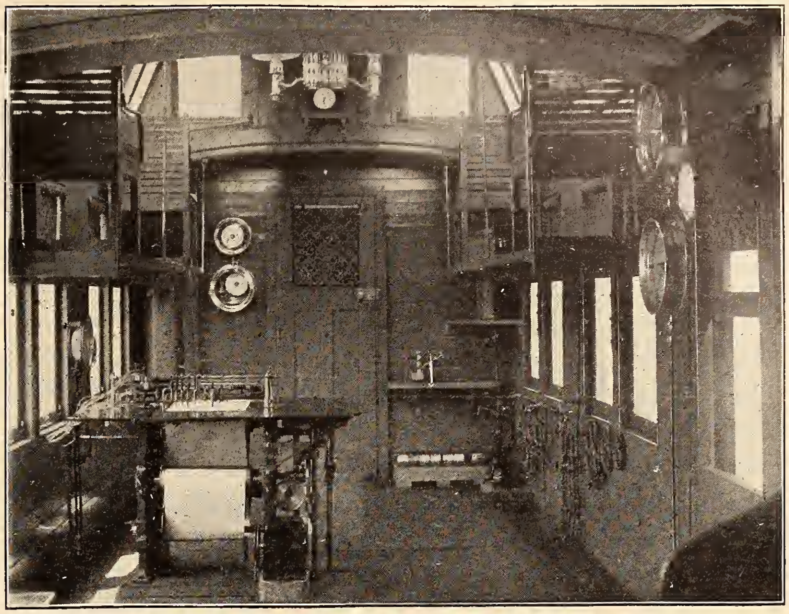
The construction of the car is very strong, in order to withstand the shocks to which it will be subjected, as its location in the train is next to the engine when making tests. There are eight 5 x 9 pine sills; the end sills are 8 x 9 and of oak. The sides of the car under the belt rail are solidly braced. The iron transoms are 1 x 8. The trucks are baggage car type, 7-foot wheel centers with 33-inch wheels and inside hung brakes.

The drawbar yoke has twin springs with 2-inch filler blocks outside the follower plates. When the car is being used in making tests these blocks are taken out and the strain on the drawbar comes entirely on the piston and rod. When not making tests the blocks are put in place and the drawbar strains are then taken by the springs. The dynamometer cylinder is filled with oil and piped from the bottom of the cylinder to the indicator of the recording machine, which is somewhat similar in principle to the steam indicator. It consists of two cylinders, one on each end of a small bed plate, having pistons which are connected by a piston rod 9-16 of an inch in diameter, extending from one to the other. The indicator springs are carried on this rod, one end against the cylinder head and the other against the stop or collar on the rod, fastened by set screws. Oil in the dynamometer cylinder is piped so that its pressure comes against these indicator pistons; the pressure from one end is piped to one indicator cylinder, and from the opposite end of the dynamometer cylinder to the other. The movement of the piston rod is multiplied by a 10-to-1 lever connected to a small carriage carrying the recording pencil, which gives a straight line movement.



Plan of Dynomometer Car.

The piping in the car is so arranged that the oil can be forced from the oil tank into the dynamometer cylinders with air pressure from the auxiliary reservoir, or it can be forced back from the dynamometer cylinder into the tank at any time required. This is usually done when the car is traveling from one test to another, so that there is nothing but air in the dynamometer cylinder when not making tests.

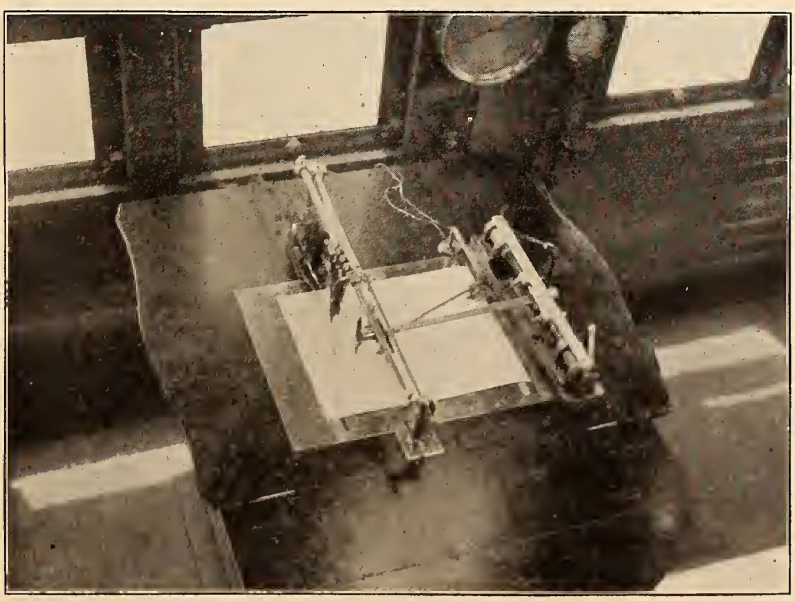


Interior View of Dynamometer Car, Showing Recording Table.

The mechanism for moving the record paper consists first of a worm and gear attached to the car axle under the recording machine, which drives a shaft passing up into the car and by means of suitable gear moves the paper along at the provided speed. This gearing is arranged for three speeds; one of 6 inches per mile, one of 12 inches per mile, and one of 60 inches per mile. Other speeds can be added at any time by putting in other gears. The gear can be thrown out of action, put into forward gear or back gear, as is desired, in much the same manner as the back gear of a lathe is operated.

There is a device in the gear case on the axle for throwing the gear wheel out of connection with the worm on the axle, so that the gear wheel does not operate whenever the car is not engaged on a test. In order to protect the machine in case anything gets in between the teeth of the gearing, one of the pins in the upright shaft is made of wood, and while strong enough to drive the paper rollers, will shear off in case any sudden strain is brought upon it.

In addition to the pen which records the drawbar pull on a sheet of paper there are other pens which record locations, such as mile-posts, stations, tops of grades, etc. One pen is connected to a circuit breaker clock and makes a record every five seconds. Another pen is connected to a commutator on a mechanical integrator, and by means of the record made it is possible to calculate the mean effective strain on the drawbar at all times in much the same manner that the planimeter determines the area of an indicator card. There is also a pen, operated by a push button on the engine, which is used to show the position of reverse lever the instant at which indicator cards are taken or to register any other observations made. These pens are operated by magnets and batteries, which are in the operating room of the car. The recording gauges are placed on the side of the car, in positions where they will be most convenient for the operator. The brake cylinder and train pipe recording gauges are placed on the side of the car, while the hydraulic gauge is located close to the machine and about the same height as the gauge tester, so that no calculations need be made in the different heights of oil at either of these points when calibrating the indicator or hydraulic gauge.



Top of Recording Table in Dynamometer Car.

The hydraulic gauge, air brake, recording gauges and gauge tester are from the Crosby Company. The steam pressure recording gauge and electric counters are from the Schaeffer & Budenberg Company. Clark, Burris & Company furnished the electrical switchboard and magnets. The recording machine was built by E. M. Burr & Co., Champaign, Ill. The Republic Railway Appliance Company, of St. Louis, furnished the roof and friction draft gear for one end of the car, while the brake-beams are from the Waycott Supply Company. Westinghouse high-speed brakes are used. The car is equipped with air brake, air signal and steam heat pipes, so that it can be coupled in passenger trains.

In many respects this car resembles the C., B. & Q. railroad test car, illustrated in the Railway Master Mechanic, May, 1902. The castings for the dynamometer cylinder and indicator cylinders were obtained from this company. The indicator arrangement, the integrator, electric pens and the magnets for operating them are the same as used on the Burlington car, which is said to be one of the best of its class.

Other machinery and instruments will be added to this car as experience shows them to be necessary so that tests of all kinds, both of steam distribution, smoke box gases, etc., can be made as well as drawbar tests.

Handling Injectors on the Road

Editor, Railway Master Mechanic:

Your editorial in the May issue on operating injectors has been read with a great deal of interest.

The chief cause of leaking flues is the ashpit tragedy. Educate those in charge of cleaning and dumping fires to the least possible use of the blower and you will soon find a big decrease in expense sheet of boiler department.

About keeping injectors on while drifting: Except on level roads there will be a wide variation of the amount of water used, especially with a full tonnage train. Of course you can say adjust your injector to the different condition. Take for example on an undulating road, the engine is forced to its full capacity to get over a hump, after which there is a drift for several miles. Now, the average locomotive after being on the road over six hours and having a fire not absolutely clean—to get over this hill requires full pressure and full stroke, beside having had to make a run for it. Result is injector has been shut off for a time and must be kept on part if not all the way down and shut off temporarily just before working steam again.

All this time you have a heavy fire and steam coming out of the safety valve. On free steaming engines this is not always necessary. I am taking the average locomotive, the average hilly road and the average tonnage train.

Again, the engine crew gets on the engine and knows nothing of her performance on the previous trip, except from what the work report says. The engineer and fireman are strangers usually, especially in freight service, and neither knows what or how the other does his work and steam first is an unwritten law.

If the fireman works the water he is sure to favor himself, and if the engineer works the injector he will usually cut it as fine as possible and the let the fireman fire against the injectors, as he should when consistent.

You want to make a station for a superior train—short time to do it in—it can be done by hitting her hard—result, get there, and into clear, but with a heavy fire and water low enough to keep injector on for some time. We will put on blower, steam is already at popping point, now it is either howl, howl and waste water or shut off blower—usually the latter.

We must save water on some divisions. Theoretically, the fire should be burned down on approaching a stopping point; but how many times can that be done and have steam to start again? Different conditions govern entirely.

I am not advocating the promiscuous use of injectors at any and all times regardless, but if locomotives are drafted so as to steam under conditions for which they are used so that the engine crew will not have to favor the engine continually, I believe there would be less trouble from leaking flues on the road.

The blower is the fireman's best friend, and the flues' worst enemy. Used judiciously I can see no harm done; but the usual ashpit method—well, the sooner the "Powers that be" get after those gentlemen of the hoe and rake the fewer flues will leak.

Many roads object to engines blowing off steam at stations. On a heavy passenger train where the time is fast it is not practicable to come into a town where the stop is short with a light fire and injector shut off. Generally the fireman has a heavy fire and the injector and blower on, the pressure is up and popping. We must have water and a heavy fire to start—consequently we keep on the injector as daily performance shows necessary, but we must not let her blow off nor pile on a lot of coal and get the anathemas of those covered with black smoke for blocks around and a nice letter from the master of mechanic asking why.

Let us have the locomotives so they will steam, and there will be less heartaches, backaches, black smoke, and, above all, fewer leaky flues and no song of the blower.

Another suggestion: Why not have less side track delays by reducing the tonnage so that the engineer can make time and get over the division? When a train is lying on sidings half the time on a trip and before arriving at the division terminal the flues are spouting to the door, if no arch is used. The primary cause is the "'side track layovers," which necessitate a dying down and building up of the fire continually.

It is against human nature to expect the engine crew to take the same amount of interest after being on a "drag" for eighteen or twenty hours that it would if only on duty twelve or fourteen hours.

For my part I advocate keeping the fire against flue sheet when standing at roundhouse, fill boiler while blower is being used to get up steam and know that there is fire at front end of firebox.

On sidings keep good fire at flue sheet and let back end burn down if necessary. Work injector according to work being done. Start out with proper amount of water. I don't specify how much; the engineer is the best judge.

And now let me say that if engineers and firemen will read and study about their business and take at least one mechanical paper and follow what they learn, there will be a greater increase of success and decrease of failures in their calling than there has been since railroads were first built.

I believe in education first, last and always.

Yours truly,

Albert S. Erskine.

Editor, Railway Master Mechanic:

Referring to the subject of handling locomotive boilers which has been given some prominence in recent issues of the Railway Master Mechanic, I wish to submit my opinion and an outline of the practice followed on the Michigan Central.

The blower should not be used any more than is absolutely necessary to build up fire. A habit some enginemen have is to open blower wide just at the time when engine throttle is shut off. This to avoid emitting black smoke and gases. It is left open longer than necessary from mere force of habit while fire is burned out or light over grates. This draws in large quantities of cold air through grates and thin fire chilling fire box, flue sheet and flues, causing them to contract and leak. This habit is more noticeable in large engines with short stacks and cabs high up.

The heat in fire box should be maintained at an even temperature at all times, never allowing steam to vary more than 5 to 8 lbs.

The fire over grates should be kept level, never allowing it to burn light in spots, or burn too low before shutting off or in pulling into side tracks. Great care should be taken to avoid slipping engine when starting train, as the cold air rushing through when a thin or light fire is carried may cause flues to leak at once.

Blower should be used very light on cinder pits or when men go in firebox to clean off grates and flues, or boiler makers to fix flues. If it becomes necessary to put a large quantity of water in boiler, a small amount should be put in at a time, this to allow water to become heated and lessen the contraction.

To prevent popping, the fire door should be opened just a very little. Before fire is cleaned out at cinder pit the boiler must be left full of water, never putting water in boiler after fire is cleaned out. A dirty or clinkered fire should be avoided as much as possible, as it prevents the air passing through grates and fire. Cold air passing through door over top of fire striking flues chills and contracts them, causing them to leak.

Care and attention should be given boilers in the manner in which they should be washed out. In cooling an engine down as much cold water should be put in boiler as hot water is let out, to avoid doing damage to firebox and sheets. The practice here is to use hot water in washing boilers.

Never allow engines to run too long between washing out. Injectors should be worked just to supply boilers and only at stations to avoid popping.

Yours truly,

W. H. Corbett,
Traveling Engineer, M. C. R. R.

FROM A GENERAL FOREMAN.

Editor, Railway Master Mechanic:

Your editorial in the May issue relative to the care of locomotive boilers while in service, is well taken in many respects. However, it is the easiest job in the world to find fault and to sit in a nice comfortable office and tell the engine crews how to handle engines to bring about good results. Where conditions are favorable for the engineer to handle his engine properly, he will do so if he is a fit man to handle one at all. On the other hand, the tendency is to overload engines and at the same time we insist on our engineers getting their trains over the road on time.

There are long, fast runs with many stops where it is absolutely necessary for the boilers to be filled while pulling into and standing at stations. Almost invariably the blower will be used to keep up as nearly uniform a fire as possible. Moreover, we cannot deny that conditions are frequently such that engines have to be abused in order to get them over the road. The fault lies not with the engine crew nor with the master mechanic, nor with the head of the mechanical department, but higher up. In the hands of the men at the head lies the remedy.

A great many of the engineers' troubles can be obviated by furnishing them with locomotives which have received proper attention at the engine house. Tanks should be kept clean, injectors and branch pipes should be kept in good order; lost motion should be kept out of shaker rigging; grates, dampers and ash pans should be looked after; flues should be bored out and kept clear of cinders (every time a flue stops up, a certain portion of heating surface is cut out); front ends should not be forgotten and we should insist on the ashpit men getting all of the cinders out of the smoke-arch for a full front end assists in stopping up flues as much as a 'honey-combed flue sheet. If the enginehouse foreman will see that these things are done, the running repairs to the machinery, flues and firebox will be looked after also.

You say: "The most practical method of handling the injector to advantage is to hold the water level while the engine is working and use the injector after shutting off steam merely to the extent necessary to prevent 'howling,' etc." What is an engineer going to do when he has an engine which is too light for the run; which uses more steam than it can make? He has got to keep up his water level and the only time he can gain what he has lost is while rolling into and standing at a station or going down grade.

Care at the ashpit and after the fire has been knocked out is paramount. On many types of engines we have found that fires can be cleaned or knocked out without using the blower at all.

Your rules on page 162 of the May number are first class.

Rate the engine fairly; keep up the repairs; watch the handling at the roundhouse; provide them with good water and give the firemen good coal—then if your road foreman of engines or traveling engineer cannot produce results, give him an assistant before you discharge or set him back. All of the above items are obtainable and reasonable in price; are they logical or not?

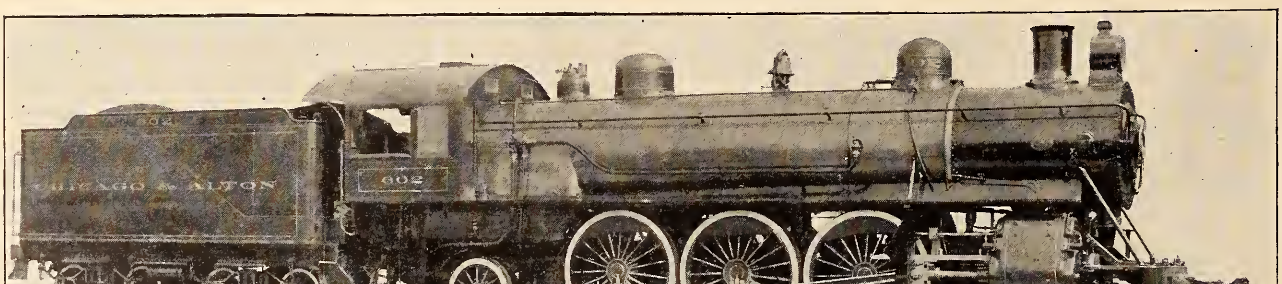
Heavy Passenger Locomotive, Chicago & Alton Ry.

IT will be remembered that about a year ago, after a number of exhaustive tests, the Chicago & Alton Railway had two large passenger locomotives built to handle their heavy traffic. These engines were described in the Railway Master Mechanic, April, 1903, page 163. The Baldwin Locomotive Works has recently turned out a number of locomotives of the same general type for the "Alton" to be used in handling their portion of the traffic to and from the St. Louis Exposition. It is interesting to compare the more recent design with that of the older engines in order to observe what changes have been deemed advisable after a year's trial. The modification of the boiler wherein there appears a difference in ratios of surfaces and a construction which permits freer circulation, are the most noticeable.

While the total weight of each new engine is 2,000 pounds greater than that of either of the older, the later engine carries 6,590 pounds less on drivers and greater weight is carried over both forward truck and trailing wheels. There are 245 tubes in the new boiler as against 328 of the same diameter and length in the older, while both boilers are of the same diameter at front. The smaller number of tubes reduces the seeming large flue heating surface, which in the last year or two has had a tendency to be carried to extreme. By using a ⅞-inch bridge in place of the usual ⅝-inch, much freer circulation is provided for. Further provision for free circulation is made by a wide mud ring of five inches all around the firebox. By reference to the transverse section of the firebox the shape of water leg is seen to be such as to give perfect freedom to steam generated therein and will have no tendency to restrict circulation.

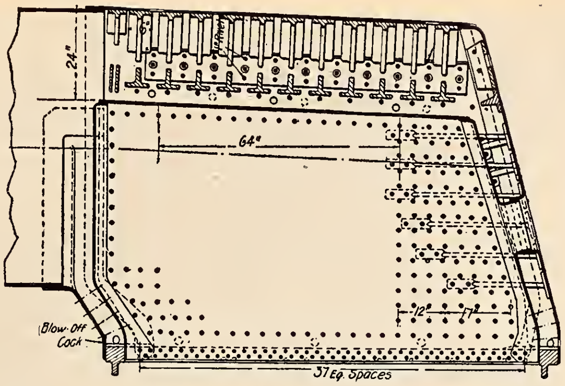
The two locomotives previously built had driving wheels of different diameters, 73 and 80 inches, respectively, to determine by experience the diameter of driver best suited to prevailing conditions. It will be observed that the diameter selected in the new design is 77 inches, or nearly an average between the two. In comparing the respective tractive powers of the old and new design we refer to the locomotive with 80 in. drivers.

The tractive effort of the old engine was 31,678 and that of the later engine 29,920, and tractive efforts by one quarter weight on drivers are 35,425 and 33,777, respectively. Comparing adhesive weight with tractive effort gives a ratio of weight on drivers to tractive effort of 4.47 for the old and 4.51 for the new; and comparing tractive effort with heating surface gives a ratio of tractive effort to total heating surface of 7.76 for the old and 9.8 for the new.



HEAVY PASSENGER LOCOMOTIVE, CHICAGO & ALTON RAILROAD.

A comparison of heating surfaces evidences that the tube surface has been reduced 1002 sq. ft., considering the firebrick tubes which were used in the older engine; the firebox heating surface is 23 sq. ft. less, yet there is a larger per cent of total heating surface present in the firebox of the new boiler. The ratios for the two engines are as follows, the figures for the older engine being given first in each case: Total heating surface to grate area, 75.5 and 61.67; total heating surface to firebox heating surface, 20.18 and 17; firebox heating surface to grate area, 3.74 and 3.61; total heating surface to volume

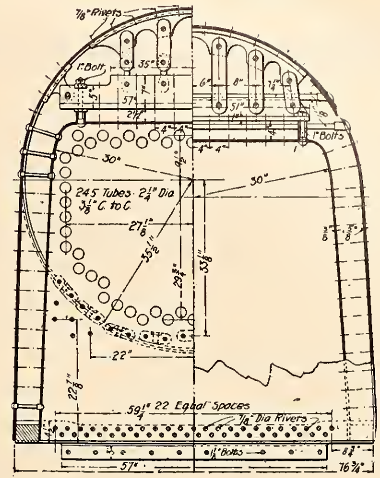


C. & A. Locomotive—Sectional Elevation of Firebox.

of both cylinders 331 and 247.8. The last figure shows a much closer approximation to that recommended by the well-known '97 committee report, in which the relation is expressed as total heating surface = 205 vt., where vt. = volume of both cylinders in cu. ft.

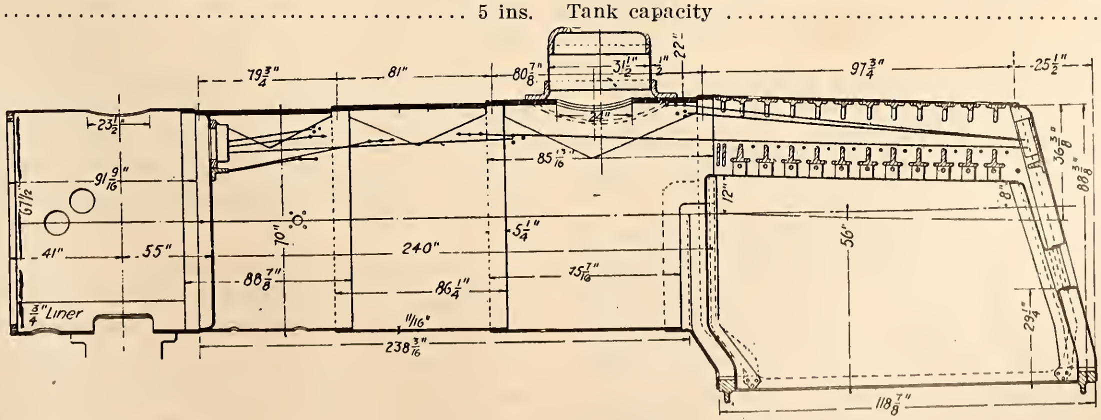
Inasmuch as the principal features of interest embodied in this design are apparent in the boiler, we accompany the halftone engraving of the locomotive by drawings of the boiler only. Consideration of this design shows an effort to provide for free circulation of water and to reduce tube heating surface, a surface to which too much value has been attached in many cases.

The following table presents the principal dimensions of the new locomotives:



C. & A. Locomotive—Cross Section of Firebox.

Gage	4 ft. 8½ ins.
Cylinder	22x28 ins.
Valve	Balanced
Boiler.	
Type	Straight
Material	Steel
Diameter	70 ins.
Thickness of sheets	11-16 in.
Working pressure	200 lbs.
Fuel	Soft coal
Staying	Crown bars
Firebox.	
Material	Steel
Length	180 ins.
Width	66 ins.
Depth front	68 ins.
Depth back	64 ins.
Thickness of sheets, sides	⅜ in.
Thickness of sheets, back	⅜ in.
Thickness of sheets, crown	⅜ in.
Thickness of sheets, tube	½ in.
Water Space.	
Front	5 ins.
Sides	5 ins.
Back	5 ins.
Tubes.	
Material	Iron
Wire gauge	0.125 M. M.
Number	245
Diameter	2¼ ins.
Length	20 ft.
Heating Surface.	
Firebox	179 sq. ft.
Combustion chamber	
Tubes	2,874 sq. ft.
Firebrick tubes	
Total	3,053 sq. ft.
Grate area	49.5 sq. ft.
Driving Wheels.	
Diameter of outside	77 ins.
Diameter of inside	70 ins.
Journals, main	10x12 ins.
Journals, others	9x12 ins.
Engine Truck Wheels.	
Front, diameter	33½ ins.
Journals	6x10 ins.
Back, diameter	45 ins.
Journals	8x12 ins.
Wheel Base.	
Driving	13 ft. 4 ins.
Rigid	13 ft. 4 ins.
Total engine	33 ft. 4 ins.
Total engine and tender	62 ft. 8¾ ins.
Weight.	
On driving wheels	135,110 lbs.
On truck, front	40,500 lbs.
On truck, back	45,940 lbs.
Total engine	221,550 lbs.
Total engine and tender, about	376,000 lbs.
Tender.	
Wheels, No.	8
Wheels, diameter	36 ins.
Journals	5½x10 ins.
Tank capacity	8,400 gals.



C. & A. Locomotive—Boiler.

Electric Locomotives for the N. Y. C. & H. R. R. R.

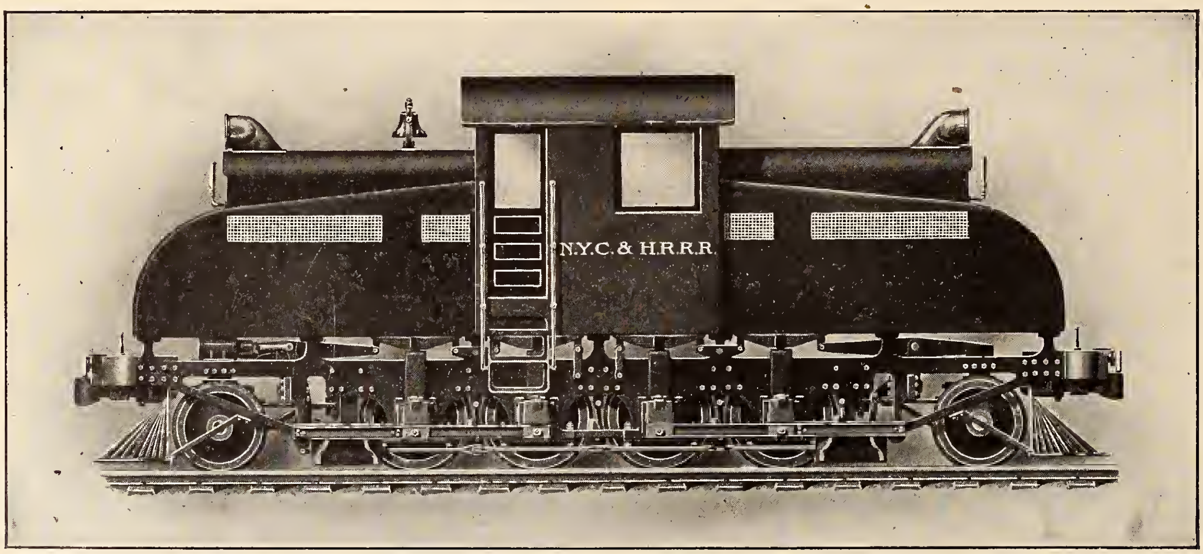
THE following description of the electric locomotives for the New York Central & Hudson River Railroad has been prepared by the General Electric Company, under the supervision of Mr. W. J. Wilgus and Mr. E. B. Katte, both of the New York Central: The new electric locomotives which are being built for the New York Central & Hudson River Railroad Company at Schenectady, by the General Electric Company and the American Locomotive Company, differ radically in their electrical features from any electric locomotive hitherto constructed.

The motors are bipolar gearless, the magnetic circuit, the field windings and the motor poles being integral with the locomotive frame, and spring supported. The pole faces which are laminated are vertically tangential to the armature, thus providing for vertical movement of the locomotive frame with attached poles without affecting the armature air gap. The armature is assembled on a quill which is pressed solidly on the axle. The dual weight of the assembled rotating part, including the armature, axle and wheels, is less than on many steam locomotives and there being no uncompensated reciprocating parts, there is a perfect rotative balance.

This design was submitted in accordance with specifications prepared by the Electric Traction Commission appointed by the railroad company, the members of which are Messrs. William J. Wilgus, fifth vice-president, N. Y. C. & H. R. R. R.; John F. Deems, general superintendent of motive power of the railroad company; Bion J. Arnold, Frank J. Sprague and George Gibbs. The secretary to this commission is Mr. Edwin B. Katte, electrical engineer of the railroad company.

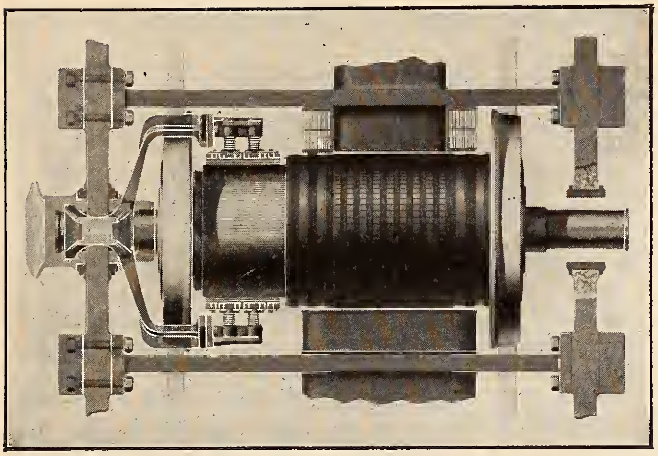
This commission, after careful deliberation, had prescribed the conditions which must be fulfilled by electric locomotives taking the place of steam locomotives as far as Croton on the Hudson River line and as far as North White Plains on the Harlem division a distance of 34 miles and 24 miles respectively.

These conditions were, briefly, that the successful bidder should furnish an electric locomotive capable of making two regular successive trips of one hour each between Grand Central station and Groton with a total train weight of 550 tons, a single stop in each direction and a lay-over not to exceed 20 minutes. In addition to this it was provided that a similar schedule should be maintained with somewhat lighter trains making more frequent stops. Finally, it was provided that with a total train weight of 435 tons, the electric locomotive should be able to run from Grand Central Station to Croton without stop in 44 minutes, and, with one hour lay-over, be able to keep up this service continuously. This last schedule is the equivalent of the present timing of the Empire State Express, though the latter has a somewhat lighter train.



Electric Locomotive for the New York Central & Hudson River Railroad.

Specifications embodying these conditions were prepared by the commission and sent to all the principal electrical manufacturing companies both here and abroad. It will be observed that no restriction was placed on bidders as to whether direct or alternating current was to be used. The successful bidders were the General Electric Company, in conjunc-



Arrangement of Armature, Brushes and Field Coils—Electric Locomotive of the N. Y. C. & H. R. R. R.

tion with the American Locomotive Company. The choice of a direct-current type of locomotive was dictated largely by its own reliability of service, owing to the amount of experience which had been accumulated with the direct-current motor.

The new electric locomotive will be 37 feet in length over all. The wheel base will consist of four pairs of motor wheels and two pairs of pony truck wheels, the length of the total wheel base being 27 feet; and of the rigid wheel base consisting of the four pairs of motor wheels 13 feet.

The diameter of the driving wheels will be 44 inches and of the truck wheels 36 inches. The driving axles will be 8½ inches in diameter. The locomotive will be a double ender, and will not require the use of a turntable.

The frame will be of cast steel, the side and end frames being bolted together at machined surfaces and stiffened by cast steel cross transoms. The journal boxes and axles will be designed to permit sufficient lateral play to enable the locomotive to pass easily around curves of 230-foot radius.

The superstructure of the locomotive is to be of steeple form so designed as to offer the least practicable wind resistance, consistent with the adequate housing of the apparatus and its convenient operation. The cab is designed so as to afford a clear view of the track. The whole of the superstructure is to be of sheet steel with angle iron framing, and the doors and windows of the cab are to be fireproof.

The driving power of the locomotive will be furnished by four 600-volt direct-current gearless motors, each of 550 horse power. This will make the normal rating of the locomotive 2,200 horse power, with a maximum rating of about 2,800 horse power, or about 50 per cent greater than that of the largest steam passenger locomotives now in service.

The armatures will be mounted directly on the axles and will be centered between the poles by the journal boxes, sliding within finished ways in the side frames. The armature core will be of the iron-clad type, the laminations being assembled on a quill which will be pressed on the axle. The winding will be of the series drum-barrel type. The conductors will be designed so as to avoid eddy currents and will be soldered directly into the commutator segments.

The commutator will be supported on the quill. The commutator segments will be made of the best hard-drawn copper and will have the ears integral with themselves. The brush holders will be made of cast bronze and mounted on insulated supports attached to the spring saddle over the journal, maintaining a fixed position of the brush holder in relation to the commutator.

Unlike the ordinary four-pole motor where the magnetic circuit is made through a separate box casting, the magnetic circuits in this type of electrical locomotive are completed through the side and end frames. The pole pieces are cast in the end frames and there are also double pole pieces between the armatures carried by bars which act as part of the magnetic circuit.

The pole pieces will be shaped so that the armature is free to move between them with ample clearance on the sides. As the poles move up and down with the riding of the frame on the springs, they will always clear the armature and provision is made so that the armature will not strike the pole pieces even if the springs are broken. The field coils will be wound on metal spools bolted to the pole pieces and will consist of flat copper ribbon.

The Sprague-General Electric multiple unit control will be used on this type of electric locomotive. There will be two master controllers in the cab, so placed that the operating engineer looking ahead will always have one of these under his hand. The control system will permit two or three locomotives to be coupled together in any order in which they happen to come and to be operated as one unit by the engineer in the leading cab.

The control system will also be semi-automatic in its action, as it will provide a check on the rate of acceleration of the train, which the engineer cannot exceed, while he may accelerate at any lower rate if he so desires. Should two locomotives break apart the control current will be automatically and instantly cut off from the second locomotive without affecting the ability of the engineer in charge to control the front locomotive under his charge. The control system is designed for a minimum of 300 volts and a maximum of 750 volts.

The weight on drivers is 136,000 pounds, and on trucks 54,000, total 190,000. The traction power will be approximately 34,000 pounds. Proper distribution and division of the weight among axles will be accomplished by swinging the main frames from a system of elliptical springs and equalizing levers of forged steel, the whole being so arranged as to cross equalize the load and furnish three points of support.

The locomotive will be provided with all the usual accessories of a steam locomotive, including an electric air compressor to furnish air for the brakes; it will have whistles, a bell and an electropneumatic sanding device and electric headlights at each end. The interior of the cab will also be heated by electric coils.

In actual performance this locomotive is expected to give better results than any engine hitherto placed upon rails. With a light train the locomotive is expected to give speeds up to 75 miles an hour and with heavier trains similar speeds can be attained by coupling two locomotives together and working them as a single unit. Its tractive force will be greater than that of any passenger locomotive now in existence and it is believed that in the simplicity and accessibility of its parts and in the provision made in its design to insure continuous operation with the minimum chances of failure, that it marks an entirely new and successful type of electric locomotive.

Personals

Mr. J. M. Gibbons has been appointed general storekeeper of the Missouri, Kansas & Texas, with office at Parsons, Kan.

Mr. C. H. Shearman, heretofore general car foreman of the St. Louis, Kansas City & Colorado, has been appointed general car foreman of the Chicago Junction Railway, with office at Union Stock Yards, Chicago.

Mr. M. J. Lynn has been appointed master mechanic of the Buffalo and Rochester divisions of the Buffalo, Rochester & Pittsburg, and Mr. C. J. Harrison has been appointed master mechanic of the Pittsburg and Middle divisions.

Mr. A. J. Ball, having resigned as superintendent of motive power and equipment of the Toledo, St. Louis & Western, Mr. G. W. Taylor has been appointed superintendent of motive power and Mr. G. L. Dickover has been appointed superintendent of the car department, with headquarters at Frankfort, Ind.

Mr. J. W. Hopkins has been appointed general foreman of the Richmond division of the Pennsylvania Lines west of Richmond, Ind.

Mr. J. O'Hearne, master mechanic of the Wheeling & Lake Erie, and Mr. C. S. Morse, master car builder, have been appointed to similar positions on the Wabash-Pittsburg Terminal Co.

Mr. C. H. Osborn has been appointed foreman of the shops of the Chicago & Northwestern Railway at North Fond du Lac, Wis.

Mr. H. H. Harrington, former general foreman of the Santa Fe shops at Newton, Kan., has again entered the service of the Santa Fe as foreman of the Oklahoma division, with headquarters at Arkansas City, Kan. The Santa Fe plants at Purcell and Shawnee, Okla., will be under his supervision.

Mr. J. F. Graham, heretofore master mechanic of the Oregon Railroad & Navigation Company, has been appointed superintendent of motive power of that road, with headquarters at Portland, Ore., effective on July 1. He will have charge of the general shops and supervisory authority over division shops.

Mr. F. B. Childs, heretofore traveling engineer on the Idaho division of the Northern Pacific, has been appointed master mechanic of that division, with office at Spokane, Wash.

Mr. J. Foulk, master mechanic of the Jacksonville & St. Louis at Litchfield, Ill., has resigned and the duties of that office have been assumed by Mr. T. L. Smith, master mechanic of the Chicago, Burlington & Quincy at Beardstown, Ill.

Mr. B. D. Lockwood has been appointed mechanical engineer of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Inianapolis, Ind.

Mr. F. T. Hyndman, heretofore master mechanic of the Buffalo, Rochester & Pittsburg at Dubois, Pa., has been appointed superintendent of motive power of that road, with headquarters at Dubois, Pa.

Mr. W. L. Harrison, heretofore master mechanic of the Chicago, Rock Island & Pacific at Cedar Rapids, Ia., has been transferred to the Cedar Rapids division in a similar capacity, with headquarters at Cedar Rapids, Ia.

Mr. James H. Little, heretofore traveling engineer of the Chicago, Milwaukee & St. Paul, has been appointed general foreman of the locomotive department at Ottumwa Junction, Ia.

Mr. C. B. Cramer has been appointed master mechanic of the Southern Railway at Charleston, S. C.

Mr. R. F. Hoffman has been appointed assistant to the general superintendent of motive power of the St. Louis & San Francisco, with headquarters at St. Louis, Mo. Mr. D. E. Fitzgerald has been appointed chief motive power clerk of this road, also with headquarters at St. Louis, Mo.

Mr. L. C. Clemson has been appointed road foreman of engines, Middle division of the Pennsylvania, with office at Altoona, Pa.

Mr. J. A. Barhydt has resigned as division master mechanic of the Buffalo, Rochester & Pittsburg at Rochester, N. Y., and Mr. A. Bardsley has resigned as master mechanic at Bradford, Pa.

Mr. J. R. Hill has been appointed general foreman of the St. Louis, Watkins & Gulf at Lake Charles, La.

Locomotive Testing at the St. Louis Exposition

The Pennsylvania Railroad has already distributed Bulletin No. 1, describing the organization under which the tests at the St. Louis exposition will be carried on, and Bulletin No. 2, describing the testing plant as erected in the Transportation building. Bulletin No. 3 has just been issued by the company, giving in detail the methods employed in carrying on the tests and in obtaining the original data, as well as calculated results. A list of items, comprising the observed data and calculated results are embodied in the bulletin, arranged in subdivisions and carefully numbered. It is divided into seven general headings, as follows:

1. Description, Dimensions and Proportions.
2. Constants.
3. Observed Data.
4. Summary of Average Results—Boiler.
5. Summary of Average Results—Engine.
6. Summary of Average Results—Locomotive.
7. Summarized Statement of Average Results.

OBSERVED DATA.

All instruments will be read at intervals of ten minutes during the test. Observations of the more important facts will be taken by two methods, and all calculations will be carefully checked.

The locomotive will be gradually brought to the required conditions of speed and drawbar pull, and after it has been running under these conditions for a sufficient time to secure uniformity in the rate of firing and to allow all parts to come to their normal working condition, the test will be started.

The heavy power tests will continue until thirty pounds of water have been evaporated per square foot of heating surface; the lighter power test being stopped at the end of four to six hours.

The duration of test, given in hours and decimals of an hour is the elapsed time from the start, as given above, to the close of test.

A return crank, attached to the rear pair of drivers, is connected to a rotating revolution counter, which will be read at the beginning and end of test, and every ten minutes as well. A reciprocating revolution counter is connected with the corresponding supporting axle. From the diameters of the driving wheel and supporting wheel, a factor will be obtained by which the number of revolutions shown on supporting wheel counter can be compared with the number shown by driving wheel counter.

A tachometer will also be driven by the supporting axle, and this will provide a check for the average revolutions.

For the smoke box temperature a thermometer, with carbon dioxide above the mercury, will be used as a check on the indications of the pyrometer.

Le Chatelier couples and a galvamometer reading to millivolts, will give the smokebox and firebox temperatures.

The couple in the smokebox will remain in position; the couple in the firebox will be inserted through an opening in the side, about midway of its length, and at a height above the bed of coal of about twelve inches. After it has been in position with the fire door closed a sufficient time to assume the temperature of the firebox, readings will be taken and the couple withdrawn from firebox.

The temperature of the steam in branch pipe will be calculated from the observed pressure of steam in same and from the observed pressure and temperature of the steam in the calorimeter connected to the branch pipe.

The feed water temperature will be taken in the receiving tank.

Steam pressures will be obtained by special test gauges; the gauge for indicating boiler pressure will be located on the steam dome on the calorimeter pipe connection, and the gauge for branch pipe outside of smoke front, connected to branch pipe by as short a pipe as possible. The pressure gauge located in pipe from boiler or branch pipe and leading to throttling calorimeter will be read (after the other calorimeter readings have been taken) with the valve between boiler or branch pipe and calorimeter closed on account of the drop in pressure in the pipe leading to the calorimeter while the valve is open.

The barometric pressure will be measured by use of a mercurial barometer, reading being corrected for temperature, and readings in inches of mercury converted into pounds per square inch.

The draft will be measured by "U" tube draft gauges, the readings of which will be checked by recording draft gauges of an approved type.

The quality of steam in dome and branch pipe will be obtained by Peabody throttling calorimeters, provided with mercurial gauges reading to tenths of pounds, and thermometers reading to half degrees.

The quality of steam, and degrees of superheat, for the throttling-calorimeter, will be calculated as follows:

Let χ = the "quality of the steam" or the number of pounds of "dry" ("saturated") steam of the same boiler pressure per square inch and containing the same quantity of heat as one pound of steam under test. χ therefore may be greater or less than unity according as the steam is superheated or moist and equal unity when that steam is dry or saturated.

λ = Total heat of dry steam due to the absolute boiler pressure.

r = Latent heat of dry steam due to the absolute boiler pressure.

q = Heat of the liquid due to the absolute boiler pressure.

$r + q = \lambda$.

λ_1 = The "Total Heat" of dry steam due to the absolute pressure in the calorimeter.

t_1 = The temperature due to saturated steam at calorimeter pressure.

t_s = The temperature of the steam in the calorimeter in any case.

t_{s0} = The temperature of the steam in the calorimeter in case the steam in the boiler is dry.

k° = The number of degrees of superheat in case of superheated steam.

The following formula is then derived on the assumption that no heat is lost by the steam in its passage from the boiler to the calorimeter, and that 0.48 is the "Specific Heat" of steam.

$$\chi r + q = \lambda_1 + .48\ (t_s - t_1)$$

consequently, the quality of steam is

$$\chi = \frac{\lambda_1 + .48\ (t_s - t_1) - q}{r} \qquad (1)$$

The steam under test is dry (saturated) when $\chi = 1$ and in that case, t_s becoming t_{s0} as defined above,

$$t_{s0} = \frac{(r + q) - \lambda_1 + .48\ t_1}{.48} = \frac{\lambda - \lambda_1 + .48\ t_1;}{.48}$$

so that when the temperature t_s in the calorimeter is higher than t_{s0} or that due to dry steam, the steam is superheated and the number of degrees of superheat will be

$$t_s - t_{s0} = k^0,\ k^0 = t_s - \frac{\lambda - \lambda_1 + .48\ t_1}{.48} = \frac{\lambda_1 + .48\ (t_s - t_1) - \lambda}{.48} = \frac{(\chi - 1)\ r}{.48} \qquad (2)$$

When the temperature in the calorimeter is less than t_{s0} the priming is $(1 - \chi)$, χ being found as per formula above given. If, however, t_s drops to t_1, the limit of the calorimeter is reached and $\chi = \chi_0 = \frac{\lambda_1 - q}{r}$ at most, and the priming $(1 - \chi_0) = 1 - \frac{\lambda_1 - q}{r} = \frac{\lambda - \lambda_1}{r}$ at least.

Therefore, for any case here t_1 is equal to t_{s0} the priming is equal to or greater than the capacity of the calorimeter, and to determine such greater amount of priming, Carpenter's separating calorimeter, also attached to the dome on the same connection, will be used whenever the temperature in the calorimeter falls close to, or to within, say, 5° of the limit referred to.

In this case, the quality χ is determined as described by Carpenter in his "Text Book of Experimental Engineering," or as follows:

Let ω = Weight of dry steam discharged at the exhaust orifice of the calorimeter, the amount being known from calibration to agree very approximately with Napier's Rule, namely, "The flow in pounds per second" = 1-70th part of the product obtained by multiplying the pounds per square inch absolute pressure in calorimeter by the area of the orifice in square inches.

W = Weight of the water drawn from the separator of the calorimeter.

R = Weight of the water of condensation in the calorimeter, due to radiation from the same.

And if we now call W_1 the portion of W left after deducting the radiation, the weight of dry steam that would have been discharged had there been no radiation, is $\omega + R$ and the total steam and water delivered to the calorimeter is $(W_1 + R) + \omega = W + \omega$, so that

$$\chi = \frac{\omega + R}{W_1 + R + \omega} = \frac{\omega + R}{W + \omega}$$

If the radiation is neglected, $\chi = \dfrac{\omega}{W + \omega}$ .... (3)

which with the instrument provided will be considered correct, as the radiation loss is very small.

The "quality of steam" being thus determined, the "correction for quality of steam" is found as follows:

Let F = "The factor of correction for quality of steam" desired.

Let χ, λ, r and q stand for the same qualities as in the above formula for the quality of the steam.

q_1 = "Heat of the Liquid" due to the feed water, the temperature of which will be observed.

Then the amount of heat actually added to each pound of feed water, making steam of quantity χ, is

$\chi\lambda + (1 - \chi)\ q - q_1$ or

$\chi\ (\lambda - q_1) + (1 - \chi)\ (q - q_1)$ and $(\lambda - q_1)$

is the amount of heat that would have been required by each pound of the same feed water to make dry steam at same pressure.

Consequently, the amount of dry steam equivalent to one pound of the actual mixture (i. e., the amount of dry steam requiring for its generation the same supply of heat as that actually supplied to each pound of feed water) is

$$F = \frac{\lambda + \chi\ (1 - \chi)\ q - q_1}{\lambda - q_1} = \frac{\chi\ (\lambda - q_1) + (1 - \chi)\ (q - q_1)}{\lambda - q_1} =$$

$$\chi + (1 - \chi)\frac{q - q_1}{\lambda - q_1} \qquad (4)$$

Formula (3) is the general one for F and may be used in any case; but when the steam is superheated, χ is greater than unity, consequently more convenient will be

$$F = \chi - (\chi - 1)\frac{q - q_1}{\lambda - q_1} \qquad (4a),$$

and as the degrees of superheat are known from the formula (2) for degrees of superheat, the simpler formula

$$F = 1 + \frac{.48\ k^\circ}{\lambda - q_1} \qquad (4b)$$

may be used, that is of the formulae (4), (4a), and (4b) each one gives the same value for "the factor F of correction for quality of steam."

In case observations are made of the actual temperature T and of the pressure p of the superheated steam itself, the degrees of superheat will be more directly obtained by subtracting from this T the t given in Peabody's steam tables corresponding to the pressure p. The valve of F in that case is also more directly obtained from

$$F = \frac{(\lambda - q_1) + .48k^\circ}{\lambda - q_1} = 1 + \frac{.48k^\circ}{\lambda - q_1} \qquad (5)$$

as already given.

All coal used will be furnished by one mine throughout the entire period of the tests, precautions being taken to have it as uniform as possible.

The coal will be brought to the testing plant loaded in boxes containing approximately 1,000 pounds. These boxes will be moved by the traveling crane, as needed, to a calibrated platform scale, weighed, and the coal box moved to firing platform and the coal dumped. After dumping and before sprinkling, if this is necessary, a small sample will be taken and placed in a covered box, so located that the coal contained will not be exposed to heat. The empty box will then be weighed on the platform scale, and the difference of the gross and tare weights so obtained will give the coal used; the amount set aside as sample being subtracted from the total coal charged to the boiler. The amount of water used in sprinkling coal will be noted and correction made if necessary.

The coal taken as a sample will be crushed to the size of an almond, and reduced, by quartering, to about fifteen pounds weight. The latter will be weighed on an accurate balance, and dried by an electric heater until loss of weight ceases; the loss in weight will be considered as the moisture contained in the coal as fired.

The total dry coal fired will be obtained by deducting from the total coal fired the weight of moisture.

Both of these quantities will be found by analysis, because the draft in a locomotive firebox is so great as to draw a part of the ashes through the flues and give incorrect data if actual weights were taken. If the ash is found by analysis, the combustible must necessarily be obtained in the same manner.

The smokebox front will be cleaned at the beginning of test and at close, and the quantity of cinders which have collected during the test will be weighed by an accurate scale.

The stack, by which the smoke will be removed from the building, is provided with a deflector and a receptacle into which the sparks which strike the deflector will fall. This receptacle will be cleaned at commencement of test and at close, the sparks which have been collected during the test being carefully weighed.

The analysis of the coal will be made in accordance with the method decided on by the Committee of the American Chemical Society, and given in Volume 21, No. 12, of their journal.

The calorific value of the coal and cinders and sparks will be determined in the Thompson calorimeter.

The analysis of smokebox gases will be conducted by the use of the Orsat apparatus.

The water used by the boiler will pass through two calibrated water meters to two steel measuring tanks holding about 1,500 lbs. of water each; and from thence to a receiving tank holding about 17,000 lbs. of water.

The measuring tanks rest on calibrated platform scales, so that their capacities can be calibrated at frequent intervals, correction being made for temperature.

To obtain the total water delivered to injectors, the number of times each tank is emptied will be multiplied by their calibrated capacities at the average temperature of water during the test, and the fractional part of tank weighed out at close, added.

At the beginning of test the level of water in the boiler and receiving tank will be noted; the levels of water in both will be kept slightly below these levels during the test. At the close sufficient water will be fed into the receiving tank to restore the initial level. The level in the boiler will be noted, and when not the same as at the start, a correction will be made.

The quantities found by the measuring tanks are checked by two meters. Provision being made to catch and measure the small amount of water wasted in filling the tanks, the meter readings less this waste will be a check on the quantity delivered by the measuring tanks.

The water which escapes from the injector overflow pipes will be caught and returned to receiving tank; and no credit will be given the boiler for the rise in temperature, if any, of this water.

Great care will be taken to prevent leakage from the boiler; the air pump and steam heat throttles will be disconnected so that leakage may be detected and the throttles made tight.

Leakage tests, when necessary, will be made on boiler after close of test, due allowance being made for change of temperature of water.

The pull exerted by the locomotive will be measured by a traction dynamometer, already described in Bulletin No. 2.

The pen on the dynamometer will give a continuous record of the drawbar pull, which will be measured at ten minute intervals; the average of these measurements to the scale of springs used will give the average drawbar pull.

An integrating attachment records the square inches of the area included between the line of zero pull, or the base line, and the line of drawbar pull; this area, divided by the length of diagram will give the average height and provides a check for the mean height obtained in the method first described.

The maximum and minimum drawbar bull will be found by measuring the diagram after the test, or will be registered by an automatic attachment.

The per cents of stroke, at which cutoff, release, and beginning of compression take place, will be determined by locating on each card the points at which these events occur. This will be done by the same method throughout the entire series of tests.

The length of each indicator card will be measured and an average obtained for cards from each end of each cylinder; the length of stroke up to the time cutoff takes place will be measured and averaged in a similar manner. The percentage that this average length of cutoff forms of the average length of card, will be the result on the data sheet. The per cents of stroke at which the other events mentioned, take place, will be calculated in a similar manner.

The points showing the events of the stroke on indicator card at which pressures are measured, are described in the preceding paragraph, with the exception of the point representing the initial pressure which also will be measured.

The pressures of steam corresponding with the several events of stroke in cylinder, as shown by the indicator card, will be measured by appropriate scale, and the results for each end of each cylinder averaged for each event. The average thus obtained will be corrected for the error of the spring under the conditions and pressure—i. e., whether under increasing or decreasing pressure.

Indicator cards will be taken from indicator on steam chest, the pressure given is the average pressure of these cards.

The least back pressure will be measured and the results averaged.

The exact location on the card of the point of least back pressure will vary somewhat on different cards of the same test, but the least back pressure will be taken without regard to exact location.

SUMMARY OF AVERAGE RESULTS.

Boiler.

The "moist steam per hour" is the average water evaporated by boiler per hour uncorrected for moisture in steam, while "dry steam per hour" is corrected for moisture by multiplying the moist steam per hour by the "factor (F) of correction for quality of steam."

The equivalent evaporation from and at 212 degrees, pounds per hour, is found by multiplying the dry steam per hour by the factor of evaporation.

The factor of evaporation $= \dfrac{\lambda - q_1}{965.8}$ when

λ = total heat of steam at observed pressure.

q_1 = heat of feed-water at observed temperature.

The equivalent evaporation from and at 212 degrees, per pound of coal as fired, is found by dividing the equivalent evaporation per hour by the weight per hour of coal as fired.

The equivalent evaporation from and at 212 degrees, per pound of dry coal, is found by dividing the equivalent evaporation per hour by the weight per hour of dry coal.

The equivalent evaporation per pound of cumbustible is found by dividing the equivalent evaporation per hour by the weight per hour of combustible.

The boiler horse power will be found by dividing the equivalent evaporation per hour by 34.5.

The efficiency of the boiler is found by multiplying the equivalent evaporation per pound of dry coal by 965.8, and dividing the product by the number of thermal units in one pound of dry coal.

No credit is given the boiler for heat units used in evaporating moisture contained in fuel as fired.

Engines.

All indicator cards will be integrated twice by different computers.

After the average mean effective pressure of the indicator cards for each end of each cylinder has been ascertained, the card most nearly approximating the average will be selected to represent the test. In case these cards are subject to correction, resulting from a calibration of the indicator spring, the following method will be used:

Vertical lines dividing the length of card into ten or twelve equal parts will be drawn. At the points where these lines intersect the lines of the card, the card will be corrected (correction curves having been made for each spring); if an increasing pressure, for the error of the spring under similar conditions; if descending, in like manner. A new card will be drawn through the points thus located and the relation of the area of the rectified to the actual card will give a factor which will be used in finding the corrected M. E. P.

The corrected average area of card, divided by the average length of card, and multiplied by the scale of spring used, will give the mean effective pressure.

Receiver pressure on compound locomotives, will be observed by gauges attached as closely as possible to the receivers.

The number of expansions, for simple locomotives, will be found by dividing the volume at release plus the volume of clearance, by the volume at cutoff plus the volume of clearance. For head end of right cylinder, on simple locomotives,

Number of expansions = Release, per cent of stroke + clearance, per cent of piston displacement, divided by cutoff per cent of stroke + clearance, per cent of piston displacement.

The formula for the other items are similar in form, with the corresponding per cents of stroke substituted.

For compound locomotives, the form of the expression used is as follows, but until the path followed by the steam is known for each locomotive, formula cannot be given.

$$\frac{\text{Vol. at Release, L. P. Cylinder + Vol. of Clearance, L. P. C.}}{\text{Vol. at Cutoff, H. P. Cylinder + Vol. of Clearance, H. P. C.}}$$

The Indicated Horse Power is found by multiplying together the I. H. P. constant, the average revolutions per minute and the mean effective pressure.

The dry steam per Indicated Horse Power per hour is found by dividing the dry steam per hour less the steam used by calorimeters or other instruments, by the total Indicated Horse Power.

The B. T. U. per I. H. P. per hour is found by multiplying the dry coal per I. H. P. per hour by the calorific power of one pound of dry coal.

Locomotive.

The dynamometer horsepower is found by multiplying together the D. H. P. contant, the average revolutions per minute, and the average drawbar pull.

The pounds of coal, steam and B. T. U. per D. H. P. per hour are found in the same manner as the corresponding items for indicated horsepower hour.

The number of foot pounds is found by multiplying together the average drawbar pull, the average circumference of the driving wheels in feet and the total revolutions.

As the coal, steam, etc., have been reduced to hourly quantities, for convenience the product obtained by the multiplication in the preceding paragraph, will be divided by the duration of tests in hours.

Since the I. H. P. has already been determined from the mean effective pressure as a basis, the tractive force T can most conveniently be obtained by formula as follows:

$$T = \frac{33{,}000 \times \text{total I. H. P.}}{\text{circumference of drivers} \times \text{revolutions per minute.}}$$

The machine friction of locomotive in terms of horsepower, is the difference between the average indicated horsepower and the average dynamometer horsepower. This does not take into account the friction due to engine truck and trailing wheels and axles.

The machine friction in terms of pounds mean effective pressure, for simple engines will be taken as the machine friction in horsepower, divided by the average horsepower constant and the average revolutions per minute.

The machine friction in terms of pounds drawbar pull is the frictional horsepower, multiplied by 33,000 to convert it into foot pounds, divided by the distance in feet per minute.

The machine efficiency of locomotive in per cent will be taken as 100 times the ratio of the D. H. P.

Efficiency of locomotive will be found by dividing the heat equivalent of one horsepower for one hour, by the B. T. U. per dynamometer horsepower shown by test. This quantity multiplied by 100 will be the efficiency in per cent.

$$\text{Efficiency of locomotive per cent} = \frac{254{,}498.7}{\text{B.T.U.perD.H.P.per hour.}}$$

CALIBRATION OF INSTRUMENTS.

Indicators.

An approved type of inside spring steam engine indicator has been purchased.

Indicator springs have been tested on steam drum with automatic dead weight valve, in which the volume of the steam remains practically constant, and the pressure may be varied by changing the weights on the valve.

Each spring has been tested, and the errors noted both for ascending and descending pressures at intervals of ten pounds throughout the range of the spring. These tests will be repeated at intervals of one week throughout the period of the tests, unless by reason of unsatisfactory results it is found necessary to make tests at shorter intervals.

All indicators have been tested for parallelism of pencil movement, by removing the spring, and pushing the pencil to the top of card and allowing it to fall, at several points on the circumference of the drum.

The perpendicularity of these vertical lines to the longitudinal line drawn by revolving the drum with the pencil motion in its lowest position, and the parallelism of the vertical lines to each other show the correctness of the parallelism of the pencil movement.

The parallelism of the piston movement to the drum axis with the spring in place was determined by verifying the angle between the atmospheric line and a steam line made with the drum at rest.

By the use of a device similar to the Brown drum spring testing device diagrams for various tensions of drum springs have been obtained, and before each test diagrams of the drum spring tension for each indicator will be taken and the tension adjusted to give the best results at the speed at which test is to be run.

The influence of the inertia of the moving parts of the indicators has been ascertained by taking cards at very slow speeds, and others at the highest speed which will be attained; the difference in length of the card shows the influence of inertia.

Steam Gauges.

All steam gauges have been tested at intervals of ten pounds on dead weight gauge tester, and errors noted both for increasing and decreasing pressures. The recording steam gauge has been tested in the same way; no readings being taken unless piston of tester was revolving.

Steam Calorimeters.

A design of throttling-calorimeter, which has been approved by Prof. Peabody, and which is essentially a Peabody calorimeter has been made and three calorimeters were manufactured on this design.

The calorimeters have been tested to a water pressure of four hundred pounds, and made tight at that pressure.

Removable orifices have been provided, which will deliver about two hundred pounds of steam per hour; the diameters of the eleven sizes of orifices being appropriate for pressures ranging from 180 to 250 pounds. The deliveries of these orifices have been carefully calibrated by a coil condenser; all the steam passing through calorimeter being condensed and weighed.

The calorimeters are lagged with an asbestos cover, 2½ inches of hair felt and a casing of Russia iron outside of the hair felt.

No correction will be made for radiation from the calorimeter.

Weighing Scales.

Standard weights have been provided with which all scales will be tested at intervals of one month, or oftener, if the results indicate the necessity for more frequent tests.

Water Meters.

Both water meters have been tested by passing water through them, and weighing the water, and observing the temperature.

Tests have been made at rates of flow varying from 3 to 15 cubic feet per minute, both for intermittent and continuous flows.

The correction factor, for the average rate of flow during the test, will be used in comparing the results of metering and weighing the feed water.

Pyrometer.

The pyrometers for measuring firebox and smokebox temperatures consist of thermo couples each couple being composed of a junction of platinum with platinum-rhodium wire, forming the pyrometer Le Chatelier.

The temperature reading is obtained by means of a millivoltmeter showing the electromotive force set up in the thermo couple, when heat is applied. The couples and millivoltmeter have been compared with the official standards of the Bureau of Standards at Washington, D. C., and all temperature readings will be corrected by reference to their certificate.

Thermometers.

Thermometers have been provided as follows:
Six, reading from 0 to 212 F. for feed water.
Ten, reading from 0 to 400 F. for calorimeters.
Six, reading from 0 to 600 F. for calorimeters.
Four, reading from 0 to 550 C. for smokebox.

Of these thermometers, two of each kind have been calibrated at a number of points throughout their respective ranges, by the Bureau of Standards, Washington, D. C., and these certified thermometers will be recalibrated at intervals and will be used as standards for the determination of the errors of all other thermometers used.

Barometer.

For observation of the atmospheric pressure a mercurial barometer will be used. This instrument has been calibrated by the Bureau of Standards, Washington, D. C., and a curve of true pressure has been plotted which will be used to correct all readings.

Draft Gauges.

"U" tube gauges containing water will be used to obtain the smokebox, firebox and ash pan pressures. These gauges have been tested by the Bureau of Standards, Washington, D. C., for accuracy of graduation of scales and uniformity of bore of tubes. These corrections have been plotted and will be applied to all readings.

To measure the lower pressures in the calorimeters single tube mercury pressure gauges will be used. These gauges have a range from 0 to 7 pounds per square inch and have been tested by the Bureau of Standards at Washington, D. C., for accuracy of scale readings and uniformity of bore of tube, and the plotted curve of tests will be used to correct all readings.

Coal Calorimeter.

The calorimeter to be used is the Wm. Thompson calorimeter with some slight modifications to facilitate working and output. This calorimeter has been standardized by testing in it two samples of coal which were previously tested in ten different bomb calorimeters, including a test in the bomb calorimeter at the Bureau of Standards, Washington, D. C. The mean of these ten determinations is taken as representing the heat units in these two coals, and these coals when tested in the Thompson calorimeter, enable it to be standardized so as to give results the same as the bomb calorimeter. Furthermore, a sufficient amount of these two coals has been prepared so that the Thompson calorimeter can be frequently checked. It also provides a means of ready standardization, in case of accident to any of the parts of the Thompson calorimeter, or in case of getting a new instrument complete.

Orsat Apparatus for Analysis of Smoke Stack Gases.

The Orsat apparatus to be used in analyzing the smokebox gases has had its measuring pipette carefully calibrated by filling with water at room temperature, and then weighing this water as a whole and in successive portions corresponding to the graduations on the measuring pipette. The necessary corrections, where any were found requisite, will be used in reading the percentages from the measuring pipette.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. A. Portrait Gallery

JOHN STOCKS.

The portrait in our January issue was rather a libel on the successor of Edward Hartshorn at the Maine Central shops at Waterville, being taken a dozen years ago. In this issue appears an up-to-date likeness of an up-to-date foreman painter, which we gladly insert to square accounts, as the

Mr. John Stocks.

other was used in a hurry without his consent. The reader is referred to the January issue for a sketch of Mr. Stocks' career. "Jack" hopes to meet with us at Atlantic City and there join our association. We hereby introduce him to all "the boys" as one of our shop "cubs," trusting that they will see that he is properly initiated.

The Late Report of Special Committee on Locomotive Painting

CHAIRMAN DANE EXPLAINS.

Editor Railroad Paint Shop:

I notice in the report of the Committee on Locomotive Painting, published in the July number of the Railway Master Mechanic (page 311), under suggestion "Eighth"—"In the way of labor-saving appliances and facilities we would recommend," etc., the item: "The material-saving paint sprayer" appears. This item certainly did not appear in the copy which I furnished you for publication. It did appear in the advance sheet of subjects issued by the Master Mechanics' Association, it having been unauthoritatively inserted in the report by Mr. Quest, after the majority of the committee had signed, and was accidentally mailed to the secretary of the Master Mechanics' Association without being eliminated by the chairman of the committee.

The paint sprayer was a subject of some discussion at the first meeting at which I was unavoidably absent by sickness, and a paragraph relating to this subject was conceded to Mr. Quest. After reading the report of this meeting by the committee then present, as chairman of the committee, I called a second meeting, as it was my opinion that this and some other matters that had been omitted should be thoroughly threshed out. At the second meeting I strongly objected to the subject of the paint sprayer being mentioned in the report, but out of deference to Mr. Quest's absence the committee courteously allowed it to remain.

"Favorable conditions" do not exist in a locomotive repair shop for paint spraying. It takes longer to clean and prepare the surface for painting than it does to paint an engine, and if the air that it would take for a sprayer was utilized in a sand-blast, economy might be spoken of; but the waste of material and the waste of time expended in "getting ready" to use a sprayer and cleaning the apparatus, and cleaning paint from parts not to be painted, shows an extravagance wholly uncalled for and which would not be tolerated by any up-to-date management of a railroad repair shop.

It was for these reasons we did not recommend the paint sprayer as an economical appliance in the painting of locomotives. I have nothing to say outside of my personal experience in thoroughly testing its practicability in locomotive painting. The results obtained satisfied me that it was not only impracticable but extravagant in labor and material.

I think Mr. Quest exceeded his authority even as a member of the committee by inserting above the names of three of the committee, especially when he knew that his insertion would be objectionable to those who had signed. The most reasonable manner, to say the least, would have been to inform the chairman by letter of his desire for the addition to be made, or refuse to sign the report. His action supplied a chance for an accident (which happened) for an article objectionable to the majority of the committee to enter the report, one which they could not conscientiously sign, having already expressed an adverse opinion to their respective officials in relation to this subject and placing them by such action in a farcical and unenviable position.

I am very sorry that anything occurred to mar the otherwise complete and satisfactory report, but being unusually busy and anxious to hurry the report to its final destination, I unintentionally allowed the insertion to pass me, fully believing I had passed a blue pencil through the insertion. But having done all in my power, as I thought, in righting the matter at Saratoga, I was astonished to find the "same flea" in our own department. Please correct, as it does not appear in the original official report of the Master Mechanics' Association publication, and as I have received strong letters of protest from Messrs. Miller and Wright on the subject and demanding that this correction be made in the August issue of our official organ, which is no more than right.

Yours respectfully,
A. P. Dane,
Chairman of Committee.

The foregoing communication from Mr. A. P. Dane makes it incumbent upon the editor of the Railway Master Mechanic to explain an error occurring in the report of the special committee on locomotive painting, presented by a committee of the Master Car and Locomotive Painters' Association, before the last convention of the American Railway Master Mechanics' Association. This error occurs in section eight of the report, under the head of labor-saving appliances and facilities. The report as presented in the July issue includes "the material saving paint sprayer." The report received at the office of publication from the editor of the "Railroad Paint Shop" did not mention this device. The advance copy of the proceedings of the Master Mechanics' Association contained this line, and in reading proof, during the preparation for press, the proof reader compared the official report with that received from the Master Mechanics' Association, and noticing the omission of this line, inserted it as a correction.

Editor, Railway Master Mechanic.

Spigot Wisdom and Bunghole Foolishness

Almost all railroads are more or less blessed (?) with the above-named traits in combination from the top to the bottom of their management. They watch for the occasional drop from the spigot, and give it another twist to stop it, while there is that going into the bunghole and out, which they do not see, that amounts to infinitely more importance. In other words, to use a Scriptural phrase, they "strain at a gnat and swallow a camel." They can see an ant crawling uphill, while their backs are turned and their ears are deaf to the locomotive going down to the scrap heap. They will consent to be bled so long as they do not see the blood They would not miss a quart of blood taken from their veins without their knowing it, but would whoop like savages to see a drop from the scratch of a pin. In other words, never mind what a thing costs so long as it does not show on paper! Dollars may come and dollars may go, if they come and go in any other way except by bills presented to be paid. What mortal dread some have of finance expressed in a little black ink out of the regular routine! A good-sized brook may be included in a river unnoticed, but the merest rivulet trickling along separately is dammed quicker than lightning. (N. B.—This is not profanity.) It is funny how much a man will allow himself to be deceived, or the road he is supposed to represent, when he would kick like a Texas steer if one undertook to deceive him or to get the best of him with relation to his personal business or private matters. Business is business with him in the things he must pay out of his own pocket, but business is too often politics with the road whose interests he is hired to safeguard.

We need not particularize here. The avenues of extravagance or of economy are too well known to most railroad men of sense to need the index finger to be pointed at them. Those who have long been in the mechanical departments know what things cost and their worth regardless of bills presented. Dollar articles are not obtained for fifty cents, except of benefactors and others looking for a return investment. Dollar articles are not made in the shops for fifty cents either, except that the other fifty cents is in passenger, freight car or locomotive repairs, similarly as the drummer's suit of clothes were in his expense account—charged as something else. If men managing railroads know a spade when they see it and will call a spade a spade all through the game and stick to it, they would be more likely to win in the long run and save themselves a lot of trouble in trying to do what they cannot do—deceive others who know as much about these things as do they.

An Important Ingredient

An important ingredient too often left out in mixing primers and surfacers for painting passenger equipment, and one we are sorry to say too scarce in many paint shops, is brains. That is, we mean in mixing them so they will stay on the wood a reasonable length of time and wear as they ought to. As you look at a car that has been painted only three or four years and behold the peeled paint, with the bare wood showing its teeth at you, you are reminded of the words of Whittier:

> "Of all sad words of tongue or pen,
> The saddest are these—It might have been."

It might easily have been painted to last three or four times as long and without any of these results, if brains had been mixed with the primer and surfacer.

Well, says one, do not our primers and surfacers come to us all mixed ready for use? Yes, they come in cans, but too often that important ingredient before referred to is left out. Brains says that lead and oil, colored with suitable pigment, is the best primer for passenger equipment constructed of wood; and if it is evident that none of these ingredients are in the primer, when it comes, then they should be put in in liberal quantities, especially the best Dutch process keg lead. Transparent primers of a resinous or varnish-like nature are all right for some purposes; but they are not for the wood, and especially when thinned with turpentine to work easy, as is too often the case, until the nature and toughness and adhesion of such a primer is killed by this practice until its strength of fibre to cling to that which it is applied is weakened or destroyed. Lead added gives more adhesion to any such primer. Then it may be tinted with lampblack to a slate color; and that lampblack also imparts tenacity to it. Then best linseed oil—all the new wood will take in—should be added. If one will build upon this foundation properly with the right-surfacers he will not be pained to see his work go to pieces before a reasonable length of service.

A Visit to a Fellow Associate, and His New Device

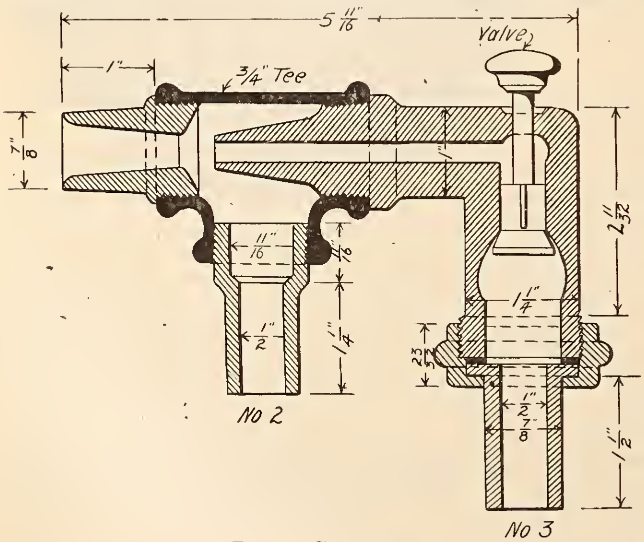
Mr. A. P. Dane, of the B. & M.'s Boston locomotive shop, and the writer recently called on the veteran "Sam" Brown at the Roxbury shop of the New Haven road; and, after the usual exchange of courtesies, and the comparison of notes that painters always will make about their business when together on any occasion short of a funeral, we were invited out to Sam's home to see a section of a new car painter's scaffolding that he has lately devised and has in operation in his stable. It came about, so "Sam" says, that one Sunday morning when perhaps he ought to have arisen and gone to church with other good folks, he, refreshed by a good night's sleep, lay there and thought out this device for the benefit of the craft. After seeing this device in successful operation we are inclined to think he did well to let theology go that morning and let phosphorescence work his brains along the lines which it did. We think "Sam" has solved a vaxatious problem and will have "the best thing out" when he gets it into actual use. It is entirely of metal, except the plank upon which the painter sits or stands to do his work, and requires no pins, links or anything else to fasten it at any given height; just let go the hoisting device and it is all ready to get on to go to work and the whole thing must break down before it will slip its hold to drop. That troublesome thing, usually not thought of by the architect, of having the shop posts put in at the right distance away from the car to rig the orginary stage thereto, is all solved by this unique device. It is being protected by letters patent so that we are not at liberty to describe it here, but he hopes to be able to come to the Atlantic City convention and bring a perfected and improved model of it with him, therefore a description of it here would also be unnecessary.

"Sam" Brown, as is well known to fellow members of the M. C. & L. P. A., earned the sobriquet of "Shellac" Brown by his defense of that much misunderstood material at our Boston convention, fourteen years ago. This is the first opportunity the writer ever had of proving some of "Sam's statements. He was shown a seat in his toliet room (that has been referred to in convention) that was finished in shellac over a corn starch filler fourteen years ago, with no other material applied over it since, and it is in a good state of preservation yet!—in a much better state than a new one of the writer's put in less than two years ago. To all who know the effect of ammonia from urine upon varnish in closets in cars this ought to be of interest. Moreover, we were shown —what we never dreamed before could be reasonably done with safety—graining in the front hall that was finished in shellac over it instead of varnish, and it was looking well, having been rubbed down with pumice and oil. There was a twinkle in "Sam's" eye, of course, when he showed us these things and talked "shellac" again, which we have not heard him mention for sometime, thinking possibly it was a "chestnut," we suppose, or his associates might think him a crank or gone daft over it. Altogether, three fellow members of the M. C. & L. P. A. spent a profitable and enjoyable afternoon together talking business.

A New Paint Sprayer

To the Editor:

I enclose herewith a blue print drawing of a paint sprayer, which among various other useful shop tools and appliances was originated by our versatile master mechanic, Mr. J. F. Enright, and I am indebted to him for the privilege of publishing the same in our official organ for the benefit of the



PAINT SPRAYER.

craft. As the drawing is self-explanatory, it is unnecessary to go into details concerning it, except to say that to the front opening below the mouth of the sprayer is to be attached the suction hose, which should be about four and a half feet long, one end of which is dropped into a bucket of paint which is carried in one hand while the sprayer is operated by the other by simply pressing the valve. A large portion of our rough painting is done with this sprayer. We have recently completed the painting of the interior of our shop buildings with it, using cold water paint, and have had excellent results.

At the point marked No. 2 is to be attached a piece of hose about 4½ ft. long for a suction hose, the other end to be held in the paint bucket. At the point marked No. 3 is to be attached the air hose. To operate, simply drop one end of suction hose in paint bucket and press the valve. Should the sprayer or suction hose become clogged, press the orifice against the side of car and press the valve; by doing so it will clean out the suction hose. It is advisable to protect suction hose by wrapping lower end with a piece of coarse wire gauze to act as a strainer. The sprayer should be taken apart occasionally and cleaned out. Yours truly,

Whistler, Ala. J. H. Pitard, M. & O. R. R.

Notes and Comments

We learn that Mr. John H. Dunn has resigned his position of foreman painter of the Wilmington shops of the Pullman Company, presumably on account of a return of a former illness, as our informant mentioned a call at his residence where he was found considerably discouraged. Too bad, poor fellow. We hear him kindly spoken of.

Another new foreman painter, Mr. Albert V. Locke, took charge of the Thirty-ninth street elevated shop of the Brooklyn Heights R. R. Co., Brooklyn, N. Y., July 11th. He has about 100 men and has 74 elevated cars on the floor all the time. He was a small boy at the time the writer served an apprenticeship with his esteemed father in Lakeport, N. H., in the fall and winter of '67-'68, and has been working for Mr. Harry L. Libby at the Boston Elevated shops for a few years, who likely recommended him for this position. He hopes to get to the Atlantic City convention in September, which ought not to be difficult from that point.

"Nothing doing" is a characteristic expression that applies with fitness to New England passenger car paint shops at the present time, especially on the B. & M. There never was a time it seems when men, materials and work was at such a low ebb as now and such a Sunday air about the shops. It's positively lonesome. This is largely the case in summer every year with a large passenger carrying road to the beaches and mountains; but curtailment percipitated it earlier this year than common, as well as a summer schedule that became effective on five divisions at least a week earlier than in previous years. With an equipment 200 cars shy of being shopped and a possibility of an autumnal business running late into the fall to keep the cars in service, it indeed looks discouraging to get the equipment in shape a year hence. But "where there's a will there's a way."

The annual output of the passenger car paint shops of the Boston & Maine R. R. for the year ending June 30, 1904, is 1,355 cars, of which total number 99 were burned off, 58 painted over old paint, 64 new or resheathed, making a total of 221 cars painted throughout, striped and lettered; 1,051 were "cut in," and 228 varnished inside; 1,117 cars were cleaned "touched up," or "cut in" and varnished, and 19 copper covered cars were cleaned and renovated on the exterior and the interior woodwork, including sashes and doors, varnished; 47 cars of other lines were put through this road's shops, including 33 cars new and old for the electric road at Concord, N. H.; 191 engines and 194 tanks were painted by car department men at Springfield, Concord and Lyndonville; 3,066 cars of all classes of freight equipment were painted. The road is shy 113 cars of its passenger equipment over last year, on account of delay caused in changing couplers on 425 cars last October, November and December.

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RAILWAY MASTER MECHANIC

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PRESIDENT F. W. BRAZIER in his address before the members of the Master Car Builders' Association at their last convention at Saratoga certainly had the courage of his convictions when he suggested the consolidation of the Master Mechanic's and Master Car Builders' Associations, which he warmly advocated. After thirty-seven and thirty-eight years of separate and distinct organization, although in late years closely allied, there will in the very nature of things be an opposition to any change of the old order. There is, no doubt, with many members of both associations a disinclination to merge the individuality of their own organization with that of another body and in a sense pass out of existence. In reality it would probably be a change in name only. Still the question is not to be viewed from a sentimental or personal standpoint but as to whether the railway service of the country can be served better by one organization or two. Both associations can point with pride to their past records and to their present high standing, which perhaps for many would seem to indicate the desirability of allowing the associations to remain separate. This is an age of specialty and perhaps from that may be argued that two organizations, each in its special field, would be productive of better results.

On the other hand one association would have its advantages. The two associations combined in one would, of course, make a larger and more influential organization. Its official actions would be even more authorative than the actions of the two separate associations, the work of the two when combined in one could be more effectually carried out and it would seem that for many reasons one association properly organized might well represent all railway officials who have charge of motive power and rolling stock. Another important factor in the situation was ably presented in the address of Mr. H. H. Vreeland at the recent conventions, in which attention was called to electricity as displacing steam as a means of propulsion on our railway systems. Electric power will bring what Mr. Vreeland designates as a "hybrid combination, neither car nor locomotive" and when this comes, with it will come problems which will certainly have to be taken up jointly by the two conventions.

The membership in both associations is composed largely of the same men; the subjects considered in both conventions pertain to the duties of the master mechanic and the mechanical superintendent, the latter title on many roads being so varied as to embrace the car department as well as the motive power equipment, for instance, superintendent of motive power and rolling stock, though in most cases the head of the mechanical department is understood to supervise all car work as well as locomotive maintenance. The title of master car builder is fast disappearing, and where two departments heretofore existed the car department is being placed under the jurisdiction of the mechanical superintendent, or the superintendent of motive power, as the title may be phrased on a particular road. On some large systems where the duties of the entire mechanical department require a large executive force, the head of the department is assisted by a staff of two or more assistant superintendents, in addition to the mechanical engineer. One of these assistants is usually more or less of a specialist in car work and is called assistant superintendent of rolling stock, and again a man of this type is given the title of assistant mechanical superintendent or assistant superintendent of motive power, with the understanding that his duties relate to car work exclusively. From this viewpoint it would seem that one association called perhaps the "American Railway Mechanical Association" would be best fitted to represent those in charge of the motive power and rolling stock of American railways. Valuable time would be saved in discussing together matters of mutual interest to the car and locomotive departments and one opening exercise would do where time is now taken for two. The meetings might be presided over by a president and two vice-presidents; the office of president to be honorary and this officer preside at the opening and closing functions, while a session devoted to car interests might be presided over by one of the two vice-presidents and a session of particular interest to those more closely in touch with locomotive work be presided over by the other vice-president. With such an arrangement each vice-president would serve two years, their terms of office expiring in alternate years so that one would be advanced to the position of president every year. Later the department of electricity might be represented by a vice-president.

With some the proposition to unite the two associations is looked upon as a mistake, with others it is a step in the right direction. It is a matter which should most certainly be given the careful consideration of each individual member and the question thoroughly discussed before any change is made. Have the question well ventilated and if that is done it will either prove to be the wise course to pursue or it will, as "Bob" Burdette once said, "rapidly disintegrate upon exposure to air."

WHEN a locomotive is turned out of the shop it is, of course, desired to keep it in condition to develop its full power and hauling capacity for as long a time as possible. The duty of maintaining power between shoppings naturally devolves on the roundhouse, and because of its importance the roundhouse should not only be thoughtfully designed, but also be furnished with well selected equipment. The principal shops repair the locomotives and renew them for service, but the roundhouse force comes in constant contact with the engine, and upon it, therefore, depends much of the responsibility for getting the engine over the road and helping it to make its full mileage. Since it is very often necessary to turn the power and get it back over the division as soon as possible. Cases are constantly occurring in which a job is hurried through and put in shape for one or two runs only, when greater care would probably eliminate a recurrence of the same trouble, or possibly divert a disaster.

MR. H. I. MILLER,
GENERAL MANAGER OF THE CHICAGO, ROCK ISLAND & PACIFIC RAILWAY.

Mr. Miller was born August 18th, 1862, at Cleveland, Ohio, and was educated at Cornell University. He began his railroad career in 1880 as a clerk in the superintendent's office of the Pennsylvania Company, and has been continuously on the Pennsylvania Lines up to the time of his entering the service of the Rock Island. In 1882 he was made chief clerk, and a few months later became inspector of masonry and then assistant engineer. He was next promoted to be engineer of maintenance of way, and was in April, 1888, assigned to special duties on the Cincinnati & Richmond, which was then in process of construction. The following September he was appointed superintendent at Richmond, Ind., and in 1890 was transferred to Louisville, Ky., where he remained until 1894, when he took a similar position on the Vandalia at St. Louis. From this position he was promoted to be general manager of the Vandalia, which place he left to go to the Rock Island.

An interesting instance of such character which comes to mind is the case of an engine which came into a certain division point with the back end main rod brass broken up from running hot. The engine was wanted immediately, and for that reason thorough investigation as to the cause of failure was not made. The crank pin had not been cut, the pin was getting oil, and the brass, according to the story given by the engineer, gave no evidence of having been improperly fitted or lined. Instead of examining further as to cause, a new brass was fitted and the engine turned out. In one way it was not the roundhouse foreman's fault, for the reason that the superintendent and trainmaster were "standing over him with a stick" in order to get the engine back on the "turn." The engine arrived at the other end of the division with the new brass burned. It was again renewed with no further investigation, conditions requiring that it should be prepared for the next run as soon as possible. Five miles from its destination, when running at a high rate of speed, the engine stripped itself on the side on which the failures had occurred. As soon as a stop could be made, the engineer found the back and front end main rod brasses and crosshead key gone, the front end of main rod broken, crosshead irreparably damaged, piston and cylinder head blown out, piston rod packing completely demolished, guides sprung and main wheel center cracked through crank pin hub. Upon recovering the piston and rod, it was found that the piston rod had been working in the crosshead fit on account of a loose or poorly fitted crosshead key, with the result that the back end main rod brass was pounded hot and front end of main rod broken.

In order to keep trains moving the machinery must be kept in order, and the question might well be raised with regard to the new and heavy power, whether it would not be better to provide longer layovers in some instances and by so doing more nearly assure arrival at the other end of the division. While the older and smaller power was maintained by roundhouses equipped with a few benches and vises, the larger and up-to-date engines require a small machine shop in connection with the more isolated roundhouses and a few good machine tools in the houses approximate to division or main shops.

The facilities outside of the house also require careful consideration in reducing terminal detentions. Among these might be mentioned a turntable which can be turned quickly without the aid of eight or a dozen men; tracks so arranged in conjunction with proper location of water plugs and coal and sand handling apparatus, etc., that engines will not get blocked nor be required to travel back and forth any great distance to coal up, take water and knock out fires.

While improving the principal and division shops the roundhouse should be among the first to receive attention. The money expended on roundhouse equipment may not show in direct economy, but it will keep locomotives on the road and it is on the road that they earn interest on the investment which they represent. A few nuts tightened up or a key or bolt well fitted often prevents a large amount of grief, and so the larger and minor roundhouse repairs pay for themselves by preventing accidents which would require costly repairs if not the shopping of the engine.

The Training of Apprentices.

By John B. Phillips, Machine Foreman, A., T. & S. F. Ry., San Bernardino, Cal.

THE matter of training of apprentices is one in which I have had occasion to be interested for eight or nine years, during which time I have had from twelve to sixty boys at a time in the shops.

In receiving boys into the shop for the purpose of learning a trade, it is very essential to impress upon them, at the outset, the importance of the step they are taking. There are many boys who sign apprenticeship contracts who, if asked why they wish to learn the machinist trade, could not give an intelligent answer. They have no special desire to learn a trade, and come into the shop simply because they are influenced to do so. Sometimes such boys become good mechanics, but as a rule they prove to be of little value, and I believe that it is an injustice to both the boy and the company to retain a young man when the evidence becomes conclusive that he is not of a mechanical turn of mind. It seems hard to dismiss the boy on those grounds, and he feels that he is being mistreated, when, in reality, it is an act of kindness to let him go. I have frequently said to young men of this type, "My boy, I am interested in you, and I wish you would quit; you have now been in the shop six months—I have given you a good fair test on several different machines and you do not exhibit the qualities necessary to become a good mechanic, and I am sure you do not wish to be a poor one. You give no evidence of having a mechanical turn of mind; you break every machine that you are placed on; you ruin one-third of your work and the other two-thirds is poorly done, to say nothing of the unnecessarily long time you require to do it." These young men are bright enough in some directions and I consider it an honorable duty to dismiss them, advising them to try and seek some avenue wherein they can make life a success, and at the same time make room in the shop for boys who have a natural adaptability for the business. Such boys are not hard to find, and if a little more confidence could be placed in the judgment of the machine foreman, providing he is competent and has the ability to judge, I believe that our shops would be filled with a much better class of mechanics.

The time is fast approaching when all-around mechanics will be hard to find,—as with the lawyer and doctor, so with the mechanic, special lines for all men, all lines for no man. The specialty phase of the machinist trade has its advantages and disadvantages. This however, is not the question before us, and we will reserve it for a future time.

In regard to training or instructing apprentice boys, there are many points to consider. If the shop is large enough to support twenty-five apprentice boys on the machines, it would certainly be a matter of economy to have an instructor or demonstrator, whose duty in part would be to show and explain to the boys the thousand and one things that are new to them, instructing them first in the absolute necessity of keeping their machines well oiled. The man who has had much dealings with apprentice boys (and some men are not much better) is very familiar with that mournful cry—"My machine is stuck."

It should be the duty of the instructor to show a boy how to center or chuck his work; how to grind and set his tools; explain to him what rake and clearance means. I have seen so-called mechanics trying to turn wrought iron with negative rake, clearly demonstrating that they had been seriously neglected in apprenticeship days, if they ever had any.

The instructor should teach a boy how to caliper (each boy should have, and use, his own calipers). It is of great importance that caliper points and joints be exactly right if you wish to make accurate measurements. Don't borrow that pair of Bob's any more—you know you made a misfit the last time you used them—they were only six-inch calipers and the points were big enough for a pair of twenty-inch, and you know very well you lost ten minutes getting them set because the joint had the rickets. Do not set the calipers for a boy, let him set them and start his finishing cut, then stop the machine, check his calipers and try the work. I have proven this to be a quick way to teach a boy to caliper accurately.

Another very important feature is to early acquire a knowledge of the proper speeds and feeds that can and should be used under the varying conditions of metals worked and cutting tools used. My experience has been that the average journeyman (and I have asked a great many) cannot tell how many feet per minute the work should pass the tool, grade of work and tool both being shown. There is no excuse for such ignorance, and it indicates a lazy mind on the part of any machine hand who permits himself to go on year after year without becoming familiar with such points.

The machine foreman who is compelled to use a great many boys and is not provided with the luxury of having an instructor may profit by my experience of a few years ago. I had all of the drill press cones, lathe cones, and boring mill cones stamped with figures showing the number of revolutions the spindle would make per minute in the open belt or back gear when the belt was placed on any given cone. I then prepared tables showing how many revolutions per minute the spindle would be required to make in order to give the desired number of feet per minute on work of different diameters, and different kinds of metal. These tables were posted near each machine, and each boy was carefully instructed as to the relation which existed between the table and the machine, and if he failed to use the speed called for by the table he was without excuse and laid himself liable to a reprimand, which he usually received.

I am not familiar with the methods of eastern shops regarding the advantages given the boys to obtain technical knowledge. Every boy should know at least enough about mechanical drawing to readily understand a blue print, and where boys show an unusual development along that line it has been, and is at present, our practice to give them a three months' course in the drawing room, and submit to them practical problems such as are common to the engineer of tests. We have not a few boys who are able to take indicator cards and figure out all of the points they cover.

I believe that where a shop is large enough to employ a dozen boys that it is to the interest of the company to bring them together in a club meeting once a week, and get them interested along mechanical lines. Let some one give a talk on different phases of shop work, and then throw it open for discussion. I believe an occasional visit and talk from the general foreman and master mechanic would greatly encourage the boys and that the expense the company might go to in maintaining such a club would be small in comparison to the results derived.

The correspondence schools are, I believe, doing an excellent work. Twenty-five or thirty boys in our shops have taken out mechanical drawing courses in the different schools, and have been benefited just to the extent they have interested themselves. I do not, however, know of one boy in the history of the shop who has ever finished a course.

Special Tools in the Elkhart Shops of the L. S. & M. S. Ry.

A NUMBER of interesting special appliances and devices have been originated in the Elkhart shops of the Lake Shore & Michigan Southern Railway, to facilitate the progress of work and provide for the introduction of up-to-date methods. Tools of this nature designed for special work and home made have an important bearing upon the output of many of the older shops and their effect is felt even among those more recently constructed. In fact many machines and tools now on the market found their origin among the shop kinks originated for local purposes and conditions.

Not the least important device originated at Elkhart is the drill chuck designed to facilitate the use of high speed tool steel in connection with drill press work. This chuck is illustrated by Fig. 1, by reference to which it will be seen that the chuck is simple in both construction and operation. It provides for a drill of the simplest possible form and therefore the cheapest. This is shown to the right of the illustration and consists merely of a piece of flat, high speed steel on one end of which two lips are ground similar to the cutting edges of a twist drill. The corners of the upper end are ground as shown to locate the drill centrally in the chuck.

The chuck consists of a solid bar from the lower end of which a portion is milled to accommodate the drill, a pair of jaws to clamp the drill, a sleeve operating over a threaded surface to secure the jaws and a taper sleeve to press the lips of the chuck against the drill to steady the same. The shank of the chuck is turned to Morse standard taper and is made to fit the spindle of the drill press.

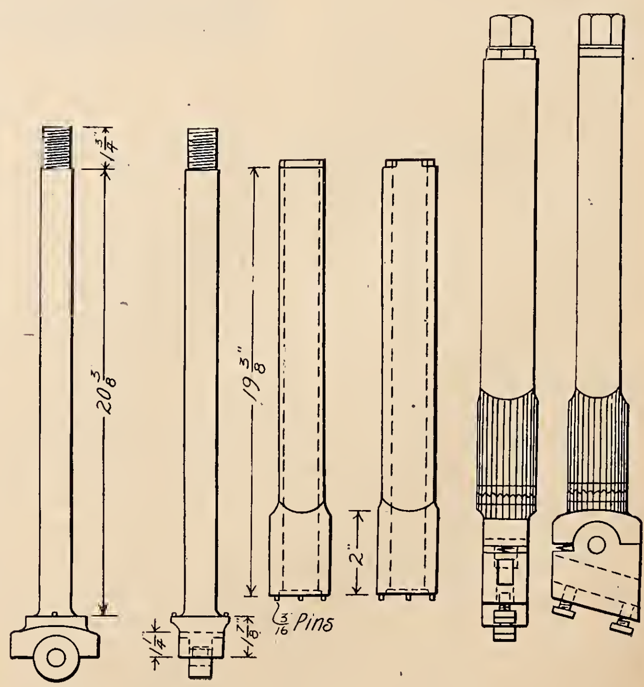


Fig. 2—Tool Holder for Slotting Machine.

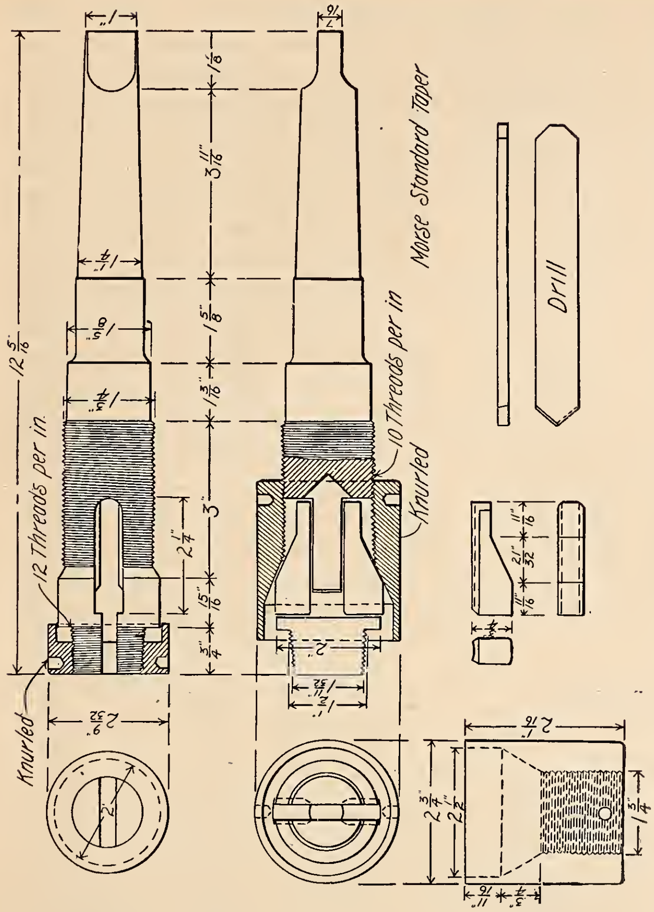


FIG. 1—DRILL CHUCK FOR HIGH SPEED TOOL STEEL.

The general arrangement of parts and their details are shown by the figure. The tool is inserted in a slot in the lower part of the chuck heretofore mentioned. The lower portion of this slot is 5-16 in. wide, an opening just sufficient to accommodate the tool. The upper portion of the slot is 9-16 in. wide to accommodate two jaws whose duty it is to hold the tool securely. The inner edges of the jaws are grooved to encompass the edges of the tool and the outer edges of the jaws are given a decided taper, as shown. To operate the jaws a sleeve having a portion tapered to correspond with the taper of the jaws works over an adjoining threaded surface, so that backing the sleeve towards the shank loosens the jaws, while running it in the opposite direction forces the jaws together thereby clamping the tool. The outer surface of the sleeve is knurled to provide a purchase while turning the same with the fingers and holes are also provided to accommodate a spanner wrench. The inner surface is chased with 10 threads per inch.

The extreme lower portion of the chuck, for a distance of ¾ in., is slightly tapered and provided with 12 threads per inch. A sleeve operates over this surface by means of which the lips of the slot are drawn towards each other and against the surface of the drill to steady its lower portion. The threads on the surfaces of these portions are left handed so that the motion of the chuck will not tend to loosen the sleeve. The outer surface of this sleeve also is knurled and provided with holes for a spanner wrench.

Any one who has operated a slotting machine can appreciate the value of a tool holder so arranged that the tool will not drag against the work on the upward or return stroke to such an extent as to ruin the cutting edge of the tool. Fig. 2 illustrates a tool holder designed for this purpose which meets the requirement very satisfactorily. The holder is free to swing about a fixed pivot, against the force exerted by a light spring. When the tool is not in operation the spring maintains the holder in the position shown in the drawing and while the tool is cutting, the pressure exerted by the tool against the work maintains the holder in the same position. On the return stroke, as the tool drags against the work, the spring is compressed lightly so that the pressure of the spring alone causes the tool to bear and this pressure is not so great as to injure the cutting edge of the tool. A noticeable feature of advantage in this design is the arrangement by which the tool is set at an angle and not parallel to the bed of the slotter. By so setting the tool it is not necessary to grind a rake on the top face of the tool, or what in this case would be really the bottom

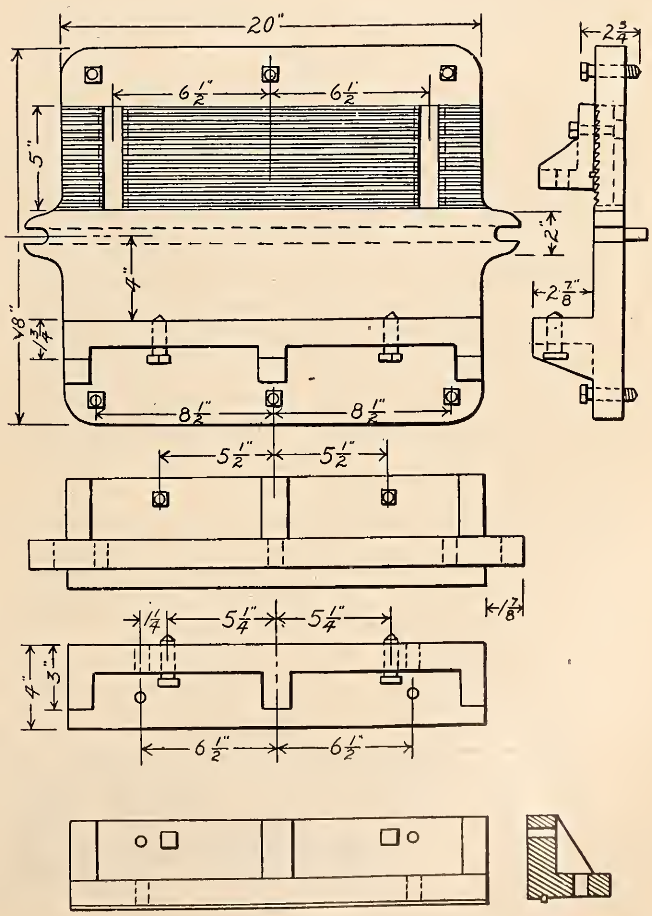


FIG. 3— PLANER CHUCK FOR SHOES AND WEDGES.

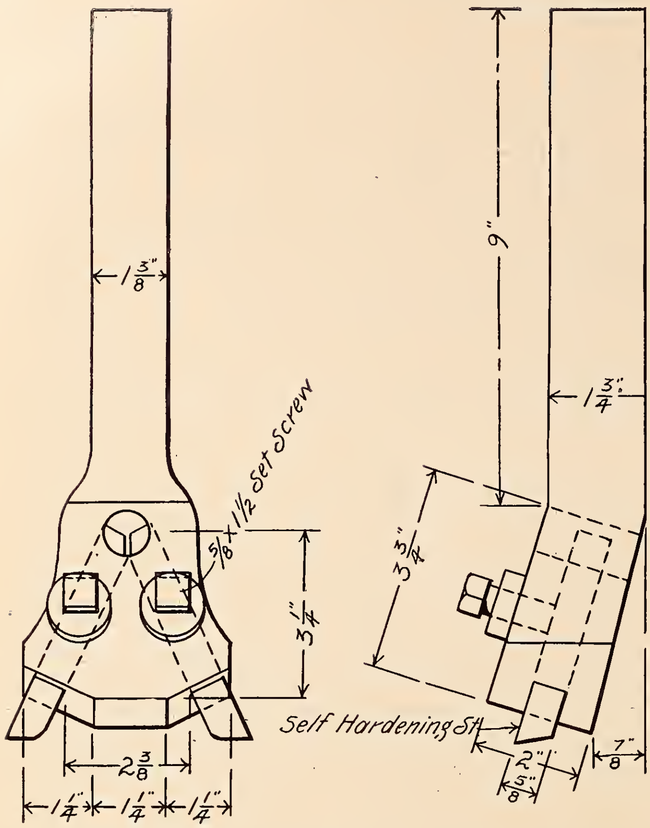


Fig. 4—Tool Holder Used in Planing Shoes and Wedges.

face, but merely grind the necessary clearance on the front face. In order that the tool may be set at any desired angle, laterally, the bottom portion of the holder is arranged to be adjustable. To provide for this the bottom portion is attached to the tool post bar by a bolt extending through the same, and terminating in a nut at its upper end. The coincident surfaces between the holder and the tool post bar are provided with teeth so that when the holder is adjusted at a desired angle and so bolted it is impossible for the holder to change its position. The construction and the several details of parts of this tool are presented by the accomanying illustration.

Fig. 3 illustrates a planer chuck for use in planing the faces of driving box shoes and wedges. This chuck is bolted to the planer bed in the usual manner by means of the lugs appearing in each end of the chuck and coincident with the center line. One side of the chuck is made adjustable so that its width may be varied to accommodate the several sizes of shoes and wedges on the different classes of locomotives. This arrangement is clearly shown by the accompanying line drawing. An interesting feature of this chuck is the arrangement by which the shoes or wedges may be readily adjusted according to the marks by which they are to be planed. This is done by means of six set screws extending through the bottom of the chuck, three of which are located on a flange on each side. In the center of the chuck is a ¾-in. strip which acts as a pivot, and by adjusting the set screws at the sides the face of the shoe or wedge can be brought to the proper adjustment.

To save time in planing shoes and wedges a special tool holder of the form shown by Fig. 4 is used in order that two tools may be operated at the same time. It will be noticed that the form of this holder is such that the tools are located on an angle with the vertical, thus obviating the necessity of grinding a rake on the top face.

A mandrel for driving box brasses is illustrated by Fig. 5, which clearly shows the construction of the device and the manner of attaching the crown brass. The brass is clamped by two collars on the mandrel, one of which is solid and the second operates over a threaded surface and is firmly secured by a lock nut. The brass is further braced by six set screws, two of which extend entirely through the mandrel supporting the brass along the center line and the other four extend part way through the mandrel, each outer end terminating in a point to engage the inner surface of the brass and prevent it from slipping. It is obvious that after one brass has been turned, other brasses of the same size can be turned without adjusting.

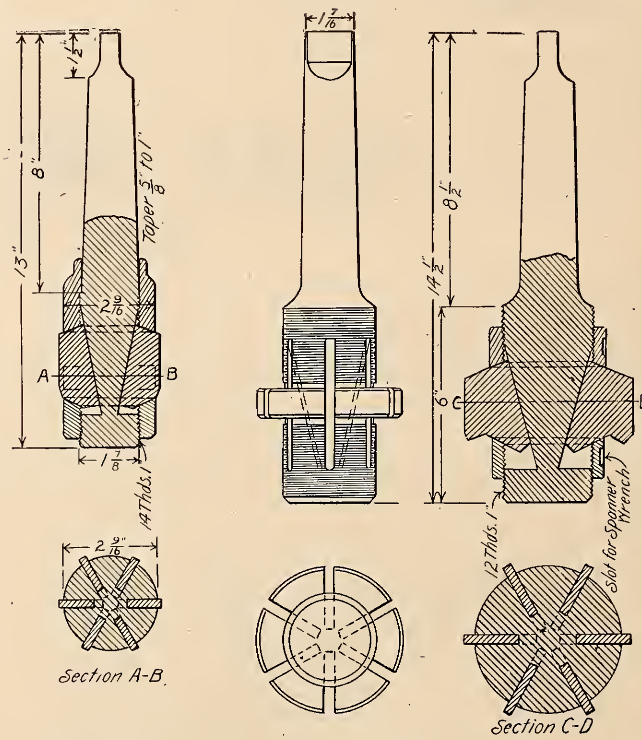


Fig. 6—Rod Bushing Reamers.

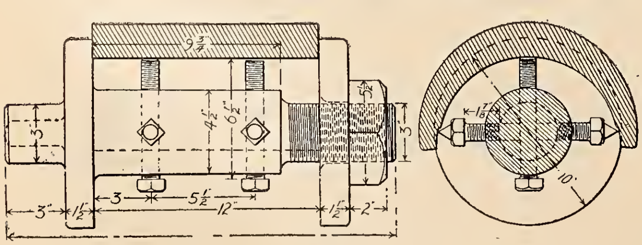


Fig. 5—Mandrel for Turning Crown Brasses.

A design for rod bushing reamers is represented by Fig. 6. The illustration shows two reamers operating on the same principle, yet using cutting blades of slightly different forms. The reamer consists of a solid bar of the form shown by the centre drawing, in which six slots are milled to accommodate as many cutting blades and two sleeves operating over threaded surfaces which adjust the blades. The bottom of the slots are tapered as shown by the dotted lines in the centre drawing, and by the two sectional views. The inner surface of each blade is formed to correspond to this taper so that when it is in contact with the bottom of the slot, the outer surface will be parallel with the centre line of the tool.

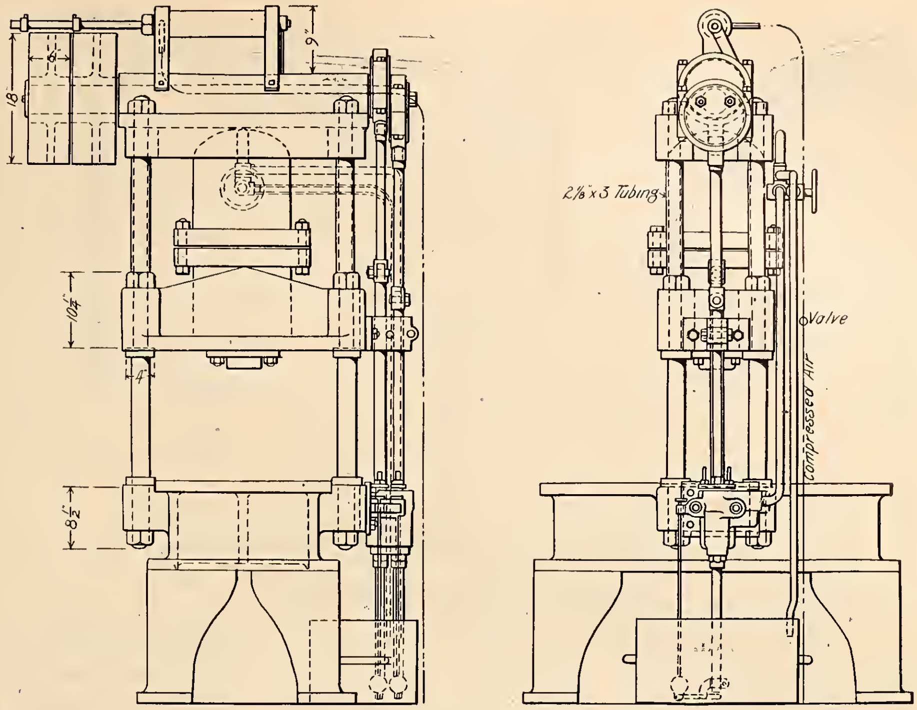


Fig. 7—Hydraulic Brass Press with Pneumatic Belt Shifter.

A collar located between the two threaded surfaces forms a backing for the several blades and relieves them of much of the strain. The position of the blades with regard to the tapered surfaces determines the diameter C across the blades. By adjusting the two sleeves, the blades may be raised or lowered, thus arranging this diameter as desired. Slots are provided in the sleeves to accommodate a spanner wrench and the blades may be adjusted securely.

In a recent issue we illustrated an hydraulic brass press installed in the Collinwood shop, which receives its power from the accumulator in the boiler shop. We now present the general outline of a 30-ton hydraulic press for rod bushings and driving box brasses for use in a shop which has no accumulator. The same design is used for both presses except that the parts of the latter are larger and more massive. The press operates on the same principle as the hydraulic wheel press and there is nothing unusual in its design with the exception of the belt shifter which is operated by compressed air. The details of this shifter are presented in Fig. 8 which clearly illustrates its operation. The shaft carrying the shifter arms is operated by a piston working within a cylinder supported by cast iron pedestals located on top of the machine. The piston operates against a coiled spring which returns the shifter to its normal position when the air admitted behind the piston to move the same has been released. A stop of steel tubing is located within the cylinder to prevent the piston from traveling beyond the required distance. The valve in the air connection controlling the shifter is located within easy reach of the operator and the operation of the belt by this method has proven very satisfactory in every particular.

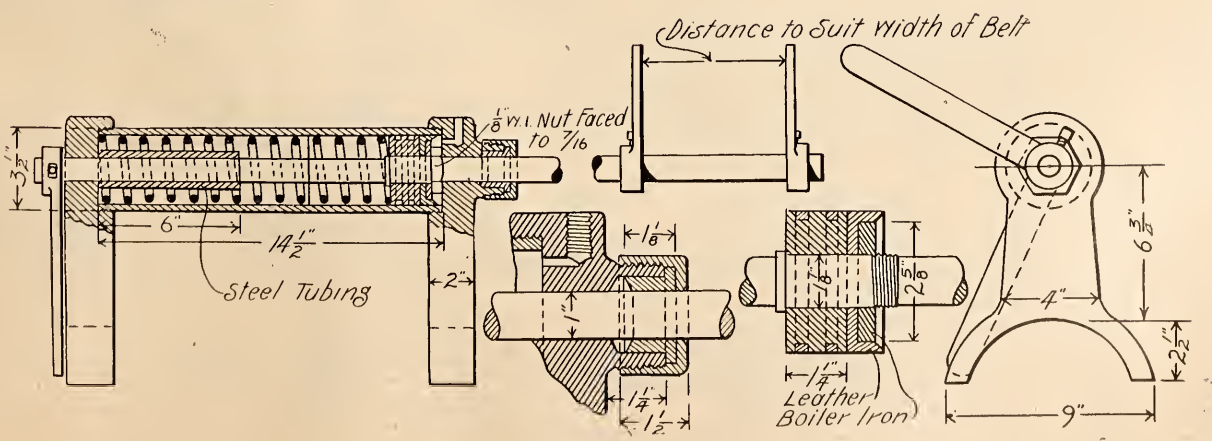


Fig. 8—Pneumatic Belt Shifter.

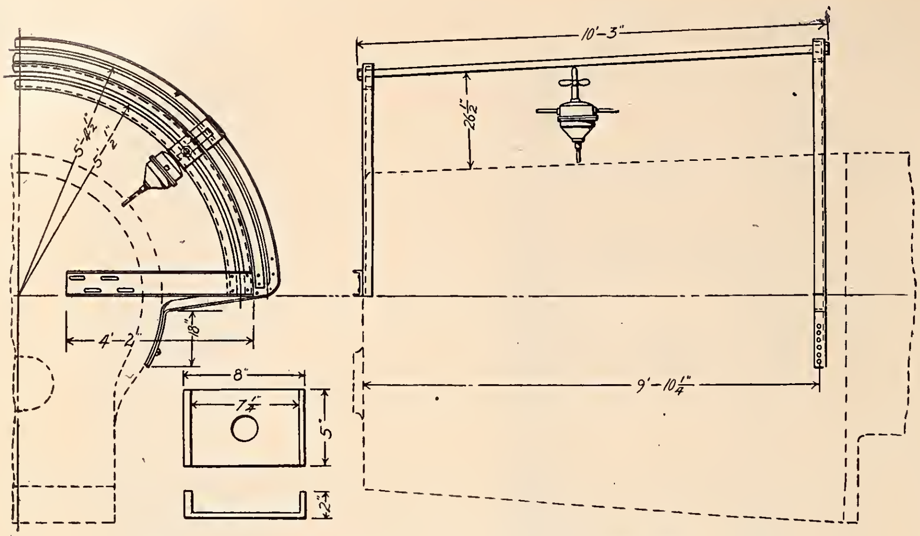


Fig. 10—Drilling Rack for Radial Staybolt Holes.

With the increased weight and size of parts of the large modern locomotive it is expedient to provide every means possible to lift and transfer these parts without overtaxing the strength of the workmen. The increased weight of the driving box has been especially noticeable and while the usual method followed in blocking up a board under the journal while fitting a crown brass diminishes the amount of lifting necessary in doing this work, it is still a heavy job. When a machinist has filed his brass and is ready to place it on the journal to test the fit, it is usually necessary to interrupt his partner to assist him in lifting the box, causing a loss of time for both men. To overcome this difficulty the substitution of an air hoist for main strength appears a practical method. This is provided for in the Elkhart shops by a frame carried on rollers which spans the track on which driving wheels are located when an engine is shopped. The application of this crane is readily shown by the accompanying drawing, Fig. 9. The frame is made of angle irons and is carried on small cast iron wheels which revolve on roller bearings. This frame carries two runways, each of which supports a trolley from which an air hoist is suspended. Air is readily provided for operating these hoists by the shop air connections.

Drilling racks for providing convenient braces for air motors used in drilling staybolt holes are illustrated by Figs. 10 and 11. That shown by Fig. 10 is for use when drilling through the upper portion of the wagon top sheet and through the crown sheet. It is made of angle irons which constitute guides for two carriages of the form shown by the drawing in the lower part of the illustration. These guides are supported by two channel irons attached to studs on the back head of the boiler and by flat iron brackets attached in the same manner to the wagon top sheet at the forward end of the firebox. Through the holes in the centers of the two carriages heretofore mentioned extends a square iron rod terminating in two nuts. Tightening the nuts serves to clamp the rod in position, and any strain imposed by the drill bears against the guides, so that the strain on the nuts is slight. In using this brace, the rod is adjusted to serve the drill throughout an entire line of holes. To accommodate the next line the rod is readily shifted by loosening the nuts and shifting the rod as desired.

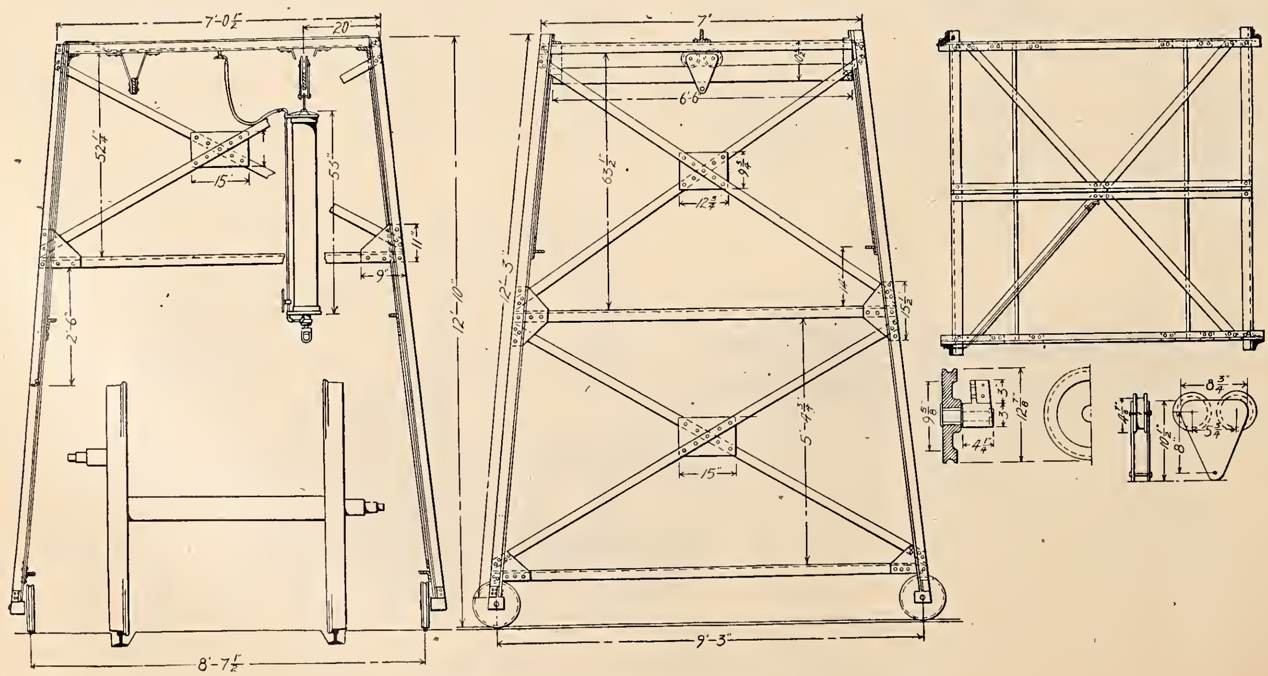


Fig. 9—Frame and Hoist for Lifting Driving Boxes.

When drilling through the lower portion of the wagon top sheet and through the side sheets, a rack is used of the form shown by Fig. 11. This rack is also made of angle irons, which, as in the case of the former rack, constitutes guides for supporting an adjustable rod. To provide against the rack being pushed away from the boiler by the pressure exerted by the drill, the base is of such form as to engage the rail over which the boiler is standing. The several braces adding to the stability of the rack are secured to the floor with lag screws. Three wrought iron extension bars of the form shown in the lower left-hand corner of the figure, 6, 8 and 10 in. long respectively, are placed on the adjustable rod to engage the end of the air motor feed screw to provide sufficient reach as the contour of the sheet increases the distance between sheet and rod.

A small self-contained pump similar to the form frequently used for testing boilers is kept in the roundhouse for setting relief valves. This test pump is illustrated by Fig. 12, by reference to which it will be seen that the pump is securely attached within a small cast iron tank. Water forced through the relief valve falls back into the tank and again passes through the pump. A gauge is included in the equipment, and when setting the relief valve, the spring is adjusted according to the desired pressure as shown by the gauge. This device is also used to some extent in the roundhouses for testing gauges by screwing a plug, which carries a gauge connection, into the receptacle for holding the relief valve.

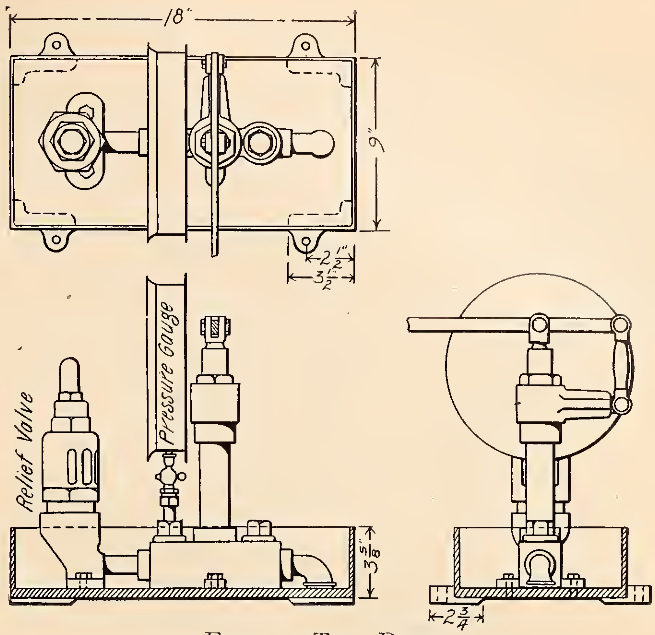


FIG. 12—TEST PUMP.

The Traveling Engineers' Association

The twelfth annual convention of the Traveling Engineers' Association will be held in Chicago this month, commencing Tuesday, September 13th, at 9 a. m. The headquarters will be at the Lexington Hotel, Michigan boulevard and Twenty-second street.

Opening of the C. R. I. & P. Ry. Line Between Kansas City and St. Louis.

The first train to use the Chicago, Rock Island & Pacific Ry.'s new St. Louis-Kansas City line arrived in Kansas City on Aug. 15. The trains have been operating for two months over the M., K. & T. and 'Frisco" tracks between Windsor and Kansas City, a distance of 40 miles. The new line is 207 miles in length.

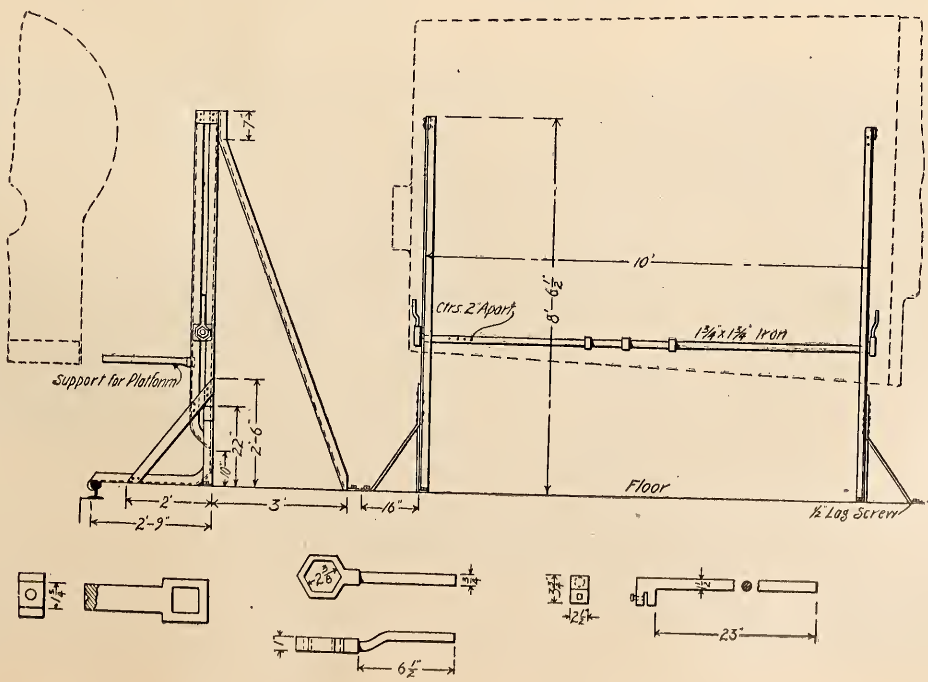


FIG. 11—DRILLING RACK FOR STAYBOLT HOLES.

High-Speed Three Cylinder Compound German Locomotive

THE recent high speeds obtained on the Berlin-Zossen line with electric cars have led locomotive designers and builders in Germany to put forth every effort to produce a steam locomotive which would rival the electric in both speed and capacity. Development along this line is represented by the three-cylinder compound high-speed locomotive here illustrated and built by Henschel & Son, locomotive builders, of Cassel, Germany. This engine is being exhibited by its builders in the Transportation Building at the Louisiana Purchase Exposition, where it is attracting much attention, particularly on account of the housing with which it is surrounded for the purpose of reducing air resistance when operating at high speed.

The entire locomotive above the running board and including the tender is enclosed in a continuous steel housing, which is made wedge shape at the front end. This housing, with its continuous smooth sides and top and pointed end, offering little or no irregular surface to be obstructed by air, is expected to reduce air resistance materially.

The presence of this housing requires the engineer's cab to be placed forward of the boiler in a position from which the track ahead may be clearly seen. There is a continuous closed passageway from the engineer's cab on each side of the boiler to the tender, and a passage through the tender and into the train, so that the objection sometimes raised to the engineer being alone in a separate cab does not obtain in this case. The passages are lighted by a number of windows, and in the front of the engineer's cab are four windows of double plate glass to facilitate the view ahead, which, in addition to two on each side, provide ample light for the interior. The glasses of the forward windows are kept clean by a brush device operated by a lever in easy reach of the engineer. To provide against excessive heat in the engineer's cab the front end is heavily lagged.

The cylinders are 20⅝ in. diameter by 24⅞ in. stroke, arranged with their center lines in the same horizontal plane. The high pressure cylinder is arranged on the center line between the frames and is placed forward of the smoke box. Its piston is connected with the forward driving axle, which is cranked to provide for inside connection The two low pressure cylinders, each of the same diameter as the high pressure, are located outside of the frames, adjacent to the saddle casting located beneath the smoke arch. The low pressure pistons are connected on the outside to the rear drivers. The steam distribution is controlled by balanced slide valves operated by a valve gear on the system of Hensinger von Waldegg. Steam admitted by the throttle passes through a dry pipe and steam pipe in the front end to the high pressure cylinder. From the high pressure cylinder it is exhausted through a pipe to a nigger head at the top of the smoke arch, and then through two breeches pipes to the low pressure cylinders. There is a semi-automatic starting valve which allows steam at a low pressure to enter the low pressure cylinders in the event of the high pressure crank being on the dead center. This valve is opened by the engineer and is automatically closed by the first exhaust from the high pressure cylinder.

The arrangement of rod connections is shown by Fig. 5, and the arrangement of cranks on the rear driver is shown by Fig. 7. he two low pressure cranks operate together and are arranged at an angle of 90 degrees to the high pressure crank. This arrangement was made to prevent any tendency of the locomotive to revolve

Fig. 1—German Locomotive with Steel Housing for Reducing Wind Resistance.

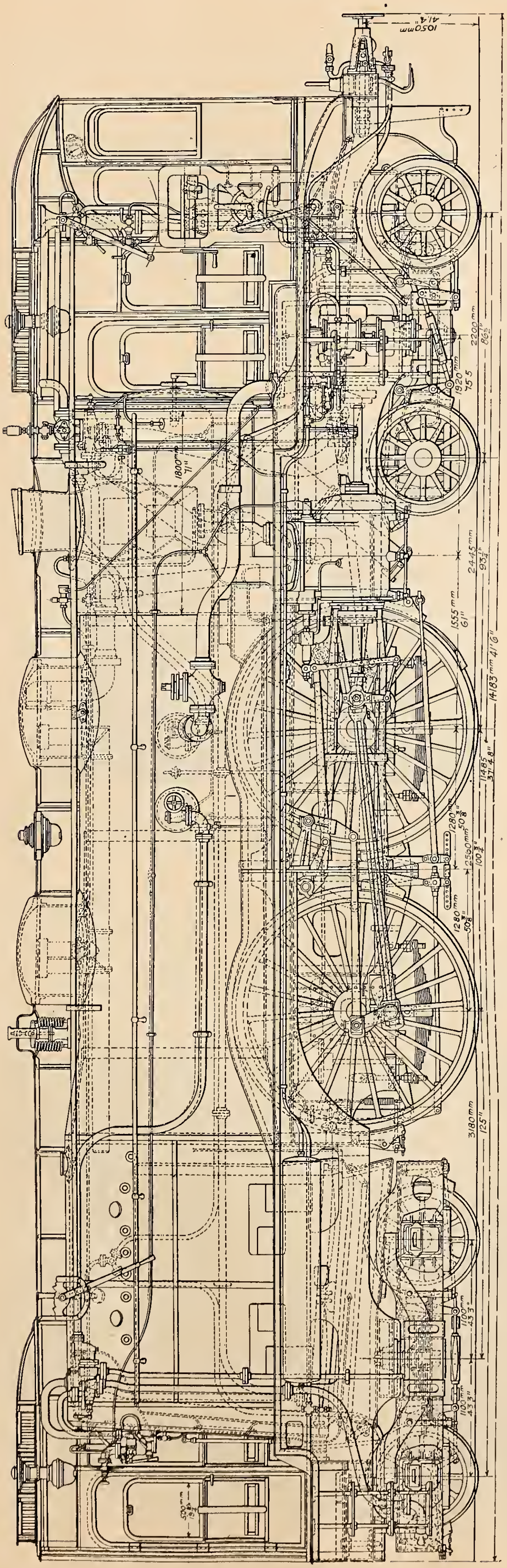


Fig. 2—High-Speed Three-Cylinder Compound German Locomotive.

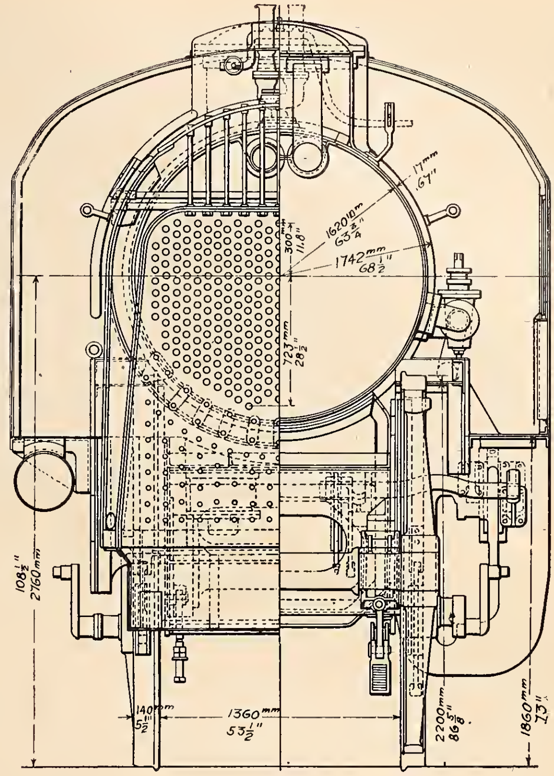


Fig. 3—Section of German Locomotive.

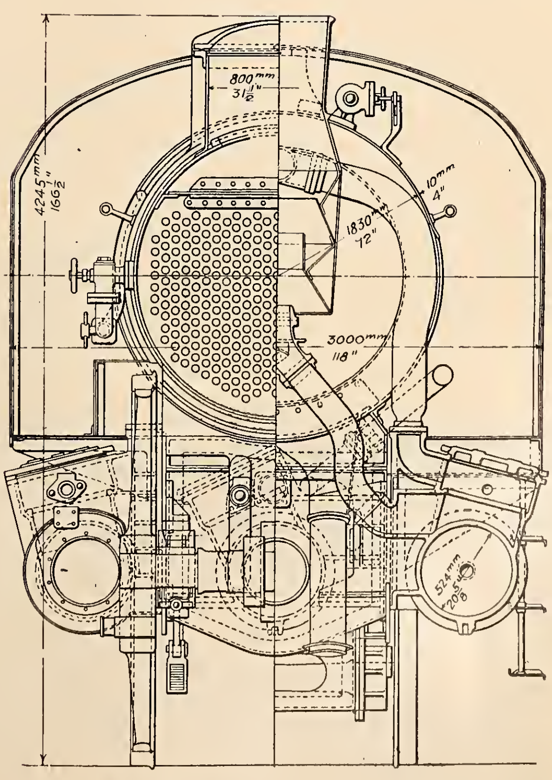


Fig. 4—Section of German Locomotive.

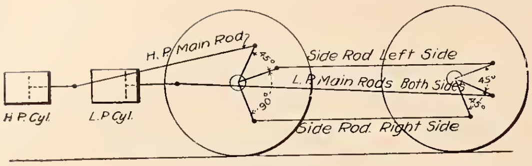


FIG. 5—ARRANGEMENT OF RODS, GERMAN LOCOMOTIVE.

about a vertical axis, or to "nose," as this motion is generally termed in American railway vernacular. The cranks to which the side rods are connected are at an angle of 45 degrees to the main rod cranks in all cases and are at an angle of 90 degrees to each other. Such an arrangement of cranks was made to prevent one axle from receiving all the stress at a dead center point of either of the main rod cranks.

The frames, which are of the usual plate style used al road, are in two sections, somewhat similar to an arrangement used on some wide firebox engines in this country. Two large deep plates extend from the bumper beam to the forward end of the firebox and are heavily braced by frequent cross connections. These carry the cylinders and weight of the front end of the boiler, and are supported by the two drivers and a four-wheeled front truck. Another pair of plates, at a lower level and outside the plane of the wheels, carry the firebox. These plates are strongly secured to the main frames by a heavy cross stay at the forward end of the firebox. They also extend forward for some distance below the running board and are again fastened to the main frames. This rear frame is supported on another four-wheel truck. The two trucks, forward and back, are built up of plate frames, and transmit their load to the axles through oscillating levers, between which the supporting springs are suspended. The load coming to the trucks is supported by the side bearings entirely. There is a center pin for each truck, which is so arranged as to allow a side motion between frame and truck. A centering device worked by springs brings them into place again after leaving a curve.

The boiler is very similar to American practice in many respects. It is 64 in. diameter at the front ring and contains 345 1¾-in. tubes 16 ft. 4⅞ in. long. A wide firebox gives a grate area of 45.4 sq. ft. The total heating surface is 2,776 sq. ft. There are two steam domes, the throttle valve being located in the forward one. A large steam collecting pipe extends from above the forward end of the crown sheet into the back dome, and another one between the two domes. The crown sheet is flat and has no slope. There are two fire doors for delivering coal to the grates. The grates are in two sets, made up of bars of a design similar to those used in stationary practice. At the front end of the grate is arranged a removable portion or dump grate for cleaning the fire. A small brick arch is arranged just below the flues.

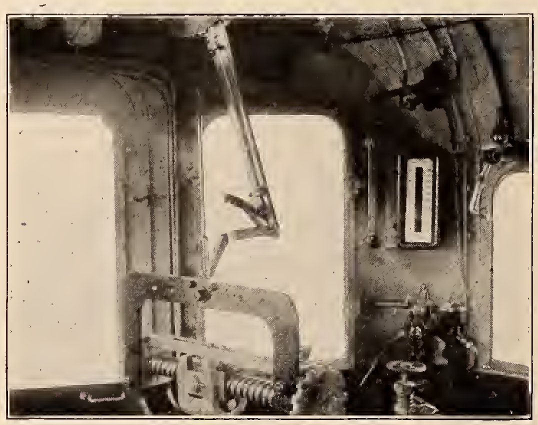


FIG. 6—INTERIOR OF ENGINEER'S CAB, GERMAN LOCOMOTIVE.

A novel smoke consuming device on the Langer-Markotty system has been applied. This consists of a steam jet located between and slightly above the doors, throwing a flat jet or fan-shaped veil of steam forward, striking just at the base of the brick arch across the whole width of the flue sheet. This veil compels the smoke and gases to pass backward and up in the back corners of the firebox, in front of the doors, and then forward to the flue sheet. An automatic damper is arranged in each fire door. This is opened by opening the door and remains open for a certain predetermined length of time after the door is closed, and then automatically closes. It is operated by means of a piston in a cylinder, one side of which is connected to the air reservoir and the other having an adjustable opening to the atmosphere. Opening the fire door forces this piston down, thus opening the damper, and when the door is closed the damper remains open until closed by the air pressure in the lower part of the cylinder, forcing the piston up. The pressure above the piston is released by being allowed to escape

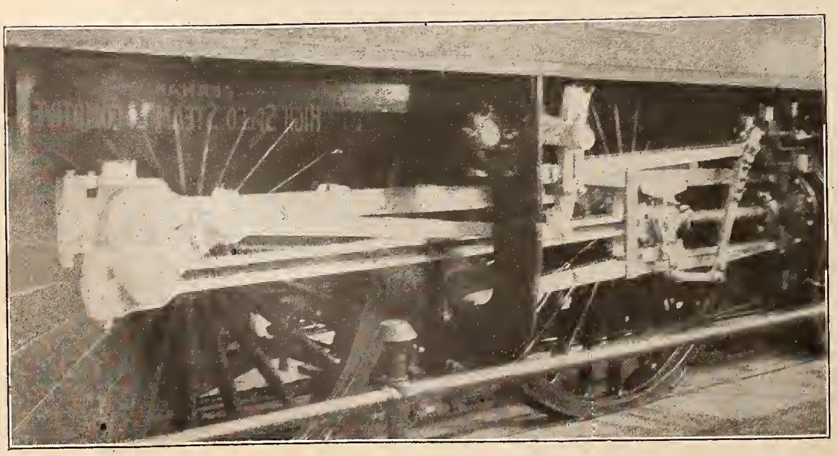


FIG. 7—LOW PRESSURE RODS, GERMAN LOCOMOTIVE.

through the adjustable opening heretofore referred to.

The boiler is attached to the frame by a heavy crossplate and two lateral connections at the front end and by a circular bearing plate between the drivers and four side and one rear movable connections on the firebox. There are two lifting injectors for boiler feeding which are controlled by the fireman. Two hand force pumps are also provided for use in an emergency. Two water glasses protected by heavy plate glass covering are provided, one on the back head and one on the smoke box in the engineer's cab.

The front end arrangement does not include a baffle plate or other draft regulating device. A circular netting around the exhaust pipe, extending to the base of the stack, prevents sparks being thrown. The exhaust pipe, as can be seen in the illustration, is short, and has a double draft pipe above. The front end door is heavily lagged to keep the cab as cool as possible, and is held air tight by a lock in the center, which is tightened by a hand wheel and screw. This allows the door to be readily opened whenever desired.

Two illustrations from photographs of the interiors of the engineer's and fireman's cabs, Figs. 6 and 8, are presented herewith. Referring to the former, the throttle lever is clearly in evidence. It is pivoted at the roof of the cab and extends horizontally within reach of the engineer, convenient to his left hand as he sits at the right of the cab. The lever is connected to the throttle rod by a long flat connecting rod. A connection with the throttle rod is made to the fireman's cab, so that the fireman may shut off steam in case of an emergency, but arranged at the same time so that the throttle cannot be opened by this lever. The motion work is controlled by a screw reverse gear, which is located at the engineer's left. This is equipped with an indicator showing

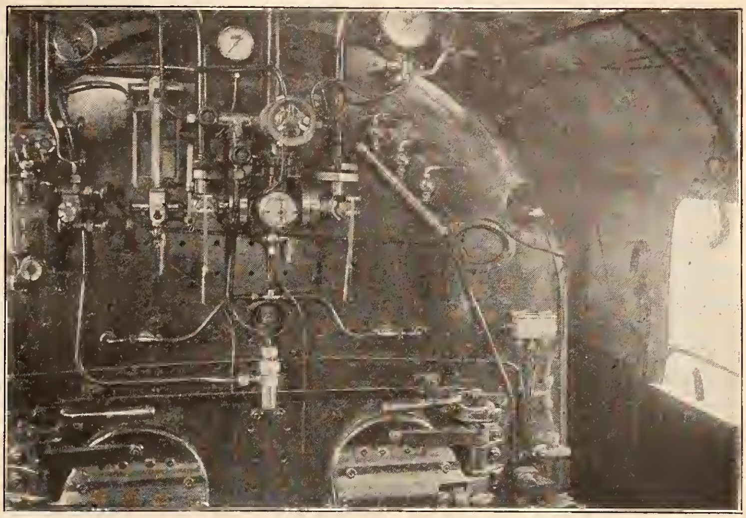


FIG. 8—INTERIOR OF FIREMAN'S CAB. GERMAN LOCOMOTIVE.

the point of cut-off for any position. On the same standard are located the lever controlling the starting device and another for the cylinder cocks, as well as the whistle lever. At the engineer's right is the brake valve, air pump steam supply valve and air sand valves. Directly in front is a speed indicator. This is a necessary appliance, as a certain maximum speed is allowed by the government, and under no circumstances is it to be exceeded. The lubricator is back in the fireman's cab. It is set before starting and not readjusted during the trip. There are two speaking tubes in the engineer's cab. One of these runs to the fireman's cab and one to the rear of the tender, for use when coupling onto a train.

The oil for all bearings is supplied through pipes running from oil boxes inside the housing, where they can be filled while running.

The engine is equipped with Westinghouse high speed brakes, all wheels being braked. The air pump is fastened to the frame at the center of the front truck, below the engineer's cab. The air pump is not operated automatically as in American practice, and the valve controlling the steam supply to the pump is located just below the brake valve at the engineer's right hand, and he controls the air pressure by means of this valve, the gauge being located on the front wall of the cab in a conspicuous position.

The tender is mounted on two four-wheeled trucks and supported by a steel frame. It is housed in a style conforming to the locomotive. Two large openings in the top permit filling the coal space from the chutes in the usual manner. The water tank is filled through a large hose, which is put in through an opening in the side

FIG. 9—VIEW OF TENDER, GERMAN LOCOMOTIVE.

of the housing. The connection between engine and tender is arranged to permit them to be easily uncoupled, which is necessary when turn tables are too short for the locomotive and tender. A rubber diaphragm joins the housings. At the rear of the tender is an ordinary car diaphragm through which access to the train is made. A brake valve is also located inside for use in coupling onto a train.

The lighting is by Pintsch gas lamps placed in the ventilators in the top of the housing, along the passageways and at the rear of the tender.

The general dimensions are presented in the following table:

Gage	4 ft. 8½ ins.
Diameter of cylinders	20⅝ ins.
Piston stroke	24⅞ ins.
Diameter of driving wheels	86⅝ ins.
Diameter of truck wheels	39⅜ ins.
Rigid wheel base	8 ft. 4¾ ins.
Working pressure	200 lbs. per sq. in.
Grate area	45.4 sq. ft.
Heating surface	2,776 sq. ft.
Water capacity	4,400 gallons.
Coal capacity	7 tons.
Weight, empty	75.5 tons.
Weight in working order	85 tons.
Weight on drivers	32 tons.

Report of Tank Car Committee, M. C. B. Association.

REFERRING to the action taken by the American Railway Association requiring that after September 1, 1904, all tank cars of 6,000 gallons capacity or less, carrying volatile inflammable materials, must be equipped with one 5-inch safety valve of approved design, those of over that capacity to be equipped with two 5-inch safety valves.

As intimated in the discussion on the report of the Tank Car Committee of the Master Car Builders' Association, read before the convention of that association held in Saratoga in June of this year, the committee has made a further experiment in order to determine whether tank cars containing as much as 6,500 gallons should be recommended for acceptance with one 5-inch safety valve. The committee was not willing to make such a recommendation in the absence of actual test, which test the Union Tank Line Company agreed to make. Consequently, the committee met at Lima, Ohio, July 27, 1904, to witness a test of Union Tank Line Company car No. 8,031, taken out of service for the purpose, equipped with one 5-inch safety valve and filled with stove gasoline, and then subjected to test by fire. This was a steel tank having a capacity of 6,491 gallons to the base of the dome, but as actually filled contained 6,509 gallons, which partly filled the dome as well as the tank. The inside diameter of this tank is 76½ inches and the length between calking edges 26 feet ½ inch. There were five barrel sheets 3-16 inch thick, and the bottom sheet was ¼-inch thick. The dome sheet was 3-16 inch thick, dome head ¼-inch thick, and diameter of dome 36 inches. All rivets used in tank were ½-inch diameter. The longitudinal seams of the bottom sheet were double riveted, with a distance between the rows of 2⅛ inches, and 2⅛ inches spacing of rivets. All the other seams were single riveted with 2-inch spacing of rivets, except dome head to dome sheet, in which the spacing was 1 15-16 inches. The end heads were dished to 7½ inches, with a 1⅜-inch radius in corner. The metal used was tank steel, except dome head, dome sheet, and end heads, which were soft flange steel. The tank was erected in a field on three brick piers, the two outside piers being 12 inches thick and 16 feet from center to center. The center pier was 24 by 24 inches in section, and was placed directly under the nozzle, for the purpose of protection. The dome of the shell was placed 42 inches above grade, and a basin 27 feet long, 9 feet wide by 8 inches deep was dug immediately under tank. The tank had been charged with 66½ degrees naphtha from No. 4 agitator by means of a 2-inch pipe. A 1-inch pipe line was run from the

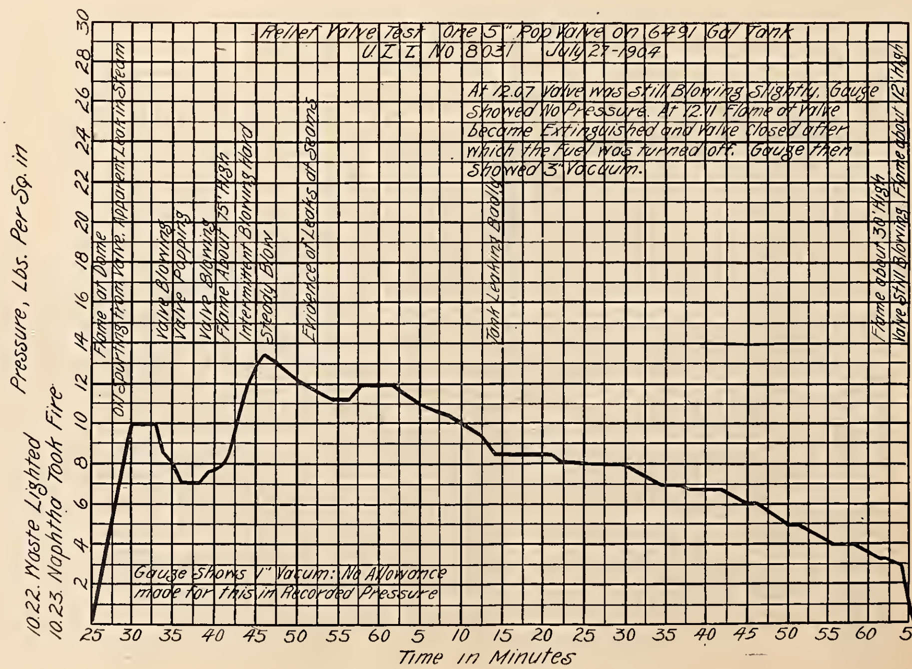
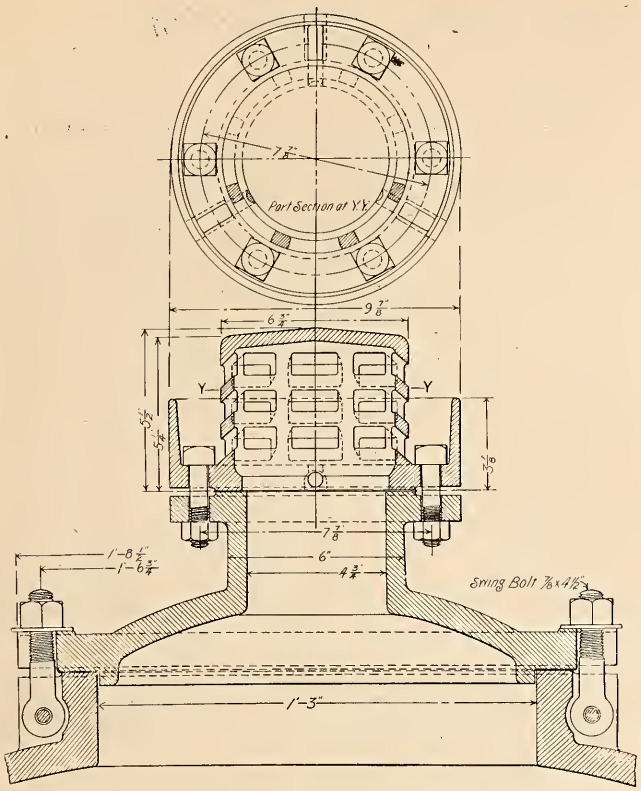


Diagram of Relief Valve Test.



Five-Inch Safety Valve with Lead Diaphram.

tank to a point about 700 feet away, for the purpose of recording pressures. One end of this pipe entered the tank through the under nozzle and ended inside of the dome; this end was fitted with a 1-inch elbow. At the other end of piping there were four gauges, and the end of pipe was plugged. The elevation of the gauges was the same as top of tank dome. For the purpose of supplying fuel under the tank, a 1-inch pipe was run to a point under the tank, where it branched into four ½-inch pipes. The ½-inch pipes ended in ½-inch vertical nipples, which were about equally spaced so as to create a uniform blaze under the tank. Before the test began these so-called burners were shifted to windward about two feet, so that the action of the wind would have less tendency to drive the flame away from the tank. At the start the tank was full and the naphtha extended about 4 inches up into the dome, containing 6,509 gallons at 76 degrees F., which equals, when corrected, about 60 degrees F. and 6,437 gallons. The temperature at the top was found to be 89 degrees, at the center 71 degrees, and at the bottom 68 degrees.

The test began at 10:22 a. m., when the waste under the tank was lit, the gasoline fuel being turned on 25 seconds later. Within 2 minutes and 35 seconds vapor from the contained liquid caught fire at a slight leak in the dome head. Within 5 minutes and 35 seconds the expansion of the liquid had filled the tank and some of the liquid was escaping at the safety valve. Within 7 minutes and 10 seconds the liquid overflowed violently, and within 8 minutes and 55 seconds the safety valve opened and vapor and liquid gasoline were thrown out with violence. The subsequent history of the test is shown by accompanying diagram, the fire being continued under the tank until complete dryness was reached.

The conditions as far as the safety valve was concerned, were just such as would be met with in service when tank cars carrying naphtha become suddenly surrounded by fire. The safety valve operated perfectly, opening promptly at the desired pressure at which it was set, namely, 8 pounds, and the pressure never exceeded 13½ pounds.

It was especially noticeable that the safety valve, which was in accordance with the design recommended to the Master Car Builders' Association, not only relieved the pressure, but also dicharged the flame upward in a compact column, the only flame coming down from the safety valve being that through the small vents which are placed around the seat in order to entrain and carry away water from rain, etc., which might otherwise gradually leak through the valve and injure certain oils.

From this test, the committee draws the following conclusions:

First, that tank cars of 6,500 gallons capacity and less, carrying naphtha, will be relieved without dangerous pressure if equipped with one 5-inch safety valve of the pattern already recommended to the Master Car Builders' Association.

Second, that this flame will be directed upwards, allowing wrecking forces to approach the tank to apply cooling streams of water; and,

Third, that the tank, although somewhat buckled and sprung in the rivets by the fire, lasting nearly two hours, was apparently in no danger of explosion.

The committee submits this as a progress report, with the recommendation that it be published in order to guide railroad companies issuing circulars covering tank car requirements, who may wish, in framing their notices, to fix the limit of capacity for which but one safety valve will be acceptable.

A. W. Gibbs, Ch'n; C. M. Bloxham, Robt. Gunn, Tank Car Committee, Master Car Builders' Association.

The "New York Central System."

The official title of the great aggregation of railroads controlled by the Vanderbilt interests is now the "New York Central System." Heretofore this system has been known under the name of the Vanderbilt Lines. The handling of all the receipts and disbursements of these lines west of Buffalo is now concentrated in one office, under Mr. Charles F. Cox, treasurer of the Lake Shore & Michigan Southern Ry., with office in New York. Until the recent change was put into effect, each one of the principal lines of the Vanderbilt system had its individual treasury department, with a salaried head drawing from $7,500 to $12,000 per annum. Under the new order of things, a single treasurer assumes the duties and responsibilities of seven or eight treasurers and saves to the general system a large sum in salaries alone, besides other economies.

National Railroad Master Blacksmiths' Association.

Twelfth Annual Convention.

THE twelfth annual convention of the National Railroad Master Blacksmiths' Association was held at the Grand Hotel, Indianapolis, Ind., last month, beginning August 16, 1904.

TOOLS AND FORMERS.

Under the head of tools and formers for steam hammers in general railroad work, a letter was read from Mr. James J. Godsill, C., B. & Q. Ry., referring to a number of blue prints which he forwarded, illustrating attachments for bending links and performing other jobs. He also explained his methods of making brake beam safety hanger links, ash hoes, etc.

MR. GEORGE LINDSAY, PRESIDENT OF THE NATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.

SPRING MAKING, REPAIRING AND TEMPERING.

The committee on this subject reported the best method of making springs to be by machinery, and that railroad shops can follow the practice of the spring manufacturers to advantage, as these latter do the work well and at reasonable expense. With spring making machinery it has been found that all-round spring makers are not requisite and that an intelligent young man can grasp the situation readily.

While the foremen-smiths are required to use the steel furnished by the railroad companies, the committee reported a spring of good crucible steel to be better and give longer service than one made of open-hearth or some other inferior grade.

TOOL STEEL FORGING AND TEMPERING, INCLUDING HIGH SPEED VARIETY.

In considering this subject it was suggested that tools made of air hardening or special steel should have short points and be made from steel of the largest section that can be used, as the short points conduct the heat away more rapidly than a thin, acute point. This last is subject to a grinding action from the work, while the short takes a deeper cut, and being more under the surface, has softer metal to remove and the heat is transferred more to the cutting.

Air hardening steel is generally used for rough work where surplus metal has to be removed at a rapid rate, and should be ground on wet grinding appliances.

Carbon or tool steel holds a finer edge than the air hardening variety and can be forged or worked into any shape required, and will always be used for tools required for exact work and tools urged by impact. There should be about three grades, the first for taps, milling cutters, reamers and screw cutting dies, also for special tools used in tool-making lathes.

The next grade for machinists' chisels, cold sets, hammers, button sets, hot chisels, punches for machines, shear blades, etc. The next grade for flaters, swedges, dies for working hot metals, bolt heading and forging machines. These can be made from open-hearth steel.

In the making of tools due consideration must be taken of the cost of such tools—first, the cost of the steel in the bar; second, the making of the tools. Of these the third item depends on the endurance of the tool, and taken in connection with the rate of which the the tool can work, determines very largely its economy. In most cases the wear and the cost of redressing and regrinding is less for tools made of high grade than of low grade steel, so that it is generally cheaper to make all tools of a good grade of steel than an inferior grade. It must be remembered that at all times in forging and tempering tools it is necessary to have a good clean fire with plenty of suitable fuel between the tuyere iron and the tool, to avoid the cold blast coming in contact with the tool and to avoid too high a heat, as there are more tools spoiled by over heating than otherwise.

If steel manufacturers would brand their steel on the ends of the bars with their brands, also the number on each bar to denote its carbon temper—5, 6, 7 denoting 50, 60, 70 per cent of carbon respectively—it would avoid many poor tools. In selecting steel for the tool required to make it would be necessary to look to the brand to know what is going to be used, as the higher the carbon the more care is required as to the heating and forging. Also in making tools, for the tool smith to stamp each tool where practicable with the corresponding number on the bar, so in redressing and tempering those tools they would know just what they were handling and would govern themselves accordingly.

TESTING AND SELECTING MATERIAL.

Material being one of the important points in forgings, great care should be exercised in seeing that the quality of material used is up to the standard, and it would be to the advantage of railroad companies to have a well regulated system of testing all iron and steel as soon as received from the manufacturer, and also to have prices stamped with maker's name or brand. This method is generally adopted in Great Britain.

Upon receiving a lot of iron or steel it should be subjected to a test by taking a bar indiscriminately, and after cutting two pieces about 10 inches long from bar, put them to the bending test. Ordinary good iron will stand bending in the form of a "U" over its diameter, cold, without fracture; this is to detect cold short. To detect hot short the piece should be heated to a dull red, then bent and closed together without fracture. Hot short iron is a great source of trouble in the blacksmith shop, as very often the piece of work is almost completed before a hot short fracture is detected.

As regards testing of mild steel (as that is a material which will replace iron altogether in a few years, for general work), in addition to the physical test, which would be similar to that of iron, two pieces should be cut from a bar and welded together. This would give a smith who is accustomed to this work a good idea of the chemical composition, especially the three elements which we have to contend with most—sulphur, phosphorus and carbon.

MATERIAL FOR AND METHODS OF FORGING MOTION WORK.

Inasmuch as eccentric blades are often found to break at the juncture where the T is welded to the remainder of the blade, it is the opinion of the committee that this portion should be made from solid stock by drawing down the shank from stock sufficiently large to produce the T portion by heading the same in a die, and the shank of the forging thus made is welded to the blade.

The clevis end of the blade should be well made. The old method of making this is to jump a piece on at a right angle to a bar of iron, to form the projecting portion of the clevis. A preferable method, however, is to make this part from solid material by forging a block the proper shape and punching out the required opening. After being finished in the machine shop, this is welded to the blade with a lap weld. As this member has to be case hardened, the best quality of close grained iron should be used. If facilities for preparing special iron are not available, Norway or Swedish iron should be used. If loose or seamy iron is used, imperfections will be brought out by the continued heat in the retort.

Where a large number of links of the same class are to be forged, it is expedient to form dies to forge them. The links should be rough forged and pressed in the die by a powerful machine or steam hammer. Where but a few links of one class are to be made the use of dies is not profitable.

In forming rocker arms the most desirable method appears to be to form the round portion in dies under the steam hammer, leaving projecting heads, about six inches square, on the ends, to which the arms are welded.

Of the different methods of forming the stem and yoke current in different shops, the cheapest method is to jump the stem on the center of the front side of the yoke, forging and bending half of the ends. The opposite side is forged and bent to correspond to the front side; then the two ends are welded together, forming a perfect yoke and stem. Two objections to this method, however, are that a perfect union is not always insured and that the chemical action of steam and oil upon oxide of iron, which may have accumulated between the welded surfaces may cause the weld to deteriorate.

OIL FURNACES.

The only paper presented discussing oil furnaces would appear to imply that much better results can be obtained from oil than from coal, and the furnace more quickly prepared. The oil furnace is cleaner to work at, as there is neither coal nor ashes to handle; hence a cleaner and better heat is the result. On the whole, it is found to be a simple operation. The brick in the furnace will last eight months, while with coal the furnace will last but three months. With oil it is possible to accomplish from 25 to 100 per cent more work than with coal.

IDEAL BLACKSMITH SHOP.

An excellent paper was presented discussing the construction, arrangement and facilities of a modern blacksmith shop to produce best results in railroad practice. This paper will be reproduced in the columns of the Railway Master Mechanic.

FRAME MAKING.

The committee on frame making reported little additional information to that already thrashed over before the association on previous occasions. The remarks presented referred particularly to piling and forging slabs and welding on the legs of the frame.

REPAIRING FRAMES.

The report of the committee on repairing frames was not unlike the previous report, bringing out but little information additional to that of previous years. Several sketches were submitted showing welds made by different members.

FORMERS FOR BULLDOZERS AND FORGING MACHINES.

In designing and making dies and formers for bulldozers and upsetting machines, two chief points are to be considered—first, the forging, or article to be made; and secondly, the number of same required. If only a small quantity is wanted, the dies should be made to suit the amount, and as cheaply as possible. If, on the other hand, there is an unlimited number to be made, too much care cannot be exercised in the making of the dies, in order that they may be accurate, as it will be found very difficult to make good forgings with badly constructed dies.

The wearing parts of dies and formers should be made of the best obtainable material. Cast iron is very suitable for a great variety of dies, with cast steel parts set in where there is any wear or friction. Dies are often made too complicated on account of wanting to do too much at one revolution of machine; an extra stroke does not take very long and often improves the forging materially.

ELECTION OF OFFICERS.

The election of officers for the ensuing year resulted as follows:

President, Thos. F. Keane, Ramapo Iron Works, Hilburn, N. Y.; first vice-president, D. B. Swinton, C. P. Ry., Montreal Canada; second vice-president, J. C. Sullivan, P., C., C. & St. L., Dennison, Ohio; secretary and treasurer, A. L. Woodworth, C., H. & D., Lima, Ohio; chemist, G. H. Williams, with B. M. Jones, Boston, Mass.

NEXT PLACE OF MEETING.

The next annual convention will be held at Cleveland, Ohio.

Clearance Reducing Valve Mechanism and Cylinder.

THE increase in the efficiency of the locomotive and the economy to be gained by the reduction of clearance space in cylinder volume has been given much attention during the past few years by Mr. Ira C. Hubbell, the author of several valuable papers concerning this subject, who has been ably assisted by Mr. J. B. Allfree, the patentee of the Allfree valve gear and valve. It is interesting to review some of the work accomplished along this line by these gentlemen, and to note the application of the principles which they have advocated, to a practical mechanism for increasing efficiency by reducing cylinder clearance and timing the valve motion.

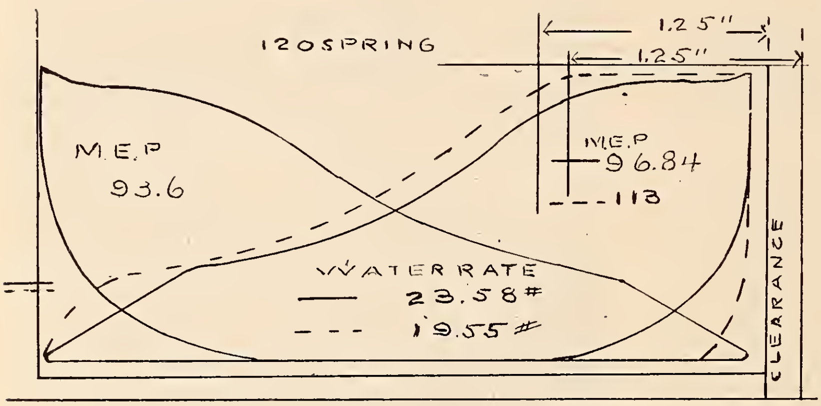


FIG. 1—INDICATOR DIAGRAMS ILLUSTRATING RESULTS OBTAINED BY REDUCED CLEARANCE.

Cylinder clearance not only includes the space contained in the striking distance, but also the space contained in the ports; and clearance is therefore all the space from the face of the valve, as the valve covers the port, to the face of the piston when the piston is at the extreme of its travel on either stroke.

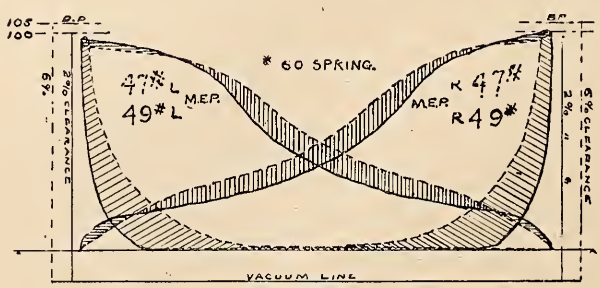
A cylinder may have a greater amount of clearance at one end than at the other, and when it is said that a cylinder has a given amount of clearance, for instance, 8 per cent, it is meant that the clearance at the two ends of the cylinder averages 8 per cent at each end, and in locomotive practice refers to the average amount of clearance in each end of each cylinder.

While clearance space cannot be totally eliminated, clearance is a waste, a source of loss, and it is therefore essential to the efficiency of an engine to reduce this space to a minimum.

To substantiate this statement it is interesting to observe the lesson evident in the diagrams, figures 1 and 2. Referring first to Fig. 1: The full line card is taken from a locomotive with the usual link motion and having 8 per cent clearance. This card may be considered as showing very good operation under usual locomotive conditions; it shows free admission, as well as good steam and expansion lines. The M. E. P. is 96.84 lbs. Total terminal pressure is 76 lbs. above vacuum.

Over the full line card a dotted diagram has been reproduced, taken from a locomotive arranged with a valve gear which delays the opening and closing of the exhaust port at all points of cut-off, and which permits a cylinder clearance of only 2.4 per cent.

This diagram, with the same initial pressure and the same quantity of steam as the full card, shows a M. E. P. of 113 lbs., with a total terminal pressure of 69.25 lbs. above vacuum. It will be noted that the gain



DATA.

CARDS	CYLINDERS	% CLEARANCE	B. PRESSURE	R.P.M	I.H.P.	WATER H.P.H.
47 L&R	14 × 15	6	98	172	93.5	28.35
49 L&R	14 × 15	2	105	172	97.0	23.72

CU. INS. STEAM ADMITTED TO POINT OF CUT-OFF (INCLUDES CLEARANCE)	CLEARANCE	6%	741.99
		2%	554.18
CU. INS. STEAM ADMITTED PER POUND M.E.P. (INCLUDES CLEARANCE)		6%	15.79
		2%	11.31

FIG. 2—INDICATOR DIAGRAMS FROM STATIONARY ENGINE, SHOWING RESULTS OBTAINED BY REDUCED CLEARANCE.

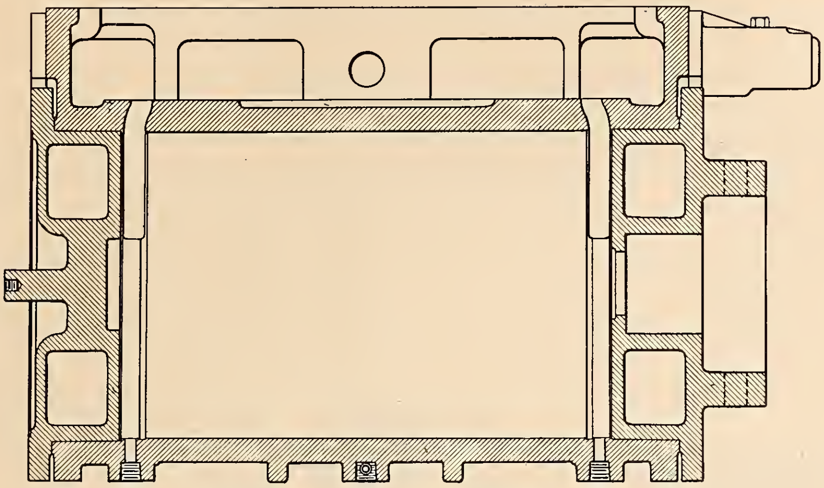


FIG. 3—CYLINDER HAVING SHORT PORTS, USED WITH ALLFREE-HUBBELL VALVE GEAR.

is in the increased work done in the cylinder, by admitting more steam to the cylinder for work and less to fill the waste space, or clearance, and correspondingly decreasing the volume in compression as shown by the compression line, whereby a very material reduction is made in the negative work due to delayed compression.

Fig. 2 shows two sets of indicator cards taken from the same engine, and further proves the economy due to reduction of clearance. These cards were taken during a test made by Mr. J. B. Allfree and Mr. Ira C. Hubbell and every feature of the test was observed with the greatest care. The cards were taken from a high-speed stationary engine having cylinders 14 ins. by 15 ins. The dotted diagram was taken while the engine was operated with an automatic valve gear, the clearance in this instance being 6 per cent, the maximum clearance to be obtained with the cylinders of this engine. The full line card was taken while the engine was operated with what is known as the Allfree valve gear, by which the cylinder clearance was reduced to 2 per cent. It will be observed from the accompanying data that with the latter valve gear and the reduced cylinder clearance that the I. H. P. was increased from 93.5 to 97, and that the water rate was reduced from 28.35 lbs. to 23.72 lbs. The water rate was corroborated by the careful weighing of the condensation resulting from the exhaust steam from the engine under both sets of conditions. It is proper to state that both series of cards shown in Fig. 2 were taken from the same engine, same cylinder, same valve, etc., but in the one case striking distance, the space between the piston and the cylinder heads, is increased sufficiently to increase the volume in cylinder clearance sufficiently to balance the requirements of the automatic valve gear with its unavoidably early closure of the exhaust port when working at one-quarter stroke and earlier points of cut-off, and in the other case by changing the front and back cylinder heads, striking distance was reduced so as to decrease the volume in cylinder clearance to balance with the Allfree valve gear which was added to the valve motion after the one test had been completed, and as the Allfree valve gear delays the closing of the exhaust at all points of cut-off, and yet with the reduced volume in clearance, with reduced cylinder clearance, the terminal of compression is the same practically as under previous conditions with greater volume in cylinder clearance, and necessarily with the greater amount of work in compression.

These two examples show an increase in power and a decrease in the amount of steam used. A reduction in the steam used means less coal and water, consequently economy.

Having seen what the reduction of clearance signifies, the question naturally arises with regard to how this end can be accomplished and the more conservative will want figures and data showing what has been done already.

A valve-timing mechanism, known as the Allfree-Hubbell valve gear, has been developed, the purpose of which is to correct the valve movement so as to get more useful results from the steam admitted to the cylinder, at the same time making no change in the links or what

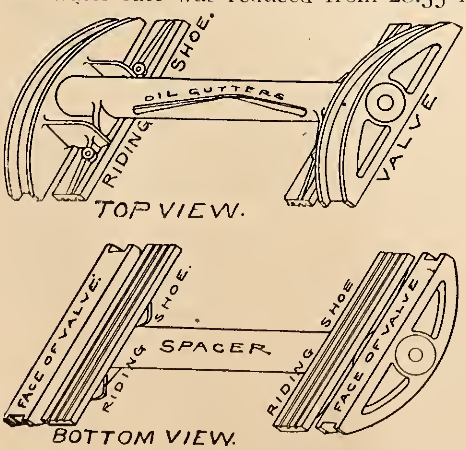


FIG. 4—THE ALLFREE-HUBBELL VALVE

FIG. 5—THE ALLFREE-HUBBELL VALVE.

is familiarly known as the Stevenson motion. While this valve affects the performance of steam within the cylinder by altering the motion of the valve in certain positions of its stroke, the reduction of the actual clearance space is obtained by a redesign of cylinder casting which provides short ports and reduces radiating surfaces. An outline drawing of this cylinder, showing the short ports, is presented by Fig. 3. A comparison of this illustration with any drawing of a locomotive cylinder will clearly disclose the difference in length of ports and the consequent difference in clearance.

The valve is illustrated by Fig. 4 and the valve in position on its seat is shown by Fig. 5. Fig. 6 illustrates

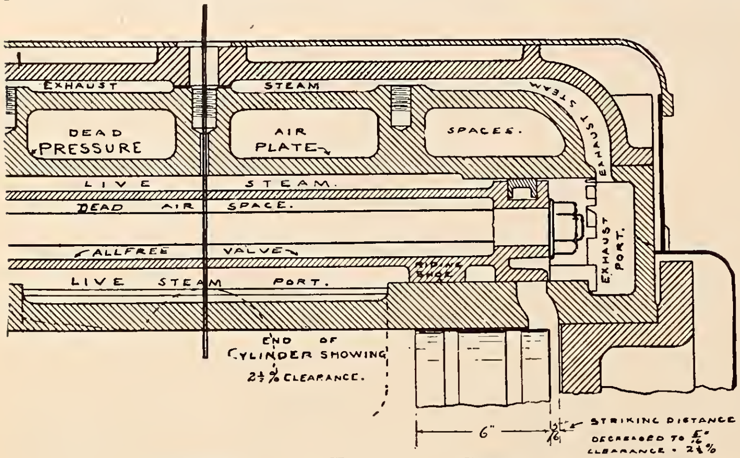


Fig. 6—Steam and Exhaust Chests of Alfree-Hubbell Valve.

the valve, cylinder and the design of ports, etc., to provide for maintaining the heat of the steam.

This last point mentioned is one worthy of careful attention and time would be well spent in observing the difference in design of this cylinder and the usual saddle and cylinder in every-day practice. In order to secure the greatest work from steam in the cylinder it is necessary to maintain its temperature as near that of the temperature at which it left the boiler as possible. This point is duly recognized by the designers of this cylinder and provided for by including air spaces between the entering hot steam and (comparatively cool) exhaust steam and by keeping the live steam close to the cylinder, maintaining a hotter cylinder than is possible with the ordinary design, insuring a high initial pressure of steam for each admission to the cylinder. The valve is of inside admission, consequently the exhaust steam is conducted from the ends of the exhaust chest without coming into contact with any portion of the cylinder walls or the valve chamber which contains the live steam, and passed to the nozzles down back of the cylinder heads, while the live steam forms a jacket over fully one-third of the cylinder walls from port to port, keeping the cylinder always hot, and thereby effecting a marked reduction in the loss from cylinder condensation, besides insuring higher initial pressure, as above mentioned. In perfecting this design the effort has been to protect the cylinders and the steam from loss of heat, for the reason that heat is the power in the steam; therefore if heat can be saved, fuel is saved, and more work can be done by any quantity of steam generated by the boiler.

The mechanism for timing the movement of the valve requires a slight addition to the present motion work of current practice. This includes a pinion crank shaft, Fig. 7, which is carried in the rocker arm; a sector, Fig. 8, which fulcrums on the rocker arm and moves through the same arc. The sole office of these parts is to accelerate and increase the valve travel at all times of opening of ports, and to retard and decrease the valve travel between the cut-off and the opening of the port for exhaust, and at the same time as between the opening

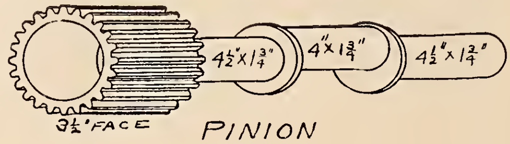


Fig. 7.

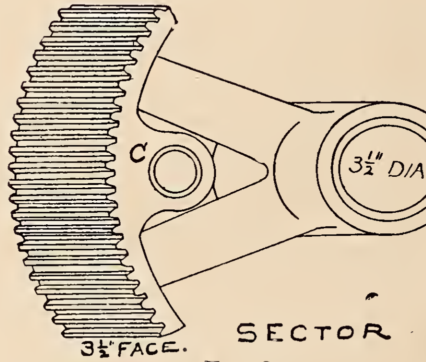


Fig. 8.

and the closing of exhaust ports. This is accomplished by so timing and arranging the pinion and sector as to interpose the length of the crank between the rocker arm and the valve at all times of opening the ports and interposing the throw of the crank against the action of the rocker arm between the cut-off and exhaust opening and between exhaust opening and exhaust closure, all during each stroke of the piston. The usual eccentrics and links move the valve as on all other locomotives. The sector and pinion are simply "timers" and the only work they are called upon to perform is to time the events of the valve and then to hold their position while the eccentrics move the valve through the links and rocker arms. The several parts as arranged for service are shown by Figs. 9 and 10. It should be mentioned, however, that with different locations and arrangement of rocker arms the timing mechanism may be as readily applied as to the form shown.

By means of the mechanism here described the steam is held in the cylinder until late in the stroke, so that a much greater percentage of the expansive force of the steam is utilized and less power lost through the early closing of the exhaust port for compression, although compression takes place up to the initial pressure, practically all of the compression taking place during the last one and three-fourths inches of the piston travel, and when compression offers the least resistance to the movement of the locomotive. It will be understood that while the volume of compression is thus reduced, its terminal pressure is not reduced, and compression is better utilized as a cushion, as intended, resulting in a smoother running engine and consequently decreased running repairs.

The valve timing mechanism is applicable to any locomotive. The valve and cylinder casting here described may be applied to any class of locomotive when being constructed or when changing cylinders.

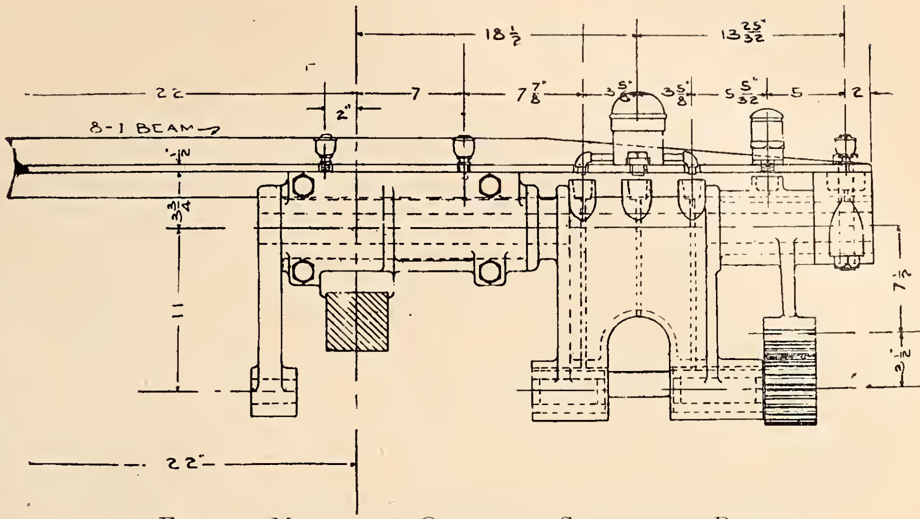


FIG. 10—METHOD OF OPERATING SECTOR AND PINION.

In order to give some figures concerning the economy of this equipment the following results of a test with two locomotives of similar design, except in the manner of steam distribution, on the Pittsburg & Lake Erie Railroad are presented for comparison:

	Locomotive No. 124	Allfree-Hubbell Locomotive No. 275
Date	5-11-04.	5-10-04.
Distance run, McKee's Rocks, north yard, to New Castle Junction	40.5 miles.	40.5 miles.
Tonnage—actual weight	2,500	2,523.
Cars all loads, mixed train	61.	62.
Cars set out	1.	0.
Elapsed time	3 hrs. 22 min.	2 hrs. 32 min.
Running time	3 hrs. 1 min.	2 hrs. 32 min.
Average speed	13.5 mi. hr.	16 mi. hr.
Increased speed, 2.5 miles per hour, or 18.5 per cent.		
Number stops	3.	0.
Slow down	0.	1.
Water used, actual	66,050 lbs.	52,300 lbs.
Decrease, 13,750 lbs., or 20.82 per cent. Gain in service, 26.29 per cent.		
Total ton miles	99,978.	102,181.
Increase in ton miles, 2,203, or .022 per cent.		
Water per 100 ton miles	66.065 lbs.	51.18 lbs.
Decrease per 100 ton miles, 14,885 lbs., or 22.53 per cent. Gain in service, 29.08 per cent.		
Diameter of drivers	49⅞ in.	50 in.
Revolution of drivers per mile	404.37.	403.36.
Type of engine—consolidation	2-8-0.	2-8-0.
Total weight of engine	140,000 lbs.	140,000 lbs.
Weight on drivers	126,000 lbs.	126,000 lbs.
Heating surface, total square feet	2,134.1.	2,134.1.
Heating surface, firebox, square feet	162.5.	162.5.
Area grates, square feet	25.6.	25.6.
Area dry pipe, square inches	34.47.	34.47.
Pounds of water evaporated per hour, per square foot heating surface	10.26 lbs.	9.67 lbs.
Per square foot grate surface	855.27 lbs.	806.43 lbs.
Size of ports	1¼x16.	1⅜x17.
Cylinders	20 in. x 26 in.	20 in. x 26 in.
Clearance in per cent of vol.	.088 per cent	.024 per cent.
Striking distance	13-32 in.	5-16 in.
Style of valve	Am. Balance.	Allfree-Hub'l.
Steam distribution	Stephenson Link.	Allfree-Hub'l.

When the No. 124 reached the end of this run it was necessary to "cut" and run for water, whereas the No. 275 had sufficient water in her tank to haul her train of 2,523 tons 11 miles further; or, in other words, she could have run 51 miles with this train on one tank of water. Each tank holds 8,000 gallons.

The principal feature of the valve timing mechanism and the design of cylinder here described may be summed up briefly in the following:

First:—They greatly reduce cylinder condensation by reducing the radiating surfaces in clearance (ports) over 70 per cent and by the valve, cylinder and saddle design, protect the steam from loss of heat in its passage to the cylinder, and maintain continuously a hotter cylinder than is possible under the ordinary design, insuring a high initial pressure of steam for each and every admission of steam to the cylinders.

Second:—Through the correction of the valve movement by the simple, durable and economical addition made to the existing link motion, the opening of the exhaust port and all points of cut-off is delayed, and therefore the steam is held in the cylinder a greater portion of each stroke, necessarily increasing the ratio of expansion, decreasing the terminal pressure, and getting more work out of any given quantity of steam admitted to the cylinder.

Third:—By the addition made to the link motion the closing of the exhaust port at all points of cut-off is delayed, thereby decreasing the volume in compression and

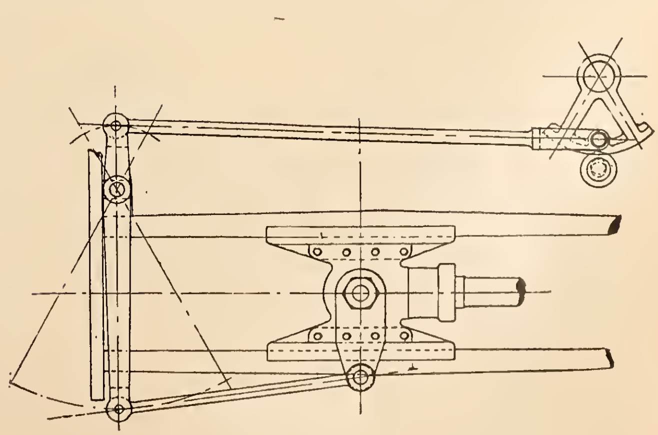


FIG. 9—METHOD OF OPERATING SECTOR AND PINION.

decreasing the negative work of excessive back pressure in just the same proportion, which necessarily adds just that much more to the positive work, the earning capacity of the locomotive.

Fourth:—By decreasing the volume in compression the cylinder clearance is reduced from about 8 per cent to about 2½ per cent in cylinders 20 by 26 inches, or with stroke only 1.3 times the diameter, enabling a considerable saving of over one cubic foot of steam for every rotation of the drivers that the locomotive moves under steam.

In substantiation of what has been said the following table is submitted, giving a comparison of the valve events under the Allfree-Hubbell system and that of the usual link motion. From this table it would appear that the Allfree-Hubbell system of steam distribution is better than can be had with the ordinary Stephenson link motion or the Walschaet valve gear:

COMPARISON VALVE MOTION ALLFREE-HUBBELL LOCOMOTIVE WITH LOCOMOTIVE EQUIPPED WITH USUAL LINK MOTION.

Cut-off	Pre-admission		Lead		Port Opening		Cut-off		Release		Closure	
	A-H	Link	A-H	Link	A-H	Link	A-H	Link	A-H	Link	A-H	Link
Full Gear	0	0	-1/32	-1/32	1 15/32	1 1/2	23 1/2	22 7/16	25 3/8	24 15/16	1/2	5/8
66%	3/32	1/8	3/16	3/16	5/8	61/64	18 11/16	18 11/16	23 3/4	23 1/8	1 1/2	2 7/8
50%	3/16	3/8	7/32	7/32	1/2	15/32	12	12	22 7/8	20	2 3/16	4 1/4
33%	7/32	3/4	1/4	1/4	1/2	27/64	10	10	22 1/2	16 3/16	2 7/16	8 3/16
25%	1/4	1 1/8	1/4	1/4	7/16	11/32	7 5/8	7 5/8	22	15 7/16	2 13/16	9 1/8
20%	3/8	1 5/8	1/4	1/4	13/32	9/32	5 7/16	5 7/16	20 7/8	14 1/4	3 9/16	9 1/4

Personals

Mr. Webb C. Ball has been appointed general time inspector of the Chicago, Rock Island & Pacific and the Chicago, Rock Island & Gulf Railway companies, with headquarters at Chicago, Ill., vice Mr. J. W. Forsinger. Effective Sept. 5, 1905.

Mr. J. W. Sutcliffe has been appointed division foreman of the Central Branch Railway, operated by the Missouri Pacific, at Atchison, Kan., to succeed Mr. F. G. Dunbar, resigned.

Mr. G. G. Allen has been appointed assistant general storekeeper of the Chicago Great Western, with headquarters at Oelwein, Ia.

Mr. David Hamilton has been appointed traveling engineer of the Oregon Short Line, with headquarters at Salt Lake City, Utah.

Mr. William T. McGuigal, traveling engineer of the Montana division of the Northern Pacific, was recently killed in a wreck on that road.

Mr. James Langley is appointed master mechanic of the Oregon division of the Oregon Railroad & Navigation Company, with office at Albina, Ore.

The jurisdiction of Mr. L. R. Fields, superintendent of the Oregon Railroad & Navigation Company, has been extended over the maintenance of way, bridge and building, and mechanical departments, not including Portland shops.

Mr. A. Struthers has resigned as master mechanic of the El Paso & Southwestern at Douglas, Ariz.

Mr. W. E. Killen, superintendent of motive power and equipment of the Chicago, Peoria & St. Louis at Jacksonville, Ill., has resigned.

Mr. Thomas Paxton, heretofore master mechanic of the St. Louis, Iron Mountain & Southern at Baring Cross, Ark., has been appointed superintendent of motive power of the El Paso & Southwestern.

Mr. Mord Roberts has resigned as superintendent of machinery of the Kansas City Southern, and has been succeeded in that position by Mr. W. E. Symons, who has heretofore been mechanical superintendent of the Gulf, Colorado & Santa Fe.

Mr. James M. Boone, who was master mechanic of the Pennsylvania Lines at Fort Wayne, Ind., for a number of years up to 1881, died at his home in Chicago on Aug. 1, at the age of 74.

Mr. A. Harrity, division master mechanic of the Atchison, Topeka & Santa Fe at Raton, N. Mex., has been appointed mechanical superintendent of the Gulf, Colorado & Santa Fe, with headquarters at Cleburne, Tex.

Mr. D. A. Williams has been appointed general storekeeper of the Baltimore & Ohio.

Mr. M. D. Stewart has resigned as master mechanic of the Rio Grande, Sierra Madre & Pacific to accept a similar position with the Chicago, Peoria & St. Louis.

Mr. J. W. Oplinger, heretofore mechanical inspector of the Atlantic Coast Line, has been appointed superintendent of motive power of the second division of that company, with headquarters at Savannah, Ga.

Mr. Charles H. Bowers has been appointed assistant master car builder of the lines of the Canadian Pacific east of Port Arthur, with headquarters at Montreal, Can.

Mr. A. B. McHaffie has been appointed master mechanic of the Intercolonial Railway at Moncton, N. B.

Mr. James Reilley, master blacksmith at the Pullman Company's Buffalo shops, died at his home in Buffalo, N. Y., recently.

Mr. F. A. Chase, who has been general master mechanic of the Burlington, with headquarters in St. Joseph, Mo., has been made general mechanical inspector of the Burlington system, and the position of general master mechanic has been abolished.

Mr. James K. Lorney has been appointed general car inspector of the Chicago & Alton, with headquarters at Bloomington, Ill.

Mr. W. H. Dressel is appointed master mechanic of the Washington division of the Oregon Railroad & Navigation Co., with headquarters at Starbuck, Wash.

Mr. J. P. O'Brien has been appointed general superintendent of the rail lines of the Oregon Railroad & Navigation Company, with headquarters at Portland, Ore. He will have charge of the transportation, maintenance of way and bridge and building departments, and of the mechanical department, not including the general shops.

Sixteen-Inch Crank Shaper

The accompanying illustrations present the principal features of a new 16-inch crank shaper recently perfected by the Queen City Machine Tool Company, Cincinnati, Ohio, especially designed for heavy duty and long life. A high degree of accuracy in the work produced by this machine is insured by the great care exercised in its manufacture and erection. Full benefit of the high speed tool steels, now in wide use, may be derived, such service being provided for by the ratio

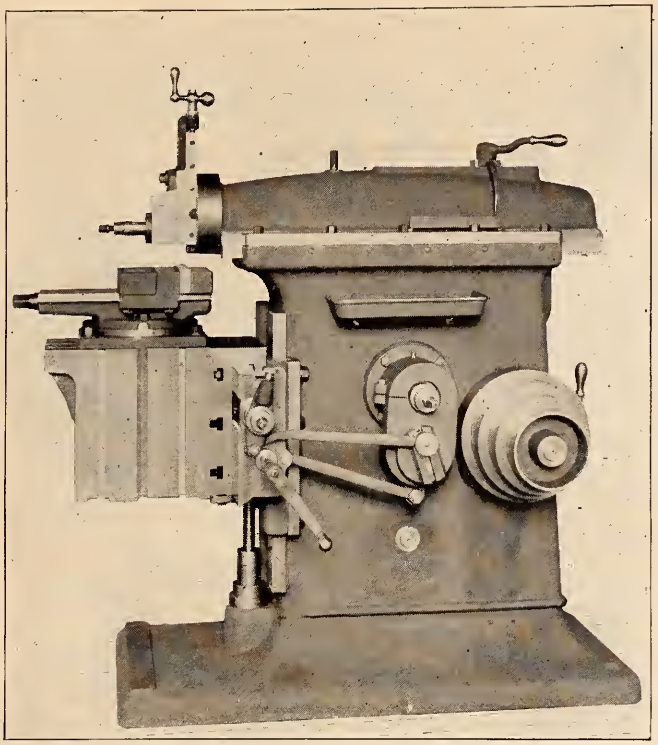


Fig. 1—"Queen City" Sixteen-Inch Shaper.

of back gearing of 20 to 1. This gearing is shown in Fig. 2.

The column is of large proportions. It is very heavy and reinforced at proper points to resist working strain. The bearing for the ram is 30¼-inch by 10-inch, and attention is directed to the manner in which the slides for the same overhang, especially in front, giving the tool increased stiffness.

The ram design is original with the builders. The arch construction brings the maximum section of metal into service at the point where leverage is greatest, i. e., when the cutting tool is in its extreme forward position. Length of stroke and position of ram can be changed without the operator leaving the work, and while the tool is in motion or at rest.

The rail is extremely heavy. It has 9 ins. front and 1½-ins. top wearing surfaces, insuring permanent alignment of the table. The cross traverse is 21 ins. and the screw has graduated collar. Vertical adjustment is effected by means of bevel gears that are protected from chips and dirt, and provided with ball bearings, which reduce friction to the minimum. The improved telescopic screw does away with cutting a hole in the floor.

The rocker arm is connected to the ram by means of a link, properly set, giving a straight pull and an even cutting speed, with a very quick return and no lost motion. Fig. 3 shows this construction, and also the very superior adjustment to compensate for wear of crank shoe.

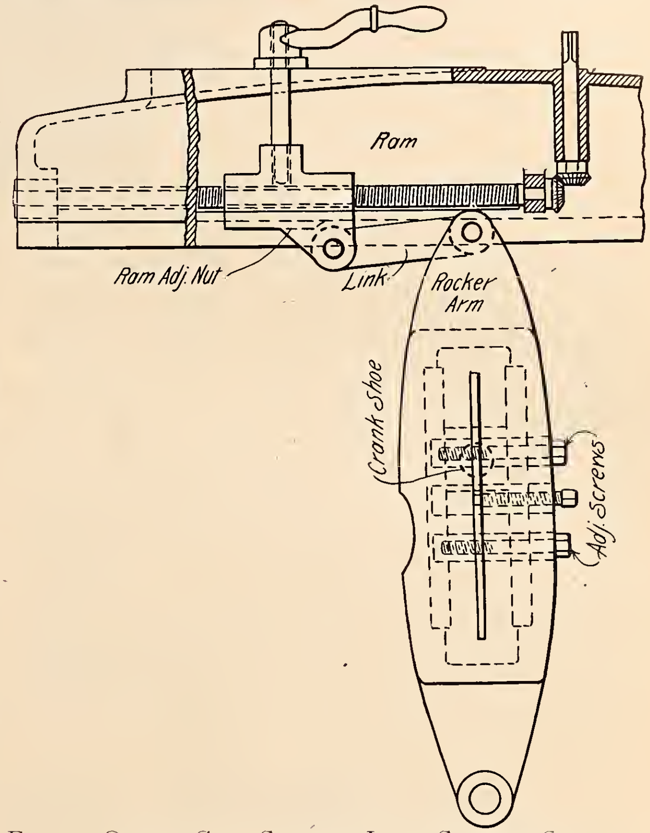


Fig. 3—Queen City Sixteen-Inch Shaper, Showing Connection of Arm and Rocker Arm.

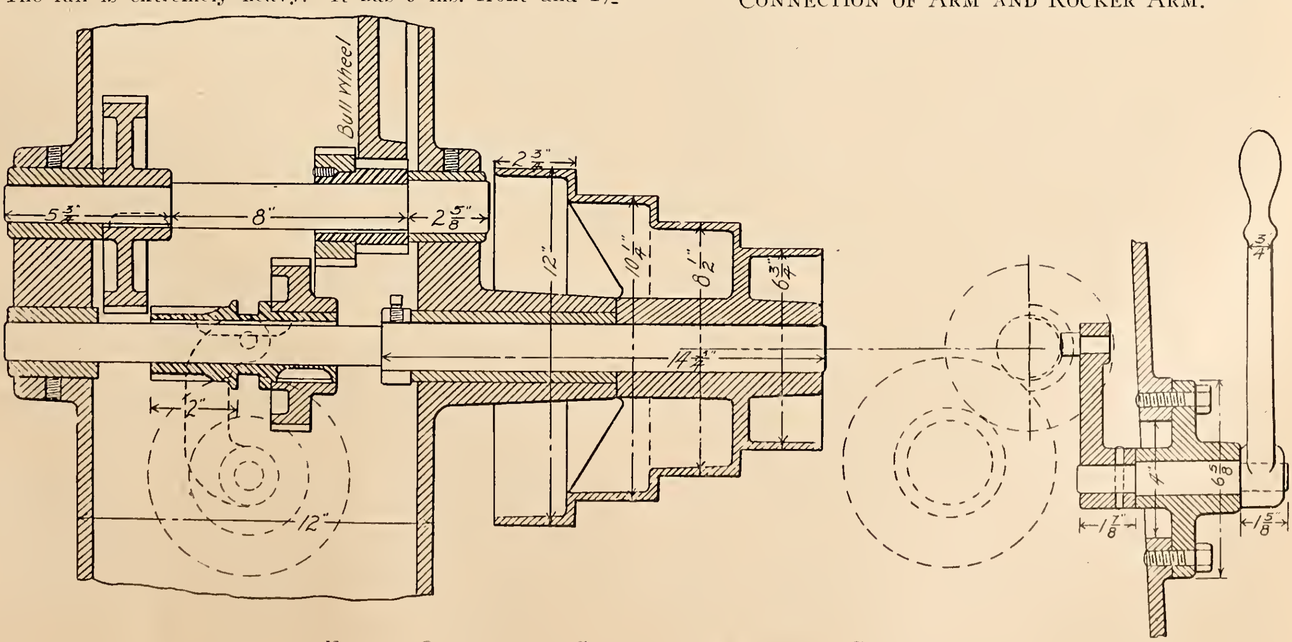


Fig. 2—Queen City Sixteen-Inch Shaper-Gearing.

The table is of box form, with T's slotted on top and sides and has V for holding shafts and similar work vertically, and can be readily detached from saddle. Extension provides for broad clamping surface, utilizing the full length of the stroke. An outer support will be furnished on order.

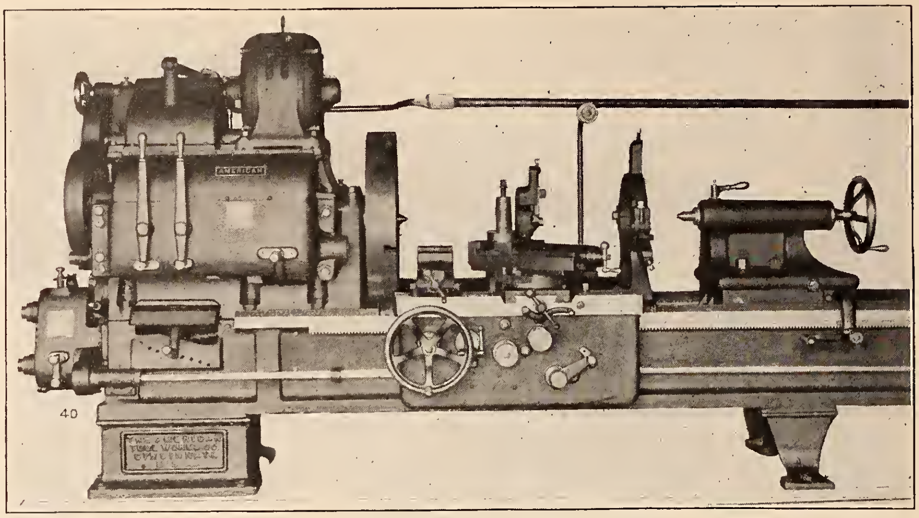
The vise is planer type and will hold absolutely solid even on angle cuts. It has a base that can be firmly bolted to top or sides of table and swivel is held in the same manner; both are graduated, and can be set to any angle quickly and accurately. The down feed screw to head is provided with a graduated collar.

All flat wearing surfaces are scraped to a standard surface plate. They are extremely wide, and so gibbed as to permit of close adjustment for wear. All column holes are unusually long, and bushed, providing for the maintenance of original centers. Means have been provided for perfect lubrication.

Materials used in the construction of this machine are carefully selected. All pinions and bevel gears are of steel, as are the vise jaws and bull wheel slide. All gears and T slots are cut from solid stock. Wrench connections are hardened. The feed gears are covered. The large opening under the ram provides for the keyseating of shafts and similar work of any length. Each machine put on the market is belted and thoroughly tested before leaving the works of the manufacturers.

All extra attachments, such as power down feed, concave attachment, tilting and revolving table, mold makers, vises, mandrels, index centers, etc., furnished promptly on order by the manufacturers of this shaper, the Queen City Tool Company, Cincinnati, Ohio.

Thirty-Inch Engine Lathe



THIRTY-INCH "AMERICAN" ENGINE LATHE.

The accompanying illustration shows a 30-inch "American" engine lathe equipped with an unusually interesting method of motor drive, built by the American Tool Works Company of Cincinnati. The interesting feature of this drive is that the motor employed is constant speed. The great majority of motor-driven lathes are equipped with variable speed motors, even though at much greater expense. In this instance, a constant speed motor, either direct or alternating current, is used, and the various speeds to the spindle are obtained mechanically through the all geared headstock. This consists essentially of patented clutch and gear mechanism, which employs the minimum amount of gears and shafts, and is a simple, efficient and practical drive. Through manipulation of levers 1 and 2 shown at the front of head, and 3, shown at the lower right-hand corner of the head, sixteen distinct and positive speeds to the spindle are provided, in geometrical progression, ranging from 3.8 to 246. Thus a wide range is obtained entirely through mechanical means, sufficient to cover the ordinary work of the lathe. By reason of the simplicity of construction, all gears and shafts can be made of large diameters. The whole is neatly encased, all parts are readily accessible for lubrication.

A non-reversible constant speed motor may be used if desired, because the reverse is obtained mechanically, by means of the rod shown mounted above the lathe, out of the way, yet very convenient to the operator. The superiority of this construction is that the motor is at no time reversed, but runs at continuous constant speed, all starting, stopping, and reversing of the machine being readily accomplished without interference with the motor.

The motor is substantially mounted above the all-gear headstock, and the lathe may be at any time converted into a belt driven machine, by replacing the motor by a single pulley mounted on the upper shaft.

Locomotive Educational Chart

Railway and Locomotive Engineering has recently produced an educational chart descriptive of up-to-date American passenger locomotive practice. The chart is a transparent engraving of an Atlantic type locomotive and every part is carefully and clearly numbered, each number corresponding with a like number in a list on the margin giving the names of the several parts so indicated. This chart is being given away (unframed) with a year's subscription to Railway and Locomotive Engineering, or selling at 25 cents a copy.

Northern World's Fair Exhibit

The exhibit of the Northern Electrical Mfg. Co., Section 14, Palace of Electricity, Louisiana Purchase Exposition, is of especial interest to railroad men because of the comprehensive showing of modern shop practice. While the exhibit is primarily devoted to Northern motors, both constant speed and variable speed, it includes a variety of types of machine tools as driven by Northern variable speed motors. Booklet No. 41, just issued by the company, gives an index to the exhibit, as well as indicating the location of machine tools and appliances scattered throughout the grounds operated by Northern motors.

The Northern, single voltage, variable speed motors, as exhibited, operate on the two wire, single voltage system, taking their current from the Exposition Company's power circuit. Speed variations as high as 5 to 1 are provided by the Northern system, are accomplished by the use of compact motor fields and simple controlling mechanisms. There is shown a Gould & Eberhardt shaper with ram strokes from 7 to 110 per minute.

Northern electric emery grinders and buffing lathes, as shown in the Northern exhibit at St. Louis, will appeal particularly to railroad shop men who have quantities of grinding to do and inefficient, inconvenient grinding appliances. The Northern electric emery grinder is a compact, self-contained device, and consists of a special motor mounted upon a suitable pedestal and equipped with tool rests and wheel guards. The shaft and bearings are extremely rugged and have been designed especially for the service required.

Notes of the Month.

Mr. J. W. Dawson, heretofore machine foreman at the Burnside shop of the Illinois Central Railroad, is now representing Edwin R. Kent & Company, general U. S. agents for Edgar Allen & Company.

The offices of Templeton, Kenly & Co., the Rookery, Chicago, manufacturers of the Simplex car jacks and dealers in light section rails and track supplies, have been consolidated with the shops and warehouse at 33-37 East Ontario street, Chicago.

The Duff Manufacturing Company has recently received a contract from the Trans-Siberian Railway Company (Russia) for an additional quantity of Barrett track jacks, and this shipment has gone forward as an additional order to the car load order of Barrett jacks received from this railroad some time ago. This company has also received a contract for Barrett track jacks from the Egyptian Railways, at Alexandria, Egypt, and this consignment has also gone forward.

"Valve Troubles and How to Avoid Them" is the title of a small pamphlet being distributed by Jenkins Bros. The first part of the booklet is devoted to a summary of the difficulties —if any—commonly encountered in the installation and use of valves, together with some suggestions for the remedy of such difficulties. The balance of the booklet is devoted to the illustration and description of the principal types of valves manufactured by Jenkins Bros., space not permitting the illustration of all the different types. The first valve illustrated is the regular Jenkins Bros.' brass globe valve, which is very extensively used today, there being comparatively few steam plants in the United States where at least some of these valves are not in use, nor few experienced engineers who do not have some knowledge of their merits. The extra heavy brass valves are next shown, these valves being designed for a working steam pressure of 150 to 300 lbs., or for hydraulic pressures up to 1,000 lbs. The booklet is illustrated with half-tones throughout, and special attention is called to the transparent cut of the "Excelsior" straightway back pressure valve, showing at a glance the simplicity and advantages of this valve. The description of the Jenkins Bros. safety valves is also noteworthy. The company distributing this little book is anxious that it should reach every engineer and steam user and therefore will be pleased to send copies on request.

The controlling interest in the Commonwealth Steel Company has been acquired by Mr. Clarence H. Howard. In this investment Mr. Howard likewise represents a syndicate of his friends and the control of the company was purchased from the Niedringhaus firm, which retains a minority interest. The company is capitalized at $1,000,000, and the plant is located at Granite City, adjacent to the Niedringhaus enameling works. The Commonwealth is a cast steel plant, with a monthly capacity of 3,000 tons of open-hearth cast steel. Under the new management the plant will be devoted principally to the making of railroad cast steel specialties as far as possible, such as cast steel double-body bolsters for passenger cars, the Davis counterbalanced locomotive wheels, the separable body bolster for freight cars, etc. At a meeting of the new company recently held, Mr. Howard was elected president. He has had a remarkable career in St. Louis. He is a graduate of the manual training school of Washington University and in the past twenty years he has held many positions of prominence, including assistant master mechanic of the Missouri Pacific Railway, superintendent of the Missouri Car & Foundry Company plants at Cambridge City, Ind., and at Kansas City, Mo.; manager of the Scarritt Car Seat Works; manager St. Charles Car Company; secretary and manager of the Safety Car Heating & Lighting Company; vice-president and general manager of the Leighton & Howard Steel Company, and vice-president of the American Steel Foundries consolidation, from which last position he resigned last December.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

The Locomotive Painting Committee Report

Following is the part taken by Mr. Dane, the chairman, at the Master Mechanics' Convention in June, concerning the above-named report, as reported and forwarded us for publication, and about which mention was made in our last issue:

President Lewis: I note that Mr. Dane is now present. I would be glad to have him come forward and read the paper on painting.

Mr. Albert P. Dane (Boston & Maine): Mr. President and Gentlemen: "I thank you for the very cordial invitation received from your president to attend this convention and the opportunity afforded me to present this paper.

"I think it hardly necessary to read the paper, even in the abstract, for the committee, not expecting to be present, was very careful to compile a report as concise and self-explanatory as possible.

"There is, however, an item which appears in the report, which is in direct opposition to the views of the majority of the committee, and the manner in which it was placed there is in opposition to all custom and without authority.

"On page 5, paragraph 8, under the head of labor-saving appliances, the second item reads: "the material-saving paint sprayer."

"At the first meeting of the committee it was contended by the majority of the committee that the paint sprayer was not an economical appliance in locomotive painting and therefore should not be mentioned in any way in the report.

"It was finally settled amicably and satisfactorily to all, we thought, by inserting a paragraph which appears at the bottom of page 3, 'The paint-sprayer (under favorable conditions), etc.'

"After properly compiling and arranging, the report was dispatched to the members of the committee for their respective signatures, but when received by the fourth member of the committee, he inserted with pen and ink this item, 'The material-saving paint sprayer,' and signed his name to it.

"I was much surprised at the action taken by the member, who is a man generally of very good judgment; but knowing it could not be entertained, for the simple reason that the report had previously been signed by three of the committee, this item should have been erased.

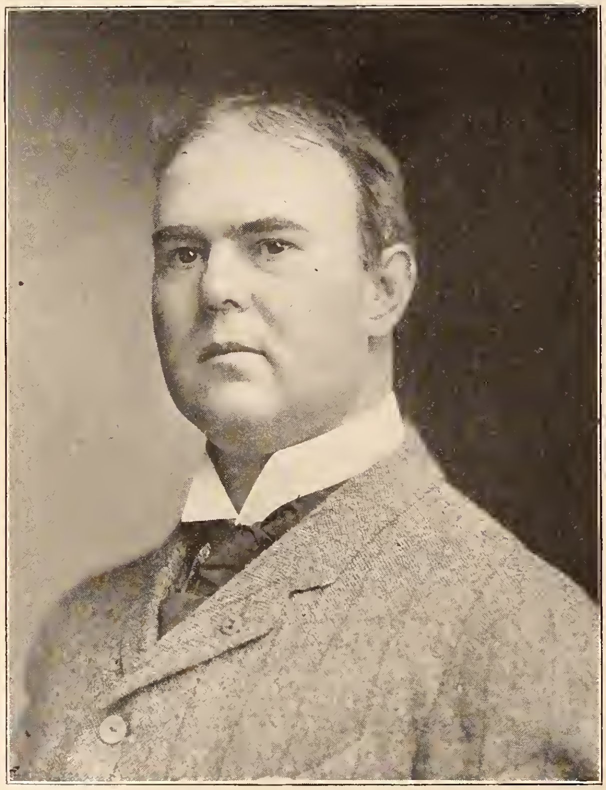
"In the hurry and anxiety to have the report forwarded to Mr. Taylor promptly for publication, if he so desired, the erasure was accidentally omitted. For this reason I came here to respectfully request every member who received an advance copy of this report to expunge from that list the second item, it being unauthoritatively placed there.

"I wish to state that the article mentioned will not appear in the original report, nor will it appear in either of the railroad publications represented at this convention, and as chairman of the committee I would deem it a great favor if you would kindly draw a line through the second item in the list. I thank you, Mr. President."

M. C. & L. P. A. Portrait Gallery.--E. J. Arlein

We take pleasure in presenting the photo and sketch of another of our younger members in this issue, namely, Mr. E. J. Arlein of the Chicago & North-Western Ry. Shops, Chicago, Ill.

Mr. Arlein was born in Chatham, Canada, in 1865. At the age of sixteen he entered the St. Thomas shops of the Canada Southern R. R., where he worked five years, leaving there to



Mr. E. J. Arlein.

go into the Detroit shops of the Michigan Central R. R. Seven years later he came to Chicago, securing employment in the Pullman shops. In 1898 he was appointed foreman painter in the street car department, which position he held until that department was discontinued in 1900, when he entered the service of the Chicago & North-Western R. R., where he is at present employed.

Does Paint-Spraying Pay?

Editor Railroad Paint Shop:

A Symposium of artices in the affirmative by Messrs. J. H. Pitard, E. T. Congdon and W. O. Quest, all well-known members of the M. C. and L. P. A.

Since the advent of the paint sprayer, sufficient time has elapsed to demonstrate its strong and weak points, and while at first it threatened to put the paint brush out of business, its area of operations since, seems to have been greatly circumscribed. As to what combination of circumstances this is due can only be surmised. It may be mentioned, however, that one of its distinguishing and rather striking characteristics, is its impartiality, as it distributes the paint about evenly over the surface and likewise over the operator. This trait of impartiality is greatly to be admired in men, but is a wasted virtue when applied to a painting machine. But regardless of its defects, the paint sprayer remains the friend of the busy painter, and present conditions seem to justify the belief that in a few years the sphere of the paint sprayer will be greatly enlarged.

It is not my intention, however, to discuss the merits of paint spraying in this article, but rather to tell what we are doing successfully along this line. On our freight cars, the roofs and trucks are sprayed, also the bottoms and interiors of steel gondolas and coal cars. For a while the bodies of all our cars were sprayed, but on account of the enveloping mist, we experienced some trouble in retaining reliable operators, therefore we decided to limit the spraying to the parts mentioned above.

On our engines, we spray the engine frame and trucks, also the pilot, and on the tanks, the tank-frame and trucks. In many instances the driving wheels on freight engines are sprayed, using a brush to take up "runs." The engine frames are usually sprayed in the late afternoon, in order to have it dry by morning so that other workmen may not be deterred by fresh paint.

On coaches, all the underneath brake rigging and gas drums and platform irons are sprayed before the car is placed in the paint shop. Both the exterior and interior of coach trucks are sprayed, using oil color for the interior, and enamel for the exterior. Much of our roadway work, such as coal dumps, etc., is sprayed. Wherever dust is encountered, it is disposed of by removing the suction hose from the paint bucket and blowing off the dust with the sprayer.

On such work that we paint with the sprayer, I estimate that we save the labor of five or six men. In fact much of the work that we paint with the sprayer, would be impractical, in fact impossible to paint with a brush, such for instance as the remote parts of steel trucks in order to protect such parts from the weakening effects of rust.

Regarding the waste of paint, I find that it is more than offset by the gain in labor. Much waste is obviated by using a reducing valve when the air pressure is over sixty or seventy pounds, which pressure will suffice in all ordinary circumstances. A higher pressure forces out the paint faster than it can be controlled. We purpose lengthening the tube of our sprayer to about six feet in order that the operator may be sufficiently removed from the mist as to enable us to paint our freight cars entire by this means.

We have recently completed the spraying of the interior of all our shop buildings, using cold water paint with complete success. It is perhaps well to explain just here for the benefit of all who contemplate using the Enright sprayer, that ordinarily it will not lift paint over four feet through the suction hose; this fact is not due to any defect of the sprayer, but is something that is governed by natural laws. The paint sprayer in our shops has become a fixture, and without it I would be hard pressed to make my monthly output.

Yours truly, J. H. Pitard,
M. & O. R. R.

Editor R. R. Paint Shop:

Complying with your request, I give you my views on the paint sprayer as a mtaerial-saving, or labor-saving device. I have never advocated that the paint sprayer was a "material-saving" device. My own experience is, unless conditions are favorable, that there is a certain amount of paint lost with the spray—with some machines more than others; but with a good, up-to-date machine the loss is very small and the labor saved far exceeds the loss.

My experience with the sprayer has been very satisfactory and I consider the one we have in use indispensable. We have three machines, one each for engines, freight and passenger cars and confine their use to work to which they are adapted. On engines the tender trucks and all the iron work underneath, which it is necessary should be protected, also buffer and draw bars, we spray with nubian black, which costs about 25 cents per gallon, adding to one gallon of black a little less than one quart of turps, or benzine. Five quarts of this sprays the above-named parts, including the wheels.

The cleaning of trucks takes less time than to clean for brush as all loose dirt is blown off with sprayer and oil boxes are cleaned with benzine.

The actual time it takes to spray these parts is about 15 minutes and when finished is more satisfactory than if done with brush. All corners, nuts, and bolt heads are covered with a glossy coat of this black as well as the face of the work.

For painting pilots the sprayer has proven a success and a saving to the company. The western district of the Northern Pacific is supplied with pilots from this point and a great many are made and I consider for pilots alone it is a great advantage and labor-saver. A few days ago we had a number of pilots to spray. I put the man who runs the sprayer to work at them, not letting him know that I was going to time him. I timed him on two pilots and he sprayed the first one in two and one-half minutes and the second one in one and one-half minutes. Of course the machine was filled and coupled up ready for use.

There are other parts of engines on which sprayer could be used to advantage could painters have the engine at certain times to themselves. This is impossible in some shops, as the painter is supposed to have the engine finished as soon as do the machinists. Yet when it is possible we use it on frames, firebox and front trucks. We have a small hand machine that holds one quart, using but one hose to spray these parts. We also use it for blacking iron-work under passenger cars, but use the large machine on all passenger car trucks, saving time and labor.

On freight cars we use it on all classes, except for patching, where a 6-inch flat paint brush, put on a long handle, is more practical. My experience in painting freight cars with the sprayer is certainly in its favor. Four years ago 250 36-ft. box cars were built at South Tacoma, and they were all painted with the sprayer. They were built in the summer months. Our freight shop has three tracks holding six cars to the track. When the eighteen cars were ready for painting, three men and sprayer would prime them in three hours, including time for filling sprayer and making air connections. We kept account of the material used and found it was but very little more than used with brush.

I want to say we used quite an amount of benzine in our paint which lessened its cost without detriment to durability, as time has proven. I examined one of these cars recently and found the paint to be in splendid condition after four years' service. I account for this in the new method of applying the paint.

Under favorable conditions the sprayer is a material saver. We recently painted a thirty-foot, twin-hopper coal car, 6 ft. 6 ins. high, 8 ft. 6 ins. wide, one coat, only using 2¼ gallons paint. By brush it could not be painted with less than three gallons. Time spraying, 15 minutes.

There is no question in my mind as to the paint sprayer being a labor-saving device, and every railroad shop that is equipped with air should be supplied with one or more up-to-date sprayers. I find in most cases that have come to my notice where they are not using a sprayer that the foreman painter does not want one, and if he has had one he has not given it a fair trial before condemning it. To use the sprayer successfully the operator must first learn how to manipulate his machine; and the man that knows how to apply paint with a brush makes the most successful and economical man to use the sprayer.

In looking up the experience of practical men, foremen painters who belong or have belonged to the M. C. & L. P. A. and have expressed their views in the official journal, I find it to be decidedly in favor of the sprayer and many of them have made the assertion that it is a material saver. If I am not taking up too much of your space I will quote a few of them on this subject.

R. R. Car Journal, November, 1896, article by W. O. Quest, who says: "We are also satisfied that this particular spray could be employed in any railway freight car painting department, large or small, to great advantage not only as a matter of economy in labor, but also in that of paint consumed for doing this class of work. This fact we developed through making several comparative material tests."

R. R. Car Journal, April, 1897, clipping from the Daily Railway Age of June 22, 1896, the Erie R. R. Shops of Meadville, Penn., speaking of sprayer: "In painting freight cars they have been very successful; they formerly had a gang of six men and now they have only three, and one of these is doing stencil work exclusively and he is occasionally helped by the other two." Further on, in this same article:—"about the same quantity of material was used as by hand."

June number of the R. R. Car Journal, 1897, T. J. Rodabaugh, M. P., Pittsburg, Ft. Wayne & Chicago R. R., says: "We do not work the machine for fun, as one has said, but use it on account of its being able to do the work and effecting a saving of material."

R. R. Car Journal, October, 1897, paper read by Mr. McMasters at 28th annual convention: "We are at present building at Burnside shops, 120 new 35-foot box cars which we are painting with spray at a cost for labor complete, excepting lettering, of 57¾ cents. We painted one of these cars by hand at a cost for labor, excepting lettering, of $1.63¾, using 7½ lbs. paint more than on the car sprayed."

I would refer you to R. R. Car Journal of January, 1899, article by F. S. Ball: "Two N. E. Club Members Criticised." This article speaks plainly and gives one to understand that Mr. Ball at this time was not very favorably impressed with the paint sprayer.

In October, 1903, number of Railway Master Mechanic, 34th Annual Convention, M. C. & L. P. A., Mr. Ball, in answer to query No. 5, says: "I am using a paint sprayer for a shop of limited capacity or no capacity at all, whereas, as is commonly the case the freight cars are repaired and painted out of doors, a spraying machine is indispensable and especially during a scarcity of skilled labor such as we have experienced during the last year or more, as it enables the foreman painter to meet any or all emergencies, while without it he would often be seriously handicapped. Aside from the actual saving in labor and material the objections commonly advanced to the use of the paint sprayer are, First Is not more paint wasted than is put on the car? From an experience of about four years I say decidedly not, if proper care is exercised in the management of the machine and if the amount of air pressure and flow of paint is regulated properly; and, even if answered in the affirmative, I could also contend that the labor and time saved is of more value than the paint wasted."

In the same number Railway Master Mechanic, page 498, Mr. Gohen gives us a practical test, showing the comparative merits of the brush and spray. At the time of test he was opposed to sprayer. He says: "I got Mr. Harwood of the Chesapeake & Ohio, who is present, and will endorse every word I say. I asked him to paint me a set of samples for my own personal benefit. I told him what I wanted and told him I wanted some samples painted in warm dry weather with a brush and with spray at the same time. I wanted one coat, two coats and three coats, specifying on the panels the number of coats. I also asked him to paint during wet, cold weather a like set of samples with one, two and three coats with spray and brush. He sent them to me and I put them on this old ice house back of the paint shop at Brightwood. They have been there now about three years. Gentlemen, I want to say to you that those sprayed boards are the best boards today; they are better than the boards painted with brush and the weather did not seem to have any effect. Those that were painted in the cold, damp weather were just as good as those painted in dry weather, so I do not think the water in the air cuts much figure."

Pardon me for so many quotations, but experience and practical tests by practical men are the most convincing argument I can give you as to the merits or demerits of the sprayer as a material or labor-saving device.

Yours truly,

E. T. Congdon,

Foreman Painter, N. P. Ry., So. Tacoma, Wash.

Editor "Railroad Paint Shop":

In the columns of the August number of our official journal, the Railway Master Mechanic, we observe that we have been publicly arraigned by our esteemed friend and fellow-associate, Mr. A. P. Dane, chairman-elect of association committee elected to submit paper presented before the late June meeting of the Railway Master Mechanics' Association, held at Saratoga, N. Y., our offense, as therein stated, being that of mentioning the paint-atomizing machine on an assumed vantage ground. We have also been assured by Mr. Dane in communication that in further self-defense we are to be arraigned in open meeting at the coming Atlantic City Convention, our alleged offense being interpolation, the act of inserting spurious words in a writing.

Now, we do not wish to be considered aggressive champions in this very unpleasant matter, but we do propose to strongly stand up for our known shop practice, also individual convictions in our advocacy of the paint-atomizing machine of the future, just as we have for the machine of the present, or of the past.

As an available subterfuge by the prosecution, the arraignment is to be based on questioned right as an individual committeeman to make a suggestive insertion in a so-called closed-up committee report, but finally referred back to the several committeemen for approval and signature. When this referred report reached us we discovered that there was no mention made of a probable requirement of a paint-atomizing machine in the final summary of appliances, which, in our judgment, should have appeared, owing to the fact that mention of the machine had been made in a previous paragraph as embodied in report. As a consequence of this conviction, we side-lined in this stated summary, with signature, the following words: "The Material Saving Paint Sprayer," which you will observe was merely a final suggestion on our part, which was done, we also wish to assure you, with the full knowledge that when the report had received the final signature it would revert back to chairman of committee with personal power to erase or to again refer the matter back, if objectionable, to a majority of the committee, and, as Chairman Dane admits in a scoring communication, he both observed and personally objected, as an anti-machine man, to the insertion, but that, through undue hurry, the paper was forwarded to the Secretary of the Master Mechanics' Association, who promutly, as per custom, sent out the report as received in advance sheet form, beyond recall. Such is our side of the story, and, although we are not egotistic enough to think it errorless, we yet wished to be judged from standpoint of this version.

In a spirit of fairness we will go further:—if, after the best of authorities on parliamentary rules are consulted and it is found that we have exceeded our authority, lacked judgment, or have been discourteous—done anything that will question our action in this matter, we will then publicly make ample apology to Mr. Dane for the mistake.

To demonstrate that this trouble is not altogether a parliamentary, etc., issue, we will here quote from a communication from Mr. Dane:

"My absence at the first meeting of the committee was deplored by me, especially after reading the paragraph which relates to the paint sprayer being used under favorable circumstances.

"I objected at the second meeting to the introduction of the paint sprayer in any form or way, having previously reported it to the management of road as impracticable in locomotive painting. There are no favorable conditions—none ever exist in repair shops where the sprayer is an advantage; but I was overruled by the committee, out of deference to your absence, and it remained."

You will thus observe, through quoted paragraphs, Mr. Dane's views upon the paint-machine issue as a railway master painter, which to say the least, is straight out from the shoulder and for which we are generous enough to commend his action; but we are firm in our belief that he may live long enough to acknowledge that he, too, can be mistaken.

We here wish to thank Messrs. Miller and Wright for the stated deference shown an absent committeeman, also beg that they accept our apology for having judged them, for a time, as being unprogressive enough to have the world believe that all mechanical advancement had stopped at the threshold of the railway car and locomotive paint shop. It is also up to us to further thank the above-named gentlemen for having enjoyed the privilege of coming home to Pittsburg from that first New York meeting, strong enough in our individuality to report to our expectant officials that we, at least, had not been whitewashed, so to speak, in our endeavor to have the atomizing machine receive recognition as a probable saving appliance.

As you are aware, the committee subject submitted before our official superiors—the Master Mechanics' Association—was as follows: "What is the best practice for painting locomotives—cost, durability and appearance all being considered, especially to bring any economical appliances which have been utilized to assist in work"—which is a plain and distinct call for known saving tools and we are going to make an honest effort to prove that the paint machine is both a labor and material-saving device, where handled with that object in view.

In this attempt I will, agreeable to your request, furnish you with my up-to-date experience in the use of the pneumatic paint-atomizing machine, as foreman painter of a railway car and locomotive paint shop. The beginning of this since very active and strenuous experience was in the year 1896, when our superintendent of motive power invited me down to the company's freight repair yard to witness the "stunt" of the foreman of coppersmiths painting a box car through use of a shop-duplicated machine, modeled from lines of a machine presented by the motive power officials of a connecting line, whose foreman of locomotive painters—we were since given to understand—was the inventor thereof. Although one of the uninitiated at the to-be-exploited paint squirting demonstration, the writer was perfectly familiar with the fact that our brother foreman was, at the time, one of the captains of the McKees Rocks volunteer fire department, and as such, I wisely judged it would be well for me to respect that gentleman's ability in handling the nozzle of the innocent enough looking paint machine. With this view of affairs uppermost in mind, at the word "go," I safely located behind the man with the gun and, permit me to assure you, it was well that I did so, for if memory serves me right, I was one of the very few who reasonably escaped the deluge of paint shot up into the air through the unskilled manipulation of that machine. The motive power official, car builder and other department heads, with many other curious spectators present, retreated in anything but a dignified order; and that the man who ran the wrong way, I assure you, needed a skin-wipe of benzine and a change of linen before again appearing in good society. The car was finally coated with enough paint to cover two cars of the same surface area, but as the paint was slow-drying, it was straightened out with the brush and the all-around results were not so bad, all details considered. Thus was the first coat of paint atomized on a P. & L. E. R. R. freight car. After this stated "first round," with honors about evenly divided, the machine with all its environments, was placed under the supervision of the painter, with orders to make the thing work as it was understood it would work, where properly adjusted and handled. The machine was finally studied out and made fairly successful. This was the beginning, but not the end. Ordered and encouraged, we began to study up the mechanism that would give us a better control of our machine, which we were officially assured had come to stay, regardless of all trade prejudice. With this end in view, we started in, with many alternate failures and partial successes, to perfect a machine according to our ideals of method and efficiency, our main effort being to overcome some of the machine's many bad features in a health-handling sense, which we will be candid enough to say will never be entirely overcome, but we do think this objection can be greatly reduced with thorough care in machine construction and operation.

We regret that time and space will not permit us to submit the several drawings and photographs of some of our experimental creations along this line of action. In our striving to make progress, we soon discovered that it was the greatest machine control and not the greaest ejected volumes of paint that were the necessary essentials to lead us up to an acceptable working machine; also that it could only be economically used at best on a class of work about the railway car and locomotive paint shop. We also discovered that we could not have both quantity and quality in the same machine, especially where a material-saving, perfectly-atomized-on coat of paint was the objective point in view. To bring about this control, the syphon or ejecting head, was devised to eliminate the wasteful drip, also to produce a steady material-lift and expulsion under action of the power-producing compressed air. A great deal of attention was also given to the air and paint-controlling valves, which were made to work simultaneously; also separately adjustable in order that the material consumption might be reduced to the minimum of requirements; this dual-valve arrangement permitting us to set our machine slow, or to a limited speed at will of operator who manipulates but one lever in operation.

We further wish it understood that we do not claim the machine we are using today will do the work of ten brushmen, but we do claim that we can show a decided profit by its use, versus the brush; also that, through studied care in handling, we can show a material saving, where the same class of work is rushed through under the brush by the usually employed cheap labor.

In order to more conclusively answer your question directly as to material economy, we enlisted the co-operation of our official superiors, who promptly ordered a series of tests made exclusive to the supervision of the painting department, which, for final authenticity, the undersigned officials will hold themselves responsible.

The following are the comparative amounts of materials used in the several tests made on freight cars, passenger car trucks and the running parts of the locomotive:

"To Whom It May Concern:

The Paint Atomizing Machine versus the Brush, as a coating material and labor saver.

On July 26th, 1904, at McKee's Rocks shops, a paint test was made in the presence of Messrs. H. W. Watts, M. C. B. Monongahela Connecting Railroad, D. D. Aird, Foreman Car Repairs, P. & L. E. R. R., and G. E. Carson, General Foreman Car Department, P. & L. E. R. R.

The results of test follow:

One steel gondola car, 80,000 lbs. capacity—body of car containing 738 square feet—and two trucks containing 122 square feet, equal to 860 square feet of paint surface.

First coat by machine, 26 lbs. paint used, time 15½ mins.

Second coat by machine, 19½ lbs. paint used, time 11½ mins.

First coat by brush, 30 lbs. paint used, time 2 hrs. 42 mins.

Second coat by brush, 20 lbs. paint used, 1 hr. 44 mins.

One wood gondola coal car, 60,000 lbs. capacity (trucks not included), paint surface in body 497 square feet.

First coat by machine, 13 lbs. paint used, time 10 mins.

Second coat by machine, 10 lbs. paint used, time 7 mins.

First coat by brush, 16 lbs. paint used, time 1 hr. 30 mins.

Second coat by brush, 11 lbs. paint used, time 1 hr.

On July 27th the following test was made in presence of D. D. Aird, Foreman Car Repairs, and M. J. Sullivan, Shop Inspector:

One steel hopper car, 10,000 lbs. capacity—body containing 1,326 square feet, and two trucks, 158 square feet—equal 1,563 square feet of paint surface:

First coat by machine, 24½ lbs. paint used, time 25 mins.

Second coat by machine, 23 lbs. paint used, time 20 mins.

First coat by brush, 35 lbs. paint used, time 3 hrs.

Second coat by brush, 25 lbs. paint used, time, 2 hrs. 30 mins.

On August 5th, the following test was made in the presence of D. D. Aird, Foreman Car Repairs, and M. J. Sullivan, Shop Inspector:

Four standard 4-wheel passenger trucks—each truck containing 176½ square feet or 353 square feet of surface to each pair:

First coat by machine, 6 lbs. paint used, time 30 mins.

Second coat by machine, 5 lbs. varnish color coat used, time 30 mins.

First coat by brush, 6 lbs. paint used, time, 2 hrs.

Second coat by brush, 5 lbs. varnish color coat used, time 2 hrs. 25 mins.

Yours truly,

G. E. CARSON."

"To Whom It May Concern:

In order to ascertain the amount of saving of both material and labor effected by the use of the paint-spraying machine, we recently painted the frames, fireboxes, cylinders, trucks and pilots of two locomotives of 2-8-0 type, one being painted with the paint spraying machine and the other by hand, the engines being identical in size.

The engine painted by hand required 25 lbs. of frame black; labor of one man 10 hrs. 15 mins.

The engine painted by the sprayer required 17 lbs. of frame black; labor of one man 2 hrs. 10 mins.

In our regular practice we are using the sprayer exclusively on this class of work.

D. J. REDDING,

Master Mechanic."

In our summary remarks we wish to publicly call your attention to the fact that we fail to show a material saving in passenger car truck test, both operations requiring the same amount of paint—3 lbs. to each truck, or 6 lbs. to pair, but as we show a very gratifying labor saving and are convinced that machined trucks made the best appearance, we will leave this matter in the hands of our to-be judges. We also wish to state that all material used in above tests was carefully weighed by people under whose supervision the tests were made, which will be verified for to the extent of sworn affidavits on demand.

As stated, we also wish it distinctly understood by both the "for and forninst" that we do not make the claim entirely there will be a future machine developed which will entirely eliminate the paint-ladened air, gasification trouble, as such a feat, with our present understanding, would be, in our judgment, a physical impossibility from the fact that we further judge the most strenuous anti-machine man will be frank enough to agree with us that there is also a propertionate gaseous generation from the brush application of paint in shop interiors, which will kill or poisonously overcome where there is a lack of fresh air supply, or judgment used in handling the application. So it will be observed through this line of argument that if the same care in skilled supervision is put forth in the construction and operation of the paint machine as is put forth in the selection of a brush—also in making the cheap labor usually employed brush-wise, we think there would be less opposition to machine as a saving appliance, especially as opposed in the railway paint shop, where, at best, nothing but known economies prevail on balance expense sheet account set opposite each man's name.

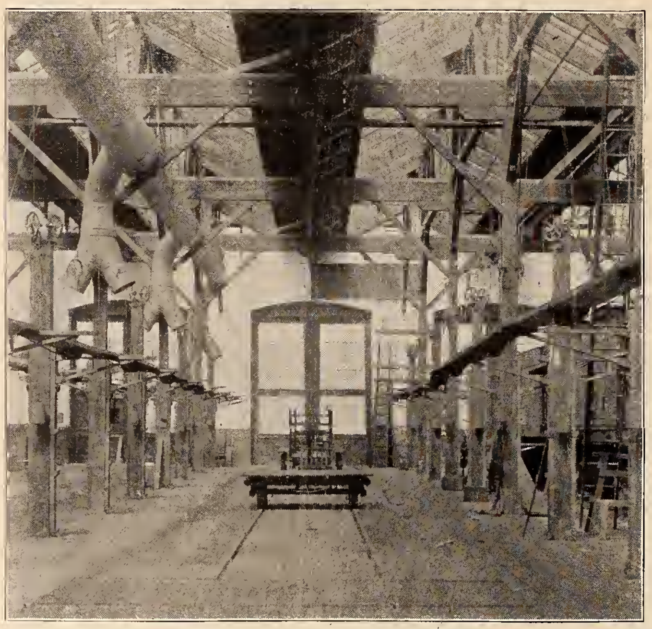
Our officials invite an investigation of our herein forced statements; they wish to demonstrate that a paint machine can be satisfactorily operated as a labor and material-saving appliance in a railway car and locomotive paint shop.

We will here also state that we do not wish to have our possibly-enforced absence from the coming Atlantic City convention misconstrued by friend or foe of the paint-atomizing machine. All we ask for is a fair and open field, but trust we will never again be called upon to defend our position against our associated fellows, for whom we have and shall ever have the kindest regards, notwithstanding the fact that we occasionally agree to disagree on civil and mechanical government.

W. O. QUEST, M. C. P.,
P. & L. E. R. R., McKees Rocks, Pa.

New Shops of the P. B. & W. R. R. at Wilmington, Del.

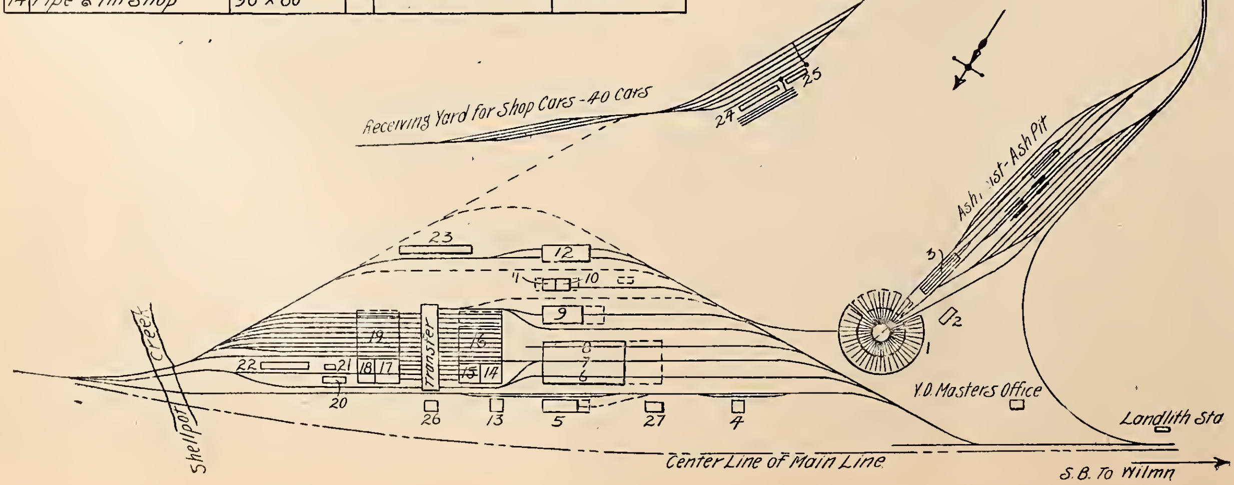
Through the courtesy of our friend and associate, Mr. Charles A. Cook, president of the Master Car and Locomotive Painters' Association, and foreman painter of the P., B. & W. R. R. at Wilmington, Del., we are pleased to embellish our columns this month with views of the new shops lately constructed for this part of the Pennsylvania system, and some account of the same.



View in Paint Shop of P., B. & W. Railroad, Showing Staging and Heating Pipes.

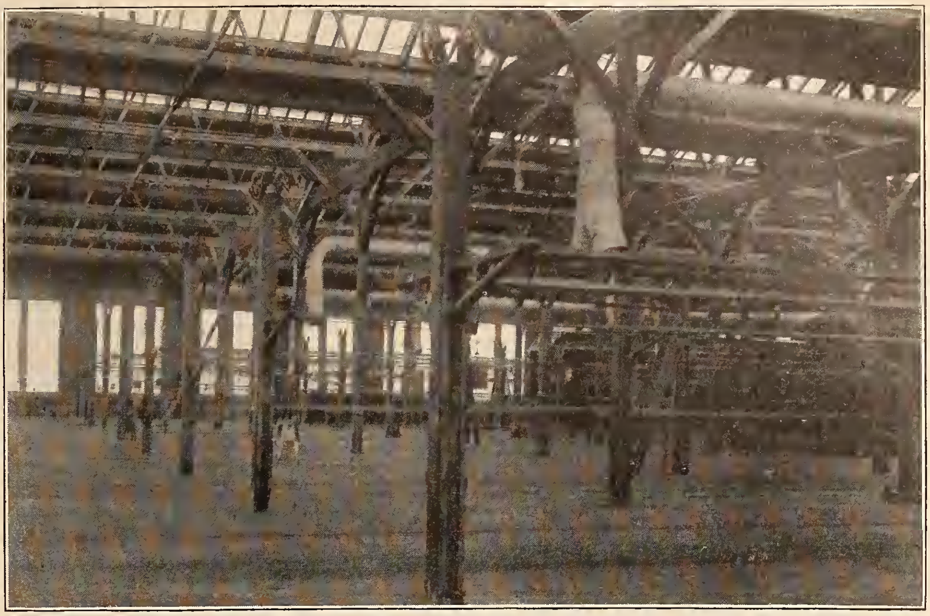
For many years the P. B. & W. R. R., as the initials of the road were until recently, contemplated the erection of new and modern shops, as the old shops were inadequate for the thorough and economical handling of its equipment. Having seen the old shops last November, about two months before they were abandoned for the new ones, it is a wonder that they were able to use them so long as they did and keep up their passenger equipment in them. Then, again, they were hastened in their abandonment by the oncoming of the elevated granite structure that has been carried clear through

No	Name of Building	Dimensions	No	Name of Building	Dimensions
1	Round House	363' Dia	15	Varnish Room	90'x80'
2	R. H. Office & Bunk Room	75' x 27'	16	Paint Shop	160'-6"x180'
3	Coal Wharf		17	Cabinet "	119'-8"x80
4	Oil & Waste Storage	53'-9½"x 50'	18	Upholstery Room	60' x 80
5	Office & Store Room	149'-10¼"x50'	19	Car Erecting Shop	180'-6"x180'
6	Boiler Flue & Tank Shop	342'-7½"x50'	20	Buffing Building	91' x 40'
7	Loco. Erecting "	" " x78'	21	Dry Kiln	
8	Machine "	" " x50	22	" Lumber Shed	
9	Blacksmith "	179'-2¼"x 80	23	Lumber	
10	Boiler House	75'x50'	24	" Dressed	
11	Power "	" x "	25	Oil, Bolts & Castings	
12	Mill	200'x70'	26	Car Shop Lavatory	53'-9½"x50'
13	Paint Storage	53'-9½x50	27	Loco. Dept.	69'-9½x50'
14	Pipe & Tin Shop	90' x 80'			



General Layout, P., B. & W. Railroad Shops at Wilmington, Del.

the city to abolish the road's grade crossings, for this structure was down to the shops, which were in its way when we were there, and waiting for their tenants to move out. On this and other accounts the new shops could not be built on the old site, which was well within the heart of the city, so a larger tract of land was purchased just on the edge of the city limits. Plans for both locomotive and car shops combined were designed, as the old ones were separate, and in the summer of 1902 the foundations were begun. The erection of the steel framing for the various buildings was commenced in January, 1903, and by spring of the present year were occupied. They are of steel framing filled in with brick. Most of the buildings have temporary ends providing for future extension, which is a good idea, for a road's equipment is liable to increase, and unless a corresponding increase is made in the size of shops, congestion results.



Interior of Paint Shop, P., B. & W. Railroad.

The several illustrations shown give a general idea of the entire plant. The various shops are equipped with all the modern improvements. Power for all the shops is distributed from the power house. A telephone system connects all the buildings with the main office.

The paint shop has eleven tracks, each track holding two of the larger coaches, or three ordinary ones. It is equipped with stationary scaffolding, which is raised or lowered by means of a balance weight running over a pulley. The varnish room, where all detachable parts of both cars and locomotives are varnished, is 90 ft. x 90 ft., and adjoins the paint shop. Both have an abundance of light and are heated by the hot air system, driven by three large fans through overhead pipes. All the buildings are heated in this manner, excepting the storeroom and offices, which are heated by steam.

There is much yet to be done in the way of laying out the grounds, etc. We congratulate Bro. Cook on having so good new shops and hope to follow suit some sweet day.

Prepared Paint Oils

Chemistry has been challenged for years to prepare an oil that would in any way take the place of linseed as a paint oil; and in the minds of many practical painters she is just as far from its accomplishment as ever. But is this opinion based upon facts? We hardly thing so altogether. Some men are so swayed by prejudice that it is next to the impossible for them to form a just estimate of anything whether of politics, piety, pills, paint or plasters. If an article is brought to their attention, if they do not feel like it they do not want it, and that is all there is to it; and they do not feel like looking into it if it is an innovation upon established customs. They can tell why they do not want it in language forcible enough, but it is in the language of a prejudiced mind and not in that of one enlightened, technical, expert, candid and reasonable. They can't tell why in this sort of reasoning, but it is so because their fathers and grandfathers thought so and did so. Now when anything is suggested of which their fathers disapproved it will surely be discountenanced at once, without preamble or ceremony. To step anywhere else is to tread on dangerous ground; and so, as they dare not bear the weight of their foot on new soil, no new step is taken in advance in—anything? Yes, it is taken in about everything else except in some materials and methods in painting. Why is this? Well, probably there is no class of artisans more prejudiced than painters. Their trade is guarded by a jealous eye, which is all right provided that eye is not bandaged by prejudice in the hands of ignorance.

Paint Shop and Front of Paint Storage, P., B. & W. Railroad.

Now, linseed oil—what is it? You would think it is some nectar handed down by the gods, to hear some people talk. In its purity it is the expressed juice of flaxseed—a vegetable product. In commerce it may be almost anything, and mixed with water by a steaming process at that—it may be from the seed of weeds and grass growing with it; it may be from cotton seed or from corn growing far away from it; it may be not at all from any of these—it may be from a fish or from an animal. But to hear some talk you would never think it could be adulterated any more than their mothers' religion can be. Why, it is linseed oil, you know; and linseed oil is linseed oil, isn't it! if not, what is it? "You may search me," to use a street phrase. It is easier to tell often what it is not than to tell what it is. We know that it is getting to be powerfully sophisticated and some who handle and use it are mightily unsophisticated.

Now it would seem to be very queer if there is nothing else in this wide world of vegetation, to say nothing of its wealth otherwise, that will produce an oil fit for a painter's use, excepting that little flaxseed! As a matter of fact, science says there is. True, we have looked in vain for it here in this land of wealth and enlightenment; but that dark, heathen land (as we think), where we send our missionaries, is sending back by the same ship barrels upon barrels of an oil that possesses merits that linseed never contained, especially one of which is the production of a more water-proof film than linseed and hence a better vehicle, when properly treated and fitted for use, for a protective paint for iron and steel. We refer to Chinese wood oil, which bright chemists have been studying for years and are now successfully incorporating into many paints and varnishes; and we prophesy a still wider field for this useful article in various ways. We believe the most successful prepared paint oil, of which there are many on the market, will have this in its subtle composition to a marked degree; and that before very long, if it is not already accomplished.

Notes and Comments

Mr. Edward Reid, we are informed, has been appointed foreman painter of the Buffalo shop of the Erie, to succeed Wm. R. Knapp. Mr. Reid was formerly connected with the old Wagner shop at Buffalo, and later engaged in house painting, etc., in the Bison City. More recently, however, he has been working as a journeyman under "Bob" Shore at the Collinwood plant of the L. S. & M. S. R. R.

It is a pretty good test for the working qualities of an aluminum paint when a ten-pound can of it is opened and kept around for months—covered, of course—and used on small jobs and still not settling but working freely, covering well and producing just as good results as at the first until all used up. Such is the product of the S. W. Co. A banana-oil article will not do that.

Specialties in the paint and varnish line are continually being devised by the supply trade as an aid to the foreman painter with limited time and facilities at his command. These are generally gotten up, if of real service and value, by some one familiar with the business—some one perhaps who formerly was in the shop and knows its needs. Where once the painter had to concoct about everything he used, about all he has to do now is to lift a cover from a can, stir its contents and go to work. Still the field isn't all occupied yet. Bright men will ever be exploiting and experimenting with new things in new ways. Here's where success lies in the trade.

A neat, tasty way to treat rattan chairs, provided that color will harmonize with other furnishings, is to give them a coat of Moss Green "Lacqueret." This is a transparent varnish stain that produces a pleasing effect over rattan not too much blackened by age. If the latter is the case, the rattan may first be painted with a coat of rattan-colored paint composed of white lead, ochre and a bit of raw amber and mixed "flat" in spirits turpentine. When dry the "Lacqueret" can be applied over this ground with the same effect as over new rattan. No varnishing is necessary, as the varnish is in the "Lacqueret." It is also made in various other shades, such as "Walnut," "Dark Oak," "Light Oak," "Rosewood," "Mahogany," "Cherry" and "Rich Red." It is manufactured by the Standard Varnish Co. and on sale at various agencies throughout the country.

We are sorry "the opposition" have not seen fit to express themselves on the paint sprayer question in this issue. Mr. Dane gave his views in the August number as against it, but the excellent and candid articles elsewhere in this issue are all strongly in its favor—all one way. We had hoped that some champions against its use would have entered the arena; it would have made it more interesting. Our columns are not shut to any of our members on either side of any vital question.

Ever and anon somebody with a zeal not according to knowledge bobs up with a cold water paint which he would fain force on you for freight-car painting. There's nothing like it—in his mind. He sells it—if he can; you use it—not as an outside paint, nor for any other purpose, except as a substitute for whitewash. It's all right for shop interiors and the like, but the butter milk compound never should be thought of for a freight-car paint. Imagine the standard brown oxide of iron used for this purpose mixed in water! Paint a car with it and during a rainstorm your hand will be red with paint every time you touch it. A neighbor of the writer painted a picket fence with it and became disgusted.

Because flakes of rust an eighth of an inch thick come away from pressed steel five-sixteenths of an inch thick, it does not follow that but three-sixteenths of steel remain. Rust is a growth, like a cancer. Still it eats, like a cancer, whatever it grows upon and must finally destroy that upon which it feeds. This will be done speedily unless arrested by some process of eradication as well as protection. It is a waste of time and material to paint over rust flakes with anybody's paint. One may as well paint a cancer with vaseline to stop its growth. The rust-pits must be cleaned out with the sand blast before painting, or time and money are lost. Steel can be protected from rust, if one will go at it with the right materials in the proper way and it is followed up at reasonable intervals.

The Boston & Maine R. R. has just received from the Pullman Company fifteen first-class 60-ft. passenger coaches that were contracted for to be built by that company some months ago. They were made throughout in accordance with plans and specifications furnished by the B. & M., and are equipped with Pintsch gas, Hale & Kilburn seats in old gold plush, the Gould steel platforms, buffers and couplers, and Chaffee centering device. Also the Pullman patent anti-telescoping device, the Gold heating system, and are finished in mahogany on the interior, with quartered oak headlinings and have continuous bag racks that are put up and are detachable in four-foot sections. The exteriors are painted Pullman color and striped and lettered in uniformity with the standards of the contracting railroad. This makes about 75 cars, 65 of which are straight passenger coaches, that the Pullman Company has built for this road in the last eight years.

Our readers will have noticed in Mr. Dane's explanation in the August issue remarks as strongly opposed to paint spraying on locomotives as are the articles in this issue in favor. And had Messrs. Wright and Miller contributed articles against, as they were invited to do by the editor, they would doubtless have put up as honest, candid, convincing arguments. What then? Well, the truth is doubtless on both sides, and is a further exemplification of the fact that has been brought out in our convention controversies that shop conditions, facilities, methods and requirements of work vary in proportion to the variance in discussion; and level-headed mechanical superiors understand this and do not demand the unreasonable from their foremen painters. They want all the information obtainable whether they profit by it or not, and our association should give it, as will these columns. That is what they are for, and not to make fast rules to follow.

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RAILWAY MASTER MECHANIC

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ON page 383 of this issue we present a number of communications discussing the consolidation of the American Railway Master Mechanics' and the Master Car Builders' Associations, received in reply to an editorial concerning this subject which appeared in the September issue of the Railway Master Mechanic. The majority of these communications express decided approval of the suggestion made by Mr. F. W. Brazier, late president of the M. C. B. Association, that the two associations should be brought together as one organization, a move which would seem to be a step in progress.

The last few years have brought out new methods of doing work, electricity has been introduced more or less in suburban railway service and the duties of railway mechanical officers have been broadened on such account. The question of the future of the two associations is now a very pertinent one and a prominent motive power official has recently suggested to us that the question should be fully agitated by the railway press so that more light on the subject may be obtained before action is taken.

As the stand taken by most of our correspondents is so decidedly in favor of a consolidation of the interests of the two mechanical associations we would like to see some arguments from the other side of the question if there are many who are opposed to the move.

IT is a noticeable fact that during the discussion of the future locomotive engineer—how can good material be obtained and retained? at the recent meeting of the Traveling Engineers' Association, nothing was said about securing material from the ranks of helpers in the roundhouse and erecting shop. The training received while employed as a helper is of much advantage in familiarizing a man with the construction and operating parts of a locomotive, as he comes in contact with it in different stages of assemblage and sees the machine dismembered and again assembled for service.

Some roads hire men for work as firemen and put them in the shop for preliminary training, and often pick out from among their most likely helpers men who make good road men, but who had no idea of becoming firemen when they first entered the service of the road.

Why would not this be an interesting topic of discussion among the traveling engineers, as they are the men who are very closely concerned?

INCLUDED in this issue are reports of the twelfth annual convention of the Traveling Engineers' Association and the third annual convention of the Master Steam Boiler Makers' Association. The former organization is well known by its work in improving the service of the locomotive and its influence has been widely acknowledged. The Master Boiler Makers' Association is young, having been in existence for about three years only. There is an opportunity for the development of much good in the field reached by this association and there is every reason to believe that it will be productive of good results.

The report of each association, presented on other pages under this cover, is but a compendium of the proceedings. Space would not permit a reproduction of any of the papers or a detailed account of the discussions. The outlines given are for the purpose of advising the higher railway officials of the subjects and problems considered by their subordinates in order to advance the interest of the railway companies, and for the benefit of those members of the associations who were unable to attend the conventions. From these synopses it is possible to learn what questions were given greatest prominence, so that those specially interested in one or more of the subjects considered might know where to look for more detailed information.

The transactions of the Traveling Engineers' Association are published by Mr. W. O. Thompson, secretary, Oswego, N. Y., and the proceedings of the Master Steam Boiler Makers appear in the columns of Motive Power, a monthly journal published by the association.

EXHIBITIONS of improved appliances and new machinery, and the practical demonstration of the use of new devices, have a double value. They not only bring forward their individual merits to attract the attention of a prospective purchaser, but, further, exert a valuable educational influence. In both instances the exhibit shows to better advantage when accompanied by a competent representative, thoroughly familiar with the principles to be illustrated and having a knowledge of the conditions under which his device or appliance is expected to operate in actual service and the competition to be met with others in the same field.

When a visitor inspects a machine, locomotive appliance or other device, he is either attracted by a novelty in design, a peculiar feature of merit, or makes an inspection with the express purpose of considering it for some service which he has in view. In either event it is likely that he will have some questions to ask, and he wants answers, not mere replies, and it is in this particular that the man of experience enhances the value of the exhibit in his care.

While not detracting in any manner from the ability of young men, nor questioning that they are necessities and therefore worthy of being given every opportunity, it too often happens that situations of this nature are entrusted to men who have not had sufficient experience to become well enough acquainted with general practice to appreciate thoroughly and present to advantage the good features of that which is under their care. Such instances sometimes occur when companies who are training young men for positions of responsibility, entrust work of this nature to these young men for the experience to be gained. It would appear to be more to the advantage of the employer and the protege if the latter was given experience under service conditions, and entrusted with exhibits after becoming further advanced.

MR. C. R. GRAY.

GENERAL MANAGER F THE ST. LOUIS AND SAN FRANCISCO R'Y.

Mr. Gray was born September 28, 1867, and was educated at the Arkansas Industrial University. He entered Railway service with the St. Louis and San Francisco in 1882, and his entire railway career has been with that system. He was telegraph operator from March, 1882, to March 26, 1886. From that date to April 19, 1887, he was clerk to the division freight agent at Wichita, Kansas, and from July 1, 1890, to October 17, 1897, he was division freigdt agent at the same point. He was then transferred to the operating department and was appointed superintendent of the Western division. He was made superintendent of transportation with headquarters at Springfield, Mo., on October 15, 1900, which position he held until his promotiou as general manager of the St. Louis and San Francisco and the Chicago and Eastern Illinois.

IT would appear that in years past the characteristic impression of a roundhouse force was to do as little work as possible on an engine to get it in shape to leave the house, the prevailing idea seeming to be the necessity of getting it out on the road, without due regard to the lack of efficiency likely to ensue and the number of hours of overtime work for which engine and train crews would probably be paid while standing over sidings because of the inability of the locomotive to haul its train from one siding to another within reasonable time. Under such conditions as these an engine will struggle along until it is hardly able to turn a wheel and the joints are all badly shaken, when it will be sent to the shop and put in good condition. If put back on the road under similar circumstances, it will soon pound itself to pieces again from lack of proper roundhouse care.

While such seeming neglect is responsible for a large number of engine failures, it cannot be directly attributed to inability or disinclination on the part of roundhouse foremen to recognize necessary running repairs and give an engine proper attention. These bad results can largely be traced to the desire of the operating department to keep engines on the road every possible hour between shoppings.

Such conditions should not be permitted to exist, and tend to illustrate the old and homely expression, "A stitch in time saves nine." There are engine repairs which can be made satisfactorily in a well equipped shop only, where a complete dismantling is possible. If what are known as running repairs, however, are kept up consistently, with especial care to boiler repairs and washing, it is believed that each engine will spend more actual hours in service on the road and operate more efficiently than when cared for in the slipshod method outlined above. An engine may be held in the house an hour or so longer to get it in shape, but that extra time will probably enable it to make its run between sidings without laying out superior trains.

What is known as "hot work" has been practically eliminated on one division of a prominent trunk line, and its experience by so doing would intimate that flue mileage could be increased at least 25 per cent with little additional time at division terminals. When a boilermaker climbs into a hot firebox, where it is too uncomfortable for him to remain a sufficient length of time to do a thorough job, the work has to be done after every trip. He mauls a few flues, which stop leaking until possibly a few minutes after he is out of the firebox, which is too hot for him to remain in for more than two or three minutes at a time, and the work has to be done over at the other end of the division. Another feature is that he expands and caulks flues too much by reason of the fact that they are softer hot than cold. The condition of the boiler determines the time on many roads when engines shall go to the shop, so that time given to cool down a boiler for washing and repairs would increase the life and usefulness of the entire machine.

A few large systems have promoted motive power men to jurisdiction over both the mechanical and operating departments, with the noticeable results that roundhouse facilities are being improved and greater consideration is being given to the request of an able roundhouse foreman when he asks for time in which to make necessary running repairs.

It must, of course, be admitted that in the event of a blockade any engine that will get a train out of the yard will help the situation. However, if the power has been kept up properly during the dull season, it is more than probable that the busy time will find it in condition to meet the emergency.

Should the M. M. & M. C. B. Associations Consolidate?

ON page 349 of the September issue of the Railway Master Mechanic, there appeared an editorial discussing the consolidation of the American Railway Master Mechanics' and the Master Car Builders' Associations, suggested by President Brazier, of the M.C.B. Association, at the recent convention. Judging by the following replies to this editorial, the majority of which approve of such an amalgamation, his suggestion seems to have been received very favorably:

Editor, Railway Master Mechanic:—

I have read your editorial in the September issue, in which you refer to a consolidation of the two associations, viz., the Master Mechanics' and Master Car Builders.'

I will give you my opinion in a very few words—Dryden says—"Even wit is a burden when it talks too long." At this age, consolidation is the proper thing to do. I see no need of spending two weeks at conventions when the business can be done in one week just as well and by the same parties.

Very truly yours,

John Kirby.

Adrian, Mich.

Editor, Railway Master Mechanic:

I have noticed an editorial appearing in the September issue of the Railway Master Mechanic discussing the consolidation of the Master Mechanics' and Master Car Builders' associations.

For several years I have thought that it would be advisable to have the two associations combined in one, and in my way of thinking there are no good reasons against such a combination.

I have looked over the membership list of the Master Car Builders' Association, as published in the proceedings for 1903, omitting the names of those members whose occupations are not given, or whose titles do not clearly indicate with which department they are associated, and I find but one hundred and thirty members with authority in the car department only. A large majority of the representative members are superintendents of motive power, or men occupying the same position under a different title, and there is a constant tendency towards the consolidation of the two departments on the railroads of this country.

In my opinion, it would be a very wise move to have the two associations consolidated under the title proposed in your editorial, namely, the American Railway Mechanical Association.

Yours truly,

S. Higgins,

General Manager N. Y. N. H. & H. R. R.

Editor, Railway Master Mechanic:

I am pleased to note the editorial comment given to the recent suggestions by President Brazier, of the M. C. B. Association, in favor of a consolidation of the two railway mechanical associations.

It is a subject worthy of full and careful consideration and discussion.

Personally, at the present time, I am in favor of a merging of interests under certain restrictions, and on a basis which will avoid unnecessary duplication of effort and will yet not curtail the separate important lines of development in each sub-department of the mechanical field of railroading, provision being also made for the adding of a new branch in the near future, embracing the electrical motive power side.

I believe that an unprejudiced committee from the two present associations could agree upon and present a basis of consolidation which would greatly facilitate the business transacted at the annual conventions, and at the same time not detract one iota from the high standard of effective work heretofore accomplished by the separate organizations.

The step recently taken of placing the Master Mechanics' Association on a representative basis has made the way much simpler for getting together.

This is not an age of sentiment, but rather of practical common sense.

It would seem to the writer that sentiment would for a few years longer fight against the inevitable union of these kindred interests, while practical, common sense would merge them in a wise and broad basis in the near future.

The suggestions made by you as to a possible division of duties and honor in the offices of president and vice-presidents seem to have much of merit in them and commend themselves for further consideration. I trust that the subject will be agitated, and a full discussion of its merits be brought out.

Yours truly,

A. M. Waitt.

Yonkers, N. Y.

Editor, Railway Master Mechanic:

I am heartily in favor of the consolidation of the Railway Master Mechanics' and Master Car Builders' Associations under the one title of "The Railway Mechanical Association of America."

For busy men, the present plan of having two conventions, which practically uses up two full weeks' time, is not satisfactory. The results are that a part of the members go to the M. C. B. convention on account of very important executive duties connected with the M. C. B. rules and standards, and cannot stay for or have any advantage of the master mechanics' meetings.

A good many members take no interest in the M. C. B. proceedings, but go only for the M. M. Association's meetings, whereas, they would be very much benefited in their future advancement if they took more interest in the car building side of their work.

The two conventions can be very comfortably held without undue labor within the limits of one working week, Monday to Saturday inclusive, by holding morning and afternoon sessions, the Monday morning session to be, we will say, the M. C. B. session and the afternoon to be the M. M. session, the following day, the rotation should be reversed so as to hold the M. M. session in the morning and the M. C. B. session in the afternoon. This would give six sessions for each association, which is ample.

The number of papers and reports to be discussed by each association should be limited, and only such subjects chosen as will be of greatest interest and utility.

Members could then select from their programs what particular meetings it would be most profitable for them to attend for each branch of the service, and spend their spare time when not so occupied, at the exhibits or in amusements.

There would be a distinct saving in time for both associations by combining the organizations into one, in that the election of officers and standing committees, the annual address, the address of welcome and the closing exercises would be reduced 50 per cent.

There is a good deal of work connected with the preparation of reports of proceedings, correspondence with other associations, railroad clubs, etc., which is duplicated now, and which could be reduced 50 per cent, cheapening the cost thereby.

In the old times, the meetings of the M. M. and M. C. B. Associations were, to a considerable extent, pleasure meetings, coupled with a reasonable amount of business.

Now-a-days the conditions are reversed; those who attend the meetings go there because they are of business importance, and the attention of members is very closely occupied between the meetings with the exhibits. Every year the pleasures and entertainments are becoming of less consequence and considered of less importance by both the members and their friends of the supply fraternity.

For the reasons above mentioned I hope, within a couple of years at most, the two associations will combine into one, especially as it has become a fact that with the exception of a few well-known and prominent men, there are no exclusively Master Car Builders left in the railroad service to-day, the principal executive duties of the Master Car Builder having been combined with the general motive power responsibility.

Yours truly, R. P. C. Sanderson,
S. M. Power, Seaboard Air Line.

Editor, Railway Master Mechanic:

Referring to your editorial on the consolidation of the Master Mechanics' and Master Car Builders' Associations. I quite agree with President Brazier of the Master Car Builders' Association that the time has now come when these two associations should be joined in one, and I think the title of the American Railway Mechanical Association would certainly embrace the men in both lines of work.

When the Railway Master Mechanics' Association was formed, the car and locomotive departments were, on many lines, entirely separated and had absolutely distinct heads. The old titles I believe being—Master of Machinery and Master Car Builder, and it was therefore at that time perfectly reasonable and logical that there should be two societies, but as this condition no longer exists there is no reason why these associations should be longer separated and distinct.

It certainly is very true, as Mr. Vreeland points out, that the introduction of electrical traction on many of our lines brings about a condition which necessitates the combination of the car and engine. It is also true, that the majority of our superintendents of motive power or mechanical superintendents are responsible for both car and engine work, and members of both the present associations, and it therefore seems perfectly logical that these two associations should be combined.

I believe all the work of both associations could be as well done now, and possibly better done with a combination of the two associations, and it could be done in much less time, and believe those who will give serious thought to the matter will certainly endorse and approve of Mr. Brazier's happy suggestion.

Yours very truly,
G. A. Gillis, Superintendent,
Richmond Works, American Locomotive Company.

Editor, Railway Master Mechanic:

I have read with interest your editorial comment on President Brazier's address before the Master Car Builders' Association, at their 1904 convention, and I believe that the suggestion to consolidate the Master Car Builders' and Master Mechanics' Associations would be a step in the right direction. There is a general tendency on all railroads to consolidate these two mechanical departments, and with few exceptions, the car department is placed under the supervision of the superintendent of motive power; it is therefore considered that this arrangement gives the best results. This being true, it would surely warrant the consolidation of the two associations, as all subjects discussed at each of these conventions are of equal interest to the master mechanic and the master car builder. It would seem as if the same work might be accomplished in one week, which now takes two weeks of the time of the members who attend both conventions.

The days of the convention, and the subjects to be discussed, could be alternated so as to dispose of all of the work in one week, giving the members more time for committee work, while at the convention, and also giving each member an opportunity of attending both conventions at the same amount of time that is now required to attend one convention.

As a member of the Master Car Builders' Association I personally would favor consolidation of these two organizations.

Yours very truly,
W. E. Sharp,
Superintendent, Armour Car Lines.

Editor, Railway Master Mechanic:

The consolidation of the Master Mechanics' and Master Car Builders' Associations is, I believe, inevitable, and the logical outcome of the present conditions of railroad organization. I do not believe the Master Mechanics' Association should join the Master Car Builders' Association, or vice versa, but I do believe the two should join forces and form an entirely new organization, calling it either the "American Railway Mechanical Association," or, which I think preferable, the "Mechanical Railway Association."

The uniting of these two associations would unquestionably give the new association a much better standing, and their findings would have more weight with higher officials and railroad men in general. The work of both association conventions, by consolidation, would, I believe, be facilitated and many present complications done away with. The individual members of both associations would be benefited by their membership in the new association, and, in view of the above mentioned points, I believe it would be a mistake to further delay the consolidation of these two associations.

Yours very truly,
W. R. McKeen, Jr.,
Supt. M. P. & M., Union Pacific Railroad.

Editor, Railway Master Mechanic:

I am heartily in sympathy with the idea of combining the M. M. & M. C. B. Associations into one organization, and indorse the favorable points made in your editorial of the September issue. Sentiment should not be used to overthrow utility, and I feel as if the combination would increase the usefulness of the organizations. Certain by-laws would have to be assimilated and the question of revenue would need proper consideration, but these could easily be handled. The expenses would be less if the gross revenue were reduced; then representative membership would be uniform throughout and locomotive matters would have the same standing that decisions in car questions now have.

The name proposed, "American Railway Mechanical Association," is good. Various sections could be organized and handled in the same way that the International Railway Congress attends to its business and the length of time needed for the conventions be considerably curtailed. This might be an objection from the point of view of those who go for a "good time," but these are so much in the minority now, that the objection could not be sustained. I sincerely hope that the combination will be speedily effected.

Very truly,
G. R. Henderson.
New York City.

Editor, Railway Master Mechanic:

For the past two or three years I have been strongly in favor of uniting the two associations, but after attending the convention in June last, am opposed to it.

For the past five years I have advocated a less number of subjects, and more time given over to their discussion, and instead of there being less subjects handled, there has been a tendency to increase the number, and when the associations convene the subjects are hurried through in order to keep on time of the schedule, which is laid out by the Executive Committee before the association convenes.

With the amount of work which the heads of departments on any road are obliged to handle, there are few who can afford to give enough time to the advance sheets that are sent out, to warrant them in discussing the paper on the information obtained from the reading of the advance sheets, and the most of us depend on discussing these matters at the convention, and the average superintendent of motive power, or master car builder wants a few minutes to consider before rising to his feet, and the result has been, in the past two or three years, that about the time the members are ready to speak, the discussion is declared closed, and the reports of the committees, as a rule, approved.

The remarks of President Vreeland of the New York City Railroad, at the opening of the Master Car Builders' Association, in my opinion, was one of the strongest reasons why the two associations should not be consolidated at this time.

The only object, in my opinion, that would be worth consideration in consolidating these two associations, is to economize in time. Until we can agree on a less number of subjects, no time can be saved by consolidation. Our general officers do not expect us to attend these conventions without recreation, and for such members as only take the time given to these meetings as a vacation, with a forenoon, afternoon, and evening session, there is little time given to recreation for those of us who go there to attend to business.

Yours truly,
Geo. W. West,
Supt. Motive Power, N. Y., O. & W. Ry.

Square Engine Houses--Terminal Railroad Association of St. Louis

THE Terminal Railroad Association of St. Louis has recently completed three rectangular engine houses near the Union Station at St. Louis, Mo. These houses are operated as one terminal and serve the passenger engines entering St. Louis during the period of heavy traffic incident to the World's Fair and the switch engines belonging to the Terminal Association.

The subject of rectangular engine houses has been agitated to some extent during recent years, and arguments advanced favoring the rectangular form as a more practical construction than the present circular buildings of general practice. There are certainly some features about the rectangular building which are worthy of consideration, still its superiority over the round house has yet to be demonstrated before a substitution will be generally adopted for the present circular building served by a turn table at its center.

At the February, 1904, meeting of the Western Railway Club Mr. George P. Nichols presented a paper comparing the salient features of rectangular and circular engine houses and advocating the former as the superior design. Among the points presented in favor of the rectangular engine house are its economy of space, the ease with which it can be extended when additions are necessary, the ability to place the transfer table under the same roof with the engine pits thus providing against the inconvenience encountered with snow. Other advantages suggested are in the matter of heating, use of cranes for repair work and provision of open space around engine pits. The principal feature of objection is the necessity of providing a Y or supplementary turn table somewhere outside of the building for turning engines.

FIG. 1. GENERAL VIEW OF SQUARE ENGINE HOUSES— T. R. R. ASCN. OF ST. L.

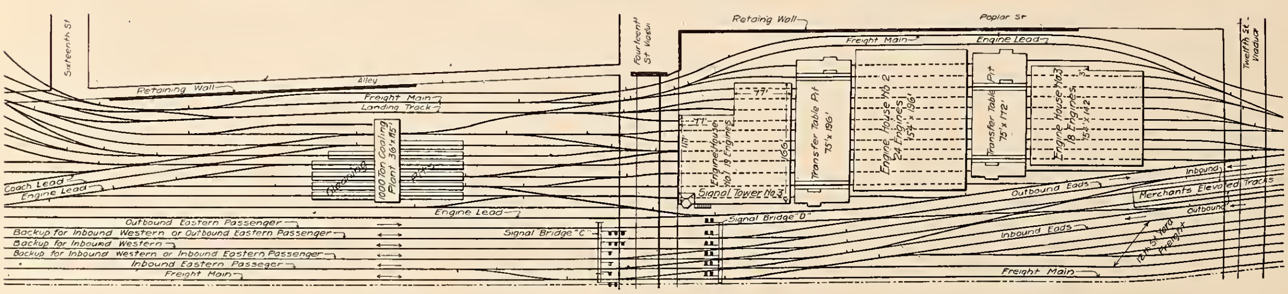


FIG. 2. GENERAL LAYOUT OF COALING STATION AND ENGINE HOUSES—T. R. R. ASCN. OF ST. LOUIS.

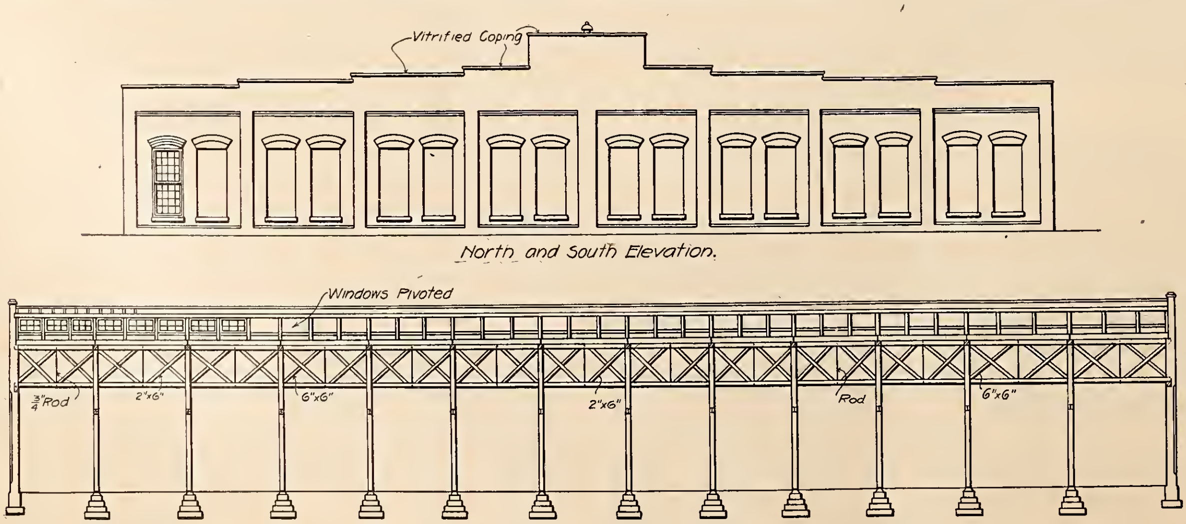


FIG. 3. SIDE ELEVATION AND CROSS SECTION OF ENGINE HOUSE—T. R. R. ASCN. OF ST. LOUIS.

The general outlay of the engine houses of the Terminal Association, location of coal handling plant and arrangement of trackage is shown by Fig. 2. By reference to this figure it will be seen that the houses are arranged in a row with a transfer table pit between the first and second and between the second and third buildings. Two transfer tables operate in each pit and in case of accident to one table no delay or inconvenience need be experienced while it is undergoing repair. The engine houses are of different widths, this dimension of each house being varied to suit the convenience of placing engine leads to the different houses and pits and to conform to the space permitted by the through tracks nearby. The house nearest to the Union Station and adjacent to the coaling plant, has a capacity for nineteen engines, the center house for twenty-four engines and the third one for eighteen, giving a total capacity for sixty-one engines. The pit tracks are of such length as to accommodate two engines on each, with space between the two pits of the same track for trucking. The transfer pits are not roofed over and as engines may enter at either end of each house a door is required at each end of each engine track. The houses are built close to the edges of the transfer pits, there being less than six feet from the edge of the pit to the doorway of the house. It is not necessary to provide space for doors to swing open, as steel rolling doors are used.

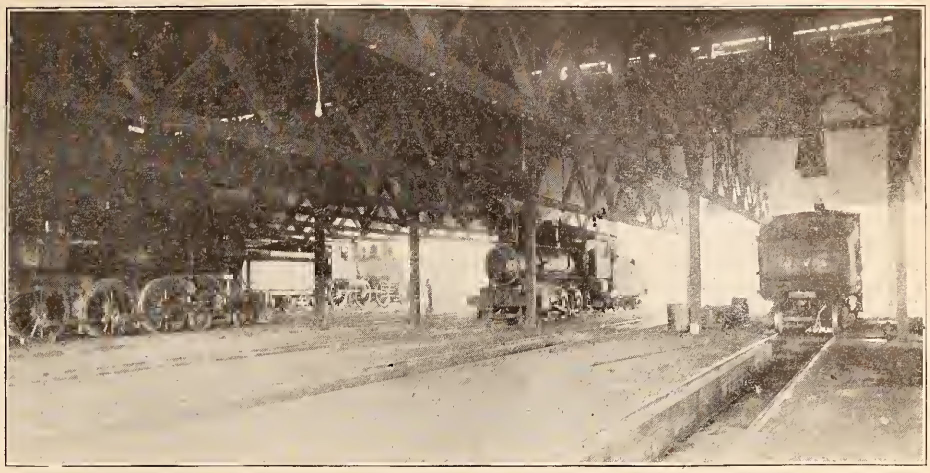


Fig. 4. View of Interior of Engine House, Showing Roof Trusses, Dickinson Smoke Jacks and Method of Lighting—T. R. R. Ascn. of St. L.

The tracks are seen to be particularly well arranged. There are numerous leads between the coaling plant and the first house, each end of each transfer pit is accessible by an outside track, and the center house has one pit connected with a lead independent of the transfer tables. Even in the improbable emergency of three tables of the four being out of order none of the pits of any of the houses would be blocked. Running repairs only are made at this point, and most of the power is operated on regular schedule. The engines can therefore be placed where they will have easy exit when it is time to take them out and it is almost impossible to block an engine as long as the leads are clear. About seventy-five passenger engines and seventy-five switch engines are handled at these houses every twenty-four hours.

No provision for turning the power was necessary to be made in preparing the plans at this point, for the reason that the houses are near the Union Station and the passenger engines reaching this terminal are turned on the Y adjacent to the station.

The construction of the buildings is very simple. The side walls are of brick on concrete foundations, and are

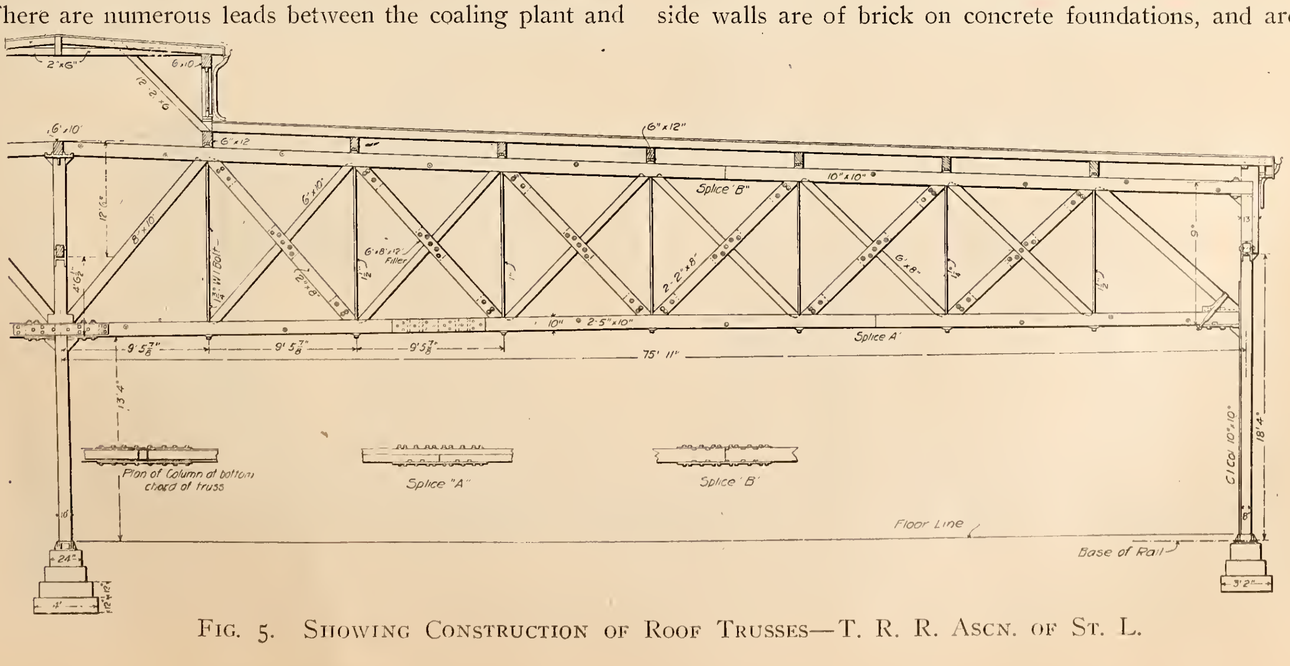


Fig. 5. Showing Construction of Roof Trusses—T. R. R. Ascn. of St. L.

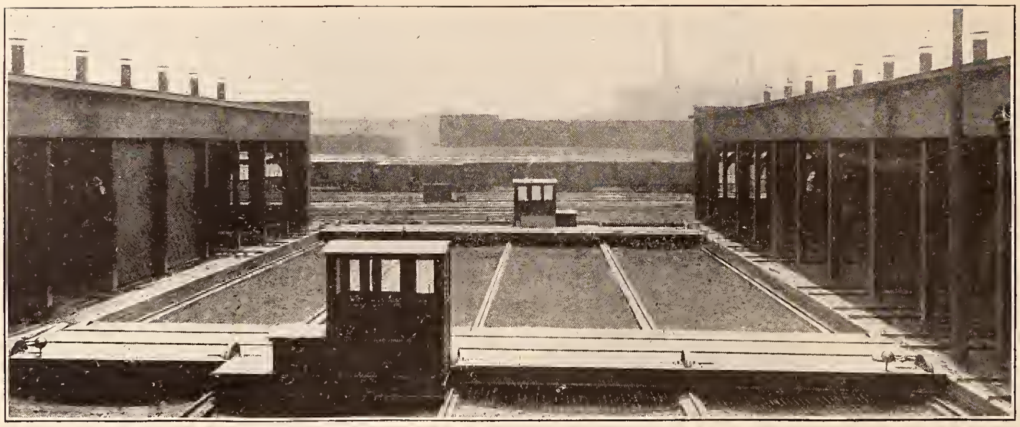


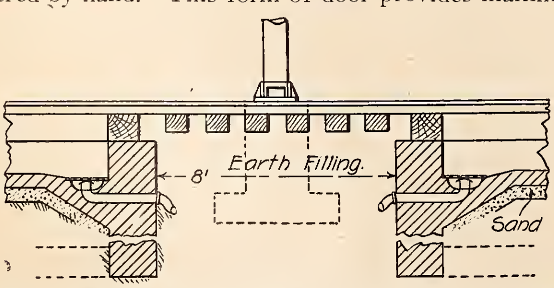
FIG. 6. SHOWING TRANSFER TABLES, PARTIAL END VIEW OF HOUSES, AND STEEL ROLLING DOORS—T. R. R. ASCN. OF ST. L.

provided with a large number of tall windows. The ends consist simply of square cast iron columns supporting the roof and providing frames for the rolling doors. There is a narrow strip of brick work between the tops of the doors and the roof. The roof trusses are of wood, supported on hollow cast iron columns 10 inches square, and arranged parallel with the engine pits. The truss is composed of two long 10 by 10 inch members with cross supports and tie rods forming a simple design for carrying the weight of the roof over the long span between supports. On account of the extreme length, the main members are made up of short pieces spliced together. Figure 8 shows a plan of the center house by which the arrangement of engine pits and location of columns can be clearly seen and the general construction of the roof truss is shown by Fig. 5. Each house is spanned by a wooden monitor, arranged at right angles to the pits and immediately over the center row of columns. The ventilating windows forming the sides of the monitor are arranged to swing about their centers and are operated by chains controlled by hand wheels situated on the columns accessible from the floor.

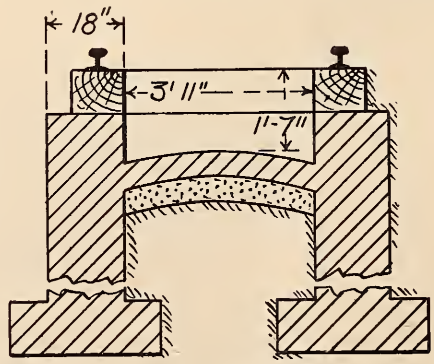
The rolling steel doors at the ends of the pits are manufactured by Kinnear Mfg. Co. The weight of each door is counterbalanced so as to be raised and lowered by hand. This form of door provides maximum opening for entrance and exit, takes up absolutely no valuable space, and permits the transfer table to be arranged in close approximation to the end of the house.

The pits are 60 feet long. The ends of the pits are 10 feet from the columns supporting the roof trusses and a space of 11 feet exists between the ends of the pits. The sides and bottoms of the pits are of concrete. The side walls are supported by a foundation of the same material and the bottom of the pit rests on a bed of sand. The bottom of each pit is convex, shedding water toward the sides and the gutters so formed slope toward the center of the house and drain into a trunk sewer as shown by the general and detail drawing, Fig. 7. The concrete walls of the pits are capped by 10 by 12 inch timbers held in position by a number of anchor bolts embedded in the concrete. The rails are spiked to the tops of these timbers. The floor between the pits is of sand with a top dressing of cinders.

Two smoke jacks are located over every pit, one above each end, this being necessary on account of the fact that the engines are not necessarily headed in a given direction when they enter the house. The jacks are built



Section showing Connection of ends of Pits with Trunk Sewer.



Transverse Section on line M-N

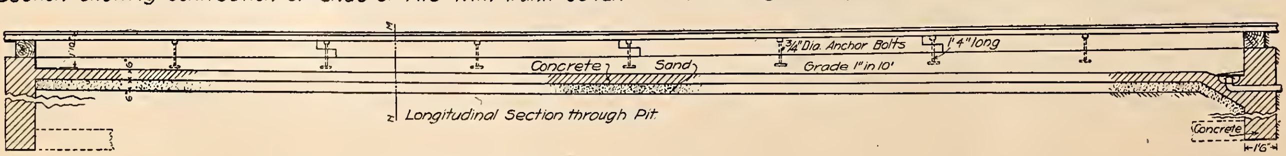


FIG. 7. DETAILS OF ENGINE PITS—T. R. R. ASCN. OF ST. L.

by Paul Dickinson of Chicago. They have a long flaring bottom, which provides against the necessity of placing the engine stack immediately beneath the center of the jack to make it effective.

The buildings are heated by hot air distributed by the Buffalo Forge Company's system. The heating coils and fans are situated in balconies supported by the roof trusses and the heater pipes are carried above the lower members of the roof trusses. Steam supplying heat to the coils is receved from a central power plant operated in connection with the Union Station.

Lighting is by incandescent electric bulbs hung from the roof trusses and suspended above the spaces between pits. Each row of lights between a pair of pits is operated by an individual switch so that when different pits are empty the lights may be extinguished without affecting the remainder of the house. Current for supplying the lights is received from the central power house above referred to.

Water and air pipes are carried beneath the floor, their connections being made at the base of the center row of columns. An air and water connection is provided for each pit.

A portion of the center engine house is partitioned off and arranged as a small machine and blacksmith shop, providing the few facilities necessary for the light running repairs made at this point. The machines are driven by an electric motor. The foreman's office, bulletin boards, etc., are also located in this section.

The transfer tables were installed by George P. Nichols and Brother of Chicago. They are electrically driven and current is delivered to their motors from wires supported along the sides of the timbers carrying the intermediate rails. These wires are protected from rain and snow by a continuous sloping cover. The tables are driven by 35 h. p. Westinghouse motors and travel at a speed of 125 ft. per minute when loaded, and at 300 ft. per minute when running light.

Each table is provided with a winding drum for hauling dead engines on and off the table. A light, provided with a reflector, located on each end of the table enables the operator to see when the rails come in perfect alignment at night. The operator's cab containing all the controlling apparatus, is entirely enclosed and all parts which might be damaged by the weather are carefully covered. A signal located above the cab indicates to the hostler when it is safe to proceed on the table.

The engine houses here described were designed by

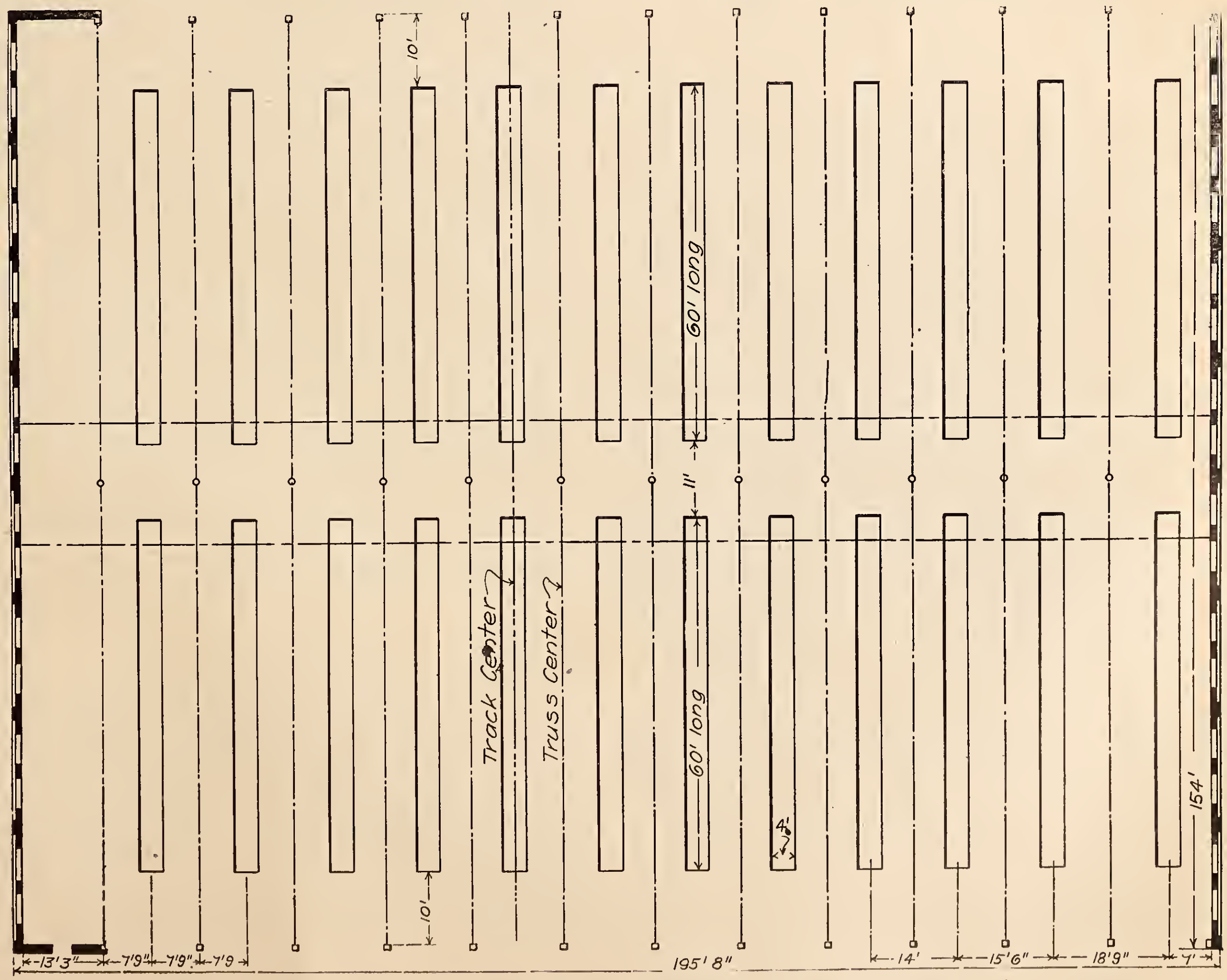


Fig. 8. Plan of Centre Engine House—T. R. R. Ascn. of St. L.

the engineering department of the Terminal Railroad Association of St. Louis, under the supervision of Mr. D. Beck, chief engineer.

The coaling station at which engines entering these houses are served is quite extensive and modern in every detail. Fig. 9 presents a view of this plant and gives some idea of the number of engines being handled during the heavy traffic on account of the World's Fair.

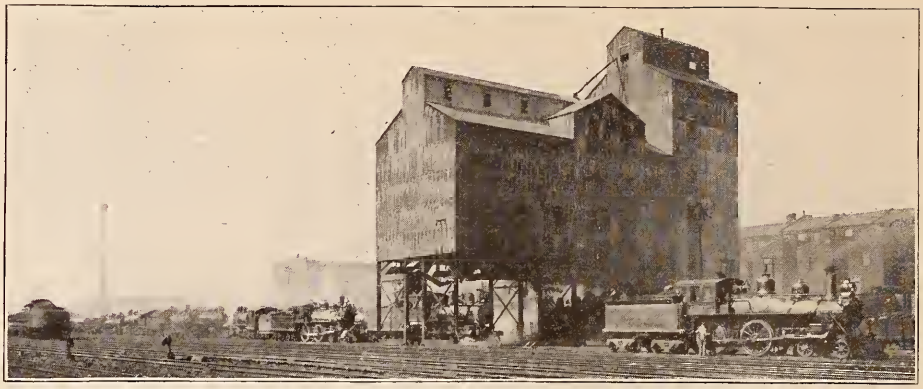


Fig. 9. Coaling Plant—T. R. R. Ascn. of St. L.

The bucket system of carriers, propelled by electric motors, is used throughout, and there is practically no manual labor required at any point. The building itself is of steel construction above the foundation, being made heavy and strong enough to sustain the large weight of coal, water and sand to be supported above the tracks. It consists simply of a steel framework arranged to carry the necessary bins, tanks and conveyor machinery to the best advantage, with no excess parts. The sheathing and roof are of corrugated steel, making it a completely fireproof structure. On the north end, in the taller portion of the building, is located most of the conveyor machinery and the sand and cinder pits, as well as crushers, sand drier and motors for driving. The remainder of the building, covering six tracks, contains the storage for coal and sand and the water tanks.

The coal supply is taken from hopper or side dump cars on two tracks, one running through the building and the other at the end. These cars are handled by cables from a double car puller located between the supply tracks and adjoining building. This is driven by a motor, and has a capacity of moving eight loaded cars on either track; thus making the plant practically independent for switching. The loaded coal cars dump into large hoppers beneath the tracks, from which the coal flows into a conveyor which delivers it to the crushers. From the crushers it falls into another hopper and from that to the elevating carrier running below. This carrier takes it up the side of the building to near the top where it is discharged into a longitudinal conveyor to be carried over and emptied into the large 1,000-ton storage bin.

The cinder, or raking pits, of which there are seven, are 210 ft. long and capable of accommodating three engines each at one time, thus giving a capacity of twenty-one engines for clinkering at once. The ashes and cinders are dropped from the ash pans and front ends into small bottom discharge steel cars running on a track fastened to the sides of the pit. These cars will be run over the center longitudinal pit where they deliver into a hopper from which the cinders are fed into a pivoted bucket carrier. This carries them along below between the coal crushers and up the end of the building, depositing into a bin above from which they are loaded by gravity, from a chute in its bottom, into cars. The return of the ash conveyor is in an inclosed runway, having a gabled top. This arrangement gives a much more shallow pit than would otherwise be required.

The water tanks, of which there are two, consist of long cylinders 6 ft. 6 ins. in diameter and 84 ft. long, having a capacity of 20,000 gals. each. They are located just above the scale jackets and at the side and beneath the coal storage bins. Sand is handled automatically to the storage bins, and from these bins will be delivered to the engines by 4 in. pipes with flexible joints, two pipes being located between each pair of tracks.

This building was erected by the George A. Fuller Company of St. Louis, under the supervision of Purdy and Henderson, engineers, of Chicago.

Rough Switching

At the August meeting of the Car Foremen's Association of Chicago, one of the questions taken up for discussion was, "What has been your experience with the ends of box cars knocked out, and what recommendations would you make to overcome this difficulty?" During the discussion consequent upon this question the principal difficulty was attributed to the rough handling of cars by switching crews, now that men are not required to go between the cars in making couplings. To provide against this rough handling, improvement in the design of the super-structure of box cars was advocated—strengthening corner post, a composite structure of steel and wood, and the use of I-beam sections.

The most forceful argument in this connection, however, was made by Mr. J. R. Cardwell, M. C. B. American Cotton Oil Company, who met the question fairly and squarely: "The limit of speed in switching is the number of breakages they have. If we strengthen the bodies of our cars, they will bump them all the harder and break the draft rigging or some other part of the car, and for that reason it appears to me that we are working toward the wrong remedy. While it is all right to make the ends of our cars as strong as possible, I think we should take the matter up and bring pressure to bear on the switching department so that they will use a little more care in handling equipment. Now the car foreman goes along and when a car has an end knocked out of it he fixes it up and there is nothing said to the switchmen. I, therefore, think the matter should be taken up with headquarters, where carelessness is evident. If we build our cars stronger they will hammer them all the harder until they break them. The only restraint will be the number of cars broken, and as has just been stated, if we strengthen the body the draft gear will then give away.

"The operating departments know nothing about construction, and it is their practice to push all the work on a switching crew that they can do. For this reason the fault is our own. When we see cars hammered together hard enough to knock the ends out, which we do every day, we should take steps to see that more care is used, for while the limit of the switching speed is the number of cars smashed up with the defects visible, there is no limit to the number of cars wrecked or damaged seriously with defects which are invisible to the switchman. Our cars are 50 per cent stronger today than they were ten years ago, and the maintenance rate per car is very much higher. From this it is very evident that for the general benefit of every railroad company concerned, the operating department should use a little more time in switching, and let the mechanical department spend a great deal less money in repairs."

Traveling Engineers' Association

Twelfth Annual Convention

THE twelfth annual convention of the Traveling Engineers' Association was called to order at 10 o'clock Tuesday morning, September 13, at the Lexington Hotel, Chicago. As Mr. R. D. Davis, president of the association, was unable to assume his duties on account of ill health, and the first vice-president being unavoidably detained, the meeting was presided over throughout by Mr. J. D. Benjamin, second vice-president. Following the usual opening events, the meeting was addressed by Mr. Benjamin. He directed attention to the necessary consideration of cost of fuel, cost of lubrication and engine failures. If one pound of coal could be saved per hundred ton miles, he remarked that it would represent an economy, and on the question of lubrication he said that a number of roads were experimenting with grease and suggested that this subject would be a good one for a topical discussion during the meeting. He reported that the front end committee had asked for more time in which to prepare their report and recommended that more time be given them.

The secretary's report showed the total membership to be 503, a gain of 57 over the number of members on the roll last year.

THE FUTURE ENGINEER.

Mr. E. R. Webb (Michigan Central), presented the first paper of the meeting. It concerned the Future Engineer—How can good material be obtained and retained? While the paper was brief, it brought out an interesting discussion evidencing that considerable thought had been expended on providing firemen of the right sort. Mr. Webb said in part: "There is plenty of material to be obtained if looked for in the right places. Some of the best men I know came from the bridge and work gangs. I believe that the future engineer must be sought among those of a hardy class, accustomed to and not afraid of hard work. The most successful engineers of the past and present came from hardy, rugged stock, growing up strong, resourceful and energetic, laying well the foundations for their future usefulness. As to keeping such men in the service—fair treatment, good engines and a fair rate of pay should and will retain a man worth having, except perhaps in isolated cases."

MR. R. D. DAVIS, PRESIDENT OF THE TRAVELING ENGINEERS' ASSOCIATION.

The discussion was opened by Mr. W. G. Wallace, who suggested that road foremen should be constantly on the lookout for bright young men who are suitable for railroad work and interest themselves in getting such men into service. He believes that new material for firemen should be hired by the road foremen and that discipline and dismissal should be disposed by the master mechanic, as that official bears the responsibility of the division.

Further discussion brought out the fact that farmers' boys and men from the bridge and road gangs make good firemen, and that all are better off for having had some plain, practical education. On account of the hard work incident to firing a locomotive and the large amount of coal to be handled, strong, muscular young men who are accustomed to heavy work are necessary. In order to get an intelligent class of men to enter such service and remain, it was stated that conditions should be so arranged that such men of intelligence can stand the work and in this connection the mechanical stoker was suggested as the solution of the difficulty. Several members spoke very favorably of results obtained by regularly assigned engines, as the men take more interest in their work, keep the engines in better shape and make greater mileage with the same amount of coal and water used. No remarks were made favorable to pooling as having a good effect on engine crews. In closing the discussion a motion was carried to the effect that firemen shall be hired by the traveling engineers and that they endeavor to keep them by encouragement, education and improvement of their conditions.

EXAMINATION OF FIREMEN.

The second subject taken up was the report of the committee on "Progressive Examination of Firemen and New Men for Employment." The report opens with a list of twelve questions which was sent out in a circular to members of the association to determine the general methods followed in examining men for employment and promotion. An outline of replies to these questions was presented and several recommendations by the committee followed. As the committee favored progressive examinations, one to be given each year for three years, the list of questions for examination was divided into three series so that the first series might be given to a newly employed fireman in order that he may prepare himself for examination at the end of his first year. The second series is to be given to a man who has been successfully examined on the first, and then the third is given. The questions are further subdivided into groups, according to the subjects to which they pertain, an arrangement which provides for the convenient omission of subjects relating to equipment which may not be in service on different roads, for instance, compound locomotives, oil burning locomotives, electric headlights, etc.

The committee recommended that when a young man is first employed as a fireman he should be sent out on an engine as a student under the instruction of an old firemen a sufficient number of trips to become acquainted with hand, lamp and whistle signals and to get sufficient practice with the scoop to be able to keep steam on the engine under ordinary conditions. When recommended by the engineer under whose charge he has been at work he should then be examined as to his perfect understanding of the signals. Whenever possible the traveling engineer or traveling fireman should go with the new man and by personal observation form an estimate of his ability.

At the end of a year's service, or as soon thereafter as possible, he should be examined on the first series of questions, this examination to be both written and oral. If at any of these examinations he is found proficient he will be passed, if not he will have another trial with the same series of questions not sooner than two months nor later than six months. When he passes the first series of questions he will be supplied with the second series and examined at the end of the year, etc., as heretofore explained.

The committee thinks that a man employed as a fireman who has had previous experience should pass the first and second series of questions the same as a young man who has had no previous experience.

The committee believes that where there is a class of examination for promotion large enough to warrant it the examination should be conducted by a board of examiners consisting of traveling engineers and the air brake instructor or such officers as may be designated. This board should meet at some central point where suitable accommodations can be secured and the work carried on with as little delay to the men as possible.

The oral examination should follow the written one to give the candidate a chance to fully explain any points he has not made clear in writing.

The discussion of this report centered largely upon the question whether it was better or not for the association to supplement the questions with answers to appear in their printed proceedings. There was a decided diversity of opinion which was finally settled by a resolution to adopt the questions as presented by the committee, from which each road will select those most suitable to its especial service, the association recommending a written and oral examination and declaring it inadvisable to publish answers to the questions.

THE WATER TUBE.

Mr. Wallace next read a paper on the water tube, by Mr. F. P. Roesch. The paper traces the use of the water tube from its early history in connection with stationary practice, refers to the first recorded instance of the water tube being used in a locomotive boiler in 1830, and predicts that if our boiler designers do not soon secure a more rational design with better means of providing for circulation and greater efficiency of heating surface, it may be necessary to follow the method of applying water tubes transversely across the firebox, as used by Mr. D. Drummond, of the London & Southwestern Railway, England. The author calls attention to the fact that incrusting matter will form very quickly in water tubes, especially in the short bend near the firebox flue sheet, where it is at all times exposed to the greatest degree of heat, and speaks of the obstruction which these tubes form to the free access to the fire flues in case of boiler repairs. He states that the objections so far surpassed the advantages that in most bad water districts the use of water tubes, or circulating tubes, has been discontinued. The paper is concluded with the opinion that a better design of boiler than is in general use at present, with a higher percentage of firebox as compared to tube heating surface, increased space between the tubes, and greater width of mud ring to improve the circulation, would entirely eliminate the necessity of water tubes as well as the brick arch.

The opening remarks of the discussion applied to the subject of better circulation and a greater distance in spacing flues was advocated. The discussion soon centered upon the firebrick arch and the usual objections to the arch in bad water districts were thrashed over. Mr. A. L. Beardsley (A. T. & S. F.), argued very forcibly in favor of the arch, claiming greater economy for wide firebox engines when the arch is used and saying that the arch increases the life of fire flues between caulkings at least three months. He reported the life of water tube, or circulating tube, to be about two years. He said further that the presence of "honey comb" in flues of a boiler equipped with the arch indicated a hole in the arch or some other improper condition, adding that flues will not honey comb when the arch is in good condition. It was pointed out that an engine drafted for service with an arch will not operate properly with the same adjustment of draft appliances when the arch is removed. The final consensus of opinion expressed in a resolution adopted, was that circulating tubes in conjunction with a brick arch constitute a valuable adjunct when applied where conditions warrant.

VALVE MOTION.

Mr. Ira C. Hubbell next presented a paper concerning "Valve Motion—Its Relation to Steam Economy." The principal features of this paper related to economy to be gained by the reduction of clearance space and the operation and performance of the Allfree-Hubbell valve motion. This mechanism was discussed in the September issue of the Railway Master Mechanic, page 366, so that further description is not necessary here.

Referring to several questions put by members, Mr. Hubbell said that with the Allfree-Hubbell valve motion a larger exhaust tip could be used than the size tip used under similar conditions with an engine equipped with the ordinary Stevenson motion, resulting in reducing the damage to the fire caused by a sharp exhaust. He showed a sector from the mechanism necessary with this type of valve motion, which had been in service over 55,000 miles, illustrating the small amount of wear to which that member is subjected. He replied further that no by-pass or relief valves are necessary with this valve mechanism.

Mr. Barton (Pere Marquette), reported that his road had equipped three mogul locomotives with the Allfree-Hubbell valve motion, which had been so equipped since November last, that no trouble had been experienced with the machinery, the engines were always ready to go out soon after they had been brought into the roundhouse and their experience had been that one of these engines would go 25 per cent further with one tank of water than another engine of the same class not having this valve mechanism.

THE HIGH-SPEED BRAKE.

A paper on the high-speed brake, by Mr. L. M. Carlton (C. & N. W. R. R.), was the next subject taken up. Mr. Carlton said in part:

"The principles involved in the high-speed brake are (a) the friction between the brake shoe and the wheel, which tends to stop the rotation of the wheel, becomes less as the rotation of the wheel increases, and (b) the adhesion between the wheel and rail remains practically constant regardless of the speed. It will thus be seen that, at high speeds, a greater brake-cylinder pressure, with a corresponding increase of brake-shoe pressure, can be used without danger of sliding wheels; but in such case it is necessary to provide means for reducing this high pressure as the speed of the train is decreased. This is accomplished by the automatic reducing valve. These facts have been verified by actual brake tests.

"The higher pressure used causes prompt response of brakes due to the quicker action of air at high pressure. In other words the brake has more life in it, the same as an engine has when the boiler pressure is increased.

"In using the high-speed brake, the engineman should bear in mind that with a train pipe pressure of 110 pounds, the usual piston travel, and a service train pipe reduction or 5, 10 or 15 pounds, no more cylinder pressure is developed than if the 70-pound train pipe pressure were employed. If. however, when using 110 pounds pressure, the reduction be continued after the cylinder pressure has reached that point at which the auxiliary reservoir and brake cylinder equalize with the 70-pound pressure, the cylinder pressure will increase until the reducing valve operates.

"At high speed, by using the emergency application when necessity requires it, the brake cylinder pressure is raised to about 85 pounds; immediately the reducing valve gradually blows down the brake cylinder pressure to 60 pounds as the speed of the train reduces, finally retaining at the latter part of the stop such pressure as is safe for slow speeds without sliding wheels. On account of this higher pressure with high speeds, quicker stops can be made, thus making it easier to accomplish schedule time."

The paper embodied the results of a number of tests comparing the retarding power of the high-speed brake as against the ordinary quick action brake? The discussion following the presentation of the paper brought out a number of points concerning air brake handling in general and no little discussion was given to the subject of sliding wheels. It was stated that a grade of oil better than that commonly used should be applied to high-speed triple valves. Mention was made of trouble experienced with frozen moisture in the air throwing the brake into emergency on a service application. In discussing slid wheels and slid flat wheels, it was explained that on a train equipped with the high-speed brakes if one pair of wheels slid the remainder holding would bring the train to a stop before the sliding wheels had become flat. It was remarked that the opening of the sand valve after an application caused much trouble in sliding wheels, but applying sand before making an application would not so result and aided the braking power. Two members discussing the cylinder release valve maintained positions exactly opposite to each other, one of them stating that the function of this valve was not to prevent wheel sliding, but was to equalize the braking pressure, while the other maintained that its function was to prevent wheels sliding. Replying to a question asked with regard to how much further a train would run with all wheels sliding as compared with all wheels braked at the maximum and holding the rails, Mr. F. M. Mellis said that he knew of but one case in which all the wheels had slid, and in this instance the train had gone 33 per cent further.

REPORT OF REPRESENTATIVE AT MASTER MECHANICS' CONVENTION.

Mr. David Meadows, late president of the association and representative at the last convention of the American Railway Master Mechanics' Association, presented his report of the June convention and outlined the work accomplished and principal features of interest. His report was accepted.

HEADLIGHTS.

Following this report was a paper by Mr. A. L. Beardsley on "Headlights—Location, Type, Operation and Care." The writer reports that before the preparation of the paper he received thirty-five replies to a circular letter, and out of this number thirty-two were in favor of and recommending the electric headlight. Because of this and in view of his own experience, the writer devoted a large portion of his paper to a consideration of electric headlights.

We quote in part from Mr. Beardsley as follows:

"Those wishing to use transparent numbers of engines on the sides of the case will find that porcelain glass with the number of the engine cut out of sheet steel and slipped over it makes a very nice number. Ground glass shows well when clean, but it is too easily soiled. The inside of the case and the back of the reflector should be painted white and kept neat. The rules call for covering the headlight when the train is on a siding, expecting to meet opposing trains, and there are quite a number of devices in use for this purpose. The curtain outside of the case is not satisfactory, because it does not work well in severe weather, and although the curtain inside of the case is not so easily affected by the weather it has its weak points. The most satisfactory headlight cover, probably, is sheet iron held in place over the glass by three lugs on the edge of the bissel. The number of the engine should be outlined in this cover by perforating it with one-sixteenth-inch holes, as I find that when the number of the engine is entirely cut out it is often misleading and the light shining through makes one think that the headlight is not covered. When not in use this sheet iron cover is carried on the back of the case in suitable brackets.

"Engineers should, I believe, care for their headlights in all cases, unless the engine is in the pool. The electric light requires very little attention and the engineer is the man to whom we should look for this care. The principal care is to keep the commutator clean and the mica cut down below the surface of the segments. The adjustment of the brushes will require some little attention on lamps having the older style brush holders. The governor valves tell you when they are stuck open or closed by the lights burning dim or by fusing copper electrode. The wires to the lamp must be connected right and your dynamo oiled according to instructions. At terminals there should be a man who is familiar with all parts of the equipment to make repairs and he should make a regular inspection at least once a month.

"The dynamo should be placed as near the cab as possible. This will give you the benefit of a short steam pipe. A very large percentage of equipment that is mounted this way has a short exhaust pipe that directs the exhausted steam over the top of the cab without any annoyance to the engine crew. The steam connection should be made at the highest point in the boiler and the wires to the headlight should be placed in a separate one-half-inch pipe. The wires leading back to the cab should be run in mouldings.

"Should the governor valve stick when it is wide open you will fuse the point of the copper electrode. This will be observed by a green light shown on the track, and you should reduce the speed of your turbine by throttling. Another time it might stick closed, which will be noted by the light growing dim, and should the pressure fall your light may go out. The cause for these valves sticking is due to the presence of lime or scale in the water. It is not necessary to lubricate the turbine wheel or the governor plungers to prevent any frictional wear, but you should remove the plug in the top of the engine cap each trip before starting out and introduce a little engine oil or coal oil. This has a tendency to cut away any scale that may have started to form.

"At least 50 per cent of the electric light failures are due to the improper manner in which the carbon is applied. Carbons are moulded and sometimes it is found that there is a little more stock at one point than another. When the arc is formed and the carbon is burning away the arc gets larger and less current passes from the carbon to the electrode. The corresponding amount circulating in the solenoid tends to weaken the magnetic pull on the levers and clutch that are suspending the carbons and at a certain point it grows weak enough to release the latter, when it feeds down or falls of its own weight. If this carbon is a little rough or out of round it will be held up so far away from the electrode that the current cannot flow across. Then the circuit will be broken and your light will go out.

"Every one who has had experience with an electric headlight knows that at some time or other the light has failed, you walked out on the foot-board, opened the headlight case door, jarred the lamp and up came your light. You then returned to the cab satisfied that you had "fixed it." And so you had, for the time being, but you had only jarred the carbon loose when it fell to the point of the electrode and your current was re-established. To avoid such occurrences you should, when you apply new carbon, remove the top carbon holder from the lamp just as you would do if preparing to remove the reflectors from the case, then place the carbon in the clamp, return carbon and clamp to the holder, release it and note if it will fall freely of its own weight and entirely through the clutch. If it will not, then turn the carbon around until you find a position in the clamp where it will, then return your holder to the lamp, and you will find that it will not be necessary to "jar" your lamp on this trip. Should your copper electrode or holder fuse while out on the road or at a terminal where such supplies are not carried, it is not necessary for you to go without a light. All that you will have to do is to remove the electrode holder from the bracket and substitute a bolt, securing the same in the bracket where the electrode holders were removed. Be sure that the end of the bolt comes up to the center of the reflector. This bolt will fuse slowly, but it will give you a good light. A carbon could be used in such emergencies, but you will find that it will burn away faster, which would necessitate its being moved up quite often.

"The point of the carbon must be set true over the point of the electrode to get a good arc. Have no hesitancy in taking hold of the electrode and holder and bending in any direction to line up under the carbon. In starting the dynamo turn on the steam slowly and allow the water to pass out of the turbine. Turn on only enough steam to get a good light. Don't be afraid of receiving an electric shock from this device; the resistance of your body is far too great for this low voltage to force a current through, and you need have no fear of handling your wires of dynamo freely when in operation."

The discussion consequent upon this paper; while somewhat general, centered largely upon the electric headlight. Exception was taken to a suggestion by Mr. Beardsley that the exhaust from the steam turbine should be discharged back of the cab, as such an arrangement would result in covering the tank and coal with ice during winter weather and interfere with the fireman taking water. Mr. Beardsley explained his point by saying he approved of this location of the exhaust for the reason that he did not beleive it advisable to place any additional apparatus in the front end. Some discussion ensued concerning the location of the exhaust pipe and it was generally conceded that it was best not to locate it in the front end, and if the exhaust was so discharged, it should not be below the draft pipe. Success was reported with an arrangement by which the turbine exhaust pipe was arranged to discharge along the side of the stack, either inside or outside.

With regard to the location of the turbine, a number of members favored placing it immediately in front of the cab in order to use a short steam pipe connection. A position in front of the stack was spoken of as being satisfactory on account of there being less dirt and moisture at that point. When so located, the steam pipe was placed beneath the jacket and lagged where it passed over the smoke arch.

Relative to the light itself some discussion was offered regarding methods of concentrating the rays of light ahead of the locomotive, the value of a strong light in preventing wrecks and derailments, trouble in bad water districts where the light was affected by the turbine slowing down on account of wet steam and other troubles of a varied nature.

BALANCED COMPOUNDS.

There then followed a paper by Mr. W. J. McCarroll, of the Baldwin Locomotive Works, illustrated with stereopticon views, on the Baldwin Balanced Compound Locomotive. This paper included a discussion on counterbalancing, the hammer blow on the rail and explained the manner of eliminating these by the balanced type of connection for locomotives.

At the conclusion of Mr. McCarroll's paper, Mr. S. M. Vauclain delivered a very interesting impromptu address in which he traced the balanced compound locomotive from its inception to the position which it now occupies.

TOPICAL DISCUSSIONS.

This address was followed by topical discussions on the "Use of Grease," and "Front Ends." At the close of these discussions a business meeting ensued.

SUBJECTS.

The following list of subjects presented by the committee has been adopted by the association for the 1905 convention:

Committee Reports:

1. Grease as a lubricant for all bearings.

2. What system will enable the traveling engineer to keep best record of tire wear?

3. What devices and arrangement of engine and tender will lighten the work of the engineer and fireman?

4. Bell ringers, air sanders, water scoops and other apparatus operated by air. Care and arrangement to get best results.

5. Front ends.

Papers:

1. Electric motors and instructing men to handle them.

2. Injectors; modern practice.

3. Latest makes of lubricators. Their operation and maintenance.

ELECTION OF OFFICERS.

The ballot for the election of officers for the ensuing year resulted as follows: President, J. D. Benjamin, C. & N. W. Ry.; first vice-president, A. L. Beardsley, A. T. & S. F. Ry.; second vice-president, W. J. Hurley; third vice-president, A. M. Bickel, L. S. & M. S. Ry.; treasurer, C. B. Conger, International Correspondence School; secretary, W. O. Thompson, N. Y. C. & H. R. R. R.; members of the executive committee for two years, W. H. Corbett, W. P. Steele, W. G. Wallace; for one year, J. A. Talty, elected to serve unexpired term of L. D. Gillett, resigned.

NEXT PLACE OF MEETING.

By a change in the by-laws it was decided that in the selection of a place of meeting the executive committee should select a place from the five cities receiving the largest number of votes at the ballot during the meeting, the city leading in number of votes to receive first consideration, etc. This change was made to provide against the discrepancy of selecting a place of meeting and learning later that its facilities are inadequate to accommodate the convention. By authorizing the executive committee to select one city from a given number, thorough investigation can be made before a decision is arrived at.

The cities receiving the largest number of votes for the 1905 convention, and arranged in the order in which they will be considered, are Denver, Chicago, Detroit, Chattanooga and Norfolk.

AMONG THE SUPPLY MEN.

The following representatives of supply companies were in attendance at the convention:

American Locomotive Equipment Company—C. B. Moore, S. B. Michael, J. B. Bond, A. Munch, C. A. Crane, J. B. Stolt.

Crandall Packing Company—E. P. Gilroy, Sam Hildreth.

Joseph Dixon Crucible Company—Dudley A. Johnson.

Galena Signal Oil Company—Alex. Turner, W. Walsh, Lewis Gleason, W. E. Brumlile, R. E. Webb, Oscar Huber.

Garlock Packing Company—F. M. Vosburgh, F. E. Ebert.

Gold Car Heating and Lighting Company—W. H. Stocks.

N. L. Hayden Manufacturing Company—N. L. Hayden, M. B. Brewster.

Handy Car Equipment Company—C. L. Sullivan.

Homestead Valve Company—C. B. Ault.

H. W. Jones—Manville Company—J. C. Younglove, R. W. Robinson.

Leslie Manufacturing Company—S. Inglis Leslie.

Michigan Lubricator Company—W. E. Bryant.

Naber Spring Company—M. H. Naber.

Nathan Manufacturing Company—Sanford Keeler, George Royal, Charles Schults, C. A. Nathan, E. J. Scully.

New York Air Brake Company—J. P. Keely, B. Pratt.

Ohio Injector Company—F. W. Edwards.

Pyle National Electric Headlight Company—M. A. Ross, E. E. Bishop, J. W. Johnson, F. E. Pyle, J. W. Cleary.

Thomas Prosser and Son—George H. Bryant.

William Sellers and Company—Charles Conlish, S. L. Kneass.

Storrs Mica Company—A. P. Storrs, C. P. Storrs.

Westinghouse Air Brake Company—Robert Burgess, S. D. Hutchins.

Radial Staybolts for Oil Burning Engines

By I. C. Hicks, Master Mechanic, A. T. & S. F. Ry.

IT has always been a serious problem to maintain locomotive boilers on oil burning engines owing to the increased intense heat over the coal burning engines. Radial staybolts have been the greatest source of complaint, owing to their leaking, and heads dropping off, and this has compelled the railroads to substitute a bolt which will withstand the enormous strains under oil burning conditions. With radial staybolts having large button heads, the most trouble experienced has been that the heads drop off after they have been caulked but a short time, and also on account of too much iron at a point too far away from the water. When the burning oil is shut off the only heat retained in the firebox is in the brick arch and brick walls. This heat is not sufficient unless a good fire is retained, and the boiler is caused to contract very rapidly, the contraction and expansion being enormous. Unless watched very carefully as to the handling of the engines, and keeping a regular fire, radial stays, staybolts, and flues become loose in the holes.

A bolt which is now being used on several systems is shown herewith by the accompanying line drawings which illustrate the method of manufacture and application. It consists of a sharp taper on the crown sheet end and is cut very close to the sheet and hammered up well, thereby making it a safe, as well as a steam tight, bolt. This bolt up to the present time has been found to meet the requirements better than any other bolt yet tried.

These bolts are made on the bolt header in the blacksmith shop, and taken direct to the boiler shop to the bolt cutter and finished complete, with the exception of nicking, which is done in a small chuck lathe, made especially for this purpose. By this process the lathe work is entirely dispensed with, and while the bolt is an expensive one for the first cost, it

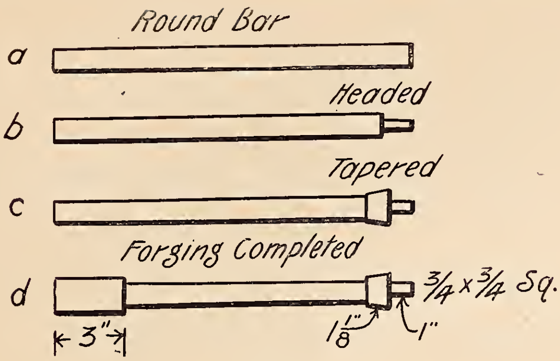


FIG. 1.

can be readily seen that by these operations they are very cheaply made, thus helping to offset the cost above mentioned.

Taper staybolts, as applied in the San Bernardino shops, are of the form shown by Fig. 6, of proper length and diameter to fit holes. The lower shank is straight and somewhat larger than the body of the bolt, and the upper head is tapered, having a flare of about one-eighth of an inch to the inch. A square head is forged at the upper end to permit the application of a wrench in placing the bolts. These staybolts are forged in an "Ajax" bolt-header, the die block being of the form shown by Fig. 2, with a triangular groove A and a countersunk cavity B, of shape and dimensions determined by the size of bolts to be headed. The rough bar, of the desired length, is first squared for a distance of one inch at one end. The bolt is then placed in position in the cavity B and the heading die-block C, having a cavity to fit the square head of the bolt, forces the hot bolt into B, forming the flared end. The straight end is formed in the usual manner in a straight block. The successive stages of the operation of forging are shown at a, b, c and d, in Fig. 1.

The holes in the sheets are tapped with a spindle tap, both threads being cut in one operation. The

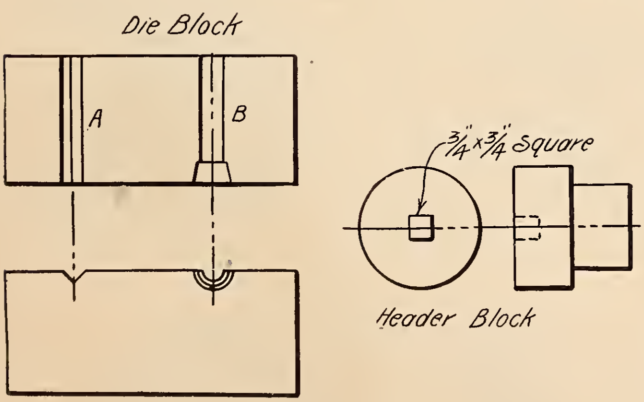


FIG. 2.

threads in the two sheets come in perfect alignment and are continuous. In order that the staybolt may follow the threads of the two holes, it is necessary that the threads at both ends of the staybolt are continuous, that is, they must "catch up." These threads are ordinarily chased in a lathe, which insures this condition, but a very simple and effective device makes it possible to cut these threads in a double-headed staybolt cutter, in this way effecting a considerable saving in cost. Tapered dies are made for the bolt cutter of the required sizes, as shown in Fig. 3. The staybolt is placed in the machine with the tapered shank in position for cutting in the dies, held in a simple chuck, shown by Fig. 4, having a cavity of the proper size to hold the square head of the staybolt, and rounded and tapered at that end to allow it to follow the staybolt into the dies. This chuck is held in the vise of the machine, and the bolt forced into the dies, which are regulated in the usual manner for the proper diameter to fit the tapped holes. After the thread has been cut

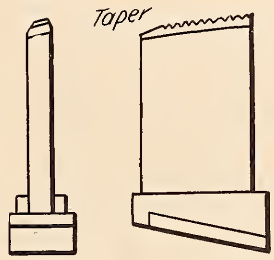


FIG. 3.

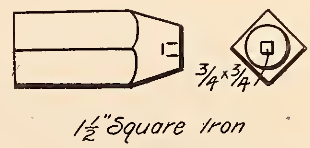


FIG. 4.

on the tapered end of the bolt, it is placed in the vise, being held at about its middle with the straight shank in position for threading; the dies having been changed to the straight cutting form. Placing the bolt haphazard in the vise will not insure making the threads "follow," and consequently a gauge, as shown in Fig. 5, is used to accomplish this end. This gauge consists of a block A, on a spindle B, held by a set screw. The block A is threaded the same as the staybolt, but the taper is reversed to allow the threads to mesh with those of the tapered end when in position. The shoulder C is made to rest in the jaws of the vise while holding the staybolt in position for cutting. The dis-

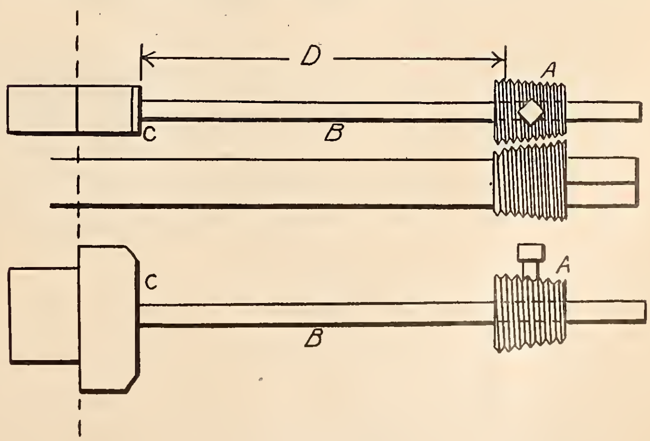


FIG. 5.

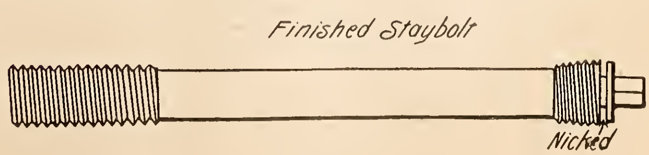


FIG. 6.

tance D from the shoulder to the bottom of any thread on the block A is set so that it will contain a whole number of threads. For example, if twelve threads per inch are used, D would be set in inches and twelfths, etc. This having been done, the distance from the shoulder in the other direction, to the threads on the other end of the staybolt will also be such as to contain a whole number of threads, and the requirement is fulfilled that the threads shall follow, and the staybolt will fit the threads of the holes.

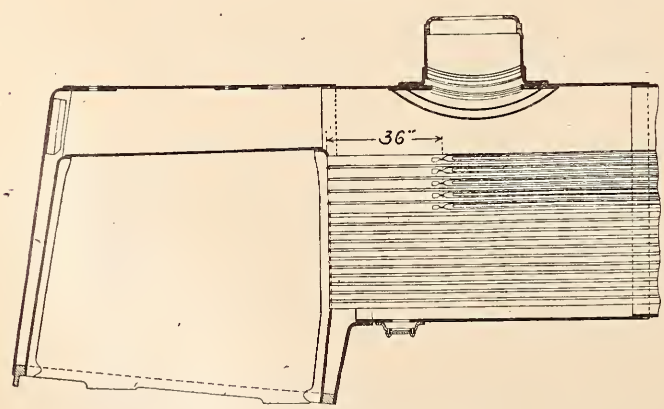
The threads on both ends having been cut, the staybolt is placed in a small cutting-off machine, and nicked just under the head, so that the square head may be easily chipped off after the bolt is in place.

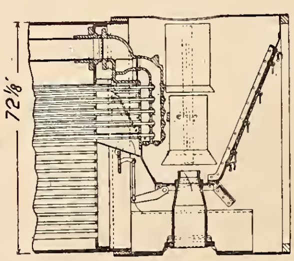
The Schenectady Super-Heater For Locomotive Practice

THE American Locomotive Company has brought out a new locomotive super-heater, designed by Mr. F. J. Cole, mechanical engineer of the company, which is to be known as the "Schenectady" super-heater; it has been applied to New York Central Atlantic type (4-4-2) passenger engine 2915, now in regular service on the Mohawk division between Albany and Syracuse, N. Y.

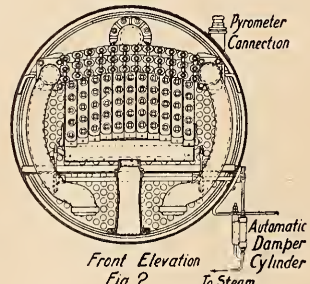
The objectionable features of previous locomotive super-heaters, both abroad and in this country, have been, first, the use of bent tubes and, second, the necessity of dismantling the whole super-heater in order to get access to a single leaky boiler tube; the accompanying illustrations show the manner in which these difficulties have been eliminated.

The first new feature of construction is in the T-pipe, the regular conventional T-pipe being replaced by one of special design, shown in Figs. 1, 2 and 4; it will be seen that this T-pipe is subdivided into two compartments by a horizontal partition, and that it extends nearly across the smoke box; steam entering the T-pipe from the dry pipe is admitted to the upper compartment only. To the front side of the T-pipe are attached eleven header castings, the joint being made with copper wire gasket, as in the steam chest practice; each header casting is also subdivided into two compartments, but in this case by a vertical partition; five pipes or flues of 1 1-16-in. outside diameter are inserted through holes (subsequently closed by plugs) in the front wall of each header casting, these 1 1-16-in. tubes having been expanded into special plugs, are firmly screwed into the vertical partition wall; these five 1-16-in. tubes are enclosed by five 1¾-in. tubes which are expanded into the rear wall of the header casting in the usual way; each nest of two tubes (one 1 1-16-in. and one 1¾-in.) is encased by a regular 3-in. boiler tube, which is expanded into the front and back tube sheets as usual; the back end of each 1 1-16-in. tube is left open; the back end of each 1¾-in. tube is closed; the back ends of the two tubes being located at a point about 36 ins. forward from the back flue sheet. The detail arrangement and grouping of the three flues are shown by Fig. 3. The back end of the 1¾-in. tube is closed by welding, and the tail is so formed as to support this tube in the upper part of the 3-in. tube, thus leaving a clear space below.

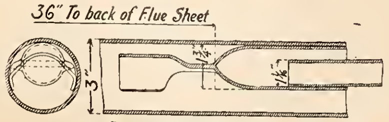




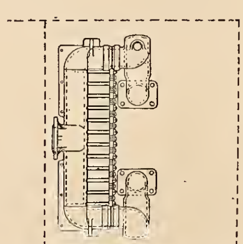
Vertical Section
Fig. 1.



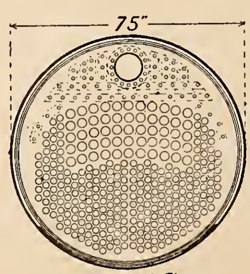
Front Elevation
Fig. 2



Detail of Back End of Superheater Tubes
Fig. 3.



Plan of T Pipe, Headers, etc.
Fig. 4.



Arrangement of Flues
Fig. 5.

The Schenectady Super-Heater.

Figure 1 indicates that the 1 1-16-in. tubes are concentric with the 1¾-in. tubes at their back ends, but the fact is the 1 1-16-in. tube is allowed to drop and rest on the bottom of the 1¾-in. tube, as shown by Fig. 3.

Steam from the dry pipe enters the upper compartment of the T-pipe and thence enters the forward compartments of each of the eleven header castings, and then passes back through each of the fifty-five 1 1-16-in. tubes, thence forward through the annular spaces between the 1 1-16-in. tubes and the 1¾-in. tubes to the rear compartments of each of the eleven header castings, thence into the lower compartment of the T-pipe, thence by the right and left steam pipes to the cylinders. In passing forward through the 1¾-in. tubes the steam is superheated by the smoke box gases and products of combustion passing through the 3-in. tubes.

In this particular design fifty-five 3-in. tubes are inserted in the upper part of the flue sheets, thus displacing as many of the regular smaller tubes as would occupy the same space. The arrangement of flues is clearly shown by Fig. 5.

In applying the super-heater to a locomotive it is necessary to provide some means by which the super-heater tubes shall be protected from excessive heat when steam is not being passed through them. In this design this is accomplished by an automatic damper, as shown in Figs. 1 and 2. That portion of the smoke box below the T-pipe and back of the header casting, is completely enclosed by metal plates; the lower part of this enclosed box is provided with a damper which is automatic in its action; whenever the throttle is opened and steam is admitted to the steam chests the piston of the automatic damper cylinder, shown in Fig. 2, is forced upwards and the damper is held open, but when the throttle is closed the vertical spring immediately back of the automatic damper cylinder (and concealed by it in Fig. 2) brings the damper to its closed position, so that heat is not drawn through the 3-in. tubes when the engine is not using steam. In this way the super-heater tubes are effectively prevented from being burned. In introducing the group of 3-in. tubes and applying the super-heater, there is a slight loss of heating surface, but it is more than offset, as regards economical results, by the super-heating process. The heating surfaces of the regular New York Central Atlantic engine and the sister engine which is fitted with the super-heater, are shown by the following table:

HEATING SURFACE (SQ. FT.)

	Regular engine.	Superheater engine.	Loss per cent.
Firebox	175.0	175.0	0.0
Fire tubes	3248.1	2837.0	12.6
Arch pipes	23.0	23.0	0.0
Totals	3446.1	3035.0	11.9

It is noticed that the application of the super-heater reduces the heating surface of the fire tubes by 12.6 per cent, and reduces the total heating surface by 11.9 per cent. The actual super-heating surface is 301 square feet, which is 10.6 per cent of the fire tube heating surface, and 9.9 per cent of the total heating surface of the super-heater engine.

A pyrometer is inserted in the left steam pipe, as shown in Fig. 2; readings from this pyrometer since the engine has been in service, show that the average temperature is about 517 degrees Fahrenheit, the boiler pressure being 200 lbs. per square inch, and the corresponding temperature being 387 degrees Fahrenheit, a super-heating of 130 degrees is accomplished.

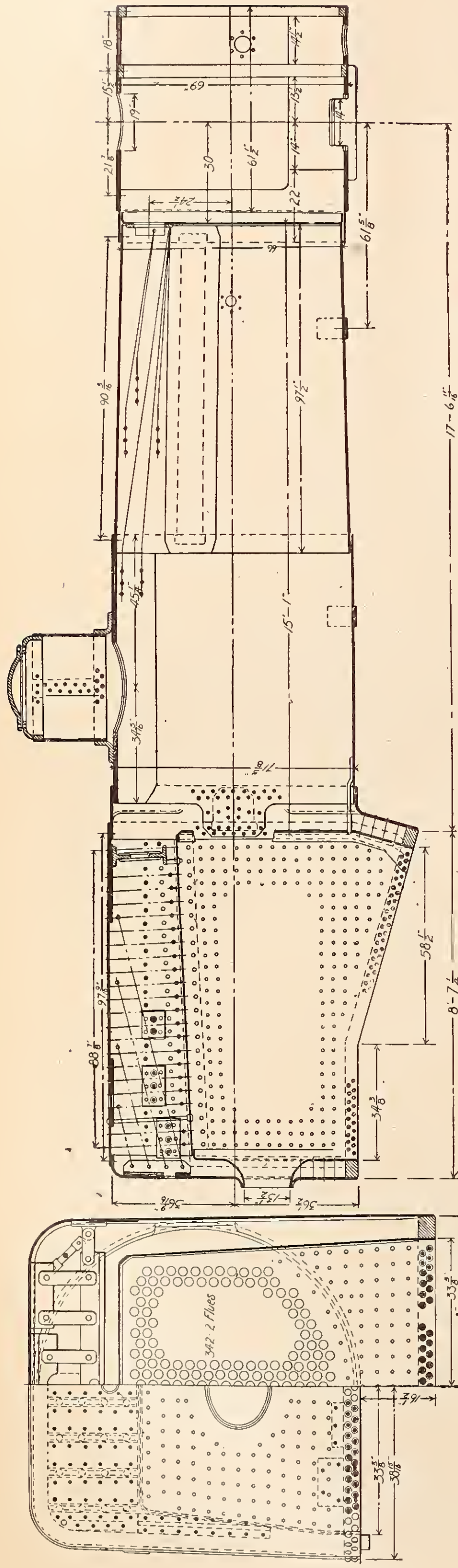
As indicating the possible economies which may result from the use of super-heated steam in locomotives, it may be said that service tests on the Canadian Pacific with a super-heater locomotive showed savings (on the ton mile basis) of 33 per cent in fuel consumption, as compared with a similar simple engine; and 16 per cent as compared with a similar compound engine, when the performance was reduced to the same unit of comparison.

The piston rod metallic packings are made of a special mixture (which, in this particular case is a mixture melting at about 1,200 degrees Fah.) to guarantee that they will not be unfavorably affected by the excess heat in the cylinder.

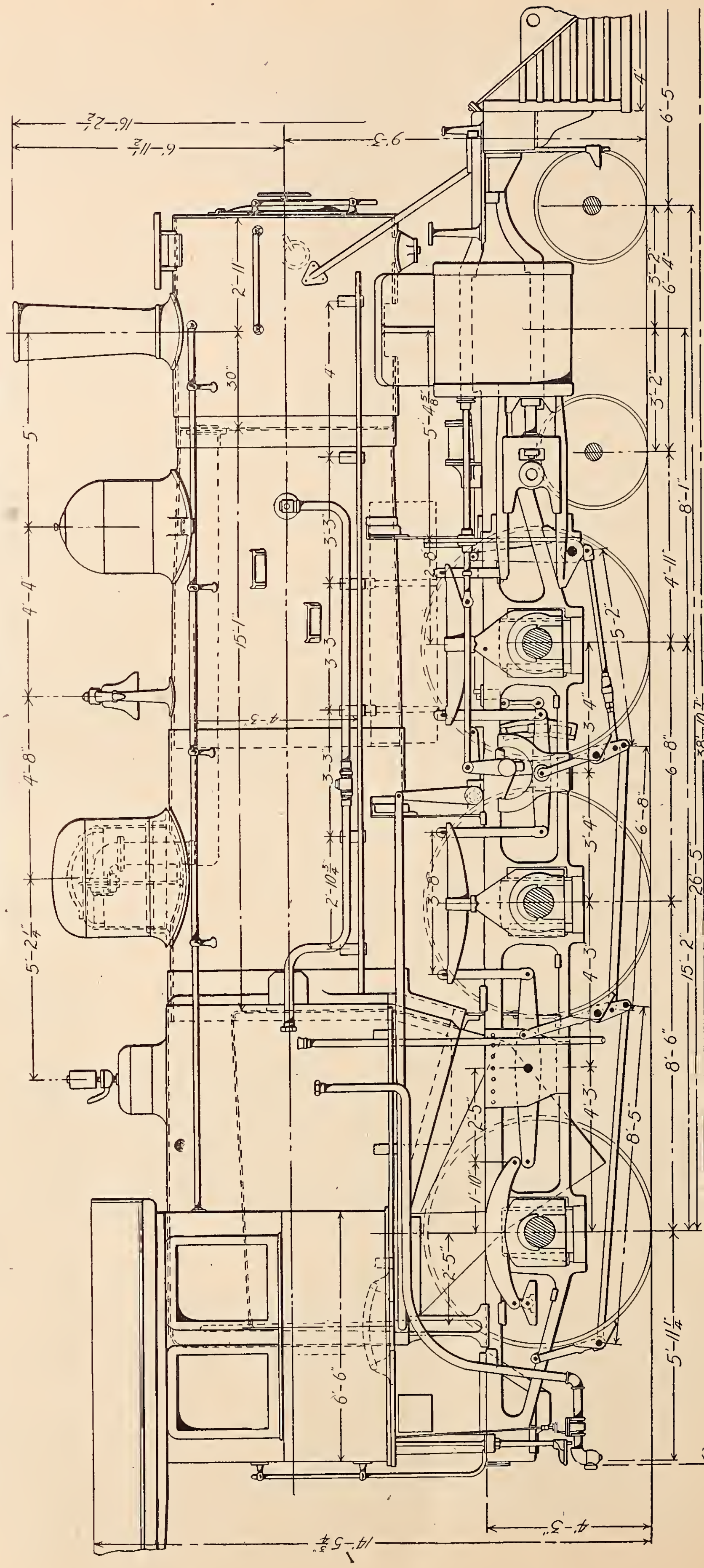
When super-heated steam is used no chances can be taken as regards lubrication of the cylinders, and, therefore, forced feed is resorted to instead of the usual gravity feed. Although the maximum steam temperature is about 517 degrees, as stated, yet the constant temperature of the cylinder walls is probably something above the mean of 517 degrees, and the average temperature (perhaps 230 degrees) of the exhaust; it is therefore probable that the constant temperature of the cylinder walls, when steam is being used, is in the neighborhood of 385 degrees which, however, is considerably higher than the corresponding temperature would be in the case of an engine not equipped with a super-heater.

The particular forced feed lubricator which is used in this case is of German make, and embodies four reservoirs which are filled with oil before the beginning of the run, the oil being forced out of these reservoirs through connecting pipes to the cylinders, by plungers which receive a gradual but constant downward impulse by a screw motion, which is actuated by a system of levers connected with a return crank on one of the rear driving wheels; in this case two oil pipes are led forward from the lubricator to either side of the engine; one of each pair of oil pipes enters the live steam passage through the cylinder saddle, and the other is led directly into the cylinder at the middle of the stroke.

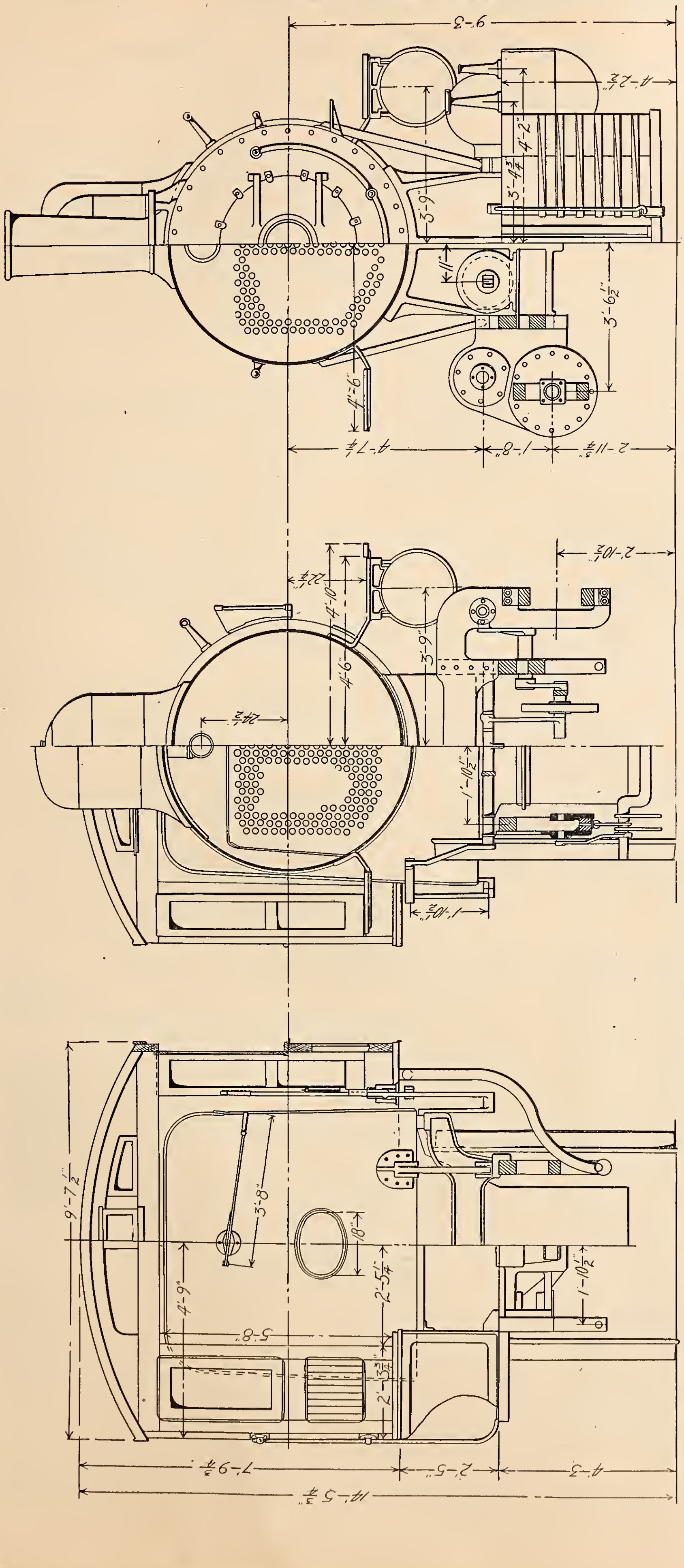
Casual consideration of this design might lead to the prediction that the upper or 3-in. tubes would be likely to choke up in service; but it should be remembered that the annular space in the lower part of these 3-in. tubes is quite free and unobstructed and can easily be reached and scoured by a steam jet from the fire box end. It should also be borne in mind that the upper flues in any locomotive are not nearly as likely to choke up as are the lower flues.



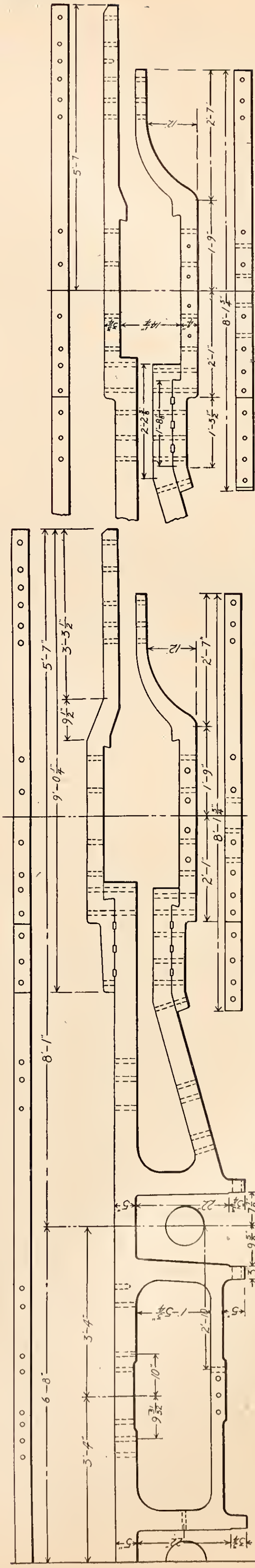
Ten Wheel Passenger Locomotive, C. B. & Q. Ry.—Boiler.



Ten Wheel Passenger Locomotive, C. B. & Q. Ry.—Elevation.



Ten Wheel Passenger Locomotive, C. B. & Q. Ry.—End Elevations and Sections.



Ten Wheel Passenger Locomotive, C. B. & Q. Ry.—Showing the Designs of Front Portion of Frame for Slide Valve Cylinders and for Piston Valve Cylinders.

Ten Wheel Passenger Locomotive With Wide Firebox Boiler.---C. B. & Q. Lines West

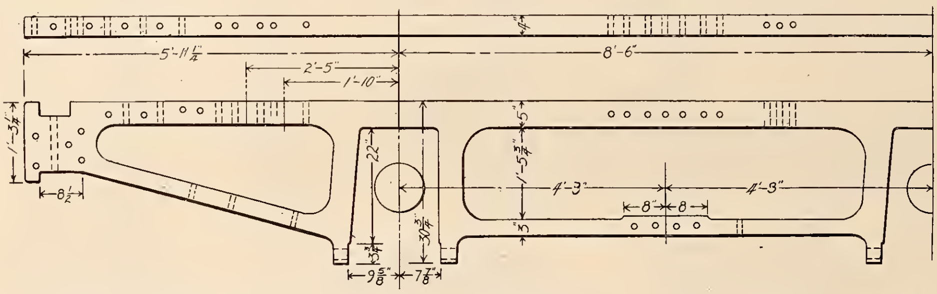
DURING the year 1902 the Burlington & Missouri River Railroad in Nebraska, now known as C. B. & Q. Lines West, built a 4-6-0 type of locomotive for passenger service, embodying in the design of its boiler the wide firebox which general practice has used with trailing wheels in passenger service, or without trailing wheels in freight service, as the small diameter of drivers permits a comparatively deep box without an unusually high center of gravity. The height center of boiler above rail of this engine was 9 ft. 6 ins., and while there are some who consider this height dangerous, no inconvenience was experienced in this particular.

The engine here illustrated is largely a development of the former, its principal features having been based on the experience with the previous ten-wheeler. It is classified by the road as the K-5 type. Lignite or bituminous coal will be used as fuel and the maximum boiler pressure will be 210 lbs.

The K-5 engine has cylinders of the same dimensions as the previous engine, 19 ins. diameter by 26 ins. stroke, but the heating surface has been increased 658 square feet by an addition of 35 tubes, increasing the diameter of the boiler from 62 ins. at the small ring to 66 ins., and making the back head of firebox vertical instead of sloping, thus increasing firebox heating surface and giving more room for water and steam. This increase in heating surface for service in connection with cylinders of the same size appears to be a point well taken, for it should provide a free steamer and at the same time supply a reserve to draw from in time of emergency, especially so in view of the prevailing tendency to load engines up to their maximum capacities.

The ratio of total heating surface to volume of both cylinders is 666. While this ratio may appear large at first thought, it is believed that the prevailing conditions of bad water and poor coal under which this locomotive will operate, thoroughly justify the relation. Designers have attempted to secure large heating surfaces and high steam pressures and at the same time increase the size of cylinders, with the result that the large boilers were required to be forced as hard as the previous smaller ones. The results to be obtained with a free steaming boiler supplying cylinders comparatively small, when judged by the ratios of recent practice, will undoubtedly be observed very closely and it is believed that the cry of "engine would not steam" would be less general in cold winter weather if the practice of a greater ratio between heating surface and cylinder volume was secured by increasing the boilers without adding so much to cylinder dimensions.

The flues are 2 ins. outside diameter and 15 ft. 1 in. long. The necessity for greater adhesion to provide increased tractive effort has made it desirable to use three pairs of drivers, and as the wide grate has been introduced to maintain sufficient steam pressure, many designers have used the trailing wheels to carry the rear portion of the boiler. This number of wheels necessitates a long boiler, and tubes 20 and 21 ft. long have followed. In the engine here under consideration, however, the omission of trailing wheels permits the use of tubes scarcely over 15 ft. in length, the boiler giving every evidence of steaming freely and the weight provided being sufficient for adhesion.



TEN WHEEL PASSENGER LOCOMOTIVE, C. B. & Q. RY.—REAR PORTION OF FRAME.

The cab is only 6 ft. 6 ins. long. This is 18 ins. shorter than the standard cab for this type of engine and about the same amount shorter than the cabs of general practice. This appears a move in the right direction, as the shorter cab brings the front closer to the engineer and provides all the room necessary for the convenience of the crew, there being absolutely no reason for putting a shed over the firebox.

The line drawings illustrate the engine as provided with piston valve cylinders and the illustrations of the frames show the design used with piston valve cylinders. A supplementary drawing is presented showing the arrangements of frame used with engines of this type having slide valve cylinders. Those with slide valve cylinders take the same lower frame as engines with piston valve cylinders, but in place of an upper front frame the main front frame is extended as a solid piece.

The motion of the link block is transmitted to the rocker arm by a short transmission bar which is supported at one end by the rocker arm and at the other end by a link suspended from the upper bar of the frame.

Determined by the usual formula, the tractive effort is 24,200 lbs.; ratio of weight on drivers to tractive effort, 5.85; ratio of tractive effort to total heating surface, 8.38; ratio of total heating surface to firebox heating surface, 19; ratio of total heating surface to grate area, 64.5; ratio of firebox heating surface to grate area, 3.42; ratio of total heating surface to volume of both cylinders, 666.3; ratio of grate area to volume of both cylinders, 10.3; ratio of total heating to weight of one cylinder full of steam at boiler pressure, 1,456.3.

The following are the general dimensions:

Gauge	4 ft. 8½ ins.
Fuel	Soft coal
Weight in working order	175,000 lbs.
Weight on drivers	141,700 lbs.
Weight, engine and tender in working order	303,900 lbs.
Wheel base, driving	15 ft. 2 ins.
Wheel base, rigid	15 ft. 2 ins.
Wheel base, total engine	26 ft. 5 ins.
Height, center of boiler above rail	9 ft. 3 ins.
CYLINDERS.	
Diameter of cylinders	19 ins.
Stroke of piston	26 ins.
Horizontal thickness of piston	4½ ins.
Diameter of piston rod	3¼ ins.
Kind of piston rod packing	Economic
Kind of cylinder packing	Dunbar
VALVES.	
Kind of valve	Internal admission piston
Greatest travel of valve	6 ins.
Outside lap	1 in.
Inside clearance	5-32 ins.
Lead in full gear	3-32 ins.
Kind of valve stem packing	Economic
WHEELS, ETC.	
Number of driving wheels	6
Diameter driving wheel, outside of tire	69 ins.
Material driving wheel centers, main	Steel
Material driving wheel centers, front and back	Cast iron
Thickness of tire	3½ ins.
Driving box material, main	Steel
Driving box material, front and back	Cast iron
Diameter and length of journals	9½x10 ins.
Diameter and length of main crank pin	6¾ ins., 7¼ ins., and 7½ ins., 20 13-16 ins.
Diameter and length of side rod crank pins, front and back	5 ins. and 6¼ ins., 13¼ ins.
Engine truck wheels	Steel spoke, 33 ins. dia.
Engine truck journals, diameter and length	5½x10 ins.
BOILER.	
Firebox	Belpaire
Outside diameter first ring	69 ins.
Working pressure	210 lbs.
Thickness of plates in barrel and outside shell of firebox	11-16 ins., ¾ins. and 9-16 ins.
Firebox, length	97 ins.
Firebox, width	66⅛ ins.
Firebox, depth, front	69¾ ins.
Firebox, depth, back	48¾ ins.
Firebox, material	Steel
Firebox plates, sides	5-16 ins.
Firebox plates, crown	⅜ ins.
Firebox plates, back	⅜ ins.
Firebox plates, tube sheet	½ ins.
Firebox water space	5 ins. all around
Stay bolts	Iron, 13-16 ins. and 1 in.
Stay bolts, spacing	3½ ins.
Tubes, material	Iron
Tubes, gauge	No. 11 B. W. G.
Tubes, outside diameter	2 ins.
Tubes, length over tube sheets	15 ft. 1 in.
Tubes, number	342
Fire brick arch	Supported on angle irons
Heating surface, firebox	151.44 sq. ft.
Heating surface, tubes	2,717.94 sq. ft.
Heating surface, total	2,869.38 sq. ft.
Grate surface	44 sq. ft.
Exhaust pipe	Single, 4⅞ ins. and 5 ins.
Smoke stack, inside diameter at choke	14 ins.
Smoke stack, top above rail	16 ft. 2½ ins.
TENDER.	
Style	Water bottom
Weight, empty	46,600 lbs.
Wheels, number	8
Wheels, material and diameter	Steel, 37½ ins.
Journals, diameter and length	5x9 ins.
Wheel base	16 ft.
Frame	Steel center sills
Tender truck	C. B. & Q. design, steel bolster
Water capacity	7,000 gals.
Coal capacity	12 tons

Master Steam Boiler Makers' Association--Third Annual Convention

THE third annual convention of the Master Steam Boiler Makers' Association was held in Congress Hall, on the grounds of the Louisiana Purchase Exposition, St. Louis, Mo., September 6th to 9th inclusive. The convention was called to order by President T. C. Best, at 10 o'clock in the morning. During the opening exercises a letter was read from Mr. D. R. Francis, president of the World's Fair, in which he expressed his regret at being unable to address the association and extended his best wishes for a successful meeting. The association was addressed by Mr. C. P. Patrick of Peoria, Ill.

PRESIDENT'S ADDRESS.

In his address President Best spoke of the indebtedness of one to the other in the world, and in this relation to the Master Boiler Makers he pointed out that their duty lay in raising the standing of their craft by assisting each other and not by endeavoring to get ahead of one's neighbors. He referred to this association as being the original society organized for the work which it has undertaken and reported a continual increase in its membership. The association is organized for educational purposes, to protect human life from fatal boiler explosions and is not a labor organization in the sense of a labor union. The foreman has a peculiar position, and his very position demands that he remain neutral in any controversy between employers and employes. With regard to boiler inspection Mr. Best said: "I am pleased to mention that the American Boiler Manufacturers' Association has been struggling for a number of years to have a bill passed through Congress for a uniform boiler inspection law, and in the past two or three years has made great progress." Continuing with relation to the progress of the association, an encouraging outlook was reported and the past work of the association would indicate greater things in the future.

ADDRESS OF VICE-PRESIDENT.

Following Mr. Best's talk, Mr. William Wilson (I. C. R. R.), vice-president, addressed the association, directing attention to the educational advantage to be derived from visiting the exhibits represented at the Fair, presenting an opportunity to examine tools and machines used in a boilermaker's business, but which all members are not fortunate enough to have in their shops. The speaker devoted some little time to reviewing the organization of the association, the necessity of keen interest on the part of members and the benefits to be derived by employers as well as the direct benefit to those who constitute the association.

LEAKY FLUES AND CRACKED SIDE SHEETS.

The first subject considered was that of "Leaky Flues and Cracked Side Sheets." It was opened by a short paper from Mr. Luke Ollis. This paper argued that if cold air entering the firebox when the door is opened will start the flues to leak, cold air coming through the ash pan—especially in cold winter weather—will tend to crack the side sheets when the fire is 6 to 10 inches, or more, above the top row of rivets in the mud ring. The writer believed this to be a reason why mud rings leak at the corners, and has found more cracks near the grate level than anywhere else. Attention was directed to the fact that countersunk rivet heads in lap joints give more trouble than rivets with heads exposed to the fire. The reason given for this is that when the sheet is countersunk a portion of the metal is cut away and the strength of the sheet is reduced, and as the plate expands and contracts with the rest of the firebox, the lap cracks from the rivet to the edge.

During the ensuing discussion a number of remarks were made with regard to the results of uneven expansion and contraction, bad water, accumulation of mud in the water leg and the presence of hard scale. The cause of cracks appearing either vertical or horizontal was explained as depending upon the direction in which the sheets were free to expand, and it was argued that provision for free expansion was necessary. Cracking around staybolts was attributed to the firebox expanding and pushing against the staybolts and the boiler head. As there were members present who attributed cracks merely to unequal expansion and contraction, Mr. Wilson explained that on the Illinois Central the locomotives in the southern divisions in good water districts are troubled very little with cracked sheets, and side sheets last from fifteen to seventeen years. On the western divisions bad water containing hard encrusting matter is encountered, and the sheets will be required to be renewed in eleven or twelve months, arguing therefrom that bad water is responsible, in addition to unequal expansion and contraction.

CARE OF THE MODERN LOCOMOTIVE BOILER.

The second subject taken up was a paper entitled "Some Points on the Care of the Modern Locomotive Boiler," by Mr. Arthur Douglas. The author traces the design of the locomotive, the governing conditions and limitations, and in opening the paper criticises designers as men lacking in practical experience. In his opinion, the length of a flue has little to do with keeping flues tight. The main trouble is that they are crowded so close together that there is not enough water between them to absorb the intense heat and the water is driven away in the form of steam faster than the circulation can replace water to take the place of that which is generated into steam. The result is overheated flues and flue sheet. Speaking of the fire brick arch, he says that any boiler that will steam with a brick arch will steam without one if properly drafted. Attention is called to the necessity of frequent washing of boilers to avoid trouble, and he attributes the cause of most broken staybolts to small water space. The location of washout plugs is considered of great importance and among other points advocated are greater steam space by making boiler shell straight, ash pans with hopper bottoms, time to do the work properly in round-houses and up-to-date modern machinery.

This paper was accepted without discussion.

REDUCING THE NUMBER OF FLUES IN A LOCOMOTIVE BOILER.

"Is it necessary to have so many Flues in our Locomotive Boilers?" was the next subject taken up. This paper was presented by Mr. T. A. Jameson (Southern Ry.) in which he discussed a method of welding a bolt in the firebox end of a flue, screwing the bolt into the back flue sheet, hammering a head on this bolt and rolling the end of the flue in the front flue sheet, thus making a brace. By disposing a number of such braces throughout the boiler, he braces the sheet and claims to have had very satisfactory results in preventing leaky flues. A blue print illustrating the method was passed around among the members. Of course this arrangement can be applied to new sheets only. When the heads on the ends of the bolts have been burned off, the braces must be replaced.

Several members reported having braced flue sheets by putting rods through flues, and spacing them in different positions throughout the boiler, with more or less questionable results in reducing leaky flues. Mr. Best advocated more water space around the flues. Some little discussion followed concerning the amount of expansion in the flue brace described by Mr. Jamieson as compared with the open flues in the boiler. Mr. Grey advocated making 7/8 in. the minimum for the bridge in the flue sheet and believed that nothing is gained by placing the flues nearer together. This opinion was strongly supported by Mr. Meyer.

COPPER FERRULES AND FLUE SETTING.

The secretary read a letter from Mr. T. C. McGrail, in which he advocated the use of a copper ferrule 3-32 in. thick and 1 in. wide. His practice is to anneal the coppers in open coke fires and cool them in water. The flues are swedged cold. They are annealed by heating in open coke fire and standing up in hot dry sand with a little charcoal mixed in. The swedged end is filed while being cut off. The flue sheet is filed on both sides so as to make a 1-16 in. countersink, and the coppers are rolled in.

Some discussion followed the reading of this communication, but no decision was reached. Some members favored the narrow ferrule and others favored the wide.

A STANDARD FIRE DOOR.

"Why not have a Standard Size Fire Door?" was discussed in a paper by Mr. F. A. Mayer. This paper recommended a standard fire door hole for firebox boilers, especially locomotive boilers, for the following reasons:

First—There seems to be some misunderstanding as to what an elliptical and oval object is.

Second—Every builder has his own notion as to what form a fire door should be made; and,

Third—Drawings do not always give the method of laying out a fire door hole, but often simply give length and width and, of course, the layer-out will use his own method in marking same.

A standard fire door hole would reduce the number of flange blocks now necessary to be kept on hand. The writer approves of round fire door holes, believing that this form is the simplest and would be the easiest to make standard. He distributed blue prints, illustrating three methods of drawing ellipses, one of which he recommended for general and practical use.

This paper was accepted and ordered published in the proceedings of the association.

EFFICIENCY OF JOINTS.

The next subject taken up was "The Efficiency of Joints," and blue prints were distributed illustrating the results on the shearing strength of rivets made by Mr. J. Wolfenden (Erie R. R.). The subject was referred to the committee on rules and regulations, to be reported on at the next convention.

STEAM BOILERS VERSUS FEED WATER HEATING AND PURIFICATION.

The secretary read a paper by Mr. Stephen Christie, on "Steam Boilers Versus Feed Water Heating and Purification." The writer directed attention to the fact that various appliances and methods are employed to obtain the best possible results from feed water, for the latter is one of the primaries for disaster and expense in operation. There followed a brief description of types and analysis of the same.

The paper was accepted as read.

TRIPLE RIVETED BUTT STRAP JOINT.

Mr. Patrick submitted to the convention a blue print illustrating a triple riveted butt strap joint, which is the usual standard design of an 86.6 per cent joint, with the addition of a third rivet placed between two rivets in the outside row to accommodate a brace.

Some discussion concerning this point ensued.

STANDARD THREADS FOR STAYBOLTS.

A resolution was adopted to appoint a committee to investigate the best type of thread suitable for staybolts and report at the next convention.

Papers were presented on "Why Direct Stays Leak in Horizontal Tubular Boilers and a Few Suggestions in Construction," by Mr. J. B. Holloway, and "Methods of Staying the Various Parts of Boilers," by Mr. Arthur W. Garside, and a committee of fifteen was appointed to investigate the subject of flat staybolts.

NEXT PLACE OF MEETING.

Chicago was selected as the next place of meeting, the impression prevailing that this city is the most likely place to which transportation is available on the majority of railroads. The 1905 convention will be in June.

OFFICERS.

The gentlemen holding office during the past year were re-elected.

Personals

Mr. James. W. Hill, master mechanic of the Peoria & Pekin, has resigned. Mr. Hill has held that position for 18 years.

Mr. George Dickson has been appointed general foreman of the shops of the Chicago, Cincinnati & Louisville at Peru, Ind.

Mr. E. N. Gower has been appointed superintendent of motive power of the Gainesville Midland, with headquarters at Gainesville, Ga.

Mr. E. S. Smith, formerly with the Atlanta, Knoxville & Northern at Blue Ridge, Ga., has been appointed foreman of car repairs of the Southern Railway at Princeton, Ind.

Mr. J. M. Borrowdale has been appointed general foreman of the car department of the Illinois Central at Burnside, Ill., to succeed Mr. C. D. Pettis, resigned.

Mr. E. Jones has been appointed master mechanic of the St. Louis, Iron Mountain & Southern at Baring Cross, Ark., in place of Mr. Thomas Paxton, resigned.

Mr. R. W. Burnett, formerly general foreman of car repairs of the Central New Jersey at Elizabethport, N. J., has been appointed assistant master car builder of the Erie, with headquarters at Buffalo, N. Y.

Mr. G. W. Innes has been appointed assistant road foreman of engines, River and Low Grade divisions of the Buffalo & Allegheny division of the Pennsylvania Railroad, with headquarters at Pittsburg, Pa.

Mr. C. D. Pettis, heretofore general foreman of the car department of the Illinois Central at Burnside, Ill., has been appointed superintendent of the car department of the St. Louis & San Francisco at St. Louis, Mo.

Mr. H. T. Herr has resigned as master mechanic of the Norfolk & Western at Roanoke, Va., to accept the position of assistant to Vice President Schlacks of the Denver & Rio Grande, with headquarters at Denver, Colo.

Mr. F. M. Pierce, heretofore master mechanic of the Hawkinsville & Florida Southern, has been appointed superintendent of motive power of that road, with headquarters at Pitts, Ga.

Mr. P. A. Logan, who has been superintendent of motive power of the Canada Eastern, has been appointed mechanical foreman of the Intercolonial, with headquarters at Gibson, N. B.

Mr. James Farrell, heretofore master mechanic of the National of Mexico at Laredo, Tex., has been appointed superintendent of motive power and machinery of that road, with headquarters at Laredo, to succeed Mr. Thomas Milan, resigned.

Mr. B. M. Waldo, who has been acting as foreman of the Santa Fe shops at Fort Worth, Tex., has been transferred to the Dallas shops, and J. W. Hill has been appointed to take the position made vacant by the transfer of Mr. Waldo.

It is stated that Mr. A. W. McElvaney has resigned as master mechanic of the Missouri, Kansas & Texas at Greenville, Tex., and has been succeeded by A. W. McLow, late assistant foreman of motive power of the El Paso & Northwestern Railway at Alamogordo, N. M.

Mr. C. E. Gossett, who has been traveling engineer on the Oklahoma division of the Rock Island, has been promoted to the position of master mechanic in the El Paso division, with headquarters at Dalhart, Tex.

Mr. J. A. Houston has been appointed master mechanic of the St. Louis & San Francisco at Sapulpa, I. T., to succeed Mr. J. M. Johnson, who has been acting master mechanic. Mr. Johnson has resumed his former position as traveling engineer.

Mr. James H. O'Gara, general foreman of the Toledo shops of the Toledo & Ohio Central, has resigned on account of sickness. He was made general foreman at Toledo about two years ago. He was at the Kenton shops of the company for a number of years.

Mr. G. W. Seidel, heretofore master mechanic of the Birmingham division of the Southern Railway, has been appointed master mechanic of the Kansas & El Paso division of the Chicago, Rock Island & Pacific, with office at Horton, Kan.

Mr. I. C. Hicks has been appointed master mechanic of the Atchison, Topeka and Santa Fe Coast Lines, with office at Albuquerque, N. M., effective on September 15. Heretofore Mr. Hicks has been general foreman of shops at San Bernardino, Cal.

Mr. R. L. Howden, heretofore round house foreman of the Wheeling & Lake Erie at Columbus, O., has been appointed general foreman of shops at that point, to succeed Mr. E. D. Shedd, who has been appointed traveling engineer in place of Mr. C. W. Coe, promoted.

Mr. G. N. Howson has been appointed master mechanic of the Birmingham division of the Southern Railway, with office at Birmingham, Ala., to succeed Mr. G. W. Seidel, resigned. Mr. C. B. Cramer has been appointed master mechanic of the Charleston division, with headquarters at Sheffield, Ala., to succeed Mr. Howson, and Mr. H. W. Burkheimer has been appointed master mechanic of the Charleston division, with office at Charleston, S. C., in place of Mr. Cramer.

Mr. Fitch D. Adams, one of the oldest retired master car builders in the country, and one of the few remaining men whose career begun nearly half a century ago, died last month in Buffalo, aged 82 years. He was with the Boston & Albany 26 years, resigning in 1896 and giving up active work. The Master Car Builders' Association had honored him some years ago by making him president, and until his health failed he had been active in its affairs for many years.

The following changes are announced in the mechanical department of the Norfolk & Western, effective on September 1: Mr. L. P. Ligon, heretofore master mechanic of the Pocahontas division, has been appointed master mechanic of the Eastern general division, with headquarters at Roanoke, Va., to succeed Mr. H. T. Herr, who has resigned. Mr. L. D. Gillett, general foreman at West Roanoke, has been appointed master mechanic of the Pocahontas division, with office at Bluefield, W. Va., in place of Mr. Ligon, and Mr. J. M. Thomas has been appointed general foreman at West Roanoke to succeed Mr. Gillett.

American Railway Appliance Exhibition

The general committee of arrangements of the American Railway Appliance Exhibition, in connection with the International Railway Congress, May, 1905, has been completed, having held its first meeting in New York City on September 8th. The committee is comprised of the representatives of the allied railway supply trades. A list of the names of the members is published herewith, together with copy of statement and recommendations made by the chairman of the committee, which were approved by the committee.

A perusal of the names of the committee will show that this movement has the cordial endorsement and co-operation of such interests as will command consideration and the movement should certainly have the hearty support of the railway supply trade.

STATEMENT AND RECOMMENDATIONS
submitted by
GEORGE A. POST, CHAIRMAN,
at the First Meeting, held in
New York, Sept. 8th, 1904,
of the
GENERAL COMMITTEE OF ARRANGEMENTS
of the proposed
AMERICAN RAILWAY APPLIANCE EXHIBITION
to be given in connection with the
INTERNATIONAL RAILWAY CONGRESS
to be held in Washington, D. C., May, 1905.

Gentlemen of the Committee:

An enterprise that, at its inception, commands the approbation and co-operation of such a body of men as is here assembled, as well as of those who have been invited to be present but are unavoidably detained by business engagements, is predestined to success.

As the humble instrument in bringing together this aggregation of the executive officials of so many important and vast manufacturing interests, I am profoundly grateful for your courteous responses to my appeal and proud of so happy an issue of the initial steps taken in promoting a movement that I firmly believe is fraught with great promise of benefit for the railway supply interests of America.

It will not be amiss, I hope, if I briefly recount the circumstances that bring us together, the object to be attained by the labors of this committee, and the probable results to flow therefrom.

In May, 1905 (to be exact, from May 3d to 14th, inclusive), the International Railway Congress will be held in Washington, D. C. This dignified and influential body meets but once in five years, and for the first time in its history will meet in the United States. Its membership comprises the managerial heads of the government and independent railways of most of the foreign countries of the world, together with the officials of similar rank of the railways of America. It is expected that about a thousand of the most able, distinguished and potential railway officials of the world will be in attendance upon this meeting of the congress. It will be an event of great importance and deep interest in railway circles, and will attract world-wide attention.

The meeting of the congress in our country was the result of strenuous efforts on the part of American railway officials, seconded by the President of the United States through the State Department, and now that the great honor has been conferred upon our country, it is the natural desire of those deeply interested in the congress and responsible for its meeting in America, that it shall be attended with such success as shall send the foreign visitors home with enlarged and heightened views of American methods and appliances.

At the annual meeting of the Railway Supply Men's Association, in connection with the Master Mechanics' and Master Car Builders' Associations, held in Saratoga, in June, 1903, a resolution was adopted, asking the officials of the American Section of the International Railway Congress, if it would be agreeable to them to have an exhibition of American railway appliances made in connection therewith. To this inquiry came the response that such an exhibition would be welcomed as a valuable and desirable auxiliary to the congress. Just prior to the annual meeting of the Master Mechanics' and Master Car Builders' Associations for 1904, a meeting of the executive committee of the American Section of the Congress was held in Washington, presided over by Mr. Stuyvesant Fish, president of the Illinois Central Railroad. It was most graciously intimated that the presence of Mr. J. Alexander Brown and myself, as the secretary and chairman respectively at that time, of the executive committee of the Railway Supply Men's Association, would be agreeable for the purpose of discussing the proposed exhibition. Mr. Brown and myself were most hospitably received by the railway officers there gathered, and were given to understand that such an exhibition was most cordially approved.

Resolutions approving the project and providing for the creation of a committee of arrangements, were unanimously adopted by the supply men in session at Saratoga on June 21, 1904, and the duty was imposed upon me to select a committee representing the supply trade as represented before the Master Mechanics' and Master Car Builders' Conventions, to act in conjunction with representatives of the Road and Track Supply Association to the end that a general committee, representing the allied railway supply trade, might be constituted to carry on the work.

This meeting is the result of the preliminaries herein above recited. The duty assigned me was a delicate and arduous one. In its performance I have sought to be controlled solely by what seemed to be necessary for the welfare of this undertaking. Restricted to a certain number by the resolutions by virtue of which my authority was conferred, I could name but a few of the many who are worthy of and whose interests might rightly be considered entitled to such recognition. My conscience is void of offence in this respect; I have played no favorites, nor have I ignored any one from prejudice. Confronted with a wealth of material, I was compelled to choose a fixed number. Nothing short of a committee of the whole would have included all who by achievement, fitness and repute would have ornamented and added strength to the committee.

Enough of history; now I speak of the future.

It remains for this committee to proceed to organize the exhibition. To make it a success requires that the manufacturers of railway appliances of our country shall be acquainted with the great privilege to be accorded them through the medium of the proposed exhibition. If the exhibition of our wares before the numerous associations of the various branches of the railway industry in our country, which meet annually, have proven of value to us, and we know they have, then it requires no argument to prove that an exhibition that will be witnessed by railway managers from all over the world, cannot fail to be productive of results that will ramify through all the arteries of the railway supply trade, giving wider markets for our goods, and adding to our wealth and prestige.

To the manufacturer who seeks export trade, the presence in this country of over five hundred foreign railway men with the power of purchase, with the time and inclination to examine his product, is surely a consummation devoutly to be wished. To him such an opportunity was never before offered. This will be distinctively an exhibition of railway appliances for the exclusive scrutiny of railway men. It will be held in a city wherein there is less to detract from the importance of this particular exhibition than would be the case in any of the great commercial centers of the country. It will be held at a season when the Federal Congress is not in session and there will be better facilities for accommodating the crowds that will attend the International Congress and our exhibition than otherwise.

To the manufacturer whose appliances are not adaptable to foreign railway use, but designed solely for American practice, the presence in attendance upon the congress of a large number of American railway executive officials should be sufficient inducement for him to make an exhibit. It should not be forgotten that this will be the first exhibition of railway appliances ever made primarily for the observation of American railway managers and under such auspices as will insure a cheerful and patient examination thereof. We shall be there, if not actually upon their invitation, at least with their cordial approval.

The American manufacturer is ever alert to improve an opportunity to exploit his goods, and if this committee shall spread abroad to the manufacturers the tidings that such a splendid opportunity is open to them to attract the eyes and ears of so many railway officials, who control the pursestrings of the world's railways, I believe that there will be installed at Washington next May a mechanical symposium that will amaze, instruct and entertain the railway officials there assembled. If I know anything about the energy, foresight, ability and get there proclivities of the American manufacturer of railway appliances, he will be in Washington in such shape that the American railway official will be proud of him, and the American meeting of the International Railway Congress will long be remembered because he was there.

At the theshold of our work we are confronted with an obstacle which must be overcome if our proposed exhibition shall prove a success. Overcoming obstacles, however, is what the American manufacturer is doing every day, so that the existence of an obstacle is not at all depressing. It is, rather, a stimulus for work. There is just one place in Washington whereon the proposed exhibition must be located, and that is what is known as the "White Lot," being a large acreage back of the White House grounds and stretching to the Potomac. It is an ideal location. It is, however, a government reservation, and the Federal statutes prohibit the erection of any temporary structures thereon, except by act of Congress. We must secure permissive legislation at the earliest possible moment after the convening of the Federal Congress on the first Monday in December next. There are precedents established for such legislation, as such special acts have been passed heretofore in connection with the Grand Army Encampment and the inaugural ceremonies.

The international character of our enterprise constitutes a convincing argument for the legislation desired. Our exhibition is for the purpose of widening the market for American manufactures; we seek foreign trade. The Federal Congress is constantly agitating measures for the accomplishment of this very purpose. How to upbuild the merchant marine is at the present moment a live topic of congressional study. Of what use are bottoms flying the American flag if there are not cargoes for those bottoms? The mainspring of our proposed exhibition is the furnishing of freight for the bottoms that ride the ocean. Our appeal for the use of the "White Lot" is based on practical patriotism. We want to send more goods to the foreign marts, and if we can create a demand therefor, then there is more work for American labor.

The industry that we represent runs high into the millions of invested capital, and the army of skilled workmen employed therein is numbered by the scores of thousands.

It would be strange indeed if the brief use of a few acres of the government soil should be denied to a body of its citizens who would use it solely for the advantage of the people, as its results would be far-reaching in the distribution of wealth by creating an increased demand for the labor of the country.

It is our duty to show to the Senators and Congressmen that our request is grounded upon reason, and we must each, individually, at once begin the campaign of education and see to it that all those engaged in our industry shall seek to reach the ear of all members of the Congress they know, and secure pledges of approval of the legislation we ask.

From now until action is taken upon the bill that will be introduced in both Houses of Congress at the opening thereof, all our energies must be focussed upon the passage of that bill. With favorable action by congress promptly taken, the details of the exhibition itself will easily be cared for.

After a careful consideration of the subject, and with a thorough knowledge of the alternative facilities that Washington might offer, I am convinced, and I say frankly, that if such an exhibition as we propose to make cannot be located on the "White Lot," the enterprise will have to be abandoned.

In order that there may be an assurance to all who may participate in the proposed exhibition in connection with the International Railway Congress, that such funds as shall be contributed for carrying on the work of the committee will be expended frugally and under the critical eye of one whose name is a guarantee of trustworthiness and administrative ability throughout the railway supply world, I have requested and, after urgent appeal, secured the assent of our distinguished colleague, Mr. Charles A. Moore, to serve as treasurer of the committee. I am confident that you will heartily confirm this selection and join me in thanks to Mr. Moore for consenting to assume this responsibility.

I am happy to state also that for secretary of the committee and director of exhibits, I have been so fortunate as to secure the consent of Mr. J. Alexander Brown, manager of the Railway Equipment and Publication Company, to serve us. Mr. Brown is now serving his third year as secretary of the Railway Supply Men's Association in connection with the Master Car Builders' and Master Mechanics' Associations, and has been secretary and is now vice-president of the Road and Track Supply Association, in which positions he has demonstrated rare organizing talent and he is splendidly equipped for the arduous work that will devolve upon that officer of this committee. I will say frankly that but for Mr. Brown's assurance that his services would be at our disposal, I would have been loath to undertake the responsibility that will fall to my lot in this enterprise. Your confirmation of this selection I have no doubt will be given, with the feeling that we are under obligations to Mr. Brown for the valuable co-operation he vouchsafes to us.

It is understood, of course, that no officer of this committee is to receive any compensation for his services; only the necessary and actual expenses of the officers, incurred by or for them solely for the benefit of this committee, are to be paid.

I recommend that the name of this organization shall be: American Railway Appliance Exhibition in connection with the International Railway Congress, May, 1905.

And corporation, association, co-partnership or individual engaged in the manufacture or sale of appliances of material used in the construction, operation or maintenance of railways in the United States, should be eligible for membership in this association, and should have the privilege of making an exhibit, upon payment of the prescribed fee, subject to the regulations of this committee.

I trust, gentlemen, that I have not wearied you with my introductory remarks, but I felt impelled to present the matter to you in considerable detail, so that you would be in possession of the situation as it exists.

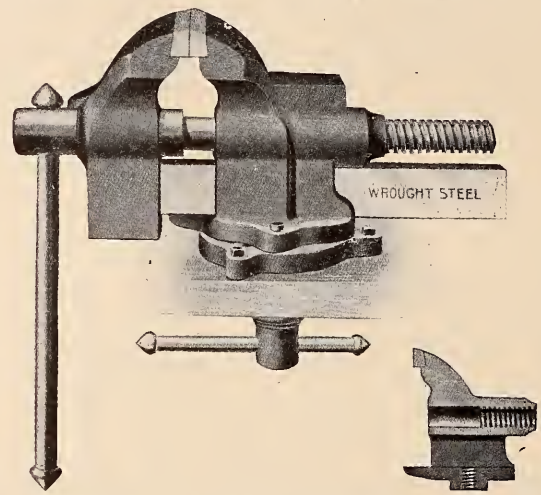
Members of the General Committee of Arrangements for the American Railway Appliance Exhibition, in connection with the meeting of the International Railway Congress, to be held in Washington, D. C., May 3-14, 1905:

H. P. Bope, Vice-President Carnegie Steel Co.
L. F. Braine, General Manager Continuous Rail Joint Co. of America.
A. E. Brown, Vice-President Brown Hoisting Machinery Co.
J. G. Brill, President J. G. Brill Co.
J. B. Brady, Vice-President Standard Steel Car Co.
O. H. Cutler, President American Brake Shoe & Foundry Co.
C. A. Coffin, President General Electric Co.
F. H. Eaton, President American Car & Foundry Co.
H. Elliott, Jr., Vice-President Elliott Frog & Switch Co.
William Goldie, Sr., William Goldie, Jr., & Co.
F. N. Hoffstot, President Pressed Steel Car Co.
H. S. Hawley, President Railroad Supply Co.
Alba B. Johnson, Baldwin Locomotive Works.
B. F. Jones, Jones & Laughlin Steel Co.
A. M. Kittredge, Vice-President Barney & Smith Car Co.
W. V. Kelley, President Simplex Railway Appliance Co.
E. B. Leigh, Vice-President Chicago Railway Equipment Co.
Wm. Lodge, President Lodge & Shipley Machine Tool Co.
General Charles Miller, President Galena-Signal Oil Co.
Charles A. Moore, Manning, Maxwell & Moore.
Governor Franklin Murphy, President Murphy Varnish Co.
D. C. Noble, President Pittsburg Spring and Steel Co.
Hon. H. Kirke Porter, H. K. Porter Co.
A. J. Pitkin, President National Locomotive Co.
Alfred A. Pope. President National Malleable Castings Co.
H. S. Paul, President Verona Tool Works.
George A. Post, President Standard Coupler Co.
C. W. Sherburne, President Star Brass Co.
C. A. Starbuck, President New York Air Brake Co.
W. W. Salmon, President General Railway Signal Co.
H. A. Sherwin, President Sherwin-Williams Co.
Albert Waycott, President Damascus Brake Beam Co.
H. H. Westinghouse, Vice-President Westinghouse Air Brake Co.
W. W. Willits, Vice-President Adams & Westlake Co.
Chairman, George A. Post.
Treasurer, Charles A. Moore.
Secretary and Director of Exhibits, J. Alexander Brown.

Three hundred squares of Paroid Roofing have recently been used to replace tin roofs of Northwestern railroad train sheds at Chicago, Ill. The large number of railroad systems now using Paroid for all kinds of railroad buildings attest its increasing popularity for this kind of work. F. W. Bird & Son, East Walpole, Mass., are the makers.

Wrought Bar, Parallel Swivel Vise

The vise shown by the accompanying engraving is the result of years of experience in manufacturing and using a vise which will stand the wear and tear of hard work. The jaws being extra heavy cannot be broken with a hand hammer, making it an excellent chipping vise. They are faced with carefully tempered tool steel pieces, which can be easily replaced should they become worn or injured. The wrought bar is machined perfectly square and parallel, and is well fitted into the pocket in the back jaw. It will be noticed that the plain part of the screw extends well into the back jaw, which enables the vise to be opened far enough for ordinary use before the thread is exposed. The screw is large in diameter, with a strong, square thread, well fitted into the back jaw, the threaded part (or nut) being as long as the jaws are wide. The vise swivels on a large washer, and can be



WROUGHT BAR, PARALLEL-SWIVEL VISE.

turned to any position and securely held there by the bottom screw and the pin through a lug on either side of the base. For strengthening rods, etc., the anvil at the back will be found very useful.

Attention is directed to the following table of weights and dimensions:

Width of Jaw.	Open.	Weight.	Size of Wrought Bar.	Diam. Screw.
4	8	70	1⅛x2⅛	1⅛
5	9	94	1⅛x2⅛	1⅜
6½	10	141	1⅜x2⅜	1⅝
8	12	212	1½x3	1⅝

No. 8 Automatic Double Car Tenoner

In bringing out the new tenoner in the accompanying illustration, it has been the aim of the manufacturers to make it as labor saving as possible, and it being entirely automatic, all responsibility is taken off the operator as to marking his stock. The machine cuts to exact lengths, and each piece comes from it accurately worked and with wonderful rapidity. This tenoner was patented June 15, 1900.

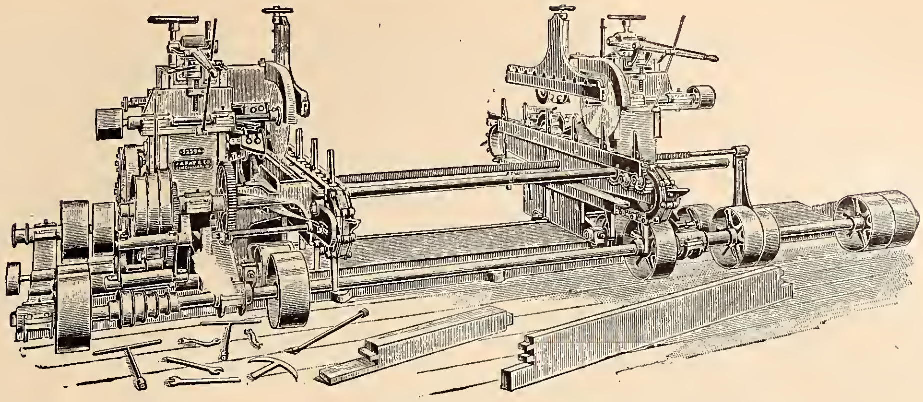
Special attention is directed to the following: It will cut off and tenon material from 10 inches to 9 feet long between shoulders, and will cut off and tenon both ends of timber to 24 inches wide and 8 inches thick. By cutting off the lengths on some other machine, dispensing with the saws on this, timbers 12 inches thick can be tenoned to advantage.

Saws 22 inches in diameter can be used, and operating in advance of the cutter heads, the bur raised by the saws is perfectly removed by the cutters, thus saving much valuable time. A special head is provided for making double tenons to 4 inches deep.

There are eight tenoning heads, two on each spindle, and each carrying two knives, cutting tenons 6 inches long, so by using two heads on each spindle a tenon 12 inches long can be cut.

The machine is massive, perfectly built to stand hard work, and lots of it, and the adjustments are made quickly and accurately.

The makers, J. A. Fay & Egan Co., West Front St., Cin-



No. 8. Automatic Double Car Tenoning Machine.

cinnati, Ohio, will send to those interested prices, cuts of machine and full information, and will also send charges prepaid, their new catalogue, showing the machines they make.

Exhibit of the H. B. Smith Machine Company at the Universal Exposition, St. Louis, Mo.

Lumbermen and others who use wood-working machines or who are interested in converting lumber into merchantable shapes, will be edified and greatly pleased at the liberal display of wood-working machinery at the Universal Exposition, St. Louis.

One of the largest exhibits of this class of machinery is that of the H. B. Smith Machine Company, of Smithville, N. J., who occupy some 5,000 square feet in the southeast corner of Machinery Hall (Block 4). They show some thirty-five modern wood-working machines of latest design and embodying all improvements to date. A number of the machines are electrically driven, thus exemplifying the modern plan of utilizing what might be called the "20th Century Power."

The H. B. Smith Machine Co. are pioneers in the manufacture of wood-working machines, the business having been continuous since 1847, and if experience is worth anything they ought to know something about their class of machinery. They keep on hand a corps of draughtsmen and designers and perhaps have contributed to the trade more original wood-working machines than any other person or company in the business, and many of their standard machines have been complimented by being copied after the patents expired.

Within the last few years they have remodeled their machines and have added many new ones to the list and it is this latter class they are exhibiting.

Their genial representatives will be glad to entertain visitors to the fair, and will explain the various machines to any who are interested to examine them.

Mica Metallic Paint.

Ever since the beginning of railroading in this country there has been no greater annoyance to the master painter than the painting and keeping painted of the front ends of the locomotive, as paint that would withstand the water would not stand the fire, and that which was fireproof would not stand the extreme heat which it was subjected to in this place. Therefore it has been not only the custom but a necessity to paint the front ends as often as each trip. Nearly all of the paint manufacturers have experimented along this line, but with little or no results. Therefore the invention of a paint which meets with the requirements as already stated will be gladly received by the painters in general. It is claimed by the manufacturers of this paint that it will withstand any heat to which a front end is subjected, as it contains nothing which can burn and is guaranteed to be water

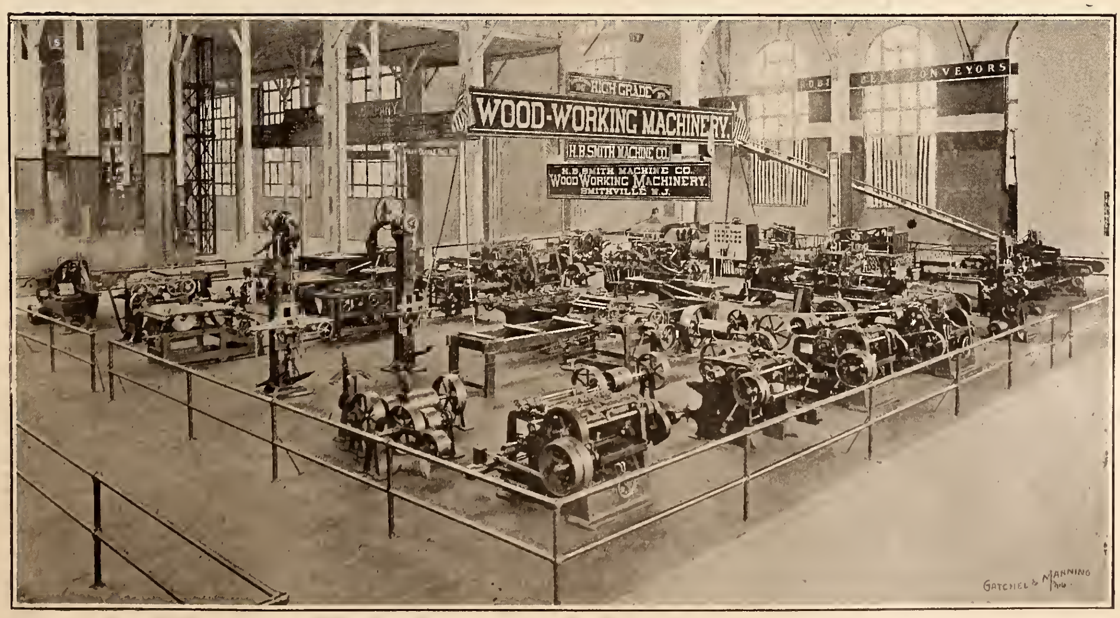


Exhibit of the H. B. Smith Machine Company at the World's Fair.

proof. Its appearance is nearly the same as enamel of a high glossy finish and jet black. It is made by the American Metallic Packing & Supply Co., 46-56 S. Water St., Cleveland, O.

Rexoid Roofing

Rexoid is a perfectly made, ready to use, roofing, intended for roofs of the best business houses, factories, sheds, etc., etc., either flat or steep roofs. It is manufactured from the genuine imported Pitch Lake, Trinidad asphalt, (guaranteed), and the best fibrous wool felt, saturated with the same asphalt, with a top coating of ground mica which renders it fireproof against flying embers. It will not dry out and become brittle, as coal tar and other so-called asphalt (domestic) roofings do, and is not affected by hail, heat, cold, acid, gases, etc., etc., and is insured under same rates as metal or gravel roofs. The cost of Rexoid is very moderate, and as it does not require coating or painting as do metal or felt roofs, the entire original cost is saved within five years. This material is put up in rolls of 216 square feet, and the price includes cement and broad headed nails for laps.

Holmes Metallic Packing

The Holmes patent improved metallic piston rod and valve stem packing is not a new metallic packing, but is in new hands, who are determined to supply the consumer with good packing and at prices that will cause it to be used and its merits substantiated. This packing is in use on marine, stationary and locomotive engines, and is pronounced by expert engineers to be excellent for the above purposes.

Mechanical engineers and engine builders acknowledge that a great loss of power is caused by friction on the rod, from the use of fibrous packing, or soft metal rings that are compressed on the rod by screwing up the gland so tight as to prevent the escape of steam. The use of fibrous packing also wears the rod out of round and uneven and in some cases scores or scratches the rod or valve stem so that it necessitates its being taken out and turned, in order to keep it tight. There have been several metallic packings brought out which have had more or less merit, but this packing not only possesses all the merits of former productions, but is an up-to-date article, and claimed by its manufacturers to be second to none.

Notes of the Month

The Mason Regulator Company, Boston, Mass., has just issued a price list of repair parts for all sizes of Mason reducing valves. A copy of this list will be mailed on application.

The American Balanced Valve Company, of Jersey Shore, Pa., have issued copies of their catalogues numbers 21 and 22 setting forth the advantages of double acting slide valves and piston valves. These pamphlets contain much valuable information concerning the valve, a very important feature of the locomotive. Copies of the same may be had by writing to the above named company.

The fire which recently damaged one of the Fay erecting shops of the Fay & Egan woodworking machinery plant at Cincinnati, O., will prove to show no detriment or delay in filling their orders as usual. A large part of the force of men employed in these shops have already resumed work and the remainder have been transferred to the Egan shops and their regular work continued as if nothing of the kind had occurred. Provision for just such a possibility had been provided for under the system in which this company is handled.

A very interesting descriptive catalogue of punches, shears, forging machines, foot-power hammers, milling machines and tool room lathes, has been issued by the C. E. Sutton Company, of Toledo, O. The machines illustrated are of superior construction and design. The material of which the parts are constructed is carefully selected and the features of design are guaranteed by the manufacturers.

The special "Pike edition" time table folder of the Chicago & Alton Railway forms an excellent guide to the Louisiana Purchase Exposition at St Louis. Visitors will do well to retain their C. & A. folders for reference when at the fair. In addition to the usual time tables and information concerning trains, it contains a panorama of the fair grounds, a list of the buildings, maps of St. Louis and the grounds, descriptions of the attractions on the Pike and much other valuable information.

The Northern Electrical Mfg. Co., of Madison, Wis., has been awarded the contract for the entire motor equipment of the new shops of the Southern Railway Co. at Spencer, N. C., designed by Mr. S. D. Cushing, signal and electrical engineer of the Southern Railway Company. About 450 h. p. of motors will be required. A combination of group and individual drive will be used, and all motor driven tools requiring speed variation are to be equipped with Northern two-wire, variable speed, motors. The Northern Electrical Mfg. Co. will also furnish a 50 kw. generator for lighting the shops of the company at Alexandria, Va.

The American Brake Shoe & Foundry Company is distributing a pamphlet showing the development of the brake shoe, used in connection with their exhibit at the World's Fair.

Previous to 1850 wooden brake blocks were in general use. From 1850 to 1860 cast iron and wrought iron shoes were used in connection with wooden brake heads, and it was not until about 1870 that metal shoes and break heads were in general use.

The wonderful development of the power brake naturally brought to light the objections to the plain cast iron shoe, which are, first, the comparative weakness of the body metal, causing rapid wear and consequently frequent renewals; second, the structural weakness, causing failures in handling or in service when subjected to blows or high heating.

The development of the brake shoe as described and illustrated in this pamphlet is practical and interesting.

Mr. G. R. Henderson has opened an office at 20 West 34th St., New York City, for the transaction of general consulting and active work on the following lines of mechanical engineering: Investigations and reports upon railway and industrial enterprises for financial and development companies; examinations into condition of railway equipments, shops and other properties, with advice as to improvements in facilities and increased economy of operation; appraisal of railway equipment and general machinery for insurance purposes and contemplating purchasers; retention as regular consulting engineer for railroads, manufacturers and financial institutions; opinions upon patents and inventions; designs and specifications for new shops, round houses and power plants, also enlargement and rearrangement of old shops and machinery; locomotives and cars designed for regular or special service, also plans for special machinery developed; standardizing of railroad equipment and reduction of stock and maintenance expenses effected; application of electric power to existing plants and installation of lighting and power equipments; estimates on construction and machinery, also bids received and criticized, and contracts drawn up and executed.

Mr. Henderson has had twenty-five years' experience with several large railroads in various parts of the country, and as reference offers the following names: Marvin Hughitt, president Chicago & Northwestern Ry., Chicago; L. E. Johnson, president Norfolk & Western Ry., Philadelphia; J. M. Barr, president Seaboard Air Line Ry., Portsmouth, Va.; J. Levering Jones, Land Title building, Philadelphia.

The Twenty-fifth Annual Convention of the Master Car and Locomotive Painters' Association of the United States and Canada

The thirty-fifth annual convention of the Master Car and Locomotive Painters' Association of the United States and Canada was called to order by President C. A. Cook, of Wilmington, Del., at the Hotel Rudolph, Atlantic City, N. J., September 13, 1904, at 10 o'clock a. m.

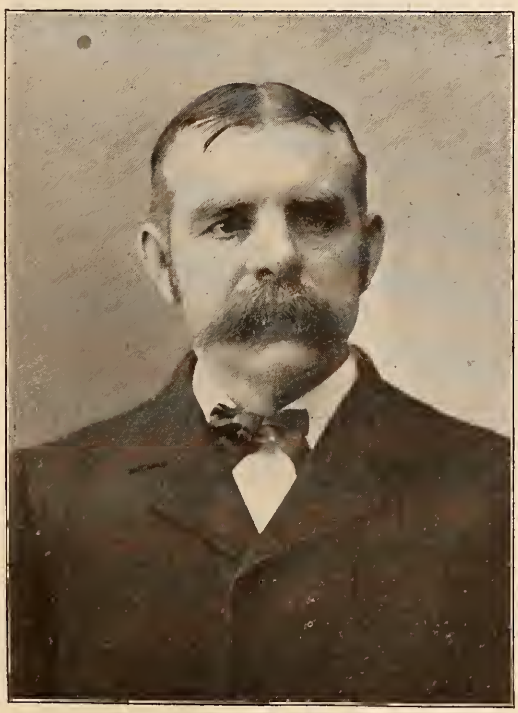
The proceedings were opened with prayer by the Rev. J. H. Townsend, of the Church of the Ascension, Atlantic City.

(At this stage of the proceedings the delegates and ladies present joined in the singing of "America" with patriotic enthusiasm.)

President Cook: Almost invariably at the opening sessions of our conventions we have been honored with the presence of the mayor of the city in which the conventions were held, and, I am glad, indeed, to see this morning that we have present with us the mayor of Atlantic City, Hon. Franklin P. Stoy, who will now address us and I am quite sure will give us a hearty welcome to Atlantic City.

ADDRESS OF HON. FRANKLIN P. STOY, MAYOR OF ATLANTIC CITY.

Mr. President, Ladies and Gentlemen: I appreciate this courtesy this morning—the invitation to be with you at the opening of this, the thirty-fifth gathering of workingmen. I am here this morning to extend to you a welcome, and I assure you that it is a hearty welcome that I extend to you. And with this welcome, I would like it understood that you, also, are extended the freedom of our city.



Mr. J. Lanfersick, President.

The National Car Builders and National Car Painters Associations gathering together as they do in different parts of the country, we are glad to mingle with them—especially this association.

We find among you a great many ladies. I have wondered what part of the business they are occupied with. It shows a goodly and friendly spirit when you take your wives and sweethearts with you on these occasions.

Now, while your occupation is that of painting and decorating cars and such things as that, and we have very little of it to do in Atlantic City, I want to say that you might, while you are here, and if you have plenty of paint, begin to paint the town. This is the time of the year when we are resting from the toils of many long days and we appreciate the presence of a delegation of this kind, and we hope, as I have given you the freedom of the city, that you will not fear the paint and will paint the town. If you will apply the paint to our city as you do in your profession we feel assured it will be a complete job. (Laughter.)

We are now about winding up the season—a long and weary season. Many things have seemed to dishearten a great many people. We have missed the presence of a great many we have been used to in Atlantic City for reasons that we, of course, really expected this year. And we hope that after everything has been cleared away and the smoke gone, that with everything else in general, we will prosper in Atlantic City as you do in your business.

I thank you for your courtesy, Mr. President, and, as you stated a few moments ago you would like to have me all day. I assure you it would be a great relief from the cares of business to stay with you. However, I must depart, but I trust your stay here will be a profitable one to you all. I trust I may have the pleasure of being with you again before you depart.

All I ask of you is, if there is anything that I can do as an official, call upon me. The police department has been notified of your presence here and I have made everything safe at headquarters. (Laughter.) I want to say, Mr. President, that I am accustomed to getting up at all hours of the night, and I shall not make any exception in the case of any member of this organization. So you can rest assured you have a hearty welcome, the freedom of the city and the protection of the mayor. (Applause.)

(A 'Stein Song" was nere rendered by Mr. J. D. Wright, with piano accompaniment, and received much applause.)

President Cook: I believe it is my happy privliege as president of the Master Car and Locomotive Painters' Association of the United States and Canada, to reply to the welcome words of greeting and hearty welcome expressed to you by His Honor, Mayor Stoy. I am sure, sir (addressing Mayor Stoy), I am authorized by both the ladies and the members of the association, to convey to you our deep appreciation of your generous welcome and open hospitality to your wonderful "City by the Sea." It is, indeed, a wonderful city, and your Golden Jubilee is a fitting climax to fifty years of almost fairy-like growth. In your city, sir, it has been demonstrated that it is possible, not only to build houses and maintain them, but to build and maintain a great city upon the shifting sands, not in bold defiance of the winds and floods that may beat upon it, but, rather as a monument to the power and genius of God's greatest creation, man.

We are here, sir, in the interest of our association and of the railroads with which we are severally connected, and when we are relieved from the strain of business we shall gladly avail ourselves of the various forms of pleasure and amusement that surround us and thoroughly enjoy the atmosphere, the hospitality and the welcome that you have assured us. Indeed, Mr. Mayor, if there is anything that we can do on our part to further increase the beauty of your city, now is your opportunity. With this aggregation of talent, in pigment and oil we will guarantee to paint your city in any or all colors but one. We respectfully decline to enter into a contract to paint your town red.

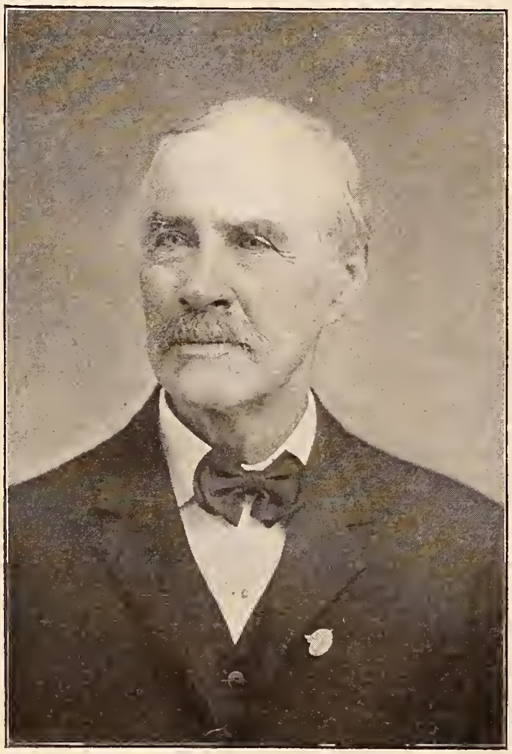
Allow me, sir, to again express our sincere thanks for your warm and generous greting to us and your interest in the life and objects of the association. (Applause.)

(Mr. Samuel Brown, of Boston, here gave a recitation entitled "The Debating Society," which was received with applause.)

President Cook: Ladies and Gentlemen: It is both my pleasure and privilege to welcome you all to this, the thirty-fifth annual convention of the Master Car and Locomotive Painters' Association of the United States and Canada. How pleasant it is to meet socially and in business intercourse! How thankful we ought to be that an all-merciful Providence has spared us during the past year and brought us all together again in safety and with a measure of health and strength. I am quite sure we all looked forward to this annual gathering with the most pleasurable anticipation and that I am justified in saying that no one will return regretting the time or means expended in attending the convention of Master Car and Locomotive Painters' Association of the United States and Canada. We are not so large an organization as to lose our individual identity on these occasions. We are more like a large family in whose midst there dwelleth peace and happiness. As such let us live and know each other during the few days we shall spend together midst the cool breezes of old ocean.

To the ladies who have come to grace this occasion—and what a cheerless and uninviting occasion it would be without their gracious presence—we express the hope that everything may combine to make this the brightest and happiest part of our convention experience. I can assure them that everything will be done to secure their comfort and pleasure during their stay in Atlantic City. Indeed, you are so necessary to the success of these conventions that a foreknowledge of your intended absence, for any cause whatever, would fill us with dismay. We should miss you, indeed, very greatly.

I know I voice the sentiments of both the ladies and members of the association to a unit when I express a warm and cordial greeting to those who year after year do so much and in so many ways to make these annual gatherings of ours the delightful occasions they invariably prove to be—it is hardly necessary for me to say it is to our friends—the supply men—whom I extend this greeting and welcome.



Robert McKeon, Secretary and Treasurer.

H. M. Butts, Second Vice-President.

To the members of the association, gentlemen, we are here in the interests jointly of our association and those of the railroads by whom we are employed. I trust that the sessions of this convention may be characterized by close attention and intelligent consideration to the topics under discussion. While perfectly justified in extracting pleasure from these annual gatherings, it is our duty primarily to accomplish definite results from the standpoint of a railroad organization. I am sure we will do so and that the papers to be presented at this convention will be of the usually high order, deserving and receiving the intelligent consideration which you are capable of giving. In this connection let me say that it is to be deeply regretted that in not a few cases members of the association who have been selected by the advisory board to prepare papers on topics selected, for some reason or other have failed to respond to this call to duty. I say "duty" unhesitatingly, for such it is. Your membership in this association is an assurance to the employing railroads that you are fully alive to the responsibilities and duties as master painters to your various employing organizations; therefore, it is, to say the least, unwise that you should find it necessary at any time to refuse to contribute your share of intelligence and knowledge to the general fund from which we may all draw and be benefited. While, gentlemen, it is well to remember that no matter how unsatisfactory in your individual opinion may be the efforts you have made to comply with the demand upon your time and intelligence, you may rest assured of its acceptance with a hearty appreciation of your individual interest in the life and purpose of the association.

Last year at the Chicago convention many of us were deeply impressed by the earnest and instructive address of Mr. Lowe, of Lowe Brothers, in which he saw the possibilities of our association. Perhaps in the near future the words that he gave utterance to then may bear fruit and some of us may yet see our association on a higher plane and in a broader field.

Another year has been added to the life of our association, and have we added proportionately to our experience? Have we individually felt the responsibility devolving upon each one of us for the uplifting, strengthening and broadening of the association which we have created? We trust so, and look to the coming sessions of this convention for the assurance. Looking backward we see we have accomplished a great deal; looking forward, we see there is yet much to be done. But we are full of faith and have great hopes.

There is another matter I feel it my duty to speak upon, something somewhat similar to what I have already said. During the early summer—and I hope you will pardon my remarks if they seem to be of an admonitive character, we can all stand a little admonition once in a while—in the early summer I wrote to the chairman of one of the most important standing committees expressing the hope that he and his committee would be in a position to make the coming convention one of unusual interest and give us a great deal from which we might draw profit. His reply to me was most discouraging. No one but himself and one other member of the committee of five seemed to be taking any interest, practical interest, in the allotted work. Now, gentlemen, the result is obvious. We must take these matters more seriously. We stand for a purpose, and for thirty years or more we have been a power in the consideration of railroad economics. If we are to remain as such it certainly devolves upon our individual efforts as to whether we fail or whether we succeed.

During the past year we have lost one member by death.

On the 23rd of May, 1904, Mr. George H. Woorrall, of the B. & M. R. R. Co., was called suddenly to his eternal rest. Mr. Worrall died of heart disease I believe he became a member of this association in 1884 and was an esteemed and valuable member of this association. The committee on resolutions will take suitable action at the proper time.

At the Chicago convention you will remember that five members of this association were selected to prepare a report upon a query submitted to this association by the Master Mechanics' Association. It is my pleasure at this time to commend the serious and efficient work of that committee. They contributed of their means and time liberally in an earnest effort to do that which would bring credit and profit to the association. They are certainly deserving of your commendation.

Now, in conclusion, let me wish for the association the most successful and profitable convention we have ever held; for the ladies uninterrupted pleasure and true enjoyment; for all of us, clear skies, cool breezes, health and happiness. (Applause.)

President Cook: I will appoint Mr. A. P. Dane, of the B. & M. R. R. Co., as acting secretary of this convention, to relieve Mr. McKeon, our worthy secretary.

President Cook: I wish it could be said of me that I never made a mistake, but I suppose that is practically impossible, but I think we can add unnecessarily to our mistakes. We have made two this morning. I made one, and the members of the association made a mistake in leaving the room. Gentlemen, indeed you had no right to leave the room until we finish our business. The mistake I made was in not calling upon Mr. Brazier to make an address to the entire convention, but I think the ladies could be dropped out. Now, here we have a hall with a lot of empty seats, and I don't think it would be courtesy to Mr. Brazier to ask him to speak to a half-filled room, but, if he is willing, I will call on him to address the convention.

Mr. Brazier: Mr. Chairman and members of the convention, it seems to me there might have been a little more inspiration if I could have faced the whole audience. But I want to take the other side of it. I know that some of you are a little afraid to express your opinion. That is not so on our system. The foreman painter is privileged to express his opinion, and very often he does not agree with me or higher officials, and we think a great deal more of him for that spirit.

I hardly know what to say. I had something that I wanted to say that went out of my head when the audience went out. This year I was president of the M. C. B. Association, and I am now what in railroad slang is called a "has-been."

I read before the convention some statistics which you painters, perhaps, would be a little interested in, to show you the growth of our Association, and the number of cars and locomotives in existence at the time our Association was formed. In December, 1867, there were, according to records, in the United States 289 locomotives, 386 passenger equipment and 5,530 freight equipment cars. On June 30th, 1902 (the latest figures compiled) there were 41,628 locomotives, 37,090 passenger equipment and 1,503,949 freight equipment cars in the United States.

In comparing the equipmen in service on June 30th, 1902, with that in service at the commencement of the Master Car Builders' Association, 1867, it will be seen that the number of locomotives has increased 144 times, passenger cars, 96 times and freight cars 272 times.

It is wonderful the advance that has been made in equipment and in every branch of railroading. I was thinking on the way down here of a few things and one was, "In union there is strength." That is a pretty old saying, yet in railroad service no one department can run the service alone. The locomotive department cannot run trains without cars. The car builder cannot build the cars without the painter. Each of us has his duties to perform, and I thought, in looking over your convention and seeing the different men here, of the different branches in railroad service, that we are all in one large family. Consequently we all have got to work in unison, and how grand it is to know that we can work in unison and get results. The Master Car Painters' Association and other associations are all children of the Master Car Builders' Association, and in my address this year I laid particular stress on this, that you and other association are preparatory schools for the Master Car Builders' Association, and are doing the work that was formerly done by them; consequently, it behooves you men to take just as much interest in your work here as those of us who do the work of the M. C. B. Association, which is a legislative body, while you are more of an educational body. I can say to you truthfully that the Master Car Builders' Association has done more to bring about this good feeling amongst railroads and amongst the different organizations than any other association; in fact, I said in my address it has brought about an interchange of cars so as to cheapen the traffic in a great many ways, and, in fact, that is the only way to get along in this life—pulling together, and I believe in the strength of co-operation, particularly in departments. I am a car man, yet I try to drill our men and get them to think that we are all working for one purpose, it makes no difference in what capacity, as you are all representing the road you are working for. You may have the duty of putting ice in the tanks of cars, but that is part of the duty, and goes to make up a perfect system. I see we have one of our representatives here, and he knows that he has full authority to express his opinion, and I tell you he expresses it, too, pretty strongly to me at times, and I find that I know very little about painting, and I think more of him—a great deal more—because I believe he and all of you intend to be honest in making tests, trials and everything. The most of you, I suppose, are bothered, the same as we are, in making tests. You get a notion that some certain material is the only thing until some new thing comes along. Let me tell you, gentlemen, do not be too hidebound. We are riding in electric carriages to-day. We rode behind mules and in old coaches in days gone by. Everything is improving, and it stands to reason that new things may come in to supplant the old, but it won't do to go too fast. Make your tests, and prove them, and when you know you are in the right, stand pat on it.

I was thinking in looking around here in the audience and seeing others here, and one young man in particular who I trust will not escape the President's eye, that we met in Buffalo a few weeks ago, with your honored member, Mr. Gohen, and in talking about the convention, we both decided that we would come down, because we really believe that you are part of us. The painting department is practically in the car department, and, consequently, you are a part of us, and I like to be with the painter. Mr. Gohen told me something that I did not know before: I believe I have the honor of being the first man who ever addressed you outside of your own organization in Washington years ago. It has been my good fortune to chase you around from place to place. I have done it purposely some times, and at other times accidentally, and the reception that I have met has been very pleasant to me. If it were not for the painter, the machinist and others, I would not be whatever success I am to-day, because no man can stand alone. You have got to have the good will and co-operation of your subordinates of your own and of the other departments, and I want to say that I give due credit to the painter, as well as to the master mechanic, or to the machinist or laborer, or any one under me who has helped to make my administration whatever success it has been.

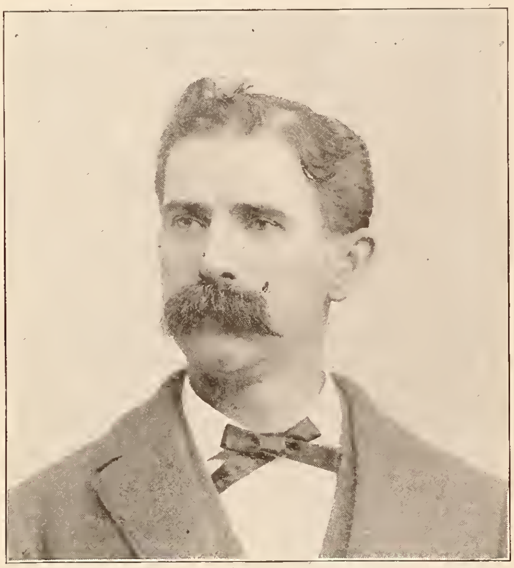
I do not want to prolong my talk, because I know how anxious you are to get to work. I sat in the office yesterday and thought: Now it may be that I will be called upon, and what can I say that will please the painters? I want to say that I consider you my friends. I like true friends. I do not want a friend that pats me on the shoulder when I am in a good position, and say, "You are a tip-top fellow," and, if I am out to-morrow, he does not know me. That is not friendship. I don't want any such friends as that. Give me the one who stands true to you in adversity and prosperity. That is the kind to have. Let me give you a tip: Be very careful whom you make friends of. Traps are set for every man in this world. Be careful. Size your man up, and know who he is. Be just to every one; treat all alike. I cannot wind up better than by saying:

Then as loyal men let us be,
A true and faithful band;
And give each other greetings kind,
With a hearty shake of the hand;
Remembering each and every one
These words, "the Golden Ten";
We are successful in life,
While acting like honest men.

President Cook: Mr. Brazier, let me thank you for your not only interesting, but instructive remarks. We are so fortunate in having you with us at our different conventions that we really feel like patting ourselves upon the back. It is always a great comfort to us and a help to us to have you with us and address us. I am only sorry you did not have the floor before recess.

Mr. Gohen: I want to say to the members of the association that it is customary in a body like this to have men come and visit you and give you a lot of taffy, but I happen to know personally that what Mr. Brazier has said to you here to-day in public he has said to me in private, and I know that is the honest sentiment of his heart. He did not come with you for the purpose of "jollying" you up, or anything of that kind, but it is just what he expresses in everyday life. I would like to hear from Mr. Parish. Is Mr. Parish in the room?

Mr. Parish: I wish to endorse everything that Mr. Brazier said in regard to this organization, and in regard to the cooperation between employees of the departments. Mr. Brazier and I have been working along similar lines for some time, and it occurred to me this morning that there was one phase of our labors very seldom touched on, and we are usually very careful not to do so; but this is a pleasant subject to me, that is, the question of the labor and of our situation in connection with our work. In order to get results, we necessarily have material and labor. We draw mostly in our organization on the technical side or material



Mr. J. H. Kahler, Second Vice-President.

end of it, but very seldom draw on the labor side. What Mr. Brazier has said has brought out the labor side. We must have co-operation between our officials and the foremen; we must have co-operation between our working men and our foremen, which is one of the most important things of all. The success of the superintendent of the shops of the Master Car Builder or Master Mechanic depends absolutely on the men whom you have under you, and co-operation between these men and yourself. This, I believe, is a fact we all thoroughly appreciate. The time is coming, and really is here, where the word which was so common years ago, and very common now, the word "boss" must pass away. The word "foreman" is much better than the word "boss." The word "boss" has been common with us for years and implies something which we do not believe in ourselves. We are not bossed. If we are successful we must be led, and I would like to have you all think of this phase of the question. I thank you. (Applause.)

President Cook: Our custom has been to omit the reading of the minutes of the previous meeting. The next in order will be the report of the Secretary.

Mr. Bishop: It is very seldom that I am on the floor of this association to say anything. I am sometimes a little fearful of what I ought to say or what I am going to say. Since Mr. Brazier has said that we ought not be afraid to speak at this time, I think it is the proper time for me to speak. The reason I speak is because it is customary in all associations to have the reading of the minutes of the previous meeting. The Master Painters, Mechanics and Car Buiders' Associations do not have this reading of the minutes, because they have been published, and each member has been furnished with a copy, and if he has not read that copy during the year, he had better not have received it in the beginning. For myself I have received a copy and have read it and have taken the pains to study it, and, if possible, benefit myself by what has been said by others, and also give to my employers the benefit which comes to me through the knowledge derived of the association from year to year. I speak of this because I have prepared a paper which has not been called for. I have not been called upon by the president of the association to writer a paper, but I have written a paper, which I wish to read, pertaining to questions that have been coming up in my mind from reading papers at the previous conventions. It may not strike you as it does me. However, as I said before, I wish to read it. I consider if I have any grievance, or if there is anything in my mind, this is the place to bring it. If the members of the association wish to "sit down on me," that permission is extended to them. I would like to read this paper in connection with passing over the reading of the minutes of the previous meeting. I do this because the papers which are to be read the next few days may have some weight in connection with this paper.

Mr. Gohen: I think that would be altogether out of order. We would be very glad to hear Mr. Bishops paper, but it is not in order right at this time of the session.

President Cook: It struck me as soon as I learned Mr. Bishop's object it would be, possibly, inopportune at present. We have lost considerable time this morning, and there are other matters that ought to receive our attention. I was going to suggest to Mr. Bishop that he have his paper ready and we will be glad to listen to it at some other time, not very far distant, probably before this session adjourns; but let us go ahead with some of the business that really comes first. Of course I do not know the nature of Mr. Bishop's paper, but I think it will come in nicely afterwards.

Mr. Bishop: I will wait a reasonable time, but I would like to read the paper before any of the subjects are taken up.

President Cook: Certainly. The next in order is the report of officers. Of course, you have the president's report in what little he said in his address. The next is the report of the secretary, which I will ask Mr. Dane to read.

SECRETARY AND TREASUER'S REPORT.

In obedience with the requirements of the constitution, it is my pleasure to present you with the annual report, showing the transactions of the association for the year ending August 31, 1904.

Our last convention, held at Chicago, was one of the best attended meetings we have ever had, and a larger number of new members were added to our list than was received at any previous convention.

The annual dues for the past few years not being sufficient to cover the expenses of the association, it being necessary to make a special assessment each year, which did not prove to be satisfactory, nor raise the required amount of money, it was decided, by a vote of all members present, to raise the dues to $3.50 per year. This, together with the large amount received for membership fees, has enabled us to wipe out the deficiency which has existed for several years.

The proceedings of the thirty-fourth annual convention were published as usual and furnished to all members.

One hundred and fifty-eight copies of the Railway Master Mechanic was subscribed for, this being sent only to active members in good standing.

The advisory committee met at Pittsburg, Pa., February 20, and arranged the program which will come before us at this meeting. This was published in the March issue of the Railway Master Mechanic and all members have had ample time to prepare for the discussion of the different subjects.

On August 1, 700 circular notices of this convention was sent to foreman car and locomotive painters. Several have responded to the invitation and expressed a wish to meet with us and become members.

We have added to our number during the year thirty-one active members, three associate and six honorary. Several active members having changed their occupation, were transferred to the associate list.

We lost two by death, E. J. Aubury and G. H. Worral.

All members over two years in arrears were notified, and those who failed to respond were dropped, there being so many of these that our number of active members has not increased, although so large a number joined last year.

September 1 we have a membership of 196 active, thirty-one associate, and thirteen honorary members, making a total of 240 members.

Receipts for the Year.

Membership fees	$123.00
Annual dues	661.50
Total	$784.50

Disbursements for the year 1903.

Sept. 1, due secretary on last year	$ 26.92
Sept. 8, C. A. Cook, for clergyman's car fare	.60
Sept. 15, express on banner	1.55
Oct. 6, Emma Jacobson, stenographer	86.50
Oct. 19, A. D. Braden, envelopes and paper	4.75
Nov. 5, 158 subscriptions to Master Mechanic	79.00
1904.	
Jan. 8, publishing 255 copies of report	181.23
Feb. 29, A. D. Braden, printing circulars and cards	5.00
July 6, receipt books	3.00
July 23, W. S. Kent, printing 1,000 circulars	8.00
Aug. 1, expenses of advisory committee	20.50
Postage for the year	48.50
Secretary's salary	200.00
Total expenditures	$668.90
Leaving a balance in the treasury Sept. 1, of	$115.60

Robert McKeon,
Secretary and Treasurer.

President Cook: The next is the report of committees. Really the Test Committee should come in here, but there is quite a display here, and I think we will take it up a little later on. I will call on the chairman of the committee appointed at the last convention to make a report to the Master Mechanics' Association. Mr. A. P. Dane, of the Boston & Maine, is the chairman of that committee. That committee was elected by the association, and their report must be acted upon—accepted or otherwise and the committe discharged.

Mr. Dane: The committee elected to report on "The best method of painting locomotives, cost, durability and appearance all being considered," held its first meeting in New York on March 6th, 1904, the following being present: President Cook, Messrs. Miller, Quest and Wright. On account of illness I was absent and Mr. Congden was also unable to be present. As no chairman was elected at the Chicago meeting, President Cook presided at the first meeting, and, before adjournment, I was elected permanent chairman of the committee. A second meeting was deemed necessary and was called by me as chairman and convened in the same place on April 22d, Messrs. Miller, Wright and myself being present. At this meeting Messrs. Congden and Quest were absent. The report drawn up and adopted at this meeting was forwarded to all the members for signature and was presented to the Association of Railway Master Mechanics at their June convention in Saratoga by the chairman.

Through an oversight the words "The material saving paint sprayer" appeared in the list of labor-saving appliances in the advance copies of the report as printed for the June convention and subsequently in the official organ of the Master Car and Locomotive Painters' Association. This recommendation, however, crept in through error and did not reflect the views of the majority of the committee.

Mr. Bishop: Mr. President and Members of the Association: This report of the committee has been printed in the Railway Master Mechanic, has gone out and been read generally. Some of the members became worked up, and I became somewhat worked up myself over that matter of paint-sprayer, and before the report is finally settled, I would like to hear an expression from some of the members on the paint-sprayer as used as a labor-saving device.

President Cook: It strikes me that to go into that question on this report would be endless. That had better be discussed under a separate heading. The question is, whether the report shall be accepted and the committee discharged.

Mr. Denny: I move that the report be accepted and the committee discharged.

The motion was seconded and carried.

President Cook: The report of the secretary will be filed on the minutes of the meeting. It is a very acceptable report, and we are indeed glad to have so favorable a one this year. Are there any other committees out?

Mr. Miller: The committee on the "Bulging of Putty."

Mr. Cook: You will remember that two years ago we appointed a committee on a very important topic—"The Bulging of Putty"—which received considerable discussion at one of our conventions. We afterwards decided to put it into the hands of a committee and have them make tests and report. Last year they were not ready to report, but this year I understand that committee has a report. I will therefore call for the report. At the advisory committee's meeting in Pittsburg that subject was brought up and a committee appointed to prepare papers on that topic, forgetting that we already had this committee out. When my attention was called to it by the chairman of the committee, I immediately wrote to the members of the association who had been selected by the advisory board, stating that a committee was already out on that two years old; that they would be ready to report to this convention, and asking them to drop their paper—that is, not present their papers, because that would only be extending the discussion unnecessarily. We have it thoroughly discussed on certain lines, and they very willingly agreed to that proposition, because otherwise it would destroy or interfere with the work of the committee, and I asked those gentlemen to prepare papers on some other topic, and they said they would gladly do so. We will see later on whether they have done it. Let us now have the report of the committee.

Mr. Miller here read the report as follows:

REPORT OF COMMITTEE ON BULGING OF PUTTY.

The question as to what causes putty to bulge from nail holes and other depressed parts has ever been a perplexing one to the practical car painter, and numerous theories have been offered in explanation thereof. It is one of the curses of the craft to have these unsightly protuberances appear with disgusting regularity directly after a car has been finished and put into service, and this too after all pains have been taken to insure the perfectly level surface aimed at by all and so pleasing to the eye of the average observer. Next to the problem of cracked cars the subject of protruding putty spots has probably caused more grief and annoyance to interested persons than any other in the painting line, and after years of study and experiments, with a view to combating and abolishing the evil, we seem about as far from a solution of the mystery as ever.

At our meeting in Boston, two years ago, a committee consisting of the undersigned was appointed with instructions to thoroughly investigate this subject in a practical manner and report the result of tests and experiments at a future meeting. This committee has, during the past two years, made extensive investigations and numerous tests at no little expenditure of time and study, hoping thereby to be able to suggest methods to be followed, both in construction and painting, which would at least reduce the nuisance to a minimum if not abate it entirely.

Let us briefly touch upon a few of the many theories advanced in explanation of conditions which cause the bulging of putty.

It has been claimed by some that certain mixtures of putty absorb moisture and oxygen from the atmosphere, causing it to expand and thus protrude above the adjacent surface. We wish to state as our opinion that there is absolutely nothing to substantiate this claim. Putty, however mixed, will never expand, but on the contrary has a tendency, while hardening, to lose in volume or shrink.

The proposition has been advanced by others that in driving and setting nails the fibers of the wood are broken and turned inward, thus giving opportunity, through the absorption of moisture and the vibration of the car while in motion, for the fibers to straighten out and resume their normal position, then tension naturally being outward, taking the putty, still more or les soft and pliable, with it. Experiments have proven that but little if any bulging is caused from this source. It has been found that nail holes into which water had been injected with a small syringe, until the fibers had thoroughly straightened, almost closing up the hole entirely, would, after being allowed to dry, primed and puttied in the usual manner, show up quite badly as far as the bulging of putty was concerned; the difference in its favor having probably been caused by the fact that the activity had been made smaller through the swelling up process caused by the water, allowing less putty to be used. It was also found that holes smoothly bored, with no perceptible turning in of the fibers, showed nothing in their favor. Only in a very small degree, if indeed at all, is this inward turned grain of the wood the cause of the disturbance.

The expansion and contraction of the nail due to the influences of heat and cold it is argued by some has much to do with the driving of putty toward the surface, and to a small degree this is correct. The expansion, however, even under the most strenuous circumstances, is infinitesimal and the disturbance created in this way, unaided by other contributing causes would in our opinion be hardly perceptible.

Among your committee's numerous exposures was one which may be of some interest in this connection. A number of nails were set three-eighth inches deep, and to prevent action through expansion it was arranged to leave an air space between nail and putty of approximately one-eighth of an inch. This was accomplished by the insertion of tightly fitting oiled paper disks previous to puttying. Upon subsequent examinations but little if any difference could be discerned between nail holes thus treated and others puttied up solid in the usual manner. They bulged equally, proving beyond dispute that the circumference of the nail hole had decreased forcing the putty outward; the nail in this case having nothing whatever to do with it.

Some have laid at least a portion of the blame to the formation of rust on the head of the nail which, as it gathered in volume, would force the closely adhering putty to the surface. There is but little foundation to the claim. Rust, in our opinion, cannot occur to any damaging extent where the nail heads have been thoroughly primed previous to puttying and where the surface has been hermetically sealed to the exclusion of moisture by the application of numerous coats of paint and varnish.

The expansion and contraction of wood due to the absorption of moisture during damp weather and the use of unseasoned lumber is the most plausible theory advanced as to the cause of putty bulging. As this moisture is evaporated from the wood through heat, usually the scorching rays of the sun, a shrinkage of the surface occurs and the size of the nail hole is correspondingly decreased which must of necessity force the putty to the surface. It is our opinion that at least ninety per cent of the difficulty is attributable to this cause; the remaining ten per cent being perhaps divided between the expansion of the nail and the action of the fibers in the attempt to straighten themselves and resume their former position. All exposure tests made by the committee strengthen this belief.

The level surface of the wood as it dries out must recede; the circumference of the nail hole is decreased through this shrinkage, and the depth of the cavity is still further reduced by the slight expansion of the nail through heat. The cubical capacity of the cavity being thus attacked in three different directions and there being but one exit for the affected mass of putty, the result is obvious.

That the principal cause lies in the shrinking of the wood was demonstrated to the committee beyond doubt in practical tests as in all cases where a small nail was used the bulging amounted to but little, but it increased with the size of the nails and with the depth at which they were set. When small-headed number 14 nails were used hardly any perceptible evidence of bulging could be noticed. In the case of five penny finishing nails it was quite pronounced, and where large-headed six penny wrot nails were employed, requiring a large amount of putty to fill the cavities, the bulging showed up in its very worst form. It invariably increased with the circumference of the hole and the depth at which the nails were set, again showing conclusively that the shrinking of the wood was at the bottom of the mystery and that the expansion of the nail had but little to do with it.

To summarize: We consider only the following causes worth considering as being responsible for the bulging of putty:

First.—The expansion and contraction of wood.

Second.—The expansion and contraction of nails, screws and other metals used in construction.

Third.—The straightening out of the fibres of the wood.

As expansion and contraction of metal and wood cannot be controlled, there will always be cause for putty to bulge as long as these materials are used in the construction of cars. It can, however, be reduced to a minimum, and in many cases overcome entirely by observing the following instructions:

First.—Use only thoroughly seasoned lumber.

Second.—Make the cavity as small as possible by using small-headed brads and sinking them not to exceed one-sixteenth of an inch below the surface.

Third.—Avoid all surface nailing wherever possible.

Fourth.—Thoroughly prime and second coat all depressions, including the heads of nails, screws, etc.

The use of thoroughly seasoned lumber is necessary at all times to produce results, and where unseasoned material is substituted the painting in general may be counted upon to prove more or less a failure.

The nails or brads used should have a small head and should in no case be driven below the surface to exceed one-sixteenth of an inch. The latter is very essential, as the smaller the quantity of putty used the less the liability of its bulging.

Time was when many believed that in order for putty to hold in nail holes a certain depth was required, giving as it were an opportunity for its "holding on." Nothing of the kind, however, is necessary, and putty will adhere to a comparatively smooth surface and the deepest nail hole with equal tenacity. This is evidenced by the daily use of putty for glazing purposes over a rough or wolly surface with no deleterious results.

The holding capacity of the nail is not increased, but decreased, by countersinking and the only one to complain will probably be the body builder who, in his efforts to get the nail out of harm's way where it will not come in contact with his newly sharpened plane, is tempted to drive it in to a point where it can never be reached even by paint or putty, except by special effort. A little patience and continued effort will soon educate him, and the new method will be installed without additional expenditure to the company. In this way only can the bulging of putty be reduced to a minimum; in fact overcome almost entirely.

Respectfully submitted,
B. E. Miller (Chairman),
J. H. Pitard,
J. G. Keil,
Committee.

President Cook: Gentlemen, you have heard the report of this committee, and it seems to me to be quite an exhaustive one, covering the ground thoroughly. A motion to receive the report and discharge the committee, with thanks, would be the proper thing to do.

Mr. Butts moves that the report be accepted and the committee discharged, with thanks.

The motion was seconded and carried.

President Cook: Next in order will be the report of the Test Committee.

Mr. Pitard: Mr. Chairman and Gentlemen of the Convention: According to the remarks made by our good friend, Mr. Brazier a few moments ago, I was particularly impressed by the word "interest" referred to—interest taken by the members in association work. The word "interest" has a very wide meaning, and is one of the secrets of success in almost any undertaking. I was brought to a realization of this fact during my connection with the Test Committee. Upon receiving notice from the secretary of my appointment to the chairmanship of the committee, I immediately opened correspondence with the other members of the committee, asking their co-operation, with a view to making a creditable test and one that would be acceptable to the association. But I regret to say that the members were slow to respond and for some little time I failed to get the support I expected. Finally, however, some of the members came to the rescue and we were enabled to get up a display and make some tests which possibly may interest you. Some of the boards are here on exhibition, and I would be very glad to have the members examine them and express their opinion on them.

REPORT OF COMMITTEE ON TESTS.

Realizing the fact that previous test committees of the Master Car Painters' Association, actuated by that commendable acumen which has proved a powerful factor in the upbuilding of our association, have explored every avenue that seemed to offer an inviting field for research, we have confined our investigations for the most part, to what seemed to us to be the most vital and unsolved question of the hour, so far as it pertains to the maintenance of railway equipment, that is the preservation of steel cars. Inasmuch as steel is fast displacing wooden vehicles of transportation, an added duty is imposed upon the master car painter to devise the best means for insuring the longest life to such equipment by combatting unsuccessfully the weakening ravages of rust. To this end we have made a somewhat peculiar test of various paints by painting plates of steel and subjecting a portion of same to wet coal dust, in order to ascertain the effect of sulphur upon various paints. A portion of these plates were also subjected to a strong salt water bath. The result in each case will possibly be of interest; the plates are on exhibition and may be examined by those present. A detailed description of these and other tests are stated by number, the key to which may be had by any member of the association who may desire it.

No. 1. Panels of seasoned wood were made and primed with a good oil and lead primer, and this was given several days to dry thoroughly, after which the panels were carsfully sandpapered and given one coat of lead paint, all panels being given identically the same treatment. At the expiration of sixty hours, a freely brushed coat of enamel was applied, this coat being given forty-eight hours to dry, when a second coat of enamel was applied. On September 28, 1903, the panels were hung out to the weather and given a southern exposure. During the winter, and, in fact, during the entire period of exposure, no abrupt changes in the condition of the various enamels were noticeable. There was simply a gradual but manifest deterioration in the condition of the samples, the sample No. 1 enamel maintaining throughout the exposure a clear advantage in point of body, brilliancy of finish, and freedom from surface checks. Sample No. 4 enamel, while failing to hold its luster as wel as No. 1, and showing a decided deficiency in depth of body, held itself intact and is practically free from checks. Sample No. 3 retained a comparatively high luster, but cracked and fissured badly Sample No. 2 shows a good measure of body, but retains little of its original luster, and has fissured and shriveled considerably.

The samples are on exhibition and may be examined by all members, and others interested in the result of the test.

The key to the names of the manufacturers of the numbered samples of enamel will be furnished any member of the association desiring it.

No. 5. Eight month exposure weather test. Condition fair.

No. 6. Two coats, exposed to wet coal dust and salt water. Condition fair.

No. 7. Two coats, exposed to wet coal dust and salt water. Condition bad.

No. 8. Two coats, exposed to wet coal dust and salt water. Condition bad.

No. 9. Two coats, exposed to wet coal dust and salt water. Condition fair.

No. 10. Two coats, exposed to wet coal dust and salt water. Condition bad.

No. 11. Two coats, exposed to wet coal dust and salt water. Condition fair.

No. 12. One coat, exposed to wet coal dust and salt water. Condition fair.

No. 13. Test for swelling of putty. In this test the nails were set at various depths and some holes were bored out smooth before the nails were put in; other holes were treated with hot water to restore the fiber. After the panel had been exposed four months and the putty swelling had ceased, some of the putty was dug out; the holes reprimed and reputtied, with the result that the putty did not again swell, which fact seems to demonstrate that putty swelling is caused by shrinkage of wood.

No. 14. Graphite nine (9) months' weather test. Condition good.

No. 15. Graphite nine (9) months' weather test. Condition good.

No. 16. Graphite on metal nine (9) months' weather test. Condition good.

No. 17. Surfacer test. Rubs freely, and produces excellent surface.

No. 18. Lead for stenciling mixed of white dead with two parts raw linseed oil and one part cotton seed oil; result satisfactory.

The committee present herewith samples of nine different pigments, which were applied to as many steel plates, each sample being labeled with the name of material when applied and when withdrawn from exposure.

These samples were furnished the committee through the combined efforts of Mr. Dane and Mr. Copp of the Boston & Maine R. R. They can be seen and examined at the secretary's table.

They show for themselves their merits and demerits, and certainly demonstrate that carbon as a preservative primer for steel or iron must be accorded a winner.

On October 1, 1903, Mr. Dane, of the B. & M. R. R., painted a locomotive boiler which was stored upon the bridge immediately in the rear of his shop, a part with "Nobrac" and a part with lampblack ground in oil.

This boiler has been exposed to the fumes of coke and coal gases from passing engines, to the extremes of heat and cold, to the fogs and dampness which naturally prevail over the salt water, and yet this pigment is in prime elastic condition and has arrested corrosion.

The boiler has lately been placed in the Boston shops as a heater, where the material will be carefully watched as to its durability.

As a result of this test Mr. Dane wrote me he thought it advisable to experiment by applying this mixture as a primer on tenders, and all which have passed through the shop since August 1 have been primed with lampblack ground in oil, thinned with raw oil, rubbing varnish and japan in the proportion of one quart of oil, one pint of varnish and one-half pint of japan.

J. H. Pitard,
A. P. Dane,
W. H. Dutton,
C. E. Mann.

KEY TO TESTS.

No. 5. Galvanum.
No. 6. Red Lead.
No. 7. Prince's Mineral.
No. 8. Black Engine Varnish.
No. 9. Lamp Black and Linseed Oil.
No. 10. Dixon Graphite.
No. 11. Lead and Oil.
No. 12. Experimental Black.
No. 13. Putty Swelling Test.
No. 14. Dixon Graphite.
No. 15. Dixon Brown Graphite.
No. 16. Dixon Graphite on Metal.
No. 17. Koons' New Idea Surfacer.
No. 18. Stencil Lead.

I wish to thank the members of the committee who assisted me in getting up these tests, and ask of the president that the committee be discharged.

President Cook: Gentlemen, you have heard the report of the Committee on Tests, and it seems to me that the association can do nothing better than to commend Mr. Pitard for the report that he has brought out on this subject, with the aid of his committee. It is very instructive, and the samples he has submitted can be examined by the members of the association at their leisure.

(It was moved, seconded and carried that the report be accepted and the committee discharged.)

Mr. Dane: I wish to state in connection with the test of lampblack that I have found since that the oil called "siccohast" oil, which is a pure Calcutta oil treated secretly—that is, it is a secret treatment by a firm in Boston, which would be not only more economical than the common raw oil—that is, do away with varnish and Japan in that mixture, for the simple reason if it is cold-pressed, as they call it, you have the quality and durability of the raw linseed oil, together with the drying quality and enamel of the boiled oil, something that cannot be had even with kettle-boiled oil. It has proved a great success, and Mr. Copp will tell you they use it in the car department of the Boston and Maine. It has been used with great success on structural work, bridges, etc. It is not generally known, I think; it is a new method of treating oil.

Mr. Rodabaugh: I do not agree with that committee, and I do not suppose I agree with the association in making the tests. I wouldn't give you two cents for those tests that have been made. I believe that tests that are made ought to be made as near conditions as possible. Let the car, locomotive or anything be placed in its natural condition. This way of making tests inside the shops to see whether it will wear or not, I do not think there is anything in it, and I do not believe it is practical. I think the tests ought to be made practical. In putting ourselves on record in making tests we ought to do it in natural conditions. I have made several tests, and several friends of mine have made tests of that kind, and they have never been satisfactory. It don't work on those boards the same as it does in natural conditions. The immersion test in coal dust, I do not think that amounts to anything. If you want to get the natural conditions, you want to get it as the coal is placed on the car, and let the rain, snow and everything come in on it and let it leak down through. That will show you whether it will stand or not. Coal dust will not have any effect on it, comparatively, as the material that is extracted from it. That is what destroys the paint. I think it remains, probably, for the painters themselves, instead of the chemists, to get up a paint that will stand the test of steel.

Mr. Keil: It is impossible for us to bring a passenger car here. The same tests were applied in a practical way.

Mr. Rodabaugh: There is not a car builder or master mechanic in the country who will not let you put it on a car, and take it out when you want to.

Mr. Keil: Those tests were made in a practical way on cars. Mr. Miller made very extensive tests. These tests are simply brought here to verify the tests that are made in a practical way. If Mr. Rodabaugh wants to examine those cars he may do so on the Lackawanna. I myself made some of these tests. This is the only way we can show the tests to the various members.

Mr. Butts: I do not want to be understood as saying that these tests do not amount to anything. Certainly these tests are very valuable, but as to the conditions being of more account in making the tests than the materials, I agree. I just want to cite one thing, and will take only a few minutes of your time. When I was on a western road we had two sleeping cars come into the shop to be rebuilt. They were both primed with the same primer, surfaced with the same surfacer, varnished with the same varnish, on the same dates, went into service at the same time and returned to the shop on the same date. One of those cars took a run from St. Paul, Minn., to Portland, Ore.; the other car from St. Paul, Minn., to Winnipeg, and were kept continuously on the road every day during the twelve months. When they were returned to the shop, the one that had the coast run was in such a bad condition that it could not be revarnished; it practically had to be repainted. The varnish was perished and gone. When we cleaned the car, we took the decoration with it, and the wood was so nearly bare in a great many places that we had to burn the car off. The other car was in very good condition indeed, and all that was necessary was to give it an ordinary cleaning, touching up places here and there and vanishing it. I ask you, suppose we had two different kinds of material on these two different cars, the one that had the coast run would be considered absolutely worthless; while the one on the other run would have been given the credit of being excellent in every respect, and probably the man who sold it would have a big advertisement for his material, wholly due to conditions alone, and the same material exactly. That often, very often occurs. I think these tests—comparative tests of materials—should be made as nearly as possible to conform to actual conditions, in order to get the proper test returns.

Mr. Gohen: I think Mr. Rodabaugh is wrong and I think he is right. It depends altogether on what you are testing for. As he says, to put the test material on a panel and hang it outside the shop, that is no indication of what it will be on a car. That was true in the abstract. Suppose you take from the paper that Mr. Pitard read. They took these panels for tests of putty, and found that by different operations on that same panel they got different results. That is where Mr. Rodabaugh is wrong, because these tests on panels do enlighten you as to the merits of the material you are using. As to Mr. Butts' statement, that was owing to conditions altogether, as he stated. The two cars were not run in the same service; and consequently he could not expect the same results. Whenever I make a test, especially of a varnish, I take a car and varnish one-half of each side with two different varnishes that we are going to try. If we have a standard varnish, one that we have been using, and knew what it was, and it was the best we could get, we would get another varnish in opposition to that. We don't try it on some other car by itself, but we take a number of cars and varnish one-half on each side. Then it does not make any difference where that car runs. Both varnishes will get the same wear and the results are obvious when they are brought in. I think these test panels are good. They put us in the right way and show us which way we ought to go. They lead us up to the right way. Although you would not get the same results from a car in service as on panels, yet it is indicative of the materials and the manner in which you apply them, and that is what you want to find out. If you take two or three test panels and use the same material in different ways it will show you which is the best way to use that one material. If you have two or three materials on the same panel it will show you the best of these materials. But if you undertake to put a test panel upon the road, like it is on the B. & O., you will find it won't agree at all. I have painted for a long time cars and at the same time hung the tests out and have had times where the cars would wear better than the test panels, but that was the exception rather than the rule. It all depends on the condition of the weather and the service, but I think a test panel is good, because it shows you what you want to do.

Mr. Pitard: Referring to the objection urged by Mr. Rodabaugh, I would like to speak of the one thing that he mentioned. This test as to coal dust was an idea of mine. How I came to make that test, at the time we were repainting our steel equipment, gondola cars, which we use for coal, I noticed a large amount of rust and deterioration was on the interior of the car. After the coal is discharged, as a general thing there is always a collection of fine coal dust left on the floor of the car; there being no opening in the bottom of the car, it will hold water very much like a boat. That wet coal dust lying in the bottom of the car, in my opinion, has a very bad effect on the paint. I made this test with a view to ascertaining what would best protect the interior of the cars. So we went to work and took different kinds of materials—carbons, principally carbon pigments—and made this test, and I think it has demonstrated considerable. I will be glad to have the members look over those boards, since Mr. Rodabaugh makes that objection, because I think certain facts have been brought out which will dispel opinions previously held by some as to the merits of the different paints. I do not see how any one can urge an objection to a test of this kind, because I consider it a practical test—very practical.

Mr. Brazier: Subjects Nos. 1 and 2 you cannot talk too much on. I want to say that your proceedings will be watched. It is something that is up to all of us, especially No. 2 and the one you are talking on now. The gentleman over here (Rodabaugh) is right and wrong. Conditions, as Mr. Butts said, rule. When a car is standing still it deteriorates faster than any other way. Paint a car beautifully and let it stand still and it is going to deteriorate. A car in service gets a sort of treatment each day which keeps it in better condition. I cannot emphasize myself strongly enough on this subject. Mr. Parish and I and a lot of master car builders of this country are deeply interested. You gentlemen are the ones we are looking to to make these tests. You are practical painters. Do not be afraid to call "A" "A" and "B" "B." This gentleman from the south, on the left of me, and the northern man and the eastern man and the western man should make these tests and let us have the benefit of them. Dont come in and have theories of your own. It is the practical part you want. As I said, especially subject No. 2—I don't know whether I shall hear it or not, but I hope to. The New York club, the Western club and the Master Car Builders have committees out, but we are all looking to you to make these tests. Discuss it and "cuss' it, as I say to our men. Don't be afraid to give your experience. Mr. Butts, an eastern man, has given us his experience, and I would like to know what the extreme western man has to say. I believe, as the gentleman said, the exposure test is all right. I think the gentleman has done a lot of hard work. He has done well. He has expressed his opinion, anyway. We are here for educational purposes. I have "butted" in on this, I know, but it is something I am deeply interested in. It is up to you, gentlemen, to tell us what is the best paint for passenger roofing and what is best for galvanized iron. If you have found how, I wish you would tell us.

Mr. Rodabaugh: My object has been partially attained, that of getting an expression on this subject. I do not believe there is anything before the painters of the United States to-day which is of so much vital importance as the painting of steel cars. I think the roof is secondary to steel cars. The brother was speaking about the inside of a car. I think when you stop putting hot slag and melting iron in your cars, then you have solved the problem of painting.

Mr. Claire: I do not see how you can keep painted the inside of a car when you are continually loading and reloading and have the materials scratching off the paint. I think it will be well to reserve any further remarks on this subject until we take up topic No. 2.

President Cook: Is there any other unfinished business? Do you know of any, Mr. Secretary?

Acting Secretary Dane: There is no other unfinished business.

President Cook: Then the next order of business will be the election of officers for the ensuing year. Nominations will now be in order.

Mr. Butts: I rise to my feet to nominate a man for president whom I think you all know very well and appreciate. I have not done any electioneering or lobbying or any political work or anything of that kind for him. I have only mentioned his name to one other party in the room, and yet I think it will be a calamity if this association does not have the man who now occupies the chair for our president for another year. He has served us so well and so faithfully that I would like to see him elected for another year. I therefore nominate our present president, Mr. Cook.

The motion was seconded.

President Cook: I can scarcely tell you how I appreciate the compliment that Mr. Butts and the rest of the association seem inclined to pay me, but I must decline. There are many good men in this association who are capable of conducting its affairs, and it has been our custom to elect a new president almost every year. I know there have been one or two exceptions, but I do not feel I can accept the nomination and election for president for another year. It has been a great honor to preside over this body, and it has been my aim and object to preside to the satisfaction of the association. If I have succeeded, it is because I have been aided by you and I owe nothing to my own ability or efforts without your assistance. While, as I say, I thank Mr. Butts and the association, if they saw fit to elect me, I must positively decline in favor of the gentleman who is to follow.

Mr. Brown: Many and many a time a president has been re-elected. I feel sure I voice the sentiment of all present here when I say that every one would be willing to wait ten years if you would serve us another year. (Laughter.)

Mr. Gohen: "Sam" and I are usually together, but I disagree with him in this instance. I occupied the position one day and can appreciate President Cook's feelings. When I had the pleasure of being elected president I considered it one of the greatest honors I ever had the members show me and I accepted it for another year. But I felt that every one of us was capable of being president of this association. It is an honor that should be conferred on as many as possible, as Mr. Cook has said. We have departed from that and the conditions at that time were a little bit different from what they are now. We perhaps thought it would be better for us to select a man for more than one or two years. That time may come again, but I do not think that time is now. We would like to honor him again, but I know just how he feels and felt at that time. It is an honor to be selected president, and it is a greater honor to decline election. I believe that is the way Mr. Cook feels about it.

President Cook: I do not think I could have any greater honor than to have the association allow me to decline reelection for another year.

Mr. Little nominated Mr. J. Lanfersiek of Columbus, O., for president.

The nomination was seconded.

A motion was made, seconded and carried that the nominations close.

Upon motion duly carried, the secretary was instructed to cast one ballot for Mr. Lanfersiek for president, and the chair announced the result.

President Cook: I will appoint Mr. Houser and Mr. Butts as tellers.

Mr. Houser nominated Mr. Butts for first vice-president.

A motion was made, seconded and carried that the nominations close.

Upon motion duly carried the secretary was instructed to cast one ballot for Mr. Butts for the office of first vice-president, and the chair announced the result.

President Cook at this point appointed Mr. Little to act as teller in place of Mr. Butts.

For the office of second vice-president Mr. Stroud nominated Mr. Kahler; Mr. Brown nominated Mr. Pitard; Mr. Miller nominated Mr. Paulus; Mr. Warlick nominated Mr. Miller.

A motion was made, seconded and carried that the nominations close

And the convention proceeded to vote.

First ballot:

Miller	20
Kahler	20
Pitard	9
Paulus	5
	54

No nominee receiving a majority of all the votes cast, a second ballot was necessary.

Second ballot:

Miller	19
Kahler	26
Pitard	7
Paulus	2
	54

Mr. Wynn moved that the two names receiving the smallest number of votes be dropped on the next ballot, which was seconded and carried.

Third ballot:

Miller	22
Kahler	32
	54

Mr. Kahler having received a majority of all the votes cast, was declared duly elected as second vice-president.

Mr. McKeon was nominated for secretary and treasurer, and, there being no opposition, was unanimously elected.

President Cook: We will now adjourn until tomorrow morning at 9 o'clock. Let me say right here there is a great deal of business to be attended to and let us all try to come into this room promptly at 9 o'clock tomorrow morning.

Adjourned.

SECOND DAY.

Wednesday, September 14, 1904.

The convention was called to order by President Cook at 9 a. m.

President Cook: I would suggest that the first thing we do this morning is to accord Mr. Bishop an opportunity to read his paper he spoke of yesterday, and, if there are no objections, I will ask Mr. Bishop to read his paper, or have it read, as he prefers.

Mr. Bishop: I asked permission to read the paper before any discussion, and I should have liked to read the paper before the report of the Committee on Tests yesterday. I may say something that may not be to your liking at all, but I wish to create no offense, but simply speak of a matter I think the association should avoid in the way of publication of its proceedings and the use of them afterward. I will read the paper and the association can either accept it or set it aside. I haven't any objections either way.

MR. BISHOP'S PAPER.

Mr. President:

Not having a desire to take up any of the time of this convention at a later hour of its sessions, I now wish to present the following preliminary to taking up reports of committees or reading of papers prepared for this convention as per program, I trust no one may take offense at what I am about to say, but ever so, I feel that the same is necessary for the benefit of the members of the association and for the association itself. I for one have no desire to make tests and comparisons of supplies and then find facts contradictory to recommendations made and accepted by the association in the form of reports. My object in speaking of this matter now is to ask that the association accept no committee report or permit any such report to go to print which may be used by "manufactures of supplies" as an advertisement. This to my mind is not only detrimental to another through the association but causes a feeling not correspondent to impression made. I have in mind a paper read at the last convention, held at Chicago, in the form of a report that has since been printed wholly and distributed broadcast over the entire country as advertising matter, and besides this, making use of the pages of our reports of proceedings for individual gain. There has been in the past two or more years several advertisements making special reference to some reports and proceedings of the association producing a representation that same, because read and printed through the medium of the association was sufficient cause to claim that it was recommended by the association.

I have had some contention along this line on this account, and wish to place myself on record as claiming that, having tested the goods mentioned, I have tested and used similar products with better results. I wish also to go on record as protesting against any part of the proceedings of this association being used for advertising purposes, and also against the use of the privileges of the floor of the association for a like purpose. Members make reports of what to them has proven best for the benefit of the members of the association, but because Yon Yonson, Ole Oleson or Peder Pederson say they have the best, it does not conclusively prove that it is so, they having, perhaps, otherwise a limited experience only. We have all of us something to learn, and our every day experience shows that we are not possessed of all knowledge. I dare say no member of the association has made a larger number of tests or of greater variety than your humble servant, neither do any make any more thorough tests, chemical analysis excepted, and I seriously object to any report being made, paper read, presented or printed by the association which may be used for advertising purposes. It has always been understood that the work of the association was not for this purpose. I myself some years ago was censured for using the name of a firm unavoidably in one of my papers, and while papers may be read that show no name, I can see nothing that justifies any member to present a report, and after proceedings have gone to press, inform the manufacturer of the key to a solution of the report and thus make it the medium for an advertisement.

Respectfully submitted,

A. J. Bishop,
Master Painter.

I submit this for the consideration of the association.

Mr. Gohen moved that the paper be received and made a part of the records, which was duly seconded and carried.

President Cook: The next topic is No. 2, "What improvement have we made in the painting of steel cars in the past year?" Here is a very, very important topic. The first paper is by Robert Shore of the L. S. & M. S., of Collinwood, Ohio.

The secretary then read the paper, as follows:

PAPER BY ROBT. SHORE.

Having had assigned to me the subject, "What Improvement Have We Made in the Painting of Steel Cars in the Past Year?" I find that although I have made wide inquiries I have, I fear, very little information to give on the matter.

Giving first my personal experience, I would say that although the road with which I am connected handles many steel cars, our practice in the past has been to simply scrape the rusty places thoroughly with a steel scraper and wire brush before painting with one of the standard makes of paint. This applies only to repair cars, as we do not build new steel cars, and it further refers only to the outside of the cars, as we have never painted the inside of steel cars.

Some roads, I understand, make an effort to paint their steel cars at regular intervals, the same as passenger equipment, but the majority of roads I think give no attention to steel cars except when taken into shop for repairs.

During the last few months the Lake Shore has inaugurated a series of eleven tests of different materials on over a hundred steel cars; we are now at work on these cars, ten cars being assigned to each test. In these tests we are thoroughly sandblasting the sides of the cars, thus getting down to the clean steel, which is then given two coats. Of course the results of these tests will not be known for some time, but careful record of the cars so painted will be kept and results noted.

I will say that in my opinion no paint will hold on steel cars so long as it is the practice of men unloading them to strike them with mauls, etc., to loosen the sticking load. Every such blow removes a chip of paint, leaving the metal exposed to the weather and rust, which undermines the adjoining surfaces and extends in definitely. Close examination of such cars will show just what I have stated, and further, that on the steel away from the neighborhood of the parts liable to such treatment the paint may be in first-rate condition.

Considering the manner in which steel cars are generally loaded, i. e., material thrown in sometimes from considerable height, I think it is of very little use to coat the insides, as the first time a car is loaded a large proportion of such coating would be removed. Respectfully submitted,

Robert Shore.

President Cook: The next paper is by Mr. W. O. Quest of the P. & L. E., McKees Rocks, Pa.

The secretary then read the paper, as follows:

PAPER BY W. O. QUEST.

As a beginning, we wish to assure you we realize that we have accepted a non-enviable position. We feel that, owing to the fact of our having read a paper at our last convention on the same subject, we should not have accepted the assignment —that the subject probably could have been made more critically interesting if placed in other hands. We will, however, enter into the spirit of the subject by offering our up-to-date views and practical experience, and will also be frank enough to admit that we have made but little improvement in the way of betterments in cleaning and material methods of our steel car painting of the past year, during which time we have led the usual strenuous life in an attempt to get some paint on a percentage of the company's steel car equipment. In conjunction with our other freight work, which up to date has been and at present is all done out of doors, we have managed to clean and machine paint from 190 to 200 steel cars of all classes per month during the late spring and summer seasons. We have ever tried hard to improve our methods of painting steel cars from the time the great modern tonnage carriers were placed under our charge.

In our opinion, the called-for improvements should not be confined strictly to the painting department, which, at best, is but a secondary matter, especially where compared with the unlimited service abuse the steel car receives, which should come in for an open share of criticism.

Regardless of the knowledge and skill used in the manufacture and application of paint on the steel car, there seemingly will exist that never-ceasing abuse that follows in its wake. To be made of steel appears to invite the destructive ingenuity of the shipping world, hammers, fire and water all being brought into play so successfully that it becomes a matter of official doubt as to whether or not there is any economy in doing expensive preparatory cleaning or using high grades of paint in the repairing of the steel car.

But as we have accepted an assignment which calls for improvement in steel car painting, we will first take up the matter of steel car cleaning. The expense of properly cleaning a steel car, preparatory to painting, seems to be the straw that has broken the railway official's patience—they cannot see why there should be such a pronounced difference between the cost in paint maintenance of the steel car of today and the wood built car of the past. They resent the information from paint experts that the steel car should be repainted every two years, if they would prevent the harmful corrosion of the ferric car structure, which, at the beginning, came under their supervision with the opinion of the expert mechanical engineer to the effect that the cost of paint maintenance would be no greater than that of the wooden car to be displaced. In our opinion, there never will be any pronounced improvements in steel car painting and maintenance until ways and means are devised to remove the flash scale always adhering to all new, common rolled steel plate; that, regardless of all adverse claims, all flash scale, hard or soft, should be removed, from the fact that when a coated over flash scale comes in contact with moisture through abrasion, it rots away from between paint coating and true under metal and falls off in large flakes, regardless of applied paint, in quantity or quality.

On the question of possible improvements, we would recommend that the sandblast method be used to remove all scale from steel car structural plate; that it also be used by the manufacturing concern in original painting; that it also be used in railway repair yards as a matter of labor saving and economy.

To further this necessary cleaning as a first improvement, we would recommend that a paint specialist be appointed on all large steel car building contracts, to see that all cleaning and material specifications be enforced, also that the very probable practice of the steel car manufacturer sacrificing the paint interest in the matter of allowing an insufficient time between coats—owing to last day hurried schedules—be also discontinued, as such practice also contributes a share in the bad after results experienced by railways in paint service maintenance of the steel car.

Suggestive to improvement, we would further recommend the construction of a suitable building, protected from weather, for all steel car painting, especially as the matter applies to the unavoidable winter months' repairs, which, in our opinion, can never be done successfully out of doors in cold weather.

Owing to a practiced official policy to discover material improvement, we have had a wide experience, which, we will say as a matter of prestige and convenience, had its beginning with the pure all red painted steel car, graduating down through the much manipulated paint stock calendar until the pure old unreliable coal tar paints, in many disguises, were inflicted upon several steel cars, as the climax of all mistakes made, which we will here pass without further comment.

The several steel cars, test-painted by company sanction with commercial red lead in raw and boiled linseed oils, also in other well-established paint oils, etc., all proved failures owing to the fact that the red lead pigment seemed to be too strong for carrying vehicles, the coatings quickly drying out hard and brittle. During the past year we have been much interested in the observation of a steel car painted with a combination of red lead and carbon black; a finely divisioned red lead was the primary coat, which was followed up to a finish with two coats of one of the finest made specialty carbon blacks. As this method of using red lead as a primary in conjunction with the over applied carbon coatings seems to be coming into considerable favor, we shall closely investigate the material system, in hope that it will prove to be one of the sought-for improvements of the year.

The iron oxide (our standard) painted steel cars of the past and present year are doing fairly well, but we cannot say that there is any decided improvement, as judged from our viewpoint. The only fault (if it be a fault) that we can find with the many makes of iron oxide paints, which includes our standard as well as many similar materials submitted for test, is that we think this heat-produced pigment, if not calcined properly, also acts after application as a semi-oxidizing agent on the oil, which our experience has taught us is the elastic wearing life of all applied paints, and that when the oil is burnt out and lifeless, there ceases to be a protective coating. Practical observation has also taught us that a hard, lifeless paint may continue to appear well to the eye and at the same time be a through-to-metal absorbent of moisture, in which case we should judge there should be no startling surprise where such coated metal surface is discovered to be in a falling condition, originally due to what is usually termed pin-head rust," or under corrosion. These facts conclusively teach us that nothing but an inert pigment should be used in making up a preservative paint for the steel car.

Our experience with graphite paints has also been very satisfactory and instructive, it having been our privilege to test, apply and inspect several makes of graphite combined paints in the past year. The found results in applying, also inspection, leave no doubt in mind but that a finely divisioned graphite pigment in paint form, as an inert material, should make one of the best wearing paints; but we also discovered that about the first thing a railway foreman painter should learn, if possible, would be to know the difference between a pure graphite and a cheap grade of plumbago, usually foisted on the market to catch the unwary. We recently had the pleasure of meeting Messrs. Gohen and Black at the Big Four Brightwood (Indianapolis) shops. While looking for points of interest, our attention was called to results of a very original graphite test, after a weather exposure of some three or four years—which, it will be remembered, was exploited by Mr. Gohen at our late 31st annual convention, held in the city of Detroit—and find that we can safely venture the opinion that Mr. Gohen's orginal idea was a step in the right direction, where claiming that good rust resisting and wearing results could be obtained through the use of a fine, pure, dry graphite pigment (dry bronze fashion) over an applied coating of oil sizing, etc. In previously making a somewhat similar test, we allowed our prepared oil to set down to about the same tac required to apply a heavy aluminum leaf, the dry, fine graphite being then thoroughly rubbed into oil, which was followed up on the following days with the usual coats to a surface finish. As there was but little preparatory cleaning of surface on this new steel tank before receiving the Gohen graphite treatment, we wish to assure the painting world that, after some twenty-two months of service, there was not the slightest sign of pain deterioration or of loose rust or flakes showing up. We wish to further say that we are now awaiting, with great interest, some test-submitted graphite paints undergoing severe tests on several steel cars running in especially hard service, which at some future time we hope will enable us to say that the past year has led us towards some material improvements in steel car painting.

In the past year we have also had quite an experience with steel cars test-painted with different combinations of manufactured carbon blacks. The natural pigment fineness of carbon black, we think, gives it an advantage over all other paint pigments used, and, consequently will, we presume, give the equal—if not better—wearing results than any other paint that can be applied on a steel car, or, in fact, for any kind of structural steel or iron painting. We have also found that the best carbon combinations are the twenty-four (or longer) hour drying kinds; with extra vehicle and pigment body, give best results, owing to the fact that, where light in makeup, the covering capacity is nothing more than a thin film which will not protect a metal surface as long as will a paint in which the pigment body has weight enough to keep a greater amount of oil life in suspension.

As a possible matter of leading up to improvements, we offer the following method of showing that a fine carbon black pigment is a factor in the makeup of a wearing paint: Remove some broad scrapings of old intact paint from the side sheets of a steel car which is to be repainted and which was originally painted with a first class carbon paint—also from a car painted with a best iron oxide paint, which also has had service wear and abuse to the limit of needing repairs —wet the removed scrapings with a drop of water from finger and if water fails to penetrate through skin, the old paint under test has been a faithful protective coating, but if, on the other hand, the drop of water quickly wets the skin through, the paint protective quality has long since been a failure. To demonstrate this testing method, we submit the scrapings from two steel cars recently repainted for the first time in the McKees Rocks repair yards, one car originally painted with carbon black having been in service seven years, and the other car originally painted with an iron oxide having been in service something over two years, which we think conclusively shows the superior protective elastic qualities of the old carbon black skin over that of skin removed from oxide of iron painted car, clearly demonstrating that an inert pigment in flake form is superior to the presumably more active granular oil oxidizing pigment.

In conclusion we will say that we have made no new discoveries in the way of method improvements in the past year that we are ready to offer at this time. For want of a better and more improved method, we are still cleaning our steel cars in the old fashioned way—by use of steel scrapers, brushes and sandstone, backed up with a generous supply of muscle—also continue to successfully paint all steel car and other freight equipment with a paint atomizing machine.

As a fitting conclusive matter we will, however, mention, with some little comment, a proposed new method and material innovation of the past year, which came to us for testing too late in the year for us to now give a satisfactory report for all concerned. The proposed improvement is the patented idea of a concern in Detroit, Michigan, who offer a Cromic Acid Solution, designed to neutralize all loose accumulation of surface corrosion on structural steel and iron, the claim being that all existing corroded matter is converted into a sesquioxide of iron, of which all iron oxide pigments are largely composed, the thus treated metal surface being guaranteed to be impervious to all future under-corrosion where covered with a protective coating—such as the same concern also offers—which, strange to say, is a graphite and linseed oil formulation, also charged with a claimed percentage of cromic acid. Through a very recent investigation we discovered from an exposed steel plate treated with Cromic acid process that the converted corrosion in case of abrasion was still soluble to the contact of water and moisture, which we are much afraid will exclude the practical use of this no doubt very valuable discovery on the steel car, from the fact of, as above stated, the great service abuse paint receives by fire, abrasion and water where applied on the steel car, but as we have no authority to further judge this new innovation at this time, we will stay on watch for developments and hope to become able to say that this new idea will enable us to point out, at our next meeting with you, that there really was some improvement made in painting steel cars in the past year, embracing the time period between our Association's thirty-fourth and thirty-fifth annual meetings in convention. Respectfully submitted,

W. O. Quest.

President Cook: The next paper is by Mr. B. F. Wynn of the P. R. R., Pitcairn Pa.

The secretary then read the paper, as follows:

PAPER BY B. F. WYNN.

In answer to Question No. 2—"What improvement have we made in the painting of steel cars in the past year?" I will say, owing to the retrenchment of our Company in all departments and not having a suitable place to carry on the work as it should be done, I have made no improvements. The question as to the best material to use has been discussed until it has become worn and threadbare, and we have not arrived at any conclusion, nor do I think we can until non-corrosive steel can be manufactured. It is my opinion that, until rustless steel can be manufactured, the painter is "up against it."

We all realize that the question is a very important one and one of which too much cannot be said. The steel car is with us to stay, and I think the time is not far distant when railways throughout the country will adopt a metallic finish on the exterior of all passenger equipment and locomotive cabs. So it behooves us to use our best endeavors to find something that will preserve the life of the steel as long as possible. I have no doubt someone will find a material either in the manufacture of paint or steel that will bring the desired result. Greater things than these have been accomplished in other lines of trade. I think if more attention was given to steel plates before the cars are built, by having all scale or flash removed with a sand blast, we would not have so much trouble with rust. I am speaking now of the outside of steel cars. I am of the opinion that if the inside is well painted when new with red lead or graphite, and the bottoms protected with oak flooring, they would last much longer. The paint would protect the steel and the flooring would protect the paint. By the way, this word improvement brings me back to Question No. 2—"What improvement have we made in the painting of steel cars in the past year?" I will say again, I have made no improvement in this line of painting, but we have in contemplation a scheme that I am sure will be an improvement over our present method. We expect to build a shop or shed with two tracks long enough to hold twenty steel cars each. Before they are taken in on track No. 1 we will remove the scale from the inside with a pneumatic hammer and the paint and rust from the outside with a sand blast. Then as they are run in we propose to paint them with a movable spraying machine suspended above the cars on a track running the length of the shop, using a double hose so that both sides of the cars can be painted at the same time. After giving them two coats we will put them on track No. 2 for drying and stenciling. If we have the facilities for carrying on the work in this manner we can take care of all steel cars that come our way. Hoping we may improve in this and other lines of painting, I am, Yours truly,

B. F. Wynn,
Master Painter, Pitcairn, Pa.

President Cook: The next paper is by Mr. F. A. Weiss, C. R. R. of N. J., Elizabeth, N. J

The secretary then read the paper, as follows:

PAPER BY F. A. WEISS.

When I was notified by the Secretary that I had been selected by the Advisory Committee to write a paper on the question, "What Improvement Have We Made in the Painting of Steel Cars in the Past Year?" my first impulse was to send him a positive declination of the task. At the same time the answer which at once suggested itself to my mind was the single word "None," and it did not seem that there was much more to say about the matter. It did not occur to me then, nor does it now, that anyone would be inclined to dispute that verdict; but, after all, what right had I to undertake to answer this question on my own responsibility and render such an absolute and arbitrary decision? I finally decided, however, to write the paper asked for by the Committee and to answer the question according to my judgment. To avoid the appearance of being arbitrary I decided also to obtain the opinions of some other members who are likewise in a position to judge and find out the results of their experiences. Those whom I have consulted believe as I do. They are of the unanimous opinion that no improvements have been made in the painting of steel cars in the past year.

Some new materials have been tried within the last twelve months which have led to great hopes, and some new methods may have been adopted; but in the short space of a year it is impossible to know if these preparations or these methods will justify the hopes they have raised. As to the durability and protective qualities of these materials, it is as yet too early to decide. I believe, not only in the method of applying the paint, but also in the treatment of the cars for receiving the paint, no improvement has been made. A positive decision, however, regarding the experiments tried in the past year would be premature just now. The problem of how best to treat a steel car so as to obtain the most satisfactory results is still young. Although we are sure that considerable improvement has been made previous to the past year, we should not yet rest content with the outcome of our efforts.

In our experience in painting steel cars we find that sand blasting is the best method of treating them (in fact it contributes more to their durability than the paint) and a carbon paint, one of the best materials for steel coating, judging from results we got compared with results that have been obtained by some other roads. Respectfully submitted,

F. A. Weis, C. R. R. of N. J.

President Cook: It is very encouraging to note that all four papers asked for on this subject have been carefully prepared and presented and that the topic has been taken up so thoroughly. It is now open for discussion.

Mr. Ball: We hear a good bit about carbon black. I would like to know a little something more definite about it, so that I can comprehend it. Is it lampblack? I used to read that lampblack was composed of 97 parts of pure carbon. Have they got something that contains more pure carbon, something better than lampblack, some new kind of manufacture; or what is that carbon black that I hear so much about? I wish someone who uses it would explain it so that I can grasp it and understand it a little better.

Mr. Pitard: Replying in a measure to the question asked by Mr. Ball I would state that to the carbon family belong graphite, lampblack and even the beautiful diamond, but most are of course of different formation, just like whiting goes under the name of Paris white and Spanish white and several other names. They are all different formations of the same material. But referring to the matter of painting steel cars, I noticed in one or two papers graphite is prominently mentioned as suitable material for this purpose. I consider the painting of steel cars a live question, because steel equipment is coming into prominence more and more every day and displacing wooden cars, especially for hauling iron and coal. Recently we made tests of graphites, lampblack and oil, and I think if those gentlemen who recommend graphite for protecting steel could see the results of those tests it would somewhat dispel their belief in graphite as a protection to steel. I might say that they are not in it with lampblack and oil, which surpasses them very largely. I just want to state this because I myself quite a while previous to the test believed very strongly in graphite for various purposes. I used it on coach roofs, believing it to be the proper thing; but I must say the results were not satisfactory and we had finally to cut it out.

Mr. Bishop: We have not painted any steel cars and I have nothing to say on the matter of the steel car myself. I am going to learn all I can from the talk, but it appears to me when one speaks in reference to carbon and graphite he probably has not tested all the graphites, but some of them are excellent.

President Cook: Referring to subject No. 9, on the bulging of putty, as we have a committee on that subject, I wrote to Mr. Whittington and Mr. Siday suggesting that they prepare papers on some other topic, but to let the committee, which had been appointed for two years, handle this subject alone. In my judgment at the time it seemed to be the most concise manner of considering this particular question. They said that they would prepare papers and they selected their own topic—the painting of steel cars. I presume you have the two papers, Mr. Dane.

Mr. Dane: Only one, Mr. Whittington's.

President Cook: Mr. Whittington wrote us today, saying he would also write. I presume there will be no objection from the association to hearing the paper read.

The secretary then read the following paper:

MR. WHITTINGTON'S PAPER.

It affords me great pleasure, I assure you, to be called upon to prepare a paper on the painting and care of steel cars.

There has been a great deal already said on this very valuable subject, and there is a great difference of opinion as to the way in which the steel should be cleaned and prepared preparatory to the application of the priming coat, and the method in which the paint is applied. I notice there is little said about the weather conditions and the advantages and disadvantages we have in doing this class of painting. I think the weather conditions should be given some consideration, as we are usually called upon to do this class of work out in the open air, sheltered by the whole canopy of Heaven. I find, to get a good job of painting on a steel car, that it is very essential that the cleaning and removing of all scale and rust must be thoroughly done by the sand blast machine. I wish to say that from the experience I have had along this line that the only safe way to clean a steel car is by the means of the sand blast machine. I think that all who have had experience with the sand in removing the scale and rust from steel cars knows that when a car is cleaned in this way they have a perfectly clean surface on which to apply their prime, and I think if any company would look into this matter and stand the expense of having a proper sand blast built to do this work they would go a little further and, while the steel is clean, have a good priming coat put on and let get thoroughly dry. After this has been done the car could be painted two or more good coats of carbon or any good paint properly thinned, with safety and durability, but under no circumstances should a car be painted when cleaned in this manner only in a dry place, or in dry, clear weather, as the iron absorbs dampness and if painted in damp weather or while the iron is wet you seal the dampness with the paint, which is surely going to come out, and when painted in this way you will see signs of rust. There is a great mistake made in the painting of steel cars. Some paint their cars almost regardless of the weather conditions. In some instances you have to rub the paint on to make it stick to a wet surface, and I wish to say that this kind of work is no good for the iron, just merely improves the looks of the car for a very short time, but no protection at all, to speak of.

I have gone into several experimental tests of steel car painting and have come to the conclusion that the only safe way to prevent rust and corrosion on steel cars is to use the sand blast very extensively and prime the car with a prime composed of equal parts, by weight, of red lead and keg lead, thinned to working consistency with equal parts of boiled and raw linseed oil and turpentine, well brushed on with a bristle brush. After this has thoroughly dried give two coats of paint, allowing sufficient time between coats to dry. If this is carried out it will insure success, and while this process costs considerably over the way in which most steel cars are painted I think it would be economy, as the cars would be better protected and remain in service and look much better for a long period of time.

The inside, I think, should be sprayed with crude oil about every six months. I prefer the sprayer for this work as the oil is blown into every seam and crevice, preventing the accumulation of rust where you cannot get at it with a brush.

J. H. Whittington,
Master Car and Locomotive Painter,
Chicago & Alton Railway Company,
Bloomington, Ill.

Mr. Bailey: Did he say you that paint on with a bristle brush?

Mr. Dane: Yes.

Mr. Little: I think this subject has been pretty well covered. The recommendations made in all the papers seem to indicate that cleaning is the essential point. That is my idea of it and I believe that the proper thing to do would be to get the companies to embody in their specifications when they order new steel cars that the builders shall be required to clean these steel cars to take off the flash and scale carefully and it will save a great deal of trouble. I think this association ought to do something in that direction—towards making a recommendation to the master car builders on that line. I notice Mr. Ball has a sandblast process up there for cleaning steel cars and he probably will have something to say on it; but he would not have to do that if the car had been properly cleaned in the first place. I would like to see the time come when all the steel cars, or even the locomotive tenders or the steel driver casting, would have all their flash taken off by the manufacturer. It would save the painter a great deal of trouble afterward. We cannot take it off; we don't have the time. They could take the time better than we could.

Mr. Denny: I think they ought to clean the cars thoroughly before they come to us to paint.

Mr. Rodabaugh: I have listened to the papers read on this subject. They talk considerably about cleaning and using the sandblast. It occurred to me while they were being read whether they had given the subject any thought as to how long it would be after the cars are cleaned before that scale will be on again and whether we will ever be successful in painting a steel car. Isn't it a fact that the scale forms again, no matter how you clean it?

Acting Secretary Dane: No. Rust forms, but not the scale.

Mr. Rodabaugh: What causes the scale? The rust, isn't it?

Acting Secretary Dane: Rolling the iron.

Mr. Rodabaugh: As true as two and two are four, the scale will come on again.

Mr. Keil: I think it would be well for us to recommend to our superiors that it is the sense of the Master Car and Locomotive Painters' Association that it is necessary to remove that scale by sandblast. I think a great many roads do not know just what that is. At the present time we are making a test on the Lake Shore of one hundred cars. We have, so to speak, ten tests. We take ten cars under a formula prepared by the analyzing chemist. It will take probably a year to know just what that test will develop, but the sandblast we all know is very important; and if it be the sense of the meeting it might be well to have some one make a motion that we recommend the sandblast for removing the scale by the manufacturer. They might not have to pay more than twenty-four dollars a car to have the sandblasting done at the building of the cars.

Mr. Brown: If my memory serves me right, last year or the year before I made a similar suggestion and am pleased that there are more who are of my opinion today than there were then. They claim we have no right to dictate what they should do. I would suggest that we recommend in our experience that it is advisable to have that scale removed. It has been stated that the scale will not return again in the same form. We will have heavy rust, but my experience has been that once you get the scale off it will never return.

Mr. Ball: Mr. President and Gentlemen: To use a sailor's expression, I think we are on the wrong "tack" entirely. If you will stop and consider a few moments the difference between the care of your passenger equipment and the care of your freight equipment you will find you are expecting too much when you expect two or three coats of protective material, or coating, to protect a steel car, or even a wooden car, for any length of time. You probably do not get a chance to take care of those cars once a year, if you do in three or five years; they cannot be spared. The powers that be have not yet discovered any way to release the cars. Now what do you do with the passenger car when it is blistered and scaled in spots? As soon as you discover there is one on a train you frantically rush to the office and try to get that into the shop or on a siding so you can go and touch up those spots. Do you do that with a steel car when somebody comes along and when they are unloading it, and picks up a sledgehammer and hammers away to loosen the load to let it down, and smashes the paint all off? Do you ask them to send that car in so that you can touch it up and keep it from rusting? No, you don't; and you wouldn't get it if you did. But I contend that the only way to take care of a steel car is to take the same care that you do with the passenger cars. When the surface is broken and the paint begins to peel or scale off you get that car and touch it up to protect it. Now, it seems to me that it is a simple absurdity to talk about painting the inside of a car that has to be loaded and unloaded with bricks, stone, limestone, coke, coal and all that sort of thing; not only that, but hot coke and hot material of other kinds from the coke ovens will burn off the paint both inside and out; and then that car goes into service for months at a time and rusts up. Then you wonder why you cannot get some kind of protecting material to protect it. You have got to protect the protector in that case, because as long as you have coke, coal, limestone and ores sliding up and down inside it is going to tear off the paint, and as soon as torn off it will rust. No matter how much you protect the outside, if you don't protect the inside that rust in time will rust clean through the steel. I am fully convinced in my own mind the only way is to have the authorities find some means whereby they can give us those cars from time to time to protect them, and they can only be protected the same as we protect passenger cars. You cannot expect two or three coats of any material that is manufactured or ever will be manufactured will protect iron, steel or even wood when you insist on having eight or ten or a dozen coats and three or four coats of varnish on the outside of a passenger car for protection. You cannot expect to take care of passenger cars that way and you must find some othre way of protecting steel cars than by two or three coats.

Mr. Shore: Mr. Ball's idea strikes me exactly. It would not make any difference whose paint you put on, as long as they are going to handle coal mauls to loosen up the sticky substance. There is no paint that will stay on. I don't care who says there is; there is no paint that will stay if you strike the car with a maul. It looks like some boy had been at it. That primer, whatever it is, as soon as it is broken is going to go. I am with Mr. Ball, that we do not get them often enough. We paint a steel car once a year and then we do not get them for two or three years.

Mr. Gohen: I have been a member of this association now, I guess, for fourteen years, and I do not know of any subject that has ever been discussed that claims my attention more than this particular subject today. I told you a few moments ago I did not want you to close this question until I came back. I had gone up stairs to get a letter which I received a few weeks ago from my superintendent of motive power on this very question, but the married woman I brought to this convention took the key of my trunk in which this paper was locked, so I could not get it, so I will have to tell you from memory something about that paper.

Perhaps about three weeks ago I received a letter from our superintendent of motive power in which he said that we were about to get some steel hopper cars. We never had any on our road, and this initial order is a small one, perhaps just as a trial order. We are to get fifty steel cars, and he says: "I would like to have you specify what, in your opinion, would be the best paint to put upon these cars." Well, I immediately answered him and told him it was a question I could not answer just then; that we had had no experience in the matter of steel cars, but I could answer it, perhaps, after I had come back from the convention—that this was the first paper we were to have discussed at the convention, and I presumed I would hear something when I came here. I told him that while we had no steel cars and had no reason to make any test in regard to them, I had, however, made a test in the shops which I thought would be of benefit to us and to some of those here engaged on the question. Mr. Quest in his paper speaks on that. You remember—I think it was at the Detroit convention, if I am not mistaken—I said then we were trying a method of painting our tanks by bronzing them over with dry graphite, but with what result I could not say at that time. The thing was treated rather lightly by some, and I treated it myself at the time in a light manner, not knowing there would be anything in it; but I found last spring—perhaps in February—an engine that had been out some twenty-two or twenty-three months which had been treated in that manner, and came back without a bit of rust anywhere upon the tank. But I found this, that the paint I had put on top of that graphite was just as dry as a bone. You could take a putty knife and scrape that all off and get right down to the graphite, and when you got it off and rubbed your finger over that graphite you would get some of that bronze graphite we put on just as readily as you would the minute it was applied; but there was not a particle of rust anywhere; so it led me to think that perhaps that was the proper way for a foundation and I did not get the proper thing on top of it. I am now experimenting in that line and hope in the course of another year to tell you something about it.

That brought to my mind the idea of trying that same principle for the steel cars, so I got Mr. Block to get a steel panel, perhaps, I should say, about thirty inches long and perhaps eighteen inches wide, and subdivided that into sections. We will draw three imaginary lines, perhaps. Say No. 1 was cleaned off with just benzine and waste; that is, the superfluous rust and dirt naturally there; No. 2 cleaned off with a steel wire brush; No. 3 was sandblasted, and on top of that I had him put a sizing of oil, and when it became sufficiently dry, as you would in bronzing, I had him go over that with dry graphite bronze. On top of that I put three coats of our freight car paint, leaving, perhaps, about two inches across the top without any paint, just leaving the graphite bronze there alone. Well, I had him expose that—I think that was somewhere in March. It occurred to me about two or three weeks afterwards that I should have gone a little bit further. I took another panel similar to that one and had him clean that off, as he did in the other, with three divisions painted the same as I did the other, only I did not put it on top of the graphite, but left the graphite off. My recollection is that the one with the graphite bears date exposed about March 20. I think the other one, which did not have graphite, was April 27, about a month's difference between them. When Mr. Quest returned from the exposition he stopped to see me and, knowing he was going to prepare a paper on this subject, I says, "Quest, you come with me; I want to show you something." We went up there, and those two panels were exposed on the south side of the paint shop. I said, "I want to say to you that the one coated over with graphite, as compared with the other one, looks like it might have been painted two or three or four weeks ago, although it was exposed one month longer." Quest said, "I think you ought to take that to the convention." I said, "No, I won't do that, because I don't know what the result will be; it may possibly turn out as I expect, but in another year I will be in a position to say something." But from present indications I want to say that the treatment of bronze graphite on steel looks to me as the only proper way for you to treat your steel cars. I may be wrong. My superintendent of motive power wants me to specify. I will not specify that, because I do not know. I have been talking to several of the members—those who have had experience—and I propose before I leave here to be able to tell him what he shall put upon his steel cars, and one of the things which I shall say to him and specify—and which most railroad companies have been objecting to, and I think they are short sighted when they do it—I shall say to him, above all things, "You have your steel cars sandblasted before you put anything on them. Clean them off if it costs you fifteen dollars to do it. (Applause.) For every car that you have painted, sandblast it before you put anything on it. You will save it inside of two or three years."

I am rather a doubting Thomas about the steel car question. Most of the boys who have prepared these papers, Quest included and Mr. Weiss, say they have made no improvement in the last year. I doubt that greatly. You all have made improvement, but you have not seen the result of it yet. You have been experimenting; you have been going on, trying to find out that which is right, which is best, and you certainly are not following something you know will prove a failure; but if you have not seen the result yet, that is no reason why you are not making improvement. You are making improvement, from the fact that you are trying to get the best. You have not arrived at the ultimate result, but you have made an improvement.

My friend Ball likens the character of a steel car to a coach. He says when your coach is blistered or presents a bad appearance, you go to the powers that be and say you want that car taken to the shop. I want to say to you, Mr. Ball, that we do not paint steel cars for appearance's sake, but we do paint passenger cars for appearance's sake. We put three coats of good paint on our wooden cars, box cars. You may turn out a passenger car on which you put three coats of varnish, color and one thing and another. You put that passenger and freight car in service coincidentally, and the freight car will be in better condition in eight years than your passenger car will, all the time, so I do not think that is a parallel case. On the other hand, Mr. Ball's statement about painting the inside of these cars is correct. I do not think you can put anything on that will protect the inside of a coal car unless you do as Mr. Ball says—protect the protector. How are you going to protect the protector? That is an impossibility. Even if the coal was so put in that it would not strike the inside of the car, the attrition, the moving of the coal in transit, sliding backward and forward, will wear off any paint you can put on it. So it is a matter of foolishness, you might say, to undertake to paint the inside of a car. On the other hand, Mr. Ball, I do not think that the car would rust inside without paint so quickly as it would rust on the outside if it is properly painted. Now we know that you can take a piece of steel or a piece of iron and by rubbing them with a little piece of sandpaper, or emery, or something like that, it won't rust. If it does, you get that little corrosion which, perhaps, if left, would penetrate and go still further. But I believe that by constant moving, loading and unloading of the coal, you don't get as much rust on the inside as you imagine you are getting. As far as the outside of the car is concerned, as Mr. Shore speaks of—these men coming along with mauls and one thing and another—I think that is a little bit foreign to the question, although it is apropos, too, because that is an abuse of the paint and not the use of it. What we want to do is to get something that will protect those cars if they are properly cared for. If they are improperly cared for, then that is none of our business, only we should call the attention of our people to that for their own benefit and their interest, and see if they won't stop that. If they do not do it, that is their fault, as well as their business. It is their fault and not ours alone, and we should call their attention to that and perhaps they can stop it.

I am awfully glad that the question has been aired so thoroughly, and I believe that the Master Painters have not gone backward. I think they have been a little bit in advance of some of the rest of us in regard to this, and I hope in the course of another year or two that with all the researches and all the interest we have taken, we will show our people that we have got something that will properly protect the steel car if they will apply it as we tell them to. If they will give us the material that we say is best for that, if they will have that material applied as we say it should be applied, then we can give them something that will be satisfactory to them. But if they persist in painting these cars haphazard, putting two coats on in a day, and putting another coat on, if it gets another coat, the next morning, stenciling it and turning it out, you cannot expect any results from that. I believe it was Quest who said in his paper that where a company are purchasing cars or getting them built should have a man there to see that every one of the specifications as regards painting are carried out to the letter. That is where our companies are lame. Suppose it costs them three, four or five dollars a day to send a man there to inspect the cars, and they are getting ten, fifteen or twenty cars a day, what does it cost them a car? Twenty cents, or a quarter, or something like that, and the expenditure of that twenty-five cents per car on the part of the railroad company is worth a hundred dollars to them inside of two or three years in the matter of preventing deterioration of their cars. So that is what we want to impress upon our people when they get steel cars—they must have them prepared for the reception of this paint and this material which goes on them must be of the best quality. I believe any of the standard good paints, if properly used on proper foundations, will be a proper protective for a steel car. (Applause.)

Mr. Butts: This subject has been so thoroughly covered I did not intend adding anything to it, but I did want to say one or two things, and that is, I do not believe there is a painter here in the room today but what, if he had a chance to paint a freight car right, could put it in condition to wear a reasonable length of time. The trouble is with the cars that are going to pieces, ninety-nine times out of a hundred have not been properly treated in the ordinary way. There is no mystery about it, how to paint a car, among the painting fraternity at all. We all agree that if the surface is properly prepared and the proper coating put on, we will get good results. Now, why do we not have it? Simply because in this day and age it is rush, rush, rush; no time for anything. I suppose that most all of the companies that have placed orders with the factories have not had a painter there to inspect them. They put on coatings, as I understand it, usually two coats in a day, and stencil it sometimes the same day, and expect to get good results. The country is full of good paint, and you can name any number of paint manufacturers who are ready to put their reputations behind the material they offer. Is there anybody here who doubts but that there is merit in those paints if properly used? They do not dry in eight hours, or five hours, nor one; we all know that. We all know they have got to be properly put on. You are talking about a protective coating more than any other part of the subject. I think that subject has been thoroughly exhausted and thoroughly covered. I do not think there is any further need of any better coating than what we have today. It is simply to inspect that thoroughly and see to it that the proper coating is properly applied; and if properly applied we will get results in the painting of steel cars, as far as it is possible for any coating to protect cars. I agree with Brother Ball, and had the pleasure of quoting him in Buffalo, and he said practically the same thing some time ago, that what we needed more than any other one thing was to protect the protector. I have never forgotten that. I think that is the whole thing in a nutshell, as far as concerns the troubles that we are having today. I remarked that nearly every steel car that I had an opportunity to inspect myself was rusting where the paint had been torn off. Other parts of the car were not rusted enough to make it a serious matter so far as the destruction of the car was concerned, but on parts of the car where the paint had been torn off the first time the car was loaded was where the trouble began. If you are going to tear off the coat the first time the car is loaded, what is the object of having a good paint on the car?

Mr. Miller: This association seems to be a unit upon the subject of painting of steel cars. There seems to be no dissension. We all seem to agree that the proper method is to use the sandblast with any good elastic coating properly applied and given proper time to dry, but it is of such vital importance—and our superior officers are watching us closely (I know mine are) upon this very subject—that I think this association should not adjourn without making some definite recommendations as to the methods to be pursued in the initial painting of steel cars. I think a committee should be appointed to report at a later meeting and make recommendations as to the methods to be pursued in the treatment of steel cars, the preparation of them for painting, and also the care of them while in use, and if I am not out of order I offer that as a motion—that a committee of three be appointed to report at a future meeting, before adjournment, their recommendations along this line. I make that as a motion.

Mr. Gohen: I will second that motion.

The motion was carried unanimously.

Mr. Gowe: I would like to ask Mr. Gohen what difference he found in the three different tests he referred to.

Mr. Gohen: At present I could not give you any determined answer, as I did not examine them under the glass, but by casual examination I think I can say that that which was cleaned with the benzine and waste shows indication of rust at this date and the others do not. What they will do in six months from now or a year I cannot say, but the indications at present are that the one which was not cleaned thoroughly, but just wiped off with benzine and waste, has what Mr. Quest calls pinhead rust. It is beginning to show that. Perhaps when colder weather and storms beat on it it will come to the surface very quickly, but that is the indication today.

Mr. Shuttleworth: We all seem to favor the outside of the car to prolong its life. While I have had no experience in steel cars, it strikes me clearly that you are not prolonging the life of your car by simply taking care of the outside of it, for most of the injury and abuse comes from the inside, from the loading, or shifting of the loads in transit, and it seems to me they are letting that go by neglect. It will certainly rust through from the inside, no matter how much coating you put on the outside. I do not see that the life of your car can be prolonged by simply taking care of the outside.

Mr. Little: Inasmuch as there is to be a committee appointed to act on this, I think we are wasting time to talk on it, because it will come up again when the committee reports.

Mr. Ball: In the matter of panel tests I have had a good deal of experience with panel tests of all kinds, and from that experience I have about come to the conclusion that the panel tests are the best tests that we can make. Some ten years ago one of our members—I have forgotten his name; he was on one of these western lines—said to me, "Did you ever try surfacing a car with kalsomine?" I said, "No." "Well," he said, "it can be done. I am doing it." I rather laughed at him, but when I got to thinking it over I thought that I would try it and see what results I could get from it on panels. I coated a number of panels, saturated them with linseed oil and took half and saturated half with linseed oil and simply finished the other in a body color, varnished and exposed them and the results seem to be all that could be desired. I had some of these panels exposed on the windowsills for ten years and they are good yet. They have only had about one coat of varnish in every two years since, but what I want to call particular attention to is, I took an iron panel five years ago about twelve inches wide and sixteen inches long, badly rusted. I coated that up with kalsomine and finished it up in the regular way, saturating it thoroughly with linseed oil, finishing it up in the usual way, putting about six coats of kalsomine on and adding three coats of varnish. That panel I examined just before I came here. It is on the roof of the paint shop and has been there for five years, and it didn't show a particle of a sign of pinheads or anything else of rust coming through it. I do not mean to say that would be effective on a car in service.

Mr. Gohen: While we do not want to prolong this question, it is not necessary to cut it off, and I will say to Mr. Ball, I believe just what he says, that as an ordinary proposition the panel test is not satisfactory. If Brother Ball had been here yesterday he would have heard me make that same assertion—that a panel test is indicative only. Now, then, I say this: If we take this steel panel and take all three of those divisions through the same process and one is better than the other two, or two are better than the one, it would certainly indicate the method of the application of that material was better on those parts where it was put under that distinctive method than in the other, and so I would not say that a car painted directly in the same manner that that panel was painted would give the same results as the panel, but the panel test would indicate which is the best way to apply the same kind of material. Am I not right, Mr. Ball?

Mr. Ball: O, yes, sir.

Mr. Lanfersiek: While it is my opinion and I believe it is the opinion of this convention that most any good oil paint will do for the outside of steel cars, the scientific men differ somewhat in that respect—totally differ. I am now painting thirty steel cars inside and out, the first coat with bitumen paint; you might call it asphaltum. That is merely as a matter of test. We simply used wire brushes, cleaned off what loose scale there was and applied the paint. They received two coats. The second coat I made out of standard P. R. R. freight car paste in proportion of ten pounds of paste to five pints of japan, and no other vehicle whatever. We have got seventeen done—or they were done when I left the shop on last Friday. Now, it seems to me that we will have to do considerable recommending to get people to conform to our idea when scientific men differ in that respect so much as that. I also believe it is necessary to use a sandblast in the first operation to clean everything off and have your cars placed in a room where there will be no variation of temperature. The least variation of a degree or two will form moisture. While it may not be seen, it is there just the same. Even if you take benzine and rub it on a piece of iron it will show moisure, but you change the atmosphere in that locality. I cleaned off three cars inside and out last year with sandblast, but that is a very expensive method. Those cars cost us forty dollars to clean them off with sandblast and paint them, and if we have to pay forty dollars for every steel car that we paint it would be quite an expensive method. It would be as expensive as our passenger car method, and that is one reason why the officers of these various corporations hate to go into it as deep as they ought to. That is why they dread the sandblast; in fact the people who do the work dread the sandblast because it is a hard thing to handle.

Mr. Ball: Where you have a large number, as we have—ten to fifteen cars a day—how would they do it?

Mr. Lanfersiek: If you have the facalities to do it, it would be all right.

Mr. Ball: But look at the impracticability of it. It would not be wise to have facilities of that kind.

Mr. Lanfersiek: If you had the facilities, you would have a sand bank with them. It takes four or five tons of sand to do one car; therefore, it would require a natural sand bank to furnish sand enough to do that.

Mr. Miller: Inasmuch as the subject is to be taken up later on, when a committee is to be appointed and will report, I believe it would be wise to pass on to the next subject. I move that we do so.

The motion was seconded and carried.

President Cook: I will at this time appoint the committee on place of next meeting as follows: Messrs. Ball, Pitard, Shuttleworth, Bishop and Clark.

President Cook: The next topic is No. 3: "What is the best material and treatment for locomotive front ends?" The first paper is by Mr. A. R. Lynch, P. C. C. & St. L., Dennison, O.

The secretary read the paper, as follows:

MR. LYNCH'S PAPER.

I will not take much of your time in giving you my views and opinion on Subject No. 3, "What Is the Best Material and Treatment for Locomotive Front Ends?"

I must say that in all my experience I have never yet run across any material used for this purpose that was equal to graphite to stand the intense heat that front ends of engines are subjected to. There may be objections raised against graphite being used on front ends on account of the color, which is, as you all know, about the color of new cast iron, but that is a mere matter of taste.

I received a sample of Cop's Front End Enamel some time ago, and found it to be quite a meritorious article, and superior to other liquid paints of this kind which I have used.

I saw a new engine going through Dennison not long since, on its way to the World's Fair, which struck me as having a front end that was certainly very nice, it having been lagged and jacketed with the rest of the boiler. While this scheme may be all right, it would have to be cleaned just the same.

My idea as to the best way for treating front ends is to cease searching for a material, and adopt a method, which is simply to clean it and keep it clean. This in my judgment is the ideal way, the cheapest, best looking and most durable method of treating front ends yet practiced. I have in mind several engines on short runs on the Pittsburgh Division of the P., C., C. & St. L. Ry. Co. (which are in the charge of regular enginemen), and the front ends of these engines are treated in this way, and they are certainly in splendid condition. The process consists of about 15 minutes' worth of elbow grease daily, applied with a piece of waste such as is used in wiping upper parts of engines; and occasionally, after washing with soap, use a small amount of boiler linseed oil (smaller amount the better), and wipe dry. One of these enginemen told me that one-half gallon of linseed oil should last about five months. So you see that the method is a more important factor in treating front ends of engines than is material. Yours very respectfully,

A. R. Lynch,
Foreman Painter P., C., C. & St. L. Ry. Shops,
Dennison, O.

President Cook: The next paper is by Mr. C. S. Denney, A. C. L., Wilmington, N. C.

The secretary read the paper, as follows:

MR. DENNY'S PAPER.

This subject has many conditions for consideration outside of a painter's jurisdiction, and involves the attention of superintendents of motive power, master mechanics and others, who may be interested on the subject. My views as a master painter are as follows:

The first trouble the painter has to contend with in painting front ends is the bad condition of same, caused by taking air and causing the front ends to become a furnace from the accumulation of cinders and sparks, which become red hot half way, or as far as the cinders and sparks will pile up inside the front.

It is a well known fact that there is no economy in trying to keep steel or iron painted when the above conditions exist. Of course, you can do your best in trying to remedy these conditions, and, as I have said before, there are others that will join in and help us in this task.

My idea of painting and to keep front ends in as good a condition as possible under the above circumstances, is to first get your front ends thoroughly cleaned off of all old paint scale, rust, etc., then apply your black as thin as possible for use, as thick black will soon give you trouble; then follow up as often as is necessary to keep your fronts in good condition.

Now in regard to the best material for using on front ends is, of course, a question of great difference with us, and I hope to hear from some of the best results at this convention.

I have had good results from using graphite, and our system is now using (spiritine) carbon graphite black with good results.

I suppose there are a number of good blacks on the market that have not come to my notice for the purpose of painting "front ends."

I have often thought if it could be made practical to incase the whole front end with Russia iron and asbestos, the same as the boiler, then all the trouble as far as painting is concerned would be over, and could be kept in good condition by cleaning with waste, the same as the jacket.

I think it would be well to hear the views of superintendents of motive power and master mechanics on this subject.

Respectfully submitted,
Chas. S. Denney,
Master Car Painter, Atlantic Coast Line,
Wilmington, N. C.

President Cook: The next paper is by Mr. Eugene Laing, N. C. R. R., Elmira, N. Y.

The secretary read the paper, as follows:

MR. LAING'S PAPER.

The subject, "What Is the Best Material and Treatment for Locomotive Front Ends?" is one which has always been passed by the former conventions with lamp black and oil every trip, which I think is a wrong idea, for in my experience lamp black and oil is no good for that purpose except they are done over every trip. There is no part of a locomotive that is more difficult to keep in order nor will spoil the looks of an engine as a rusty or patched up front end or fire box, which needs the same treatment as the front end. There are so many difficulties to overcome with rain in summer and snow in winter, water thrown from the stack upon the hot iron, that there is almost no paint that will stand it, also front ends that leak air and set fire to the cinders that gather there and heat the iron almost red hot. Generally the front end is painted, and when the engine goes out the paint is in no way dry and it is filled with dust and cinders, which spoil the looks. As the front ends are mostly painted when hot with all of those ready prepared ones, the paint will burn and smoke so that it makes the men sick that apply it. With either of these I use we have no such annoyance. It seems to me that all the life is burnt out of such material before it has any service. With some you can wipe it off with a piece of waste and nothing left but a powder. One that I tried would flash as it was mixed with naptha or benzine and all had no gloss to speak of, were almost as dead as flat color. In my experience they should be well cleaned of all rust and scale and painted with a material with a good body. I have nothing to do with these except when passing through the shop, but furnish the material to the men who apply it in the round house. I use Oxford Black or Engine Finish thinned with a little oil to keep it from setting too quick, which is as good a material for that purpose as I have ever found.

The switch engines in the yard which are kept up by the firemen are not done over more than once a month and always look good; also engines done in the round house whose fronts are kept tight will run from two to three weeks except on top when very hot get water upon them from stack or rain storms. This material costs more than cheap stack paints composed of gas tar and oil, or lampblack and oil, but as it lasts so much longer and saves more in labor than the cost of material it is cheaper in the end. I could never see any economy in using cheap material or labor in any kind of painting, as it is only a short time when it is all gone and has to be done over. It costs more in the end than to do a good job with good material in the first place, not to mention the looks of the work when finished, when you are not satisfied either with yourself or the work.

Yours respectfully,
Eugene Laing,
Master Painter N. C. Ry., Elmira, N. Y.

President Cook: These are all the papers and the subject is now open for discussion.

Mr. Little: Mr. Lynch referred to a locomotive that passed through Dennison that had the jacket extended over the box. That engine was painted at the Juniata shops. It was a French engine and sent to the fair. The under part of that was lined with regular boiler covering, magnesia. I saw that. We repainted it and the engine was left in service about a month before they took it to the fair, and there were no signs of blistering on it at all. It stood nice and it really would be no expense to take care of that part at all. Of course the front end needed attention, but it was in very good condition after running a month and required no attention whatever. Under other conditions you know what the results usually are and we usually have to paint the front ends with a very thin coating, get on as little as possible. We know it will all burn off anyhow, and we keep it looking nice with a very light coating. That is our practice.

Mr. Brown: Mr. President, that is my experience exactly. Do it very lightly and do it often. There is no use of my telling you fire-proof paint exists, for it does not. The minute you put any kind of oil in it it ceases to be fire proof. People advocate having fire-proof paint. I have been unfortunate, for I have never seen it yet. I am connected more directly with engine work today than I ever have been, and it is best to do them lightly. Whatever you put on, put on thin coats and do it often. We have one man whose business it is to go around through the yards and take care of front ends, and he has got a dandy job. (Laughter.)

Mr. Becker: I have had experience with different front end paints, including graphite, and I find the best front end paint we have is what is called maltha—very thin paint.

Mr. Fornwalt: Our method is to simply furnish the material and it is put on by the people in the round house, by boys and wipers; but there is a great deal of difference between the care of a freight locomotive and a passenger. The passenger firemen themselves take care of the front ends and we furnish the material. We use simply raw linseed oil with a little bit of Nile engine finish and put that on with a sponge with soapsuds. The front ends on passenger engines are in good condition always, while freight engines, of course, we don't pay much attention to because they have to be taken care of nearly every trip.

Mr. Gohen: We have had considerable trouble with our front ends during the last year. I think Mr. Brown and Mr. Little said that one thing was to put on a very thin coating. We had a sample of front end paint that I tried for its fire resisting qualities and found it first class. It was an elegant article and I think one or two members of the association on my recommendation used it and got into some trouble with it. I found that while the thing was very good as a sample and gives excellent results, that the continued use of that stuff was not very good. In the course of six or eight months we had the worst looking front ends there were in the United States, simply because this had piled up. It was heavy, but I was looking only at the fire resisting qualities, which were undoubtedly great, and we applied it until we had our front ends looking like alligator hide all over the road. So we discontinued that. Some were in favor of graphite. Graphite, no doubt, is very good, but it reminds me of stove polish too much and I don't like the looks of it to begin with. Another thing; the first rain you have you have a rusty looking front end. I do not care how much you use it, rust will get on graphite on the front end. We finally struck another, a great fire resisting front end paint. I think Mr. Becker got hold of some of that. It is not necessary to mention names. Mr. Block got hold of some, and nearly every shop on the road—some six of the shops—and some inside of twenty-four hours had blisters on bigger than a dollar. That was fire-resisting paint. We were in it again. So we finally stumbled onto another, this so-called maltha. I guess it is an asphalt product. It is very light. We have cleaned off all our front ends, or very nearly all of them, and we are getting elegant results. What you want to do is to put on something very thin, because you have to apply it often. As Mr. Brown says, if you get something with a very heavy body and of great specific gravity it is going to peel up and you will have bad front ends. I don't care what the fire-resisting qualities are, I don't like graphite because it rusts too much.

Mr. Brown: I had considerable experience with black manganese one time when we were installing the hot water system for heating cars. On the inside of the boiler we had to make a sort of putty and of course the hot fire comes right next to that, and then the up-and-down pipes around the drum and the fire itself come right next. It fell to my lot to get something that would serve that purpose, and after inquiring around a great deal among different parties I struck on to black manganese. I made a putty and it did remarkably well. I don't recall to mind having any leak. I feel sure there is quite a little merit in black manganese.

Mr. Wright: Before passing this subject I would like to say a word to emphasize the importance of painting the front ends and stacks. It seems to be a small matter, but they require painting so frequently it becomes a large matter. Front ends need repainting anywhere from a week to two weeks. I don't think any one makes a front end last much longer than two weeks, no matter what material he uses. It is a matter of some twenty-five or fifty cents for each coat and in a year twenty-five to fifty dollars for each locomotive. That is a large proportion of the cost of maintenance of the paint work of a locomotive. We have some two thousand locomotives, and at even ten dollars a year is twenty thousand dollars expended. The superintendent of motive power are giving this subject a good deal of attention. A number of preparations have been put on the market during the past few years that have been made especially to withstand heat and improve the condition of the front ends. I merely wanted to emphasize the importance of it before we pass on. I don't know but that it would be a good idea to have a committee appointed to make a report on this subject, or at least I think a committee ought to be appointed, to report at some future date, because I think it is quite an important thing—one of the most important subjects we have up.

Mr. Butts: I want to emphasize the recommendation that Mr. Wright makes. I consider it of vital importance. I think it has taken up as much of my time during the last five years as any other vital question. I have given it a great deal of study and made a great many experiments and have tried pretty nearly everything in the market that was offered and appeared to be of any value whatever. We have gone clear down the line of all front end paints we could find and finally settled on one policy, practically what others have recommended, and that is putting on a very thin coat—the thinner the better. We find it necessary on our passenger engines to paint some of them as often as three times a week. They come to the roundhouse, are fired up just before they go out, and often times the accumulation inside the smokestack will drop down on the front end a little while before she is ready to go out. It is a difficult matter to clean off hot alkali substance, as it will make a streak across the end and you cannot rub it off with any reasonable amount of work. And in order to keep them looking reasonably decent we have to coat them often. You can see where you will land if you put a paint on that has a heavy body. It would cost you more to scrape off the scale of that front end than to paint it a great number of times. Consequently we have worked along the line of getting a very thin paint—a mere wash, you might say. It is not necessary to have any great body to it at all. Another thing there is against us today in the care of front ends, and that is the matter of price, and also the way the labor organizations look at the work that should be done on a locomotive while it is in the roundhouse. We used to have that work done by the fireman, who usually had his regular engine, and he took a great deal of pride in it; and it was a well-known fact, I think, with every painter here that you can keep a front end looking in elegant shape with boiled linseed oil and a little lampblack. The material is a small consideration; it is the labor. You can polish it with almost any material—a little soap and water and oil added—and you can bring it to a finish in one, two or three hours.

Today the firemen are not allowed to touch the front end at all. They absolutely refuse to touch it. The crews are pooled and the fireman gets in a different engine on every other trip at least and he cares nothing for the care of it particularly. He does not put his own labor on it and consequently we have got to do it. The roundhouse labor—you know what that means today; it means the cheapest labor we can possibly get. That is right. What is the use of putting expensive work on a front end when you can make it look as good with a small amount of labor. That is what we have been working for and we have accomplished that, I think. We are getting our work done as cheap and, on the whole, looking as well as anything I have seen anywhere else. We have reduced the cost to a minimum. We only pay about fourteen cents an hour for any labor we use and it makes it very, very cheap.

Mr. Claire: This has been a source of great trouble to me for some time, possibly a year. About a year ago we had the large scales spoken of by Mr. Gohen, by the application of heavy paints. The gentleman to my left suggested soapsuds. The past six months we have been using oil, lampblack and soap and water. We have very good looking fronts, while it does necessitate frequent painting, such as two or three times a week.

A gentleman a while ago suggested that a committee be appointed, and I would make that as a motion—that a committee be appointed to look into this front end matter.

Mr. Nicoll: I think, as Mr. Butts said, to brush on a very thin coat of paint is as good a method as you can pursue; but we have been making tests of the different paints furnished to the company for that very self-same purpose, to keep the front black, and have tested a great many. Some would last a round trip and others would last two days. Finally Mr. Little suggested to me to use a certain material he spoke of a while ago. We did so and that has stood us better than anything we have used prior to that, and now after we black them and they come out of the machine shop we keep them in order with boiled linseed oil and bar soap with a little bit of lampblack. I am right in the roundhouse myself and can see them all the time and we watch these front ends to see how long they last. The process Mr. Little suggested has lasted longer than anything we have tried prior to it, and I don't know but that there is a good bit in boiled linseed oil and bar soap. It does not seem to burn off nearly as quick as anything we used prior to it.

Mr. Pitard: I think the proper solution would be to recommend to the Master Mechanics' Association that they extend their jackets out to the end of the smokestack and do away with painting entirely. Mr. Butts spoke of it being necessary to paint a front end three times a week. In the matter of dollars and cents I believe the jacketing would prove far more economical and always look presentable. On a reasonable estimate it would cost anywhere from fifty to seventy-five cents each time the fronts were cleaned. Painting them three times a week would be one hundred and fifty times a year and at seventy-five cents each time would cost seventy-five dollars a year. At very much less than that amount the front end could be jacketed and that would solve the problem.

Mr. Butts: Mr. Pitard's cost is three or four times as much. We use fourteen cents an hour labor and the paint costs from five to seven cents.

Mr. Houser: Do I understand the committee Mr. Claire suggests is to report at this meeting?

Mr. Claire: I did intend making that motion.

Mr. Houser: Mr. Butts, I believe, said that the front ends require painting possibly three times a week, some of them. I believe that is on account of a defective front end, is it not?

Mr. Butts: No, sir. The paint is not burned off the front ends. They become dirty and streaked. We want them to look good and we find that is the cheapest way to get the streaks off. The dirt falls from the smokestack and we find that the quickest and easiest way. It has all got to be done in a minute or so, you might say—between the time the engine is reported in the roundhouse and the time she is ready to go out. There is a man there with a brush and it is so thin that it scarcely needs any brushing at all. The front end is warm and it will almost flow down. It is as thin as turpentine. There is so little of it that there is nothing to accumulate, that it gives no trouble at all.

Mr. Miller: We followed the same method outlined by our friend Butts here and we find the thinner you get it on the less chance there is for coagulation where it gets hot and burns off or wears off. We also find when the front end gets red hot you have got to repaint it. If the water and soot from the stack are blown over it, you have got to repaint it; and we just about repaint every time we go over that stack as lightly as possible, and with as thin a material as we can put on, with lampblack in it, and we get very good results. In that way we prevent the caking up of material.

Mr. Nicoll: We paint all our jackets from one end to the other. If you would lag them with magnesia, wouldn't they become just as hot as anything else and burn your paint off? Would it not have the same effect on the front, even if you did cover them with casing? I ask the question simply for the reason that if we make the suggestion and it does not pan out, then what?

President Cook: You will remember that Mr. Little cited an instance where he lagged a French locomotive and after months of service it showed no indications of deterioration.

Mr. Bishop: This subject is very important and interesting from the fact that it shows our officers that we are taking some interest in the appearance of front ends, but I do not see why we should appoint a committee to draft up a formula for caring for front ends. It occurs to me it should be left to the superintendents of motive power. Ever since I have been caring for front ends I do not see where any suggestions are different than what they were twenty-five years ago.

Mr. Wright: You can make broad recommendations without making any formula.

Mr. Clark: I understand it has been suggested that a committee be appointed on this subject. If that is so, I think as every one here has had more or less trouble, it would be a good matter to have that committee and not have any definite formula handed down; that is, on hard and fast lines; but, as suggested, draw up recommendations of what is most suitable. We had considerable trouble with front ends the last year or so, and we have used equal parts of japan, raw linseed oil and asphaltum, with half this quantity of turpentine, put on very thinly. Our switching engines in good weather will run two or three weeks, but of course the passenger engines have to be gone over about every other trip; it depends on what kind of care is taken of them. There is no doubt that there are a number of men in the convention who have suitable formulas—the probabilities are that there is one or more that are better than others, but what would suit the front ends of one road would also suit the front ends of another. I think a committee that would give some broad recommendations on that line would be decidedly useful to us; in fact it would let a great many of us out of considerable trouble, because very often the superintendent of motive power, and so on, sees an engine looking as it should not look, a little rusty, dirty and so on, and they do not stop to consider what we have to contend with in the matter of front ends and we very frequently get reprimanded for the general appearance of the engine, when really we are not at fault.

Mr. Wright: I think I am the one who proposed that a committee be appointed. It is hard to get up on the floor and propose a motion to include everything that you wish it to include offhand, and a committee, with a few hours to consider the matter, can draft something that will meet the sense of the association. Now, in a general way, I believe we are a unit in thinking that the least we get on the front end the better. That is a broad recommendation and there is no formula suggested; furthermore, I believe we are a unit in believing that a material that will burn off is better for the front end than a material which will burn and cake on. I do not see why a committee could not be appointed to report at this convention, or a future convention, that would make some broad recommendations that would not necessarily include any one formula or exclude any one formula, or any particular material, but it would point the way and show the people who are manufacturing and the people who are mixing what we believe is the ideal mixture and that would, in a general way, overcome the trouble that exists in maintaining front ends.

It was moved and seconded that a committee be appointed to report before adjournment of the convention.

Carried.

Acting Secretary Dane here read the following communications regarding the next convention, being invitations from the Mayor of Niagara Falls, and the Chamber of Commerce of Cleveland:

Mayor's Office, Niagara Falls, N. Y., Sept. 1, 1904.

To the Officers and Members of the National Association of Master Car and Locomotive Painters, in Session at Atlantic City, N. J.

Gentlemen: I wish to extend to the National Association of Master Car and Locomotive Painters a most cordial invitation to hold your next meeting at Niagara Falls. Niagara Falls is peculiarly adapted to Convention work. We have a number of large hotels, thus assuring ample accommodations, and we can guarantee you reasonable rates.

As to meeting place, there are audience rooms in the large hotels, and when it is not desirable to meet directly in the hotel we have at our disposal probably one of the finest auditoriums in this country, with a seating capacity of somewhat over one thousand. This is within a few minutes' walk of the hotels, and makes an ideal place of meeting.

The many advantages of the city have doubtless been brought to your attention by our local bureau of publicity, and it is with the thought of co-operating with them in every possible way that I personally extend to you an invitation to meet with us, and to offer you the freedom of the city.

Hoping that I may have the pleasure of welcoming you at Niagara Falls, I beg to remain,

Most sincerely yours,
J. M. Hancock,
Mayor.

City Clerk's Office, Niagara Falls, N. Y., Sept. 1, 1904.

Mr. D. B. Vail, No. 10 Putnam street, Buffalo, N. Y.

Dear Sir: I beg to advise you that the following resolution was adopted by the common council at a recent meeting, and if you will kindly bring this letter before the members of the National Association of Master Car and Locomotive Painters I shall esteem it a great favor.

By Alderman Low:

"Resolved, That the common council of the city of Niagara Falls, N. Y., heartily endorses the bureau of publicity of this city and the work it has undertaken, and in this connection therewith the council, wishing to aid in this matter, hereby extends a most cordial invitation to the National Association of Master Car and Locomotive Painters to hold its next meeting at this resort."

Very truly yours,
George F. Diemer,
City Clerk.

The Cleveland Chamber of Commerce, September 12, 1904.

To the President and Members of the Master Car and Locomotive Painters' Association of the United States and Canada, in Session at Atlantic City, N. J.

Gentlemen: On behalf of the business men of Cleveland, the board of directors of the Cleveland Chamber of Commerce joins with your local members in extending to your association a very cordial invitation to hold its next meeting in Cleveland. The directors are confident that your delegates would thoroughly enjoy the time spent in Cleveland, and it is sincerely hoped that the city may be honored by an acceptance of this invitation.

By order of the board of directors of the Cleveland Chamber of Commerce.
F. A. Scott,
Secretary.

On motion, the above communications were referred to the Committee on Place of Next Meeting.

President Cook: I have appointed the following Committee on Steel Cars:

Messrs. Miller, Wright and Lanfersiek.

On Front Ends—Messrs. Wright, Dane and Claire.

President Cook: The next topic is No. 4: "What is the best construction of sand blast and method of operating same, in preparing metal for painting?" There has been but one paper prepared on that, being by Mr. J. H. Kahler, of the Erie Railroad, Meadville, Pa.

Acting Secretary Dane then read the paper, as follows:

MR. KAHLER'S PAPER.

In writing up this subject I have used ideas which I have demonstrated to my own satisfaction by actual operation; and the principles involved are taken from similar ones in operation in other mechanical devices; as the mechanism created in this letter does not refer to a reality in my possession, therefore I can only give you my idea of what constitutes a good (if not best) sand blast and method of operating the same. While there are different makes for different work, I have deemed it best to submit the following idea as one covering the greater field of usefulness in our line of work, and requiring our attention most.

The sand blast cleaning method should be carried on in a building by itself, conveniently located, with track running through it on which steel cars and locomotive tanks can be run in and cleaned of scale and rust, or old paint, as required. Dome, sand box, cylinder casings, and many other articles to be cleaned can be done here and given priming coat of paint (or more if convenient), when they may be stored elsewhere until used; then they will be found in shape to finish up. Proper ventilation should be given to such a building and means for carrying off all dust through a large flue by fan draft or blower. Means for eliminating dust by water spray in the flue or properly placed screens should be provided, as the dust being carried outside to be blown about in the atmosphere is undesirable.

A suitable size hood on each side of car or tank (as the case may be) connected and telescoping into the large flue to allow raising and lowering to suit the operator, and under this hood to do the cleaning by directing the sand against the surface to be cleaned, when all dust will be drawn up, leaving the sand on the floor to be taken up and used again. In this way cars can be cleaned in wet or dry weather, and if building is long enough they can be primed before running outdoors for further treatment.

A large bin to hold sand should be placed overhead, and rubber hose connected with bottom to carry sand to the intersection of air blast from the air compressor, which should be 100 lbs. pressure, although much cleaning can be done with less, but in the case of new tanks you want all the pressure you can get to remove the flash scale. The sand and air are further conducted to the work by means of iron pipe nozzles, or special hardened of suitable length.

The sand used for this purpose should be of coarse grain, and large per cent of quartz and silex present. It should be dried by moderate heat, as too great heat makes it brittle, and goes to dust more rapidly.

The sand can be sifted and placed in metal drum or tank, under the floor, from where it is forced by air pressure through pipe to sand bin overhead, from where it flows by gravity again to the blast.

A sand blast plant of this description can be operated by three men, one on each side to operate the blast and the third man to care for the sand, and bar the car or tank along the track at intervals, as the cleaning progresses.

Respectfully submitted,

J. H. Kahler,

F. Painter, Erie R. R., Meadville, Pa.

President Cook: The subject is now open for discussion. There being no remarks, we will pass on to the next subject, which is No. 5: "Which is the best method for removing cracked varnish on the interior of passenger cars?" The first paper is by Mr. Chris Clark, of the N. Y., C. & St. L. Railway, Chicago, Ill.

Acting Secretary Dane read the paper, as follows:

MR. CLARK'S PAPER.

The removal of cracked varnish from the interior of coaches is comparatively a new feature of the paint department. Formerly this work was performed by the carpenters, who labored diligently with steel scrapers of various shapes and sizes occupying almost as much time in sharpening the tools as in scraping off the varnish.

In recent years various varnish removers or solvents have been introduced; the work very properly being executed by the painters.

In so far as removing old varnish and restoring surface of the wood, the steel scraper does the work well, but we must take into account the time required and the necessity of employing skilled labor in the operation. The inevitable reduction of the wood also is worthy of some consideration, especially with sash which soon become too thin and veneer which is often damaged by scraping. Solvents and varnish removers do the work equally well in a much shorter period of time, with unskilled labor, without reduction of the wood, but with the additional cost of material. I maintain, however, that old varnish may be removed by the use of solvents at much less cost than by scraping, and a considerable saving of shop time can be effected. The most marked saving is in mouldings and carvings, the cost being little more for these than for a plane surface. For upright work and ceilings remover in past form should be used, but for sash, stops, seat ends, etc., the liquid is better.

A galvanized iron receptacle of suitable dimensions should be provided, and filled to the depth of about half an inch with the remover. Place sash therein, and after allowing sufficient time for varnish to have become thoroughly softened, remove and clean off with wide knife and stiff bristle brush; completing the operation with cotton waste saturated in the solution. For seat ends the vat should be made deeper than for sash, and be filled sufficiently to completely cover same. Work thus treated needs but a light sandpapering (except for repairs when necessary) to render surface in suitable condition for revarnishing. On removing an article from the vat the old varnish should be cleaned off into a box to be kept for that purpose, and not allowed to fall into the vat, or the remover will become dirty and lose strength in consequence. Answering the subject question, Which is the best method of removing cracked varnish from the interior of passenger cars? I have no hesitation in saying varnish removers or solvents in paste and liquid form.

Chr. Clarke,

N. Y., C. & St. L.

President Cook: The next paper is by Mr. A. A. Nicoll, Northern Central Railroad, Baltimore, Md.

Actng Secretary Dane read the paper, as follows:

PAPER BY A. A. NICOLL.

"Which is the best method for removing cracked varnish on the interior of passenger cars," would say under the above heading, that we have always used a steel scraper where the varnish was badly cracked and perished, which in our opinion does not make a good job, as does a first-class varnish remover. In time past, or about 25 years ago, when most of the men who did this work were first-class cabinet makers, with plenty of time to do it, we got a surface almost equal to new wood. Since that time this work has been done by carpenters, whose sole idea is to get the varnish off without any thought as to the number of gouges made. The present method, leaving out the sash, is to use either a hook or flexible steel scraper, which in an oak or ash-trimmed car leaves its stamp indelibly fixed in the soft part of the grain and causes it to show an ugly, uneven surface, which would certainly strike terror to the heart of any master painter if it had to go in the gloss; but thanks be to the management of our roads, who demand a dead finish where the eye catches the surface. Last fall we took the varnish off the inside of a coach and afterward gave it one coat of filler and refinished it (this car was trimmed in oak). This coach was thoroughly inspected by our foreman of car builders, who said, "We could not have made a job like that with a steel scraper if we took all the time imaginable to do it in." We removed it with a well known varnish remover. The edges of the wood were left sharp and none of the mouldings or carvings were torn up, as would have been the case were the other method pursued, namely, the "steel scraper." We have been using varnish removers for the past three years on all of our sash where we have given them class one repairs, with the best results, not only making a saving in the cost of labor, but also making a decided improvement in the smoothness of the surface, and with no gouged-up mouldings.

A short time ago I made a trip over another road and saw the same gouges on their cars as I have on our own, left these as a lasting memorial to the steep scraper. Removing old cracked varnish does not require a skilled mechanic, as does the old method, as we have used unskilled labor, or the men who do our clearing and rubbing, they taking great pride in doing a nice clean job.

In conclusion, would say we heartily endorse any good varnish remover for the removal of old cracked varnish from the inside of passenger coaches; one that will not discolor the wood and at the same time is not injurious to the workmen.

Respectfully submitted,

Adam A. Nicoll,

Foreman Painter, N. C. R., Baltimore, Md.

President Cook: The last paper on this subject is by Mr. William Vogel, of the Missouri Pacific Railway, St. Louis, Mo.

Acting Secretary Dane read the paper as follows:

MR. VOGEL'S PAPER.

Being appointed as one of a committee by our Advisory Committee to prepare a statement on subject No. 5—the best method for removing cracked varnish on the interior of passenger coaches.

It has been a difficult proposition for the painter to solve how to renew the elaborate woodwork on the interior of passenger coaches, when it became necessary to do so.

At the present date this question is well solved with the assistance of the chemists, by the use of various solvents. From years of practical experience I have found with the use of some of these solvents they do the work well and clean, and with results equally as good as if done by scraping; the method heretofore used, and still used today to a greater or lesser extent. These solvents prove to be a saving in time as well as a financial saving to the company.

Cracked varnish removed with solvent by the use of a vat results in economy as well as time saving, as it is more difficult to remove old varnish on upright woodwork and ceilings otherwise than it is with a vat.

It is found that the solvent has no bad effect on glue joints or veneered panels, and the woodwork can be left immersed in the solvent for hours without a bad effect. Where old varnish is well softened it can readily be removed with the use of a scrub brush, and cleaned and dried with sawdust, which is far better than the use of cotton waste.

The use of solvent paste on upright partitions, decks, etc., is well and practicable by brushing out all corners. Moulding and carving with liquid solvent; the results are found satisfactory, and in most cases woodwork treated in this manner requires but a good sand-papering to be ready for refinishing; and, as hereinbefore stated, the results are satisfactory, as time has proven it to be a fact, on the interior of sleeping cars as well as coaches.

While I find many good qualities in the different solvents in regard to doing the work with good and satisfactory results, I also find among them bad qualities. I find most of them, if not all, to be harmful to the skin and hands, together with their disagreeable odor they are sickening to the stomach.

Hope the chemists and manufacturers will in the near future improve upon these solvents, making them less harmful and more agreeable to the man working the material.

Respectfully submitted,
Wm. Vogel,
Master Painter, Mo. Pac. Ry.

President Cook: That completes the papers on this subject. I find that we have but three topics left. One is an essay, and we will run out of material. Why not leave the discussion of this subject until to-morrow's session. It is now 12 o'clock. We have worked pretty hard this morning, and, if it meets with the favor of the convention, we will adjourn at the present time.

Mr. Houser: I move we adjourn until 9 o'clock to-morrow morning.

The motion was seconded.

President Cook: Before we adjourn, I wish to announce that the Committee on Uniform Stenciling will make a report to-morrow.

The motion to adjourn then prevailed, and the convention adjourned.

THIRD DAY.

Thursday, September 15, 1904.

The convention was called to order by President Cook at 9:30.

President Cook: Gentlemen, the papers read yesterday were on, "Which is the best method for removing cracked varnish on the interior of passenger cars." Now, we want to discuss this topic, and I am going to ask Mr. Ball what he has to say, in order to get the discussion started.

Mr. Ball: Mr. President, the papers that were read yesterday, according to my recollection, each advocated the removal of varnish with some varnish remover more or less efficient, but nothing was named, I believe, and it seems to me, from conversation that I have had with various members of the organization, they all agree that that is the most efficient and cheapest way of removing varnish from the interior of cars—with one or the other of these varnish removers. I do not know that we can elaborate that thing at all. It is hardly open to discussion. There is simply one feature of it that I think possibly it would be well to emphasize, and that is that there are one or more of those varnish removers that had better be left out of general use, if you do not want to affect your men's manhood, as it is a well known fact that with one of the ingredients in those removers it will have that effect, and they are dangerous to use. The caution that I would like to offer is to see that there is not anything of that kind in them when they are being used.

Mr. E. H. Brown (Painters' Magazine): Which ingredient do you mean?

Mr. Ball: The name has escaped me.

Mr. E. H. Brown: Is it bisulphide of carbon?

Mr. Ball: Yes; that is right. There is no question about it that that is the simplest and easiest way of removing varnish with the least labor. There is no destruction of the sharp corners and the edges and points of cornices and things of that kind. When you have to scrape a car, if it is particularly hard wood, such as oak, there are portions of that wood that the scraper skips and wont have any effect on it and on other soft portions you are bound to gouge it out and leave marks throughout the whole car, and that is objectionable, of course. I think the cost of removing the varnish with any of those removers is about one-half of what it is to remove it with scrapers, as near as we can arrive at it. There seems to be a general understanding among members I have spoken to that that is the most efficient method of removing varnish, and I do not think there is any question amongst them as to the saving in cost. Now, there may be a feeling—and I have no doubt it is correct—that that is not a painter's job; at least, that is the way I felt. The cabinet makers have heretofore been in charge of that work and have cleaned the varnish out for the painters. Now, if the painters take that off their hands and remove the varnish, that means that it will have to go to them again after it leaves the painters' hands for sand-papering and to repair slight repairs or whatever repairs may be needed, and that will make a double shift, as it were. First it comes to the painters, then goes back to the cabinet maker, then comes back to the painter again; whereas, if it is done under the cabinet maker's supervision, they know whether it is done right or not and they know just exactly what they have got to do without having a painter point it out to them. There is bound to be more or less cabinetmaking work to be done on all of those cars. There are certain minor repairs that must necessarily be done. They might as well take the whole thing in charge and have it cleaned off and put in good shape before they send it to us as for us to take hold of it to merely do a portion and then send it to them to finish and send it back. I was successful in having it arranged in that way and I thin you will all find it will be better to try and do the same thing.

Mr. Weiss: Mr. Ball says the removing of varnish with a remover is cheaper. I find that not to be the case. I think we can remove the varnish for about one-third less in all cases than we could with a varnish remover.

Mr. Ball: I think that has not been our experience. It may be due to the construction of your cars.

Mr. Weiss: I would like to know what it costs Mr. Ball to remove the varnish from a car.

Mr. Ball: I have not the figures with me now. I have been reminded, however, that a car that was done lately cost $46 from the square above the windows to the floor.

Mr. Weiss: For labor and material?

Mr. Ball: For labor and material, with a varnish remover.

Mr. Weiss: From the lining down?

Mr. Ball: From the lining down. I think it costs $55 or $60 to scrape the whole car.

Mr. Rodabaugh: I doubt whether a car could be scraped for $50. Take a vestibuled car that needs the varnish removed all over and it will take, I believe, $200 to scrape that car, and I think it will take about $125 to clean it off with a varnish remover. I am speaking now of vestibuled cars. Your material will cost you about $2 per gallon and your labor will be—if you want to clean it up in good shape—eight or nine men, for you don't want to be a week or a month cleaning it, and those laborers at 14 or 15 cents an hour would not be near as much as it would be to scrape it, and I believe it will cost $150 to clean a vestibuled car with a varnish remover. Now, I mean from the top down, not just one part of the car, which we do often—just take off below the windows or above them; I am talking of the whole car. I don't believe you could scrape a whole car for $200.

Mr. Weiss: I am speaking of the car built by the Pullman Company in 1893.

Mr. Rodabaugh: There is a gentleman here from one of the southern roads who has had quite a good deal of experience in that, but whether he is present or not I do not know; he is from Georgia.

Mr. Weiss: An oak head lining, we can scrape that for $12, whereas the material alone required would cost close on to that, besides the labor of removing the varnish.

Mr. Orr: I would like to ask Mr. Ball, in a car without very much moulding, whether he thinks he can do it as cheap with a remover as he can with a scraper.

Mr. Ball: I think so.

Mr. Orr: You think you can take the varnish off of that car quicker with a varnish remover and at less expense than you can with a scraper?

Mr. Ball: Yes.

Mr. Orr: He brought up another subject. He was inclined to charge that up to the painter.

Mr. Ball: You see the advantage of unskilled labor; whereas if you have it scraped you have got to use skilled labor.

Mr. Nicoll: I do not know that it is a very good idea to put figures in for other people to read in these discussions, for people, not knowing exactly the kind of a car or what it is like, it reads bad to our managers. We are using varnish removers in Baltimore, and it seems to me we should consider the style of car that we are using it on. We use it on what we call our "P. F." You all know what they are; it is a fifteen-window car, and so is the one Mr. Ball spoke of, at Altoona. We can remove the varnish with a varnish remover at less cost than we can with a steel scraper, and it makes a much nicer and cleaner job, and there are no unsightly gouges in the wood after it is finished. I spoke of that in my paper. We have been using it on sash for a number of years, because it was a great saving both in time and in the cost of labor. My sash I clean off with what I call my old bench hands, the oldest men we have in the shop. They work on sash, blinds and such fixtures as come out of the car, and I can do the sash, I know, at much less cost than what we can do it with a steel scraper, because it saves about one-half.

Mr. Ball: There is another thing about that that is saving: The varnish remover does not affect the filler. When you scrape the car, you have got to re-fill, and you should take that into consideration as a matter of cost; that is an additional cost. When you re-fill a car, you have got to pay for the filling of it. I have had experience. That don't affect the filling, the varnish remover, and you simply varnish right over the old filler.

Mr. Houser: I would like to ask Mr. Ball if he has any bleaching to do?

Mr. Ball: Yes; we do bleaching with oxalic acid to take out the stains.

Mr. Weis: Will not the bleaching look worse than the dirt you have on there?

Mr. Ball: We have not that experience.

Mr. Weis: We have.

Mr. Ball: The only trouble with it is having the varnish dry over it.

Mr. Russell: I do not agree with the members about cheap labor in taking off the varnish with a varnish remover. I can do it cheaper with a thorough mechanic than I can with cheap labor, for the simple reason that I only take off the cracked varnish. If it is not cracked below the shellac, there is no use in going deeper than that at all. You can take it off right down to the shellac. There seems to be a division between the varnish and shellac—it works different; if you watch it and have a mechanic who understands his business, he will take it right off to the shellac, and it will be thoroughly sound below that. As far as the mouldings are concerned, that does not seem to cut much figure with us. We get a steel brush—instead of a bristle, we have a fine steel wire, and it has a handle on it like a varnish-rubber. I don't know whether you know what it is or not, but up in our country we know all about those things. We take the carvings and the mouldings with the steel brushes, and they are easily cleaned. It does not injure the edges or anything of that kind, and we can clean them just about as fast as we can anything else on the car—that is, the mouldings. We can clean a car for a great deal less money and material than with a scraper. There is one thing we have to consider in the use of a scraper. If they cut to the wood at any place, you have got to change the age of the wood; you have got to cut clear through all over the car or else you have got to do some staining. Wood ages, and if you do not cut it all over with a scraper, then you have got to loosen and touch it up, age it and stain it.

President Cook: Gentlemen, this matter is growing more interesting.

Mr. Pitard: I have tried various methods for removing varnish, and I must say I am decidedly in favor of varnish remover, instead of scraping. There is a saving of over fifty per cent.—that is, if you can get a good varnish remover, but if you get one that contains acid, you are going to have a hard row to hoe. We had the misfortune to get hold of a varnish remover that contained that acid, and we had bad luck in getting the varnish to dry over it, but if we have a good varnish remover I think the saving would be over fifty per cent.

Mr. Hengeveld: I do not know as I have had a great deal of experience; I have had some, and as far as the difference between scraping a car and removing the varnish with a remover is concerned, I think it is entirely in favor of the varnish remover, and, not only that, but I believe we get a better job—at least, that has been my experience. You will find very few cabinet makers who thoroughly understand the method of scraping a car. They dig in and do everything else, and, in addition to that, it is a great deal cheaper, in my estimation. I will say that not very long ago, last month, rather, I removed the varnish on a sixty-foot vestibuled car. I always make it a practice to put as many men on a car of that kind as I can, because it is a disagreeable job at best. I put eight men on that car and removed the varnish in that car in two days with these eight men. The gentleman over here (indicating), remarked that he believed it was better to get mechanics to clean off the varnish than laborers. I agree with him fully. In the first place, they do a better job, and, as the gentleman said, we need not go any below the shellac, if it is not cracked, and I always make it a practice to put a few good men on, anyway, in order to help the other fellows along.

Mr. Ball: In reply to the gentleman on my left, who has just sat down, does he not think it would be worth his while to use the unskilled labor and take the trouble to teach them and give them an opportunity to become skilled? It would not take very long; after they had done two or three cars they would be just as skilled in that work as would the skilled mechanic. The skilled mechanic has to learn it also and he has to have experience and practice just the same as anyone else.

Mr. Warlick: I have had experience with varnish removers on our road quite extensively, but we use it mostly on sash, doors, blinds, etc. We have a large vat which holds several barrels of the remover, and we take the detachable stuff from a whole car and put it in that bath over night. We have a man who does nothing else but that, and in that way we get the work done very cheap and get very good results.

Mr. Copp: As you pretty much all know, a year ago I made quite a thorough report on varnish removers, when I was on the Test Committee, and I do not know as I have a great deal to say in addition thereto at the present time. I thoroughly agree with most of the remarks that have been made, that that is the up-to-date method of removing varnish from the interior of cars, especially the carved and elaborate woodwork of the present day. I do believe, however, that exception should be made in some of the cars of a more ancient pattern, when they were made very plainly and a great number of coats of varnish have been applied. I do not know whether there are any other members who have such cars or not, but we have had on the Boston & Maine some cars that would be varnished inside for twenty years or so. I presume twenty-five or thirty coats of varnish had been applied on them and that varnish becomes brittle with age, and the coating, I suppose, probably nearly an eighth of an inch thick. I believe in a case of that sort, where there are so many coatings of varnish to be removed from a plain surface, and where the varnish will fly when a scraper is applied, that it is more economy to remove that with a scraper in the hands of a cabinet man than to do it with a varnish remover, as several applications would have to be made. That is merely an exception. Generally speaking, I believe in removing the varnish with a varnish remover, and I believe in nine cases out of ten there should be more of it done than there is. We have got to get into it more extensively than we have on the Boston & Maine, if they will let us have the cars and let us have the men and material to do it with. We can make new cars out of the old ones in the interior if they will give us the men and material, and we will make them look, as we all know, as good as new. But great care should be exercised in the use of most of the varnish removers in the present day; they are inflammable. We have had quite a number of fires during the present year in shops. Quite a number of shops have been destroyed in the present year by using varnish removers. Some are more volatile than others, and of course the evaporation is great, the air becomes charged with it, and we should be very careful of that flame. We came very near having a fire in our own shop once or twice, but by being prompt it was extinguished in its early stage without any great damage being done. I would like to further emphasize the test report that I made a year ago, in which I stated that you must be very careful in the use of the varnish remover which contains bisulphide of carbon; that is to say, you should not allow it in your shop. That report was made with great care. The chemist went with me to the Massachusetts Institute of Technology and translated for me from the German and from the French reports on the danger of using carbon bisulphide. The varnish remover should not be used that contains it to any extent, perceptible by the tests there given. It will produce all the effects of lead poisoning in a speedier manner. Of course we are told that men have used varnish removers; they are being made and they are putting them up, and all that sort of thing, and they do everything but drink it, and there is no harm done. That is a fatal mistake to make. Men can use it probably for quite a long while without discerning any evil effects, but they are all the time becoming loaded up with the poison, which will have its after effects, and the man when once loaded up with the poison is used up for life; he can never eradicate it. It is the same as with a man who is loaded up with lead poisoning—he is ruined. It will take a life-time to eradicate it, and I doubt if it could ever be done. Any member can make the test that I gave in that report last year to discern whether there is any carbon bisulphide in the varnish remover he is using, and if there is, he should rule it out of the shop. It is not only dangerous to the health of a man, but also in the matter of fire, because it is more volatile, and if a tank is used for a liquid remover, the lid should be kept closed, especially at night. I think it would be a good idea to have some hood over it, with means of ventilation, so as to let the gas escape. Great care should be exercised in the use of these removers. They are useful, and people go to the other extreme of ruling them out because they have had a fire. They might as well rule out firearms because somebody has met with an accident in the premature discharge of a gun. It is such a useful article that you cannot dispense with it.

Mr. Marsh: I have had experience with varnish removers, fire and all kinds of experiments, and I think the varnish remover is the proper thing to use. I will tell Mr. Copp that we get good results from the sand-blast on car mouldings. We do not use the varnish remover on carved woodwork; we use the sand-blast, and we have got to have a good mechanic to use it. I would like some of the members to try that sand-blast on carved woodwork.

Mr. Copp: Don't you find that the sand-blast cuts away the wood, as well?

Mr. Marsh: No, sir.

Mr. Copp: That is something new.

Mr. Brown: I heard some of the members state that it is not necessary to remove only the varnish down to the shellac. I am strongly of the opinion that there is no value in shellac at all. (Laughter.)

A Member: When did you change your mind?

Mr. Brown: Never. Only I wished simply to call your attention to the fact that we are coming to acknowledge that there is a little value in shellac. My friend Charlie (meaning Mr. Copp) had a chance a few months ago to see the value of shellac. I am not going to talk about shellac, however. I don't like to use the word "shellac," but they are all getting on, as Mr. Ball says, to my band-wagon in regard to there being a little virtue in shellac.

President Cook: If there are no further remarks on this topic, we will pass on to the next, which is an essay—"The Treatment of an Ideal Passenger Car from a Painter's View," —by Mr. J. A. Gohen, C., C., C. & St. L. Railway, Indianapolis, Ind. Before the paper is read, I will announce that I have a note here which I will read: "American Society for Testing Materials.—Report of Committee E on Preservative Coatings. Please criticise each scheme for testing material by letter, submitting report to W. A. Polk, member of committee, 42 Hudson Street, New York City. S. S. Voorhees, Chairman." There are a lot of these pamphlets, which are to be distributed among the members of the association, and the chairman of the committee asks for any criticism the members of the association see fit to make.

Mr. Gohen here read his essay as follows:

ESSAY BY MR. GOHEN.

I have been asked to contribute a paper on "The Treatment of a Modern Passenger Coach from a Painter's View Point."

This is rather a complex question. If I would tell you some of the views that have come to me since I first became associated with railways I am very much afraid I might cast some censure on the heads of some with whom I have been associated, and whom I have called friend and benefactor, but being, as you know, of a lamb-like forgiving nature, I will cloak the shortcomings of years ago and confine myself to the present day passenger car, and if there be censure or comment undue let those upon whom it may fall content themselves that they have done infinitely better than their predecessors.

The passenger coach of today is as far superior to the coach of infant railway days as the modern home on the Hudson is superior to the block house of the pioneer Knickerbocker, but at that it is far from meeting the requirements of a sanitary conveyance for a crowded public.

With all our boasted improvements in heating, lighting and other comforts, are our cars today better fitted for our wants than the stage coach of olden times? Our ancestors may have felt the cold more acutely and may have shivered, but doesn't Dame Nature provide for that in man as well as beast? Isn't our blood thicker in winter than in summer so as to withstand severity?

Are we not pandering to a pampered and petted society, to their detriment when we furnish them with the so-called modern passenger car? It is a question that our scientists might well ask and answer, but not such as you or I are capable of doing, so I will treat the question in concrete form, being as concise as the circumstances will permit, because you know this is only from a painter's view point, and I opine it won't amount to very much, but you are welcome to it, such as it is.

The cost today of a first class passenger car is in round figures $8,500 to $9,000, of which the painting does not exceed 6 per cent of the total. The subsequent cost of maintenance of painting is entirely dependent on the original design and construction thereof. If constructed on plain common-sense principles the cost of renewal will bear about the same proportion as the cost of construction, provided the master painter is gifted with, or built on common-sense principles, but if both of them are built on the same principle that many of our passenger cars are built, then, indeed, is our company to be pitied. How many of our passenger cars, as well as our master painters of today resemble the dining car on exhibition at St. Louis. Those of you who have visited the exposition may recall the description of this car as described by the porter in charge. "The finish of this car is flemish oak and is hand carved. It is the finest and most expensive dining car that has ever been built." He could have just as truthfully said: "And it will be the most expensive car to maintain that has ever been built."

Admitting that it is a beautiful car and a credit to the builders thereof, of what benefit can it prove to the purchaser more than if it was built plainly, neatly and consistently. Dining cars as a general thing are no revenue earners to any railway, but must be provided and maintained as an expensive luxury to meet the demands and requirements in high speed travel of today. As they then as a necessity must be provided, why not display common sense and furnish a plain, neat car free from all grooving, moulding and carving; one that can be easily cleaned and will be free from undue dirt catchers and germ producers while on the road, and when it goes to shop, as it must at stated periods, it can be properly cleaned and varnished with reasonable and just expense.

The company which I represent here at this convention is the possessor of two kinds of dining cars. Five of them are elaborately carved and seven of them have neither carving, grooving or moulding on the inside, neither are there any ledges or caps to catch and retain dust or dirt. In lieu of the elaborately carved inside work we have a decidedly plain surface inlaid, or as better known, marquetry work. When one of these cars are to be cleaned at terminals it is readily, satisfactorily and economically done, while the contrary is true in every respect regarding the elaborately carved, beaded and moulded cars, and when one of the latter cars comes to the "Hog Feather Department," as Joe Murphy used to term the paint shop, it costs us more to clean the inside than it does to clean, varnish and rub the inside of the plain finished cars, nor is the work as satisfactory when done.

This being true of dining cars costing from $12,000 to $15,000, it is equally true of coaches costing $8,500 to $9,000, and parlor cars costing $10,000 to $12,500, the latter having costly furnishings in the way of lambrequins, carpets and curtains of silk, plush or other germ propogating fabric, while the seats and lounges are upholstered with plush, which is as awake from its lethargy and relieve an overburdened, carebad, if not worse, than the curtains and carpets.

Some day some state or national board of health will less public from this disease engendering, health destroying modern coach, parlor and sleeping car whether they want it or not. The Interstate Railway Commission is lauded by the public for it earnest and ceaseless efforts in prevening the Deepwater Valley and Jerkwater Railroad from charging John Smith two cents more fare from Crow's Nest to Buzzard's Roost than it does Bill Jones. It never sleeps in the matter of tariff rates, distribution of accounts and other trivial matters, but its good offices in the matter of health is characterized by the famous remark of Grover Cleveland: "It is in a state of inocuous desuetude."

Of course one expects dining, parlor and sleeping cars to be more elaborate and better finished than the ordinary coach, because they are patronized by the class of people who have the money to pay for these luxuries, and having the money, being willing to pay, they are entitled to the best there, but at that they should not be allowed to pursue a policy prejudicial to their health. They are entitled to all the comfort and ease attainable, in addition to the increased area of cubic air space per passenger provided in such parlor or sleeping cars, but they should not be allowed to court disease by using superfluous textile draperies and upholstering when more sanitary material is at hand.

It is not the fault of the railway companies that this practice is in vogue. The over-exacting public in a measure demands it, rather flattering themselves on traveling in style and comfort. Now, while all this might be palliated in a parlor or sleeping car where there is a minimum of passengers and a maximum of space, what excuse is there in allowing it in the coach where the reverse exists and is patronized by all classes, good, bad and indifferent, including that specimen of mankind closely allied, if not related, to that animal, the flesh of which no orthodox Jew will dare eat. These are the cars that should be built on strict sanitary rules, but they are not. The railroad companies put entirely too much money in these cars in the matter of style, architecture and furnishing, and each one vies with his competitor in the production of fine equipment.

Coaches, if they could be maintained in a condition that obtains in a home of similiar pretensions there might be some excuse or the outlay, but it would bankrupt any railway that would attempt such a thing. Then why not discard the elaborately carved and highly finished wood work, the excessive ornamentation on headlining—this, however, is fast becoming obsolete—the costly and perishable plush, the finished brass and filagree lamps and other trimmings, substituting for the latter plain oxidized brass, as a few of the roads are now doing. Then, if the saloons were finished in slate or tiling and all the right angles were carved and the corners rounded, how much more satisfactory and cheaply could our cars be kept clean and sanitary than under the present conditions.

The greatest mistake our companies make is in the application of the flushing water closet. While this is a necessity in a modern home, where it is properly cared for, or in a sleeper or parlor car, where a porter attends to it, I must say in the ordinary coach, which everyone uses, including the human hog, it is out of place. In winter time it is frozen up and inoperative most of the time. At other seasons the water pipes are clogged with cinders or may be dry, my observations prompt me to suggest the dry hopper with one of the recognized disinfecting machines, as being the best sanitary closet for ordinary coaches, especially so when provided with a down draft ventilator at the bottom. This, if properly constructed, will prevent all unpleasant odors in the coach. I would discard the closet urinal because it is the most foul smelling attachment ever introduced on a railway coach.

We will now take a view of the treatment of the modern passenger car while in the hands of the painter. The maintenance of painting and varnishing a passenger car after building it should be on a well defined and common sense plan. A minimum and a maximum shopping period should be established and maintained as consistently as is possible under all circumstances. In establishing this minimum and maximum period the service in which the cars are used and the character of the material purchased in a sine-qua-non in determining same.

With first class material, the coaches in first class, high speed, long distance trains, the shopping period for paint and varnish should be from twelve to fourteen months, and in local runs from twelve to eighteen months. From observation I find this is about the shopping period for ordinary repairs to trucks, platforms, upholstery and other parts, and no coach should be stopped for painting or varnishing alone. That should be coincident with other repairs or renewals.

Should a coach be damaged in service, the master painter should exercise his best judgment as to his action in the premises; if the damage is slight and the car has been in service less than nine or ten months, he should repair the damage and flatten the varnish so as to present the same appearance as the balance of the car, assuming, of course, that he will clean the balance of the car. Some of us are under the delusion that in such cases we should varnish the car so as to make a showing in output. This is a mistake that if indulged in to any extent will sooner or later redound to your discredit. The recurrent painting and varnishing of passenger cars at short intervals for the purpose of making a shop record is not index to your worth and ability as a master painter. Quality and not quantity should be your aim and object.

That organization which turns out twenty cars a month that will run twelve months is far more efficient, capable and economical than one that turns out forty cars per month that will run only eight or even nine months, yet on paper the latter can be made to appear the better one of the two, but it is on paper alone. If, as indicated, the painting and varnishing is coincident with ordinary repairs or cars, the opportunity for the frequent and often unnecessary revarnishing or repainting is entirely removed, for in such event cars are not shopped haphazard upon appearance alone, as has been done, and is done today, especially where there are several shops on a road and inspectors or shop foremen are allowed to shop cars adlibitum. Aside from the bad order or damaged car, the shopping should be done from a central or individual point where the records are kept.

I have in mind the system that was in vogue on a road some years ago; there were several shops on that road and the cars were shopped by the foreman or inspector. Each shop was vieing with the other in turning out cars, and having the matter under their control, it was but human nature that each shop tried to get light repair cars, which they did whenever possible. While their output was satisfactory, the equipment did not improve until the system was changed. There was an immediate and marked decrease in the output of the shops, with a corresponding improvement in the appearance of the equipment, and at a decreased annual cost of maintenance of equipment.

Now, it is not my aim or desire to go into details as to how you should handle each and every car coming to you for shop treatment; that would be a work of superogation on my part. If you haven't the intuition to meet the contingencies, you had better ask some of your associates for advice, and then if you are not equal to the emergencies the best thing your compay can do is to get some one who is conversant with his business.

I take it that the capable, efficient, up-to-date master painter cannot fail to impress his superiors with his ability to subserve the best interests of his company, together with the trust imposed in him, therefore let me quote to you from Longfellow—

"In the world's broad field of battle,
In the bivouac of life,
Be not like dumb driven cattle,
Be a hero in the strife.

"Let us then be up and doing,
With a heart for any fate;
Still achieving, still pursuing,
Learn to labor and to wait."

The essay was received with applause.

President Cook: We will now have any remarks on the essay presented by Mr. Gohen the members desire to make.

Mr. Gohen: My idea in having this matter discussed is that our companies are awakening to the fact that it is costing them too much money to maintain their passenger equipment at this day. While they are at fault themselves in furnishing us with that style of equipment, I think it is up to us to tell them what they should do in furnishing that style. A few weeks ago, possibly three weeks ago, I was called away, with some others, in reference to the matter of the cost of the care of sleeping cars, and while there we took up several other matters. I found out then that the N. Y. C. & H. R. had abolished the plain brass—the polished brass—and were substituting oxidized brass, and it looks very well. I have seen it in some Pullman cars, too. It looks better, I think, on first impulse than the polished brass, and it is easier to maintain. The brass on the observation car that travels from New York to St. Louis, on what is called the Southwestern Limited, I found it cost $1.35 every time it was cleaned. Gentlemen, it is an outrage for a railroad company to pay that much to clean a brass railing on the rear end of a passenger car. I have also noticed occasionally at Cincinnati, on the Queen and Crescent Route, they have just such a car, and just as elaborately cleaned and fully cleaned as the observation car on the Big 4, and I believe it costs them $1.25 or $1.50 to clean that every time it comes to the terminal. This can be done away with. The average passenger does not care a snap of his finger about that brass work; what he wants is a nice clean couch, and why should the company be put to that expense on a car for nothing?

I received a letter from Mr. Butts a few days ago, in which he told me the man who did the oxidizing had told him it was not a good thing to oxidize the brass work that would be on the outside of a car, the hand rails, etc., because, if I am not mistaken, you said, Mr. Butts, it only wore about two months?

Mr. Butts: Yes; it is not durable.

Mr. Gohen: In any event, it is not necessary to oxidize that, and it is not necessary to put brass on there at all. Why not put an iron handle and gate there and blacken it. It will look just as well as oxidized brass, and if we have to paint it, it will only cost a little bit. Why not have that common-sense black hand-rail and end-gate? If it was brass it would be dirty inside of twenty-four hours, and you have got to go over it constantly, and keep rubbing and polishing it up all the time. Why don't they discard it and put on some common-sense rail? I want your opinion on that subject, gentlemen.

Mr. Butts: I thank Mr. Gohen for taking the initiative in advocating simplicity in the construction of passenger car equipment. I think they are altogether too elaborate for general use, and I could never see for my own part why it was the railroad company would go to such enormous expense in putting carved work and elaborate finish in a coach anywhere. A large majority of the people who ride in passenger coaches have far more simple homes to live in—not that they are not able to have them, but they don't consider them necessary. They are an unnecessary and useless expense. Take the matter of plush inside a passenger car. We all hear a great deal these days about sanitary conditions, health and things to promote health. Is there anything that can be conceived more unsanitary than the plush in the ordinary passenger car, thoroughly filled with dust, dirt and corruption of all kinds? If there are such things as germs which produce disease, it seems to me that is where they would be propagated—in plush in the passenger car, and it is a source of a great deal of expense to keep the plush clean. Plain leather or imitation leather—some of our very best cars, some of our sleeping cars, are using leather, especially in the smoking rooms, etc. We have it in our own homes, and it certainly, in the long run, is cheaper and very much easier to maintain. It can be sponged off with a mild solution of soap and water to purify and cleanse it, and why should we have plush on the interior of a car anywhere? It is a useless expense and a very difficult thing to keep clean. There are a great many other things, especially the dining cars, as Mr. Gohen spoke of. It seems to me we ought to be in favor of simplicity in every respect. A great amount of expense could be saved, the cars would be neater, cleaner and look equally as well, too. I think the tendency is towards simplicity in construction of cars. The Pullman people are doing away largely with carving, and doing away with a great many of the mouldings that are simply dirt-catchers—nothing else—and they don't look as well as the more simple car.

In this matter of brass, I was surprised the other day on inquiring how much it was costing at one of our principal terminals per month to polish the brass work on the outside of the cars alone, and looking over the book to find it was costing between $300 and $400 a month to keep that brass shining. It is certainly a useless expense. I think we ought to go on record as being in favor of more simple construction in every respect in passenger cars.

Mr. Gohen: I want to emphasize a word or two of Mr. Butts' idea expressed about our homes. We are more simple in our homes than we were. It was my good luck some four or five years ago to be fortunate enough to be able to build me a little house in the city of Indianapolis, and I specified in the construction that in that house there was to be no beading or moulding anywhere upon the inside. I had just as plain a house as anybody ever saw, and it was just as neat, and if my little good woman was here she could tell you how much easier it was to keep that house clean than the ordinary house of these modern times. I believe in practicing what I have preached. I have been preaching simplicity for the inside of cars, and I practiced it when I went to build my own home.

Mr. Warlick: We have several cars on our road with brass handrails, on our observation ends, and I do not think there is anything prettier than to see a car going out on the rear end of a train with all the brass work polished up. If you go to work and paint those, they will never look right; they would look like a man with a dress suit and a pair of boots that had never been shined. As far as simplicity is concerned in the interior of cars, I think it is a very good thing. I think they are much easier to take care of, and as far as the plush is concerned, I think they ought to try and adopt something else, instead of plush, because it is a hard thing to take care of it—it is never clean. From a sanitary point of view, I think they ought to adopt something else.

Mr. Copp: Some two or three years ago our general foreman, who was located at Boston, and who died last year, by the way, and who had the matter of car-cleaning, renovation, etc., in his charge, urged the matter upon the management of abolishing all brass upon the vestibuled cars; it was such a trouble and expense to maintain it, but the management were not ready to yield to that at that time. A compromise was made, however, and some of the brass was taken off and iron substituted and painted. I do not like to bring any discredit on the morality of Massachusetts, but it is a well known fact that anything of a brass nature that is not fastened to a car down there gets appropriated by somebody and stolen.

Mr. Gohen: The same out in our country.

Mr. Copp: In fact, the brass brake wheels in the vestibules of a car were stolen and I suppose sold to a junk-dealer. So there were iron brake wheels substituted, and some other things—I think iron disconnecting levers, etc., but they wished to maintain the polished brass on the steps and hand-rails and they have so far, but I think that if brass had been abolished on the engines, as it has for a number of years, you know, I cannot see why it cannot be as well dispensed with on the cars, for my part, and economy introduced there, as well as upon the engine. Brother Warlick has spoken about the beauty of a car going out with polished brass. That is so; it does look nice, but a good many things look nice—an engine looks nice with polished brass, if it is kept polished, but as that was long ago abolished, I think polished brass could just as well be abolished on the cars and painted work sustituted. Of course they may say that is none of the painter's business, but at the same time I think as long as the matter is up, it ought to be urged.

Mr. Butts: I want to say one word in favor of linen covering for the upholstering of the interior of the passenger car. It seems to me that would be an excellent thing. It seems to me it could be upholstered in the proper manner, instead of putting on plush—a linen cover could be placed over that, and could be removed and cleansed the same as bedding in a sleeper. I certainly think anybody—the most fastidious person in the country—going into a sleeper and seeing a nice clean pattern of linen, would feel they were in a place that was acceptable in every respect, both as to looks and cleanliness. I think it would be an excellent thing.

Mr. Warlick: In response to Mr. Butts' remarks, I will say we have a great many chair cars on our system; also parlor cars, and we use linen covers on all those cars, and at the end of every trip, clean linen is applied.

Mr. Gohen: Why not abolish it all and put leather in? You go into the finest homes in the country to-day and find easy chairs, settees or lounges upholstered in leather. It does not cost any more than plush. If it did cost a little bit more in the initial movement, it would not cost more in the long run, and leather is more sanitary than plush or any fabric of that kind. Why not abolish it altogether? I see the Pullman people are using leather now on seats of smokers and parlor cars, and for a good many lounges. Why not take it out of the coach? That is what we want to do—we want to see leather.

Mr. Forbes: Another thing that costs us is nickel plating in the lavatories, water-closets, etc. I would like to have Mr. Gohen's opinion on that.

Mr. Gohen: That would be all right. I believe when it comes to anything that pertains to sanitation, we should have that looking decent and respectable. Marble or nickel or something of that kind should be provided. Nickel is easier maintained than marble, and it would not do to discard anything like that. That is all right. You have got to draw the line somewhere. I do not believe in being ultra altogether. That is a necessity. I would maintain something that would be respectable, as far as the lavatories and water tanks are concerned. That would be all right.

Mr. Brown: My brother Copp called to my mind the matter of purloining brake wheels and such things as that—

President Cook: You are not the man, are you? (Laughter.)

Mr. Brown: That is for some one else to say. But on the New Haven road we had several cars built by the Pullman people and those levers, etc., were brass, and they used to purloin them. We got some iron ones and bronzed them and they purloined them just the same, but didn't get as much money for them.

In regard to the maintenance of the interior of cars Brother Copp also made a remark concerning cars receiving some twenty-odd coats of varnish in the space of so many years. I will tell you a little experience I practiced in my own home. In the new cars we had built there was no varnish put on the interior of the car above the window stools for a number of years—eleven years. After they had been running two years it was washed off with a solution of castile soap, but the varnish did not wear off and it was in fairly good condition. In two years more that was rubbed with oil and pumice stone and left a semi-gloss, not a real polish or dead finish, and that car was treated practically on those lines for eleven years without another coat of varnish being put on. So there was no accumulation of varnish there. It did not demand the varnish remover in those days—that treatment. In regard to the maintenance of the interior of cars, gentlemen, that work has been done and I do not see any reason why it could not be practiced in years to come. Eleven years without any more varnish below the window stools! It was not necessary to put anything on it.

Mr. Hengeveld: I fully agree with Mr. Gohen in reference to the plainness of cars. We recently received some new cars and there is no moulding of any character in them at all, and it is a great deal easier to clean them.

Mr. Gohen: Mr. Brown spoke about his method of treating the inside of cars. Now, that was applicable to the paper and that is all in order and I was very glad he spoke of it. That is our practice, Mr. Brown, we do not varnish the cars inside every time they come in, and I think it is a mistake to do so. You take a house and varnish it well on the inside and it will last from ten, or twelve, to fifteen years without revarnishing, but, of course, where the surface is marred it has to be removed and scraped or whatever is necessary. We have some cars that have been running for eight or ten years that have not received a pint of varnish on the inside. I will say to you, gentlemen, that one thing you should look to, simply because you get your car to revarnish on the outside, it is not necessary for you to varnish the inside of that car every time. You are not required to turn that car out with a high gloss. Treat it as Mr. Brown says he treats his. That is the way we treat ours. Give it an application of oil and renovate it or something like that, but do not apply high priced varnish. It is detrimental to apply too much—as much a detriment to apply too much as not enough. That is one thing in the treatment of your passenger cars that you should notice. Do not varnish them on the inside simply because you varnish them on the outside. Do not varnish them only when you have to. That is my principle.

Mr. Brown: Referring to Mr. Gohen's remarks about the interior of his house, Mr. Dane and Mr. Copp were at my home a short time ago. I showed them my little home—of course, I have a parlor. The woodwork painting was done by Mr. Pickford—he did the graining. That was shellacked some time ago, thirteen or fourteen years ago, and those gentlemen can tell you how it looks to-day, and Mr. Pickford did the graining.

Mr. Dane: I should say that it was in fine condition—first class.

President Cook: I have a communication from Mr. McMasters, from Sacramento, Cal., which I will read. I have Mr. McMasters' paper, which the secretary will read.

Acting Secretary Dane then read the following paper:

MR. MacMASTER'S PAPER.

In attempting to answer Question No. 4, namely, "What is the best construction of sand blast and method of operating same in preparing metal for painting," I am tempted to say, the best is one that will give you an uninterrupted flow of sand from 7 a. m. until 5 p. m., but fear that would hardly be satisfactory, so my experience will have to act as an answer to the question.

In the spring of 1902, while connected with an eastern road, I was called upon for an estimate cost of painting 1,000 80,000-capacity steel hopper bottom coal cars which were very badly rusted, particularly on the sides and upper part of ends.

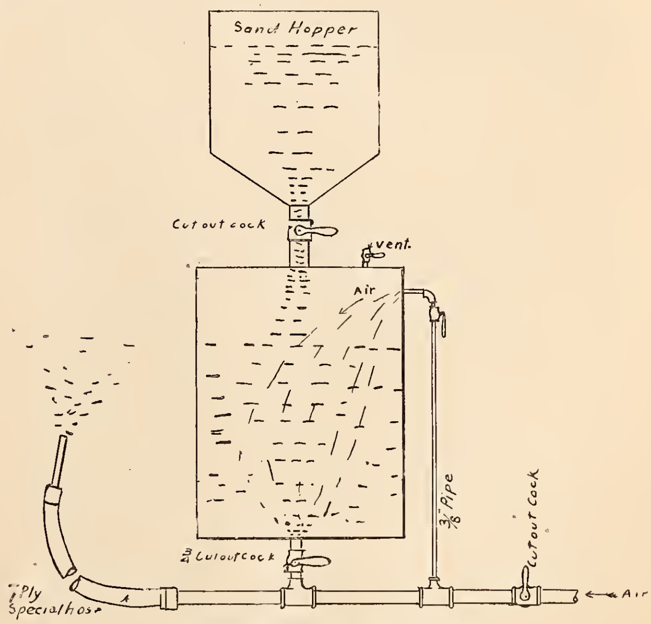
My first thought was, not as to the cost of painting, but as to how the cost of cleaning or preparing them for paint could be minimized. My next thought of course was the sand blast, but was it practical? While I knew it was practical to sand one locomotive tank in a day, I was not quite so sure about ten steel cars, which would be the number necessary to do each day in order to have them ready for the fall business.

We concluded the only way to find out was to rig up a temporary sand blast and experiment on a few cars, which we did, arriving at the conclusion that it was practicable, and would be a much more economical and satisfactory way of removing the rust, scale and old paint than by scraping or trying to remove it with wire brushes, providing we could get a sufficient supply of air and track facilities in a suitable location. This we did by going about one-quarter of a mile from the shops in an open space near a siding where the dust from the sand blast would interfere with no one, and we would not be interfered with by the switching of cars, etc.

Our first work was to lay two parallel tracks (about thirty feet apart) 800 feet in length, or long enough to hold twenty cars comfortably. One of them, which we will call No. 1, was a gravity track.

We then arranged for our air by having an old locomotive boiler and an air compresser set near the head or upper end of track No. 1, and running an air line between the tracks to the lower end, with convenient connections. With this arrangement we were supplied with air at a pressure of 70 to 80 lbs. at all times.

Ten car lengths from the head of track No. 1 we built a 40-foot platform on each side of the track about three feet high and five feet wide. On each of these was placed a stationary sand blast. By doing this we were able to work two men on the car at the same time, each man sanding one side and end, and not interfering with one another. Inside of car was not sanded.



CONSTRUCTION OF SAND BLAST.

An old box car was set off by the side of one of these platforms, which was used for storing the sand, which was purchased in two car load lots, and was unloaded after 6:00 o'clock at night, so as not to interfere with the work of the day. The men who did the sanding protected their eyes by wearing a light canvas hood with a glass about 2x4 in the front of it. Before work was commenced on the cars the journal boxes and air brake parts that might be affected by the dust were covered with canvas hoods made for that purpose.

Each evening ten cars were set in on track No. 1, the first car in stopped between the sand blasts ready for business at 7:00 a. m., the engineer having come on at 6:00 o'clock and had a sufficient supply of air ready. As each car was sanded it was given a shove and dropped down to the lower end of the track, the dust and loose sand blown off and immediately painted with the spraying machine. In this manner ten cars per day were sanded and sprayed on track No. 1. During the following night these ten cars were shifted to track No. 2 (which held 20 cars), and were second coated next day, and the following night moved along again to make room for the ten following, and the following day they were stenciled. In this manner, after we got started, ten cars were completed each day.

I am attaching herewith a blue print showing construction of the sand blast we used. (The accompanying cut is a reproduction of the blue print.) It is very simple and gave us very little trouble considering the amount of sand that passed through it.

The pipes and nozzles had to be renewed occasionally.

The nozzle used was simply a straight piece of half-inch iron pipe about 24 inches in length. Our greatest source of trouble was in getting hose that would stand the sand, and our breakdowns were frequent until we finally got a special 7-ply hose, when our troubles practically ceased. I am also sending a piece of this hose for exhibition, which was used in sanding one-half of 192 cars before a break in it occurred.

Our sand cost, including labor of unloading, an average of 27½ cents per sanded car. We found there was no economy in trying to re-use the sand.

I do not know that our construction of a sand blast, nor that our method of operating same was the best, but I do know we got excellent results at a remarkably low cost, and I am informed that the cars so treated are wearing remarkably well. Respectfully submitted,

H. G. MacMasters,
Foreman Painter, Southern Pacific Co.,
Sacramento, Calif.

President Cook: I will take this opportunity of making the announcement that I was requested to make. As you know from the program of entertainment, there is a dinner to-day at the Inlet. The 'busses conveying the members and their ladies will leave the hotel at 12:45. Any one preferring to walk must leave fifteen minutes earlier. We will now listen to the report of the Committee on Steel Cars. Mr. Miller, you are the chairman of that committee. You remember, gentlemen, this committee was appointed yesterday to prepare a report condensing the discussion.

Mr. Miller: I will state that the committee drafted a report which, if the assocation sees fit, can be adopted and entered upon the minutes as part of the proceedings of this meeting.

Mr. Miller then read the report of the committee as follows:

REPORT OF SPECIAL COMMITTEE ON STEEL CARS.

It is the sense of this association that, in the construction and painting of steel cars, the following points are of vital importance to their preservation:

First. All flash or mill scale, rust, oil, grease and dirt should be entirely removed from all parts entering into the construction of cars, before any paint is applied. We believe that this can be best accomplished by the use of the sand blast.

Second. During construction, all overlapping joints, wherever metal is placed upon metal, should be thoroughly coated with a heavy mixture of moisture repelling paint.

Third. The initial painting, being of the greatest importance, should be done in the best possible manner. The first coat should be applied immediately after metal has been sand blasted and before the cleaned surface can accumulate rust.

The material should be of an elastic nature and sufficient time should be allowed between coats for drying. It should be put on evenly in a workmanlike manner.

Fourth. We believe that not less than three coats should be applied to all exterior parts of body, including underframing, and two coats on interior of body; also all parts of trucks except wheels and axles.

Fifth. We recommend a rigid inspection of the cleaning and painting of cars under construction by competent, practical men, believing this in the line of economy.

Sixth. We would suggest that the abuse of cars in service be stopped by discontinuing the loading of hot slag, billets, etc. Also that the hammering of side sheets and other injurious methods used to facilitate unloading be discouraged.

Seventh. In the repainting of cars, all corrosion and loose paint should be removed with steel scrapers and wire brushes or the sand blast, and not less than two coats of an elastic preservative coating applied to all cleaned parts.

As the greatest loss from corrosion is found on the interior parts of coal carrying cars, we would consider the matter of painting those parts worthy of serious consideration.

B. E. Miller,
J. D. Wright,
J. W. F Lanfersiek,
Committee.

President Cook: What is to be done with that report, gentlemen?

M.r Gohen: There is only one suggestion I have to make and that is where you say "sufficient time should be allowed to elapse between the coatings." I think we ought to specify the time, and say that not more than one coat a day shall be applied. Would you think that would be right, Mr. Miller?

Mr. Miller: I do not think that a paint, of which two coats could be applied on the same day, could be termed "an elastic coating." We specify an elastic coating. Just wait until I read back: "The material shall be of an elastic nature, and sufficient time should be allowed between coats to dry. It should be put on evenly and in a workmanlike manner."

Mr. Gohen: That is right. You know what you mean to do and I know, but if you say to the car companies that you must allow twenty-four hours to elapse between coatings, then they will not put anything in which is not elastic.

Mr. Weis: I think it should be specified that a color would be used that will require a certain length of time to dry—that won't dry within twenty-four hours.

Mr. Wright: In these progressive days we do not know but that some coating will be found within the next six months that will dry in two hours, and I believe we considered that; in fact, we discussed whether it would not be advisable to put in "and not more than one coat to be applied in each twenty-four hours." We considered it would be best as we arranged it. The paint manufacturers are all working hard to secure a satisfactory preservative coating for steel, because the use of steel is growing fast and their business seems to lie in that direction; no one knows what will be accomplished within the next year on that line.

Mr. Gohen: I withdraw the objection I made to the report.

Mr. Butts: I do not think the word "elastic" is quite sufficient. I do not believe it is possible to put on any coat with any oil whatever—I don't care what the proportion is—that is not within the range of an elastic paint. The tendency of all manufacturing concerns is to get a drying paint. They could conform to that section by putting on two coats a day, and they could take the ground and argue that they had used an elastic coating. I think we ought to be more specific as to the amount of time required for the coat to dry. We ought to at least specify twenty-four hours. The greatest trouble in the painting of steel cars is that matter of painting them too quick. We want to make it positive that we are opposed to that thing if they expect durability.

Mr. Warlick: I think we ought to use the words "durable paint" instead of "elastic," because I think there is a paint on the market called "Elastic Coating," and possibly they may take advantage of this and use that.

Mr. Keil: I move that the report of the committee be accepted and that they receive the thanks of this association for their able paper, and that it be incorporated in the minutes of the meeting.

Motion seconded.

Mr. Wright: I was going to ask for permission to have the paragraph re-read regarding the inspection, which would answer, I think, Mr. Butts' objection.

Mr. Miller: (Reading) "Five: We recommend a rigid inspection, cleaning and painting of cars under inspection by a competent, practical man, believing this is on the line of economy." I believe that is a very good paragraph.

Mr. Butts: If that inspection were done by a practical man, of course he would not allow a coating to go on that would dry in less than twenty-four hours.

President Cook: I think you will find, gentlemen, that it is pretty hard to get ahead of that committee. It has been moved and seconded that the report of the committee be accepted, entered upon the minutes of the meeting, and that a vote of thanks be tendered the committee for their able report. All in favor of the motion will show their consent by saying "aye." The ayes have it and it is so ordered.

I believe the committee appointed yesterday on locomotive front-ends is ready to make a report. We will now listen to that.

Mr. Wright, chairman of the committee, here reads the report, as follows:

REPORT OF COMMITTEE ON FRONT ENDS.

The committee appointed to prepare a motion on Subject No. 3 have to report as follows:

It is the sense of this association that the treatment of locomotive front ends should be in a general way, as follows:

(1) The old material should be entirely removed from the

front end and stack by scraping, or otherwise, whenever a locomotive receives classified repairs.

(2) We believe the best results are secured from the thinest coating that can be applied.

(3) The material used should be able to withstand intense heat, and one which gradually burns off and is at all times easily removed is more desirable than an article which burns and cakes on the surface.

(4) Good results can be secured from the careful use of some of the ordinary paint materials in stock; also by the use of some of the articles which are prepared especially for the purpose, but we believe they all require careful application and efficient supervision.

(5) On many railroads the total annual cost of maintaining the paint on front ends is a large percentage of the total cost of painting locomotives. For this reason we would suggest that it might be in the line of economy to extend the jacket over the smoke box.

(Signed) J. D. Wright,
E. R. Clare,
A. F. Dane.

Mr. Pitard: Mention was made, or a suggestion, that a material be used that would stand intense heat. I would like that committee to tell us what will stand intense heat. (No response.)

Mr. Rodabaugh: I move the adoption of the report as read and that it be spread upon the minutes.

The motion was seconded and carried.

President Cook: The next topic is No. 7—"Passenger Car Roofs: Treatment and Attention of Same." The first paper is by Mr. T. J. Hutchinson, G. T. Railway, London, Ont., who is not present, but has mailed his paper with a letter, which I will ask the secretary to read.

Acting Secretary Dane read the letter and paper from Mr. Hutchinson, as follows:

MR. HUTCHINSON'S PAPER.

I accepted the invitation of the Advisory Committee to prepare a paper on Subject No. 7, "Passenger Car Roofs, Treatment and Attention of Same," for two reasons—viz.: First, because as a member I considered it my duty to aid this association in any way that I could; and secondly, because I had been making some experiments and tests along this line for the past two years that I felt might result in some improvement over present methods in doing this work. But having spent my vacation time this year at St. Louis, I regret very much that I cannot be with you at Atlantic City, to have the honor and pleasure of personally explaining to the convention the several tests that I have made, both as to color, method and the necessary care for the future of the canvas covered car roof. In order not to disappoint your committeee, and to get this in the hands of the secretary in time, I am now hastily writing this, I might say at the eleventh hour; therefore, I am obliged to be brief, and will, as it were, outline only here, for your consideration at this time, the result of my experiments and tests.

I believe the principal difficulties we have to contend with under present methods in our roof painting are caused through the use of hard drying oil colors and over-loading with the same in after coating.

This question is one that was discussed at the Boston convention, and at that time I referred to the method employed by the ship builders and sailors as likely to be the most reliable to follow; but having advised at that time against the use of oil as much as possible, you will understand that I did not consider it a perfect method by any means.

Linseed oil, generally considered, is the life of the most durable job of painting properly applied on wood surfaces, but proves when used, without doubt, the certain destruction, in a comparatively short time, of the canvas covered roof. For this reason, I believe, being exposed to extremes of temperature, heat and cold, this color soon dries bone hard, and being, as a rule, overloaded with surface color, that through constant contraction and expansion soon cracks through to the canvas, which having absorbed all the oil in the first coats, and from the excessive pent-up heat in summer has drived very hard, rotting the canvas, which then easily breaks, admitting rain to damage the wood and veneered lining. For proof of this judgment see samples submitted and marked No. 1, having been bedded in keg lead paste; Nos. 2, 3 and 4, the other samples, surface coated only, and oil color used on all. For the improved color test see herewith sample board for date, etc.

It is said, and I do no doubt the truth of the statement, that the life of the canvas covered car roof is only one-half of that of the ship's cabin roof, though covered and painted in precisely the same way, continual strain and movement of the car roof being against it in service. If this be true, naturally any improvement must first be looked for from those most concerned. Hence the importance of this subject to railway men at this time.

For the above reasons it occurred to me that something must be substituted in place of the oil that would act as a preservative to the canvas, at the same time dry, and when incorporated with keg lead in proper proportions would prevent it hardening and remain pliable. This would be necessary particularly for under and finishing coats on all new work.

All are aware of the value of beeswax as a preservative in the painter's line. I need not specify. It is also used for carriage top dressing, by shoe and clothing manufacturers, and in many other ways where pliability is required. Therefore, in order to overcome the aforementioned difficulties I have incorporated or melted the wax with turpentine in a water bath and added while hot to the lead paste, using same for thinning for finishing coats. The sample test has been exposed two years, southern exposure, and from which all may be able to judge as to any improvement over present methods. The color should be prepared for this purpose by a manufacturer.

P. S.—The care of the canvas covered roof is an important matter and should be looked after closely, and the painting done by skilled brush hands only.

I also believe, when cars are shopped for repainting that it would be economy to wash all canvas roofs, and when necessary repaint with a thin coat of specially prepared color.

Fraternally yours,
T. J. Hutchinson.

President Cook: The next paper is by Mr. Copp.

Mr. Copp read his paper as follows:

MR. COPP'S PAPER.

Asked to prepare a paper on the above subject, I take it that the Advisory Committee had in mind the tin roof. At any rate, that is all I have had any experience with worth relating, excepting a few electric cars at Concord and Portsmouth in recent years. And here let me say at the outset that the tin car roof is a nuisance that I hope to live long enough to see abated.

Judging from the amount of old dismantled, rusted-out, scrap tin-roofing that I see carted out of the shops almost daily, of which there are now three large car loads standing in the yard near where I write this, waiting to be taken to the dump, I think it must in the long run be an expensive roof to maintain from the car builder's standpoint. It is ever rusting out, and at points least expected, unless protected with paint; and it is a constant perplexity to keep it covered with paint, especially when the cars get old and the under coats of paint become non-adhesive and brittle by age. What painter has not been blamed for the peeling of a tin roof but just out of the shop, newly painted, in this climate in winter by some one in office or out who does not know any better? If they only knew what they ought to know they would know that anybody's paint, however well applied next to the tin will, in the course of years, lose its adhesion by the oil becoming absorbed by the atmosphere; and then, as successive coats are applied over it, the bad matter becomes worse until, after a new coat of paint is applied in a warm shop and is dry, the car is shifted out into an atmosphere at zero or below, when lo! a contraction takes place suddenly, and rip goes the paint, and the wind gets under it and blows it off in patches, perhap, before the car gets away on the road and likely after, and then from down the line comes back words about it not flattering to the painter, who is as innocent of blame in this matter as an angel. The fact is, if the car had been sent out without the roof being newly painted, nothing of the kind would have happened; it was the fresh coat of paint applied in the warm shop that, with the sudden contraction, did the trick. And here let me repeat what I have elsewhere said so often. Do not take any stock in the fellow, or his paint, who comes around bending pieces of tin painted with his wonderfully elastic paint, demonstrating in this way that because it does not crack and flake off it is the very thing to be used and all others discarded! When will the verdant ever learn that that test does not amount to a hurrah in Tophet—that any freshly applied oil paint or varnish paint will act that way? Tell your man to come around in fifteen or twenty years after its first coat has been applied to tin and has had occasional coats thereafter and has been exposed to the weather all the time, instead of being carried around in his handbag, and bend the tin, and you will listen to his story.

Now, my experience is that as long as a tin roof is used there will be trouble of his kind. To paint a new roof it is good practice to clean off the tinsmith's soldering acid and apply two coats of good oxide of iron paint, mixed with pure raw linseed oil, with the requisite drier; and then occasionally when needed, as the cars are shopped for varnishing, give them another coat of the same. But if they could go without painting every other year or two, it would be all the better. Still, we have some parts exposed to the cutting effects of cinders that will need a touch each year.

I am in favor of a roof paint about the color the roof gets by smoke after running a year, and I know of nothing better suited to this end than the best quality of graphite obtainable, or a paint largely composed of it. Then the roof would not need painting annually to make it look "new" with the varnished car. After the deck is varnished or enameled, the roof might be rubbed up with an oil cleaner, if it is desired that it should look fresher than it otherwise would. One thing is certain: our car roofs are painted to death by being painted each year, rather than dying in any other way.

The tin roof, once flaking and peeling, may, however, be successfully treated and repainted as good as new by beating it with a flat hoop-iron or other successful beater, as one would beat a carpet. This should be done while the roof is cool, the colder the better, and the paint, which is then brittle and nonadhesive, will fly off clean to the tin like so many chips. Then the tinsmith may look it over with solder, and when newly painted it is good for a term of years without farther trouble of this character. This is the remedy, and if the painter does not apply it when needed then the fault is his.

I am of the opinion, however, that the canvas roof, rightly applied, is the best for passenger equipment, and when properly painted a natural graphite color it need not be repainted each year of shopping, if the cleaners will be careful in cleaning the clere story, or monitor, so as not to daubt it with pumice stone or streak the side roof with cleaning compounds, but may run several years before painting, and thus avoid the cracking incidental to a roof being overloaded with paint each year. What a saving of time and material this would bring about! This is not in the interest of the paint dealer, but it is of the railroads. About $1.50 to $2 per car might be saved annually in this way, or say $3,000 or $4,000 to a road of a passenger equipment of about 1,500 cars, to say nothing of a better condition of the roofs themselves. These things are worth taking time to look into and throw our prejudice aside and see what can be done for the betterment of the service, and have good, sound-looking roofs, with no bare spots the size of the hand, from which the paint is flaked, glaring at us wherever we go.

Respectfully submitted,

Charles E. Copp,

General Foreman Painter, B. & M. R. R. Car Dept.

President Cook: The third and last paper is by W. J. Russell, G. R. & I., Grand Rapids, Mich.

Secretary Dane then read the paper as follows:

MR. RUSSELL'S PAPER.

The subject assigned me is a very important one, as it is as high as a car painter gets (the roof), "Passenger Car Roofs, Treatment and Attention of the Same." There are many kinds of material used in making the passenger car roof, but the principal ones are canvas, tin and steel, galvanized. The worst one from a painter's standpoint is the galvanized steel, as six years is about the life of paint on this kind of roof; but there is no limit to the other two. I treat the canvas roof to one coat of thin paint—or stain, it looks like, when applied—consisting of boiled oil and a little oxide of iron paint, putting on from seven to twelve gallons the first coat, according to the length of the car. Let this stand two or three days, or longer if you have the time; then apply the second coat of boiled oil and oxide of iron thick, to fill up and make smooth, and when dry a third coat, same as the second coat. This will last until the car comes to shop for general repair, then two coats of ordinary thick paint each time; and I have not experienced any bad results from this treatment, and roof lasts life of car. But on tin roofs I use a little asphaltum and oil with my oxide paint, as the asphaltum contracts the same as the tin with heat and cold; and I have not had to coat this roof again until the car is shopped for repairs. The steel roof I simply treat the same as the tin roof, and trust to luck. I have used graphite and other materials for roofs, but my objection to them is that you do not get enough on in the same number of coats to last until car comes to shop again.

Yours truly,

W. J. Russell.

President Cook: I am now going to announce the names of the cities selected by the committee for the next place of meeting, which are: St. Louis, Cleveland, Indianapolis and Niagara Falls.

I would suggest that we now have the report of the committee on uniform stenciling. I think Mr. Gohen is ready with his report.

Mr. Gohen: Mr. President, the committee on uniform stenciling finally got together in Buffalo, Mr. Butts, Mr. Miller and myself, some time in May. We submitted our recommendations to the Master Car Builders' Association and I regret very much that I did not bring a copy of our suggestions to the convention, but as the matter is now in the hands of the M. C. B. A. and will be acted upon by them at their next meeting, I presume it was not altogether necessaray to do that. As far as I can recollect, we suggested that they confine the stenciling of all cars to an eight or nine-inch Roman letter and a three or four-inch figure for the doors and ends, but Mr. Miller probably will be more conversant with that than I am just now, as they had the matter up by letter, and Mr. Miller and Mr. Butts went to Saratoga, to the M. C. B. convention, and submitted this report to them. Since the adjournment of the M. C. B. convention I received a letter from Mr. Buker, a master car builder of the Illinois Central R. R., in which he said he was very much impressed with the idea of uniform stenciling of railway cars; that he thought it would be a very good thing, as our committee had suggested we would furnish them with blue prints of the letters so that there would be uniformity in the style of letter and making of the letter and number, he said he would like to have us furnish him blue prints. I wrote and told him we had not got that far along yet, but as soon as the M. C. B. had decided what they wanted and if they wanted us to get up blue prints later we would be very glad to do so and send them. I will call on Mr. Miller and Mr. Butts to tell further what happened at Saratoga.

Mr. Miller: The report of Chairman Gohen covers about everything that is worthy of report. Mr. Butts and myself, at Saratoga, tried to do a little missionary work with whomsoever we came in contact with and broached the subject to them. They seemed to be very favorably impressed and I have no doubt at their next meeting in June this thing will focus up and in a short time we will be on the right track towards uniform stenciling.

Mr. Butts: I cannot add anything of importance to what has already been said. I took a great deal of interest in the subject and have talked with a great many men who would likely be most interested in the M. C. B. Association who have to do with the stenciling of various classes of cars that we have to repair. I have not heard one adverse criticism to the idea of having a uniform standard of stenciling. I think it will go through unanimously when it is presented in proper form. We would like to have gotten it before them so that action could have been taken at this meeting but as it is their rule to refer all matters of that kind to committees, it was impossible to have it brought up at their last meeting, but it will be at their next convention and I have no doubt whatever but that it will be adopted and appreciated.

President Cook: We now have fifteen minutes and probably we can dispose of the next topic and leave the way clear for tomorrow. Tomorrow there will be an amendment to the constitution proposed which will probably take up considerable discussion, something which involves the future of our organization.

Mr. Ball: I was fortunately impressed with the reading of these three papers which are something similar in thought and advice. If in connection with the steel car subject that we discussed yesterday, instead of tin roofs, the steel car had been put in there why wouldn't that be one and the same thing? This tin roof is nothing more than iron tinned and when the tin is off it rusts. If the remarks are good for a tin roof they are good for the steel car, in my opinion. With regard to canvas, in addition to the consideration of the protection and durability of the painting of a canvas roof, I think that one very important point it is well to consider and that is the protection from burning from sparks. If you can get a paint that would be fireproof I think that is as important as any other point in the construction of a paint for canvas roofs. I am using an ordinary metallic paint and linseed oil. We apply two coats to the surface and do not paint the underneath part at all—just paint the outside surface with two coats and then we expect to give it one coat each time the car comes in for the annual repairs. We find that there does not seem to be any of the difficulty suggested in one of these papers in regard to the rotting of the canvas or anything of that kind, but we do find what is apparently the burning of holes through by sparks. I think we ought to look in that direction for a proper protection—get a fireproof paint.

Mr. Clark: We have both canvas and tin roofs and I think for the reason that Mr. Ball has just stated, the burning of the canvas, until a fireproof paint is made, will prevent the canvas roofs from being universally used. But with regard to tin roofs I would say we have had considerable trouble, some few years ago, and we solved that difficulty in this way: By using an ordinary metallic paint, with linseed oil, and taking one quart of our priming surfacer, No. 1 or A or whatever it is, and mixing that into sufficient of this paint for certain portions of the car roof where the paint never dries —that is, never hardens, never becomes brittle, and of course, we paint the roof every time the car comes into the shop. We have taken pieces of flakes from that roof that we could bend around the same as the paint man bends his piece of tin that we were speaking about, but this is solid flakes of paint and we had absolutely no difficulty since we used the primer. Of course, it is a little expensive mixed with boiled oil and metallic paint.

Mr. Copp: Inasmuch as Mr. Ball has associated tin car roofs and the steel car question together, I would like to mention something that I thought to mention when that subject was up for discussion yesterday. When I was on the test committee two years ago there was sent to me some graphite for testing by parties whom I never saw before and haven't seen since. It was a graphite electrically made at Niagara Falls, and I wish to call the attention of the association to it. if there is anybody who knows anything about it, I would like to know it myself. They sent me samples both mixed and dry and I exposed them to the weather amongst seven or eight other samples of sheet iron and they have been exposed to the weather twenty-three months, or nearly two years. I think they made a very good showing. This graphite is electrically made and is said to contain 90 per cent of carbon, which we all agree, I think, is the vital part of any graphite paint, and natural graphite is said to contain only about 40 per cent of carbon. I would like to call the attention of the members to these samples here. I will pass them around while you are resuming your discussion.

(Mr. Copp here exhibited the samples referred to.)

Mr. Gowe: In treating our roofs, I often spray it with sand, and I think it protects it from the sparks somewhat.

President Cook: Before we adjourn, I want to say that I have been greatly strengthened and helped in presiding over these sessions by the unusually good attendance of the members. It produces a good effect and it is as it should be, of course. I think I am justified in saying it has been above the average at this convention. Now, we have one other session. Let us do even better at that than we have done so far during this convention. Let us all try to get in promptly tomorrow morning.

I now adjourn the convention until 9:30 o'clock tomorrow morning. Whereupon the convention adjourned.

FOURTH DAY.

Friday, Sept. 16, 1904.

The convention was called to order by President Cook at 9:30 a. m.

President Cook: The next topic under consideration is No. 8—"Paint Shop, Records and Accounts." The first paper is by Mr. H. M. Butts. Mr. Butts does not seem to be present, and we will hear the next paper by C. A. Cook, P. B. & W. R. R,, Wilmington, Del.

President Cook then read his paper as follows:

PAINT SHOP RECORDS AND ACCOUNTS.

PAPER BY C. A. COOK.

Just four years ago, at the convention held in the city of Detroit, this same subject was a matter of discussion, and the papers presented at that time so thoroughly covered the ground that I am at a loss to add anything that would be interesting or intructive, either to myself or the association.

It does not seem to admit of much latitude for writing or discussion. It is impossible to declare for any set form or system of records and accounts, as conditions vary so broadly. Of course, it goes without saying that all foremen painters should and do keep some system of records and accounts in their departments. Some no doubt are more intricate and detailed than others, depending somewhat on existing conditions and somewhat on the more or less methodical make-up of the foreman painter. Some system of records and accounts made adaptable to the individual environment should be maintained, as it frequently proves of invaluable aid just at the right moment. Each one should at least record more particularly any item of work out of the ordinary routine, noting the character of the work and the conditions under which it was done. A record should be kept of all orders calling for specified work—when received, when finished, and the cost of labor and material. Notations should be made of the reception and application of any new or special material, upon what applied, when and under what conditions. In fact, a sort of diary of the almost daily happenings in the paint shop will be found to be indispensable at times to every foreman painter, who thus will be enabled to keep more closely in touch with the cost and character of the work of his department. It is from him that information will be sought in many cases which he reasonably thought would be readily obtained from the office files, and his ability to give the desired information is an evidence of his close attention to details.

Feeling that this practice is universal, and diversified to suit the multiplicity of conditions existing in the various ralroad paint shops, the writer of this paper does not see the utility of exploiting any specific method of "Paint Shop Records and Accounts."

Chas. A. Cook.

President Cook: The next paper is by Mr. Geo. Warlick, C., R. I. & P. Ry., Chicago, Ill.

Mr. Warlick then read his paper as follows:

SHOP RECORDS AND ACCOUNTS.

MR. WARLICK'S PAPER.

It is a pleasure and satisfaction to be called upon to address you at this time. The subject assigned to me, that of "Shop Records and Accounts," is one for which it is difficult to find material on which to base a very elaborate report.

Bookkeeping in a paint shop, as a general rule, is usually performed in some secluded spot or corner in the shop, on a desk generally used by the foreman in making orders for materials. This is not as it should be. A master painter should have an office and a regular set of books in which to keep record of the work performed in his department. The master car builder, the general storekeeper, the general foreman—in fact, all heads of departments—keep their records of work done; and if the master painter is to know what his department is costing, whether the expenses are increasing or decreasing, he should be able to collate all the information pertaining to the operation thereof.

My idea of a system of records for a paint shop is about as follows: First, there should be a day book, in which to keep a record of all locomotives, passenger cars, freight cars, etc., as they pass through the shop. In large shops separate books should be kept for the different departments. In this book the date of entrance into the shop, the kind of car, the nature of repairs needed, the kind of materials used, and any other items of interest.

Following this there should be a ledger, or record book, into which is transferred at the end of each month the amount of labor and material expended on each car. On the index pages of this ledger or record appear the numbers of the cars consecutively, and opposite each car number appears the number of the page in the record where a complete account is kept of the kind of repairs made on each car, the materials used and the shop where the repairs were made. By this record a person can see at a glance when any particular car was in shop, at what point on the system, and materials used, because it is made up from reports sent in every month from each shop, through the proper channels, and finally reaches the master painter's office, where it is posted in the record.

From this or a similar record a blue print is made in book form, each month, of all passenger cars, showing how long the car has been in service since last shopping. In this way we are enabled to keep in touch with the condition of the equipment, showing number of months each car has been in service and date of last shopping. A copy of this statement is furnished the several departments at the general offices. Cars are ordered for shopping, using this record as a basis to work from, taking into consideration the record as to condition of paint and varnish at last shopping of car.

I make a report of the condition of the car when in shop, and if I can get nine months or a year more wear I give it light repairs and make a record that that particular car should be burned off or resheathed at next shopping. It sometimes happens that a complaint reaches us that the paint on a certain car is in bad condition and needs shopping. Possibly the car has been out ten months. By reference to this record we find that that particular car was slated for burning or resheathing when it next reached the shop.

I have in my shop a bulletin board painted black, lined up and numbered, giving a number for each track in the coach and paint shop. Opposite each number is entered the number of the car, kind of repairs, date when car is ready for trimming and when the car is completed and ready for service. From this board a record is made in my day book, and at the end of the month transferred to the record book.

I keep a similar record book for all freight cars painted and all cars reweighed; also a record of all locomotives painted and kind of materials used.

I have a form hereto attached (which should be in book form), which should be adopted. I believe it would be a great help to the master painter, and others, who would or could get the consent of their superior for its adoption. It gives the different items that are done to the car, body and interior, when in shop, in one column; the next column shows whether whole or part; the date; labor and cost in hours, dollars and cents; materials, dollars and cents, and last, the materials used. In this way we are able to keep in touch with the actual cost of labor and material of each car from year to year.

The question of shop accounts are somewhat limited, therefore my paper will be very short, that form one of the parts that go to make this subject interesting.

Service card will be used by each shop employe to report his time as well as how employed. The cards will be made out for the workmen in each foreman's office, giving the name, number and date. On arrival at the shop, each man will procure his card, reporting his presence to the foreman at the same time, and will be assigned to some particular work, provided he has completed his work of the previous day. A new card will be supplied daily, whether the work of the previous day has been completed or not. If engaged on piece work not completed at the end of the preceding day, the card when turned in will be filed away in a case assigned to the man's number, and no rates added. When the work is completed, the workman will note the fact on the card, returning it to the foreman's office, where the price will be added to the final card and all cards forwarded to the shop clerk. When a workman is absent from duty, a card will be returned for him marked "Absent."

The men will be checked morning, noon and night by the time clerk, who will, for the purpose of aiding the checking of the cards, send to the department foreman lists of all men absent.

All service cards must be carefully inspected and certified by the gang foreman or by the foreman of the department. The service cards will be turned over to the timekeeper, who will record from them the wages earned by the various men, after which they will be re-assorted and labor charges to the various shop orders and disbursement accounts obtained from them, collection book being used in that connection.

Piece-work service card will be used by shop men working piece work.

Check sheet will be used at all shops for the purpose of checking the presence of the workmen. On arriving at the shop, the workman will report to the check clerk at the check window, and from him will procure at that time his service card for the day. The check clerk will, at the same time, check the arrival of the man on the check sheet, which will be preserved for use in case of question as to earnings.

Check roll will be used by the timekeeper to record from the service card the earnings of the various workmen during the month.

Material card will be used by departmnet foremen to obtain material from storehouse and from other departments when no work is required to be performed on the material by the other sub-departments. Its use will be restricted to items chargeable to a single account.

Requisition card will be used:

First—By heads of departments when ordering material to be procured through the purchasing agent.

A separate card will be used for each item, giving the stock account, and, when possible, a definite charge for the item ordered. If the final disposition of the material is now known, it will be marked "Charge to Stock."

The cards will then be sent direct to the storekeeper, who will arrange them to conform to the stock classification, prepare requisition, place on each card the requisition number and entry number, and then file the cards in a suitable case, the compartments of which are numbered corresponding to the stock account numbers on the requisition.

When the material ordered is received, the cards will be removed and the quantity or quantities placed thereon, with the date of receipt and price. The cards will then be sent to the foreman ordering the material, who, after inspection, will note on the card in the proper column the condition of the material received, affixing his initials in the proper column and returning the card to the storekeeper.

If the card contains a definite charge disposing of the material, it will be immediately forwarded to the shop clerk. If the material is for stock, a card will be kept by the storekeeper, to enable him, if occasion requires, to show the delivery of the material.

Second—This card will also be used for ordering material from other sub-departments on which these sub-departments must perform work, when this material is required for the execution of a shop order.

In this case the foreman charged with the completion of the shop order will issue a separate card for each item that may be required for the completion of the work, numbering consecutively at the top of the card, after the words "Requisition Card No. ——," the cards issued, and at the same time registering the cards in a book provided for that purpose.

The cards will then be distributed to the foremen interested, who, when they complete their part of the work, will enter on the cards the material supplied, making the same entry in the record book supplied for that purpose (the labor being returned through the service card).

The card or cards will, upon completion of the work, be returned to the foreman issuing them. He will make an inspection of the work, note its condition, and receipt for the same, returning the card to the foreman who did the work. He, in turn being thus advised of its satisfactory character, will forward the card to the storekeeper, who will add price and forward to the shop clerk.

When the foreman from whom the original shop order card was issued has fully completed the work called for, he will indorse upon such card the numbers of the cards he has issued to each sub-department that has contributed material, thus enabling the shop clerk to know when all of the cards have been returned and enabling him to readily trace any card not returned.

President Cook: We will now have Mr. Butts' paper.

PAPER BY H. M. BUTTS.

The importance of this subject when viewed in its relation to successful shop management to my mind has never been fully appreciated or completely understood; for the most part it is allowed to pass as a matter of routine, simply to show the amount of work performed and material used, but the proper keeping of the accounts should mean far more than this.

Herein is one of the strongest weapons imaginable to be used in defence of the foreman painter in any emergency or contingency which can arise in paint shop affairs. It is as important to him as the base of supplies and reinforcements in reserve are to the commander-in-chief of an advancing army. With it he can go forward with a feeling of security, confident of success; without it, he is liable to attack at any moment from both front and rear, with a good prospect of losing every little skirmish, for he is out in the open, without even the protection of a picket line.

The foreman painter should fortify himself with a complete record, so that his position may be impregnable against any attack from any source whatever; and not only so, but with the assistance which it will afford he will be enabled to make his department more efficient and more effective in every possible way.

The benefits to be derived from having a perfect system of keeping records are too numerous to be mentioned in a paper like this. Important as this subject certainly is, I am of the opinion that whatever any one may recommend as a system or practice for keeping records and accounts would be at once rejected by a large majority of the members of this association, for the reason that conditions are so radically different in the shops of the various railroads throughout the country. A system of accounting which would be a success in one shop might not do at all in another.

For instance, take a very large shop, where piece work is in vogue. Here it is necessary to have several departments, such as "Scrubbing and Cleaning," "Outside Body Work," "Inside Finishing," "Sash, Doors and Blinds," "Ornamental Work," etc.

Each of these departments must be organized so as to be independent in a measure, as far as accounting for the work done is concerned, and still be a part of and working in harmony with the whole.

Each individual department must necessarily have a foreman at its head, who is responsible for the work done in his department, and he in turn must answer to the general foreman in charge of the whole.

In a small shop the conditions are entirely different. Here it would be impossible to have an organization which would recognize the different departments. Instead of having a head for each department, one foreman is compelled to assume the oversight of the whole; consequently a different system of accounting will be necessary. Again, keeping accounts in the shop where piece work is the practice involves quite a different problem from the one where day work is

done. The successful accounting of piece work requires quite an elaborate and perfect system, which takes into consideration the price paid for each separate piece of work as well as the amount of time consumed in performing the same.

In the day-work shop this is not necessary; only the amount of time and material used as a whole is required. The accounting for material can always be easily arranged by the stock-keeper and does not require any complicated system of accounting. Whatever system is employed will have little or no effect upon the output of the shop.

Again, the manner of keeping the records depends largely upon how the work is handled. Some roads have a system of classification of paint shop repairs, dividing the work into three or more classes; other have only one or two, and some have none at all. Each different way involves a different method. Therefore, any arbitrary or set rule which might be laid down would necessarily be subjected to more or less modification wherever it might be applied. System, however, in keeping the records is indispensable, and the more perfect the system the better.

I will endeavor to very briefly outline a system which the writer has found to work successfully in large as well as small shops. It is to have the work divided into several classes, each class to be covered by a specification. When a car is presented at the shop for repairs, it should first be thoroughly inspected and the class of repairs determined upon. After this has been done a schedule should be made, noting each transaction separately, such as stripping, scrubbing, carpentering, priming, puttying, surface coating, rubbing, coloring, ornamenting, varnishing and trimming. Opposite each item should be placed the date upon which the work is to be performed.

This date, you will understand, is to be made up in advance of the work which is to be done, taking into account, of course, the time required for carpenters and other work. Copies of this schedule, when completed, should be furnished to the foreman of each of the other departments, which will enable them to be in touch and harmony with the painting department. It will show in advance just what is to be done and when it is supposed to be completed, as well as furnish valuable data from which a record for future reference can be compiled. With a daily record of this kind it is an easy matter for the foreman to be familiar with each item of work, and to know at a glance just how the work is progressing and when it will be finished, thus enabling him to avoid any unnecessary delays, and also to locate the cause of a delay and be able to apply the remedy at once.

By making a schedule of this kind in advance of all work performed it is possible for the foreman to gauge the number of cars which can be turned out in a given time with a given number of men with a great degree of accuracy. A system of this kind, when properly understood and handled, will largely increase the output of any shop over the "go as you please" plan of guessing at the time when a job will be completed.

The advantages to be gained by having a schedule made in advance of the actual performance of the work are more numerous than will really appeal to one who is not familiar with its workings. It not only furnishes a base for a complete record for future reference, but gives the painting department its proper standing with the other departments. When once the schedule is made up, it virtually becomes an agreement—a contract, if you please—which obligates each department to complete its work within a given time or answer to the powers that be for any delays.

How often does it occur in the shop where no given time is set for the completion of different kinds of work, that the painter is not allowed a sufficient amount of time to complete his part? The carpenter or some other department may neglect to perform their part at the proper time, but it does not appear, and if the job is delayed, the painter, being the last one to finish, must necessarily bear all the blame, and every one else goes scot free.

But once a schedule is made, each must do his part; the job must go through on time or the department which is responsible for the delay must take the blame. The job should go through from start to finish on schedule time, and the schedule should be adhered to as rigidly as the running of a train on the road. This scheme has long been tried, and is entirely practicable and may be carried out in any shop, large or small, provided it has the co-operation of the different departments and the indorsement of the general foreman in charge. It elevates the painter who makes the schedule from what is too often the lowest to the place of first importance, and makes him the main factor to be considered in getting the work out on time, and gives him the credit for his share in the output of the shop. It furnishes the strongest kind of an incentive to the heads of all departments to do their best to prevent delay and work in harmony together for a common end.

H. M. Butts,
M. C. & L. P., N. Y. C. & H. R. R.

President Cook: The topic is now open for discussion.

Mr. Miller: After listening to the reading of the very able papers, I believe little remains to be discussed. I move we pass on to the next subject.

The motion was seconded and carried.

President Cook: The next in order is "New Business." Is there anything to be presented to the convention? There seems to be no new business, so we will proceed to "Miscellaneous Business." We will now hear the report of the committee on resolutions.

Mr. Wright: The committee has prepared two resolutions, one of sympathy, the other of thanks.

REPORT OF COMMITTEE ON RESOLUTIONS.

Atlantic City, Sept. 16, 1904.

To the President and Members of the M. C. & L. P. Associaiton:

Gentlemen.—The committee on resolutions have to report as follows:

Whereas, Almighty God, in his all-wise Providence, has seen fit to remove from our midst Mr. E. J. Aubrey and Mr. G. H. Worrall, therefore be it resolved,

(1) That the sympathy of the Master Car and Locomotive Painters' Association be tendered to the families of the deceased members.

Furthermore, That a copy of this resolution be sent to the bereaved and that it be spread upon the minutes of this association.

Whereas, The proceedings of the thirty-fifth annual convention of the M. C. & L. P. Association have been highly profitable and enjoyable, we would express our appreciation of the efforts of all who have contributed to its success. Therefore, be it resolved,

(1) That the sincere thanks of the members be tendered to the officers of the association for their efficient services.

(2) Also to the members of the various committees and to those who prepared papers, for their valuable assistance.

(3) To the ladies, who have added greatly to our happiness by favoring us with their presence.

(4) To the supply men, particularly those on the entertainment committee, who have provided entertainment of so pleasant a character.

(5) To the management of the Hotel Rudolf for their endeavors in catering to our comfort.

(6) That the above be made a part of the records of the association.

J. D. Wright,
Sam'l. Brown,
Warner Bailey,
Committee.

Mr. Wright: Regarding Mr. McCracken's unfortunate accident, because he is not now on the books of the association, the committee thinks it well to have a resolution expressing the sympathy of the members made verbally to Mr. McCracken.

President Cook: Mr. Walbank requests me to make the announcement that if the members will keep in touch with him or any member of the committee, they will be provided with entertainment for today. There has been no set program or anything of that kind. For instance, those who remain over will be furnished tickets for the "Johnstown Flood," and I think there is some intention to take those who may remain over down on the steel pier, but if you will just keep in touch with Mr. Walbank, or some member of the committee, you will be informed of what is going on.

It was moved and seconded that the secretary be authorized to take the usual course regarding the proceedings of the convention, sending a copy to those members who are in good standing in the association, and that the Railway Master Mechanic be continued as the official organ of the association. Carried.

Mr. Brown: We have with us one new member, whom I have been associated with for a number of years. He came to work somewhat through my influence, I might say quite largely, and afterwards worked under my direction for a number of years. He is now in charge of the Readville plant of the N. Y., N. H. & H. R. R., and while he does not advertise himself to be a speechmaker, he says he has had so much joy and pleasure in attending his first convention that he

Lakewood's Opening.

The season at Lakewood, beginning gradually after October 1st, is in full swing a month later and extends to the first of June. Situated in the pine belt of New Jersey, Lakewood is noted for the warm and healthful atmosphere tinctured with the aromatic odor of the woods which renders its autumn and winter climate so delightful. Although nine miles from the ocean the climatic influence of the Gulf Stream is readily discernable, and a uniform stratum of beach sand which underlies the soil affords a perfect drain for the surface water so that dampness is never to be encountered. The character of the soil also makes the roads well adapted for horse-back riding which is one of the most popular of the many out-door recreations. The principal driveway girds the banks of Lake Carasaijo. A line of beautiful villas commands one side of the lake while on the other the forest is supreme, and throughout the entire drive one catches glimpses of enchanting stretches of water between the pines. The famous Cathedral Drive is a narrow path through the silence of the "druid wood." The excellent railroad service brings Lakewood within easy reach of New York so that the distance of sixty miles from the Metropolis is no more than a requisite insulation against the Wall Street atmosphere. An interesting booklet on Lakewood recently published by the Central Railroad of New Jersey may be had free of charge by applying to C. M. Burt, G. P. A., New Jersey Central, 143 Liberty Street, New York City.

FISHING IN BARNEGAT BAY.

Barnegat Bay is the largest inland body of water of the state of New Jersey, covering upwards of 300 square miles of surface. As a perfectly safe sailing, rowing, fishing and shooting water area, it has no equal in the North and no superior anywhere. The nerve center of operations in the fishing season is at Forked River, Waretown and Barnegat and the shooting season, at Harvey Cedars, both on the Central Railroad of New Jersey. Forked River has the largest number of cat boats, both with sails alone and with sails and motors, for rental with operators, at from $2 to $5 per day, directly on the edge of the best fishing ground. Harvey Cedars has the largest number of sneak boxes, decoys and stands for duck and geese shooting, at similar rates per day. There are plenty of all-the-year-around hotels at rates of $2 and $2.50 per day. All northern sea fishes and all water fowl are plentiful in their respective seasons. There are no licenses to be paid by non-residents. Naturally, weakfish are more sought for by the general fishing public, because they are more plentiful and easier caught than other species. For bait, shrimps and shedder crabs are best and may be had from baitmen at the various resorts. No special tackle is required and any pole with ten yards of line is sufficient. To catch weakfish, select a spot near where others are fishing, in channels at the edge of saltgrass areas.

To know of the Barnegat Bay region send 6c in stamps to C. M. Burt, General Passenger Agent, New Jersey Central, 143 Liberty Street, New York City, for Sea Shore Book.

would not feel right if he went home without thanking the members for whatever they have done towards rendering him pleasure, and permitting him to become one of us. I take great pleasure in introducing to you Mr. Pickford.

Mr. Pickford: Mr. President and members of the association: It gives me great pleasure to meet with you. It is the first time I have attended one of your conventions. I have been a long time getting here—thirty years—but I am here to stay with the rest of you. I am very pleased with the way I have been treated here, and very glad to hear the discussions on the different methods of doing work. There are lots of little things we think we know that we do not know at all, and we can learn from one another. I have been keeping in touch with you, reading your magazines for some time, and I know the different names, but I never met any of you before. I am a member of the New England R. R. club, we have up our way, but there is not so much talk about painting. The best paper I ever heard there was by Mr. Copp two or three years ago. The subject was "Economy in Car Painting," and I was very much pleased with the way he explained everything. It was so plain that a man did not have to be a practical car painter to understand it. He could have been a machinist, engineer or anything, and he could have understood everything about it. He made it so easy for any one to understand.

As Mr. Brown stated, I am no orator, but I felt as though I wanted to thank you all for the treatment which I have received from you, and I will endeavor to be with you now every year as long as I am in the business. (Applause.)

President Cook: Mr. Pickford, we quite appreciate your expression of good feeling towards the association, and I am sure we will appreciate your efforts to make it a still better organization than it was before.

Mr. Pickford: Of course being a stranger amongst you, I have not taken part in any of your discussions, but probably next year I may have a little more to say.

Mr. Rodabaugh: I have been frequently asked where we draw the line in membership, whether assistant foremen in shops could belong to the association, and also street car men. I was approached with that last week—about street car men. We have a very bright foreman in our city who is connected with the street car painting, foreman of it, and I have been frequently asked whether we could admit assistant foremen as members of the association. I have seen quite frequently some here, and I did not know whether they belonged to the association or not.

President Cook: There are quite a number of assistant foremen who are members of this association. If that is the case I see no reason why we should not take in still more. I myself was not quite positive whether that was the fact, but the secretary informs me there are quite a number of assistant foremen who are members of the association. I should imagine it took in street car men.

Mr. Rodabaugh: Could we not have a resolution to amend the by-law now, or have we got to give due notice?

President Cook: You have to give due notice, I believe. If we have been doing it I do not think we need take any action.

Mr. Rodabaugh: We have no right to take in any except foremen, and if they are evading the law, it is easier to evade a law than it is to obey it. I move that it read "Foremen and assistant foremen of shops and street car foremen."

Mr. Brown: That is acknowledged and always has been—that street car people are always eligible. It has been the custom.

Mr. Rodabaugh: Custom sometimes would make the law, but it does not make the law in our by-laws.

Mr. Brown: That is the law, and if it has been omitted it was unintentional.

President Cook: We elected a man yesterday who was foreman painter for the Philadelphia & Camden Ferry Company.

Mr. Magee: Does not our association cover all car painters—street, locomotive and electric? That takes in the whole business, doesn't it?

President Cook: It seems to me that the title of the association, Master Car and Locomotive Painters would include any motive power. It seems to me that would take in anything in that connection.

Mr. Magee: It is not confined to steam car painting. The electric car—trolley car painters of the United States at present are quite an item in the painting business. I should think it would take in all master car painters, street, electric or steam.

Mr. Warlick: I think the by-law in that section is broad enough to cover all those points.

Mr. Little: Inasmuch as we have been taking them in, I do not see why we should change our by-laws, and go to the expense of re-printing those little books. We have them, anyhow. They come in. It is all unnecessary, in my opinion.

Mr. Brown: John Hankey, a member of this organization, came in years ago. He is now, I am pleased to say, assistant to me, and I should dislike it very much if that man should be debarred from attending our conventions, or from being a member.

Mr. King: A man here is a street car painter in the Wilmington, Delaware, shops, and I have always understood that a street car painter could join this association. I have been negotiating with a foreman painter of a street car company in our section to join the association on the ground that the Wilmington, Delaware, shops had a representative here some years ago—quite an active member.

Mr. Bishop: The same subject was talked over a number of years ago at the convention, and it was decided at that time that the word "car" included all foreman car painters. Mr. Haley, of the Queen City Car Company, was taken in six years ago. At St. Paul, Minn., (we had a little talk of this kind), and he has been a member ever since and has attended every convention but this one.

President Cook: It has been moved and seconded that we admit to membership assistant foremen. We might have a vote on it, but as for the title, I do not think there is any necessity for changing it. Really I do not see the necessity of voting on the other, because we have members of that character.

Mr. Rodabaugh: I will withdraw the motion.

NEXT PLACE OF MEETING.

President Cook: We will now proceed to ballot for the next place of meeting. I will appoint as tellers Messrs. Nicoll and Orr.

It is open to announce any other city than suggesetd by the committee. You will remember the committee reported yesterday, Cleveland, Niagara Falls, Indianapolis and St. Louis. Those are the four cities suggested.

Mr. Butts: I have no personal preference in the matter whatever, but we have met for a great number of years and have never honored the delegates from Canada by holding a convention within their territory.

Mr. Ball: Eight or ten years ago we had one there.

Mr. Butts: I would like to nominate Toronto. I have been told by different ones that they have very excellent hotels, very reasonable rates can be made, and everything is favorable for holding a convention there. It is central in location, and I would like to see that name put with the rest and get an expression from the members here.

President Cook: If there are no objections, Toronto will be added.

Mr. Rodabaugh: We have been there once or twice.

Mr. Jones: I would suggest Montreal instead of Toronto. It is a great convention city; they have got fine accommodations there, and I would like very much for the members to come there and see our people there.

President Cook: We will include Montreal.

Mr. Bailey: I nominate Concord, N. H. (Laughter.)

Mr. Little: I do not care where the meeting is held. Cleveland is put on the list. It is a very good place to go to, but the hotel accommodations, I am told by traveling men, are not good to entertain a convention. There is really only one hotel there in which we could hold this convention, and I question whether you could get into that house. I went there and they were full on ordinary occasions. Traveling men tell me that the conditions are the same right along. That is quite a point to take into consideration in voting.

President Cook: Gentlemen, that is a very good consideration. If any one knows any legitimate objection to any of these cities that will bear weight, I think we ought to know it.

Mr. Butts: Mr. Brown, who represents the Painters' Magazine, who is interested in our affairs, and always has been, I would like to hear from as to the hotel accommodations in Toronto.

Mr. E. H. Brown (Painters' Magazine): The International Association of Master House Painters and Decorators held their last convention last February in Toronto. They made the King Edward Hotel their headquarters. It is one of the finest hotels on this continent, and they accommodated the convention, which included nearly 500, with the ladies and traveling men, without feeling it in any way. In fact, there was a big crowd besides, at the musical festival. The service in the hotel was prompt, everybody was well cared for, and it was the best hotel for handling a convention that I ever have been in—and I have been in a good many.

I will also say that at Montreal the Windsor Hotel accom-

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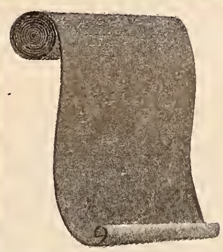

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modated the Canadian convention very nicely indeed this summer. That also is a very large and fine hotel. There is but little to choose between the two, except to judge which city is the most accessible.

Mr. Rodabaugh: My judgment would be that it ought to be central. You are going to have trouble in your attendance at your conventions if you do not make it somewhat central. You cannot go to the extreme west, but you must get it somewhere where the members can get to it and get transportation. There is not one-third who could get transportation to Toronto. Look at this convention. There is about one-half who have had to pay their fare to get here.

Mr. Beyer: I understand that if we do not get it more central there will be a split between the western and eastern members of the association. If we do that, we are "busted," and I favor sticking together and have it more central. I understand that the western men have it on foot to split the association and make a new association. I am not a western man myself, but I have been told that by good authority.

Mr. Ball: Is the report of the committee on locality ready?

President Cook: It was read yesterday.

Mr. Brown: I would respectfully suggest that if there is any gentleman here from the far west will designate some place of meeting, we will certainly put it on the list and try and get there.

Mr. Beyer: I think St. Louis and Indianapolis are both central enough.

Mr. Magee: I get up to speak for the electric car people. They do not furnish us transportation and we have got to get to our conventions the best way we can. As my friend said, if we can get it central, it makes it a great deal better for us. I believe there are quite a number of electric and street car people who are members of this association, and I think the steam car folks should take us into consideration on the place—that is, not to get too far west or too far east. Keep it as central as it can be done, in justice to all the members of the association.

President Cook: I think we can safely trust this association to do what is best for the majority of those concerned. We will of course give everything due and careful consideration. I do not think we need fear that anything will go wrong in that respect.

President Cook: We will now hear the report of the committee on next place of meeting.

Mr. Dane reads report as follows:

REPORT OF COMMITTEE ON NEXT MEETING.

President and Members of the M. C. & L. P. Association:

Your committee appointed to consider and recommend the next place of meeting, beg leave to submit the following places in the order named: First, St. Louis; second, Cleveland; third, Indianapolis; fourth, Niagara Falls.

In connection with this matter, we further recommend that steps be taken looking to the adoption of one permanent place of meeting at some central point, so situated that transportation facilities may be easily obtained by the majority of all the members.

F. L. Ball,
J. B. Shuttleworth,
J. H. Pitard,
Charles Clarke,
A. J. Bishop,
Committee.

Mr. Houser suggests that after the first ballot is taken, the two cities receiving the smallest vote be dropped, and the same be followed in the next ballot.

President Cook at this point referred humorously to his improvised gavel, whereupon Mr. Brown said:

Mr. Brown: If the association will accept it, I will be prepared to present them a gavel at the next convention. I will also state that it is made out of wood that came from Dewey's fighting ship, the Olympia (applause), and I hope it will be accepted.

President Cook: We will thank you in advance for a gavel of that character.

Secretary McKeon: I supposed that I had our gavel safe at home, but I have not seen it since we left Chicago. I think it was lost there.

Mr. Butts: There is a subject which I consider of serious importance to every member of this association which I wish to speak about, and that is the manner of publishing our proceedings, and the remarks made by individual members of this Association without their having a chance to revise those remarks before they are printed in our official proceedings. Often times we get up here and express ourselves huriedly and we are apt to say something we would like to have said a little different, although it might not change the meaning. We have been seriously criticised by railroad officials in this matter. You had two gentleman speak to you here, Mr. Brazier and Mr. Parish. Both of these gentlemen came to me and wanted to know if I could see to it that the Secretary would send them a copy of their remarks so that they might be able to revise them before they were published. Mr. Parish said, further, if it could not be done, he would not speak to the Association; it is that serious. I do not think it is fair to any member of this Association to publish every word he says in our official proceedings unless he chooses to have them published. I think we ought to authorize the Secretary to send a copy of all the remarks made here by every individual to him for revision. It is done by every other organization that I know anything about in railroad matters. It will involve some expense and some trouble, but it should be provided for and our official proceedings should be printed in a proper manner, as is done by every other association. If it is in order, I would make a motion that our Secretary be authorized to do that, and be paid for it.

Mr. Bishop: I will second that motion.

Mr. Bailey: We ought not only authorize, but instruct him to see that it is done. It has never been done, and I always thought it ought to be done.

Mr. Copp: Speaking for the publication part of it, the same rule applies this year as last year, when Mr. Gohen made a motion to cover the ground last year,—that this thing be done for the permanent bound volume only, and that the remarks go in, properly corrected, in the October number of the Railway Master Mechanic. To send these remarks to the individual members throughout the United States and Canada and get their corrected copy back for publication in the October number of the Railway Master Mechanic is simply an impossibility. Time would fail us. It is not a question of expense at all; it cannot be done. It can be done for the bound volume, which is not issued until somewhere along in February.

Mr. Butts: I agree with Mr. Copp that that is impossible, but I would like to ask whether it is of serious importance that the proceedings of this convention be published in October or not? Can they not appear in some other issue, just as well? Do we want to go before the world with remarks made here that we would not care to have published? I will cite you a little instance: One of our worthy members had a name similar to my own; his name is Putz and my name is Butts. At several conventions he has made remarks that were entirely contradictory to mine. In the proceedings Mr. Butts is put down as saying so and so and a little further along Mr. Butts is contradicted in every word he said, just because the names were confusing. I tell you our proceedings have been criticised seriously by railroad officials, and it is a very serious matter, and one that should be gotten around in some way. I think Mr. Copp could give way and publish the proceedings in a later issue, when they could be corrected.

President Cook: Before we go any further in this discussion, we will hear the report of the Tellers on the first ballot for the next place of meeting.

The first ballot resulted as follows:

Total number of votes cast, 69.

Necessary for a choice, 35.

St. Louis, 11; Cleveland, 25; Niagara Falls, 15; Montreal, 8; Toronto, 3; Indianapolis, 5; Buffalo, 1; Dayton, 1.

President Cook: We will drop Buffalo and Dayton, as they were not put in nomination; Indianapolis and Toronto received the smallest number of votes and are therefore dropped.

Mr. Pitard: Various other railroad organizations have demonstrated the wisdom of revising their proceedings before they are published, and I think the same applies to ours. Therefore, I make a motion that the editor of the official organ be instructed to defer publication of these proceedings until they can be revised.

The motion was seconded.

Mr. Ball: It occurs to me that the suggestion of Mr. Butts to send copies to each member would be rather a long-winded affair. Some of the members might forget to return them; you might not hear from them again. Why would it not be well to have a Committee on Revision, of say three persons appointed by the President, and let the proceedings be referred to them to revise? If they found anything specially objectionable in them, they could write to that member and get him to personally explain it to them. It seems to me that would be a simpler method.

Mr. Copp: The motion under discussion is to defer the publication of the proceedings in the official organ for October until such time as they can be corrected. Now, there is

no use to undertake to publish the proceedings at all in the Railway Master Mechanic unless it is done in the October number, for they would be stale. You might just as well make one publication and let it go at that in the bound volume of the proceedings, as usual—let it go entirely, but I am opposed to that plan for this reason: When our convention was held in Boston it was the sentiment of the Committee on Official Organ at that time that we should not publish the proceedings but once, and that in the bound volume, and that a running account of the convention be written up, illustrated by snap-shots, which was done, as you all know. But there was dissatisfaction over that; they would rather have the full proceedings put in; so we dropped that last year and the full proceedings were put in. We have come here this year with the same idea in view. We have got nothing else to put in the October number. Mr. Crandall brought no camera to make snap-shots, I have only made some very brief notes and would have to write up the entire convention from memory. Now, I suggest a way out of this: Last year Mr. Dane and myself went over the proceedings very carefully, editing them, and I suggest that we do the same this year. If you wish to name another man who is handy, Mr. Brown could act in that capacity in Boston, and I will undertake to mail copies of Mr. Brazier's and Mr. Parish's remarks to them for revision, and Mr. Butts, if he wishes it, but we cannot extend that very far. I will say there will be no conflict with Mr. Butts and Mr. Putz this year, because our venerable Mr. Putz is not here. I think we can straighten this matter out satisfactorily, and I will undertake to carefully revise the report. I sat up until past midnight last year doing it myself, and I will undertake to very carefully do it this year. I have been here throughout the convention, and I think I know who speaks on this and that question, and I will guarantee to give the report a careful editing personally, assisted by Mr. Dane, who is your Assistant Secretary, and, if you wish another member named, I would suggest Mr. Brown or someone handy in Boston.

The result of the second ballot on next place of meeting was at this point announced as follows:

Total number of votes cast, 66.

Necessary for a choice, 34.

St. Louis, 14; Cleveland, 32; Niagara, 13; Montreal, 7.

No choice.

Mr. Brown: I wish it distinctly understood that I am going with the majority every time. I want to now. I did not vote for Cleveland the first time, but wanted to get the sense of the meeting, but wherever the majority goes, I am going to try and get there.

Mr. Rodabaugh: I move we postpone indefinitely the former motion relative to the official proceedings.

The motion was duly seconded and carried.

The third ballot on next place of meeting was at this point announced as follows:

Total number of votes cast, 62.

Necessary for a choice, 33.

Cleveland, 50; St. Louis, 9; Niagara Falls, 3.

Mr. Brown: I move that Cleveland be made unanimous by this Association for next place of meeting.

The motion was duly seconded and carried.

NON-PAYMENT OF DUES.

Mr. Gohen: I have just a few words of perhaps a personal nature. The report of our Secretary and Treasurer as read at the beginning of our convention showed that there were a great many members who had been dropped for non-payment of dues. Now, I do not suppose there is a member in this hall to-day who knows whether I have paid my dues and whether I have been suspended for non-payment or not. I do not know who these people are who have been suspended. I do personally know that there are some people who have been suspended for non-payment of dues who have been coming to these conventions year after year and participating in the benefits, amusements and all that without contributing their mite to the entertainment fund or in any shape for the benefit of this Association. I recall very distinctly that at Chicago last year you and I and others—all of us who have been paying our dues—went down into our pockets and contributed one dollar extra, so that these men could come and enjoy the benefits of the Association. Now, Mr. President, I move that hereafter that rule in our by-laws be strictly adhered to, and that whenever any member fails to pay his dues, he be dropped from the list and a record be made in the proceedings of this Association, so that we will know, and our officers will know whether they are entitled to come here and participate in these conventions. I say it is no more than right and a matter of justice. Why should they keep coming here and participating in these proceedings if they are not entitled to? We might just as well go out on the boardwalk and ask a thousand strangers to come in here and commune with us and participate in our convention.

Mr. Bailey: I would like to have the pleasure of seconding that motion.

President Cook: Mr. Gohen's remarks are certainly pertinent. This thing has been going on for quite a while. I remember at Chicago I brought the matter up myself on these very same lines, and as Mr. Gohen said, many of us put our hands in our pockets and bore the expense, with other members. It is not right. I think Mr. Gohen's suggestion that the matter be published or announced to the convention is the very thing we need.

Mr. Bishop: The President knows that at every meeting, with the exception of the last one at Chicago, I rose to my feet and called attention to the fact that the Secretary was receiving dues; still there were members coming to the convention who did not pay their dues; in fact, I have discovered this while I sat here this morning.

Mr. Magee: I would suggest, to obviate the trouble, to appoint a sergeant-at-arms, or some man, whose duty it is to see that anyone who has not paid his dues and followed the laws of our constitution be ejected from the room, as they have no business here, or to participate in anything connected with the association. I do not see how you are going to get at it in any other way. You can pass all the motions you want here and still those people will come just the same. A man that has the nerve to come and participate in these things without a motion will come anyway.

Mr. Gohen: I want to say to the gentlemen that I do personally know, and I know whereof I speak, that there are today at Atlantic City one or more persons who are supposed to be members of this association who have not made their appearance in this room; still I saw them on the ball-room floor last night, saw them participatng in the dinner yesterday, and participating on every occasion and in all the festivities, but they did not come into the meeting room. That is what we want—compel them to come into the meeting room or keep away and not be recognized as a member of the association. They wear our badges and are entitled to everything we are entitled to. How can a sergeant-at-arms say to a man on the Boardwalk, "You have no business to go into the convention room?" He does not want to come in; he is ashamed. I am not ashamed to come in and I do not believe there is a man here but what has paid his dues. If he has not, he would not be here. I mean the men who come to these conventions, go back and make their people believe they have been here participating in the convention when they never show their faces inside the convention hall. Those are the men I am after. (Applause.)

Mr. Ball: I agree with Mr. Gohen in that matter. I also think we should go further and place those names where they will appear in the annual report.

Mr. Gohen: That is what I meant.

Mr. Fornwalt: As far as distributing badges to people who have not paid their dues, I think that ought to be stopped. A man should not receive a badge until his dues have been paid.

Mr. Gohen: I will accept that.

Mr. Pitard: As far as the man who does not pay his dues and participates in the festivities is concerned, he might do that without a badge, as far as that goes. There seems to be a unanimous desire to get at those sort of gentry in some manner. Why not have a list of the members in good standing on a board put up in the Festive Hall (laughter), or wherever the festivities are held, and let it be seen by everybody who the members are that are in good standing and those who are not?

Mr. Russell: I think the badge question has got nothing to do with this, and should not be introduced into it, because the badges are not a part of our by-laws or anything else. It is the courtesy of the Committee on Entertainment. I did not get a badge; I could not get one, for I got here too late, and they were all gone.

President Cook at this point put the question on Mr. Gohen's motion, which was carried.

NEW BUSINESS.

President Cook: Is there any new business?

Mr. Brown: I wish to speak of a matter that might come under that head. I have noticed for a number of years that we have had circulars sent out to the membership, pertaining to our business, and the name of the president does not appear on those official circulars. I think every notice that is sent out to the membership should have the president's sanction of the issuing of that notice, and I would respectfully move that every communication that is sent out to the membership at large should have the name of the president of the association attached to it, in addition to that of the secretary. I am a member of various organiza-

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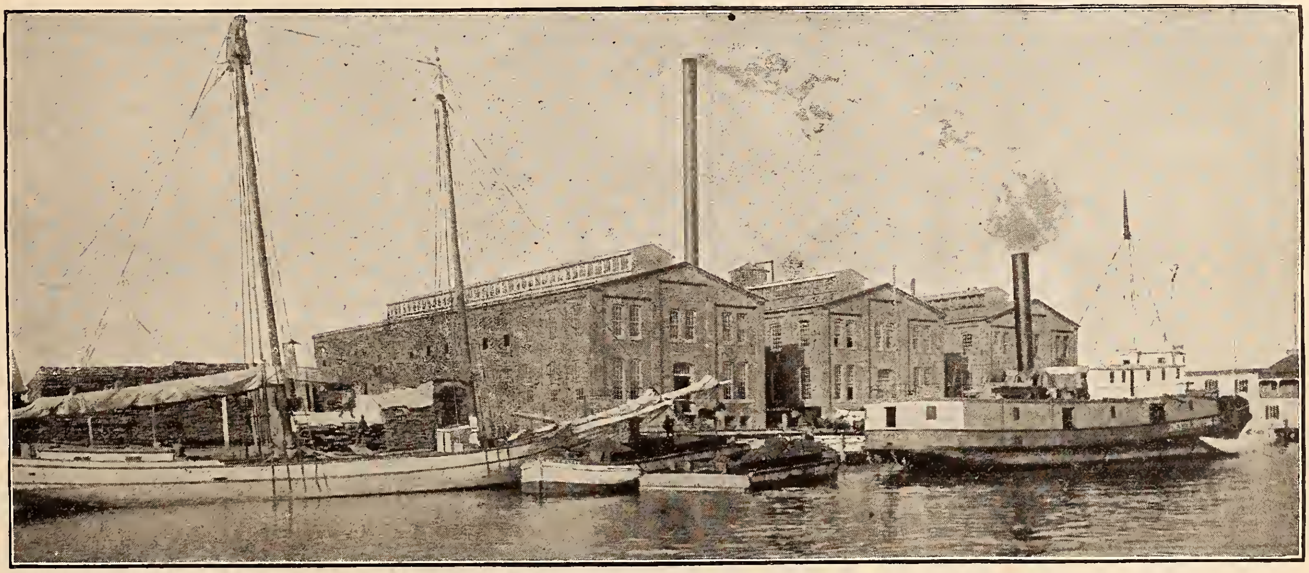

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tions and fail to find one but where the presiding officer is recognized. If he is not worthy of being recognized, we don't want him elected.

The motion was duly seconded and carried.

President Cook: The next in order is the "Installation of Officers." It seems to me the ladies should be invited in before we proceed to that. I trust that all the members of the Association will be present at the closing exercises.

At this juncture, in response to the invitation of President Cook, the ladies entered the room.

President Cook: Ladies and Gentlemen: We are about to close the Thirty-fifth Annual Convention of the Master Car and Locomotive Painters' Association of the United States and Canada. As we do so, I am sure that we are all filled with feelings of regret that the happy, delightful occasion must of necessity come to an end. After all, it is only for a while, for in another short year we all look forward with pleasurable anticipation to meeting again, and may we all be spared to meet each other at the expiration of the year. We are about to turn our faces homeward, and I am sure we will all be filled with the delightful memories of the very pleasant time we have spent by the seaside. We have very much to be thankful for, and I am sure we have not altogether forgotten from what source our blessings come.

I want to express to the Association,—and I am sorry there are very few members of the Association in the room at this time—my keen appreciation of the kindness and courtesy extended to me as your presiding officer during the year. It is only by your help that I have been able to preside with whatever credit I have presided—for the credit of the organization and yourselves—and I ask on behalf of the incoming President that you extend to him the same kindly courtesy and help you have to me. It is now my duty to install, as it is my last official act as your President, the officers for the ensuing year. The officers elected are: Mr. Lanfersiek, President; Mr. Butts, First Vice-President; Mr. Kahler, Second Vice-President. I will ask Mr. Copp and Mr. Houser to conduct the incoming President to the Chair.

Mr. Lanfersiek was then escorted to the Chair.

President Cook: Mr. President, I welcome you to this honorable position, and at this moment turn over to you the concluding exercises of this convention.

I will ask Mr. Orr and Mr. Brown to conduct the First Vice-President to the Chair.

Mr. Butts was then escorted to the platform.

Mr. Brown: It is with pleasure, Mr. President, that we have complied with your command.

President Cook: I welcome you to the position of First Vice-President.

Mr. Kahler, Second Vice-President, was then escorted to the platform.

President Cook: I have the pleasure of introducing to you Mr. Kahler, Second Vice-President. Mr. Kahler, I welcome you to the position.

President Lanfersiek then took the Chair, and spoke as follows:

Gentlemen of the convention: It is not necessary for me to make any extended remarks on this occasion. I, however, realize the fact that the duty that will be imposed upon me during the coming year will be an arduous one. When I consider the grace and dignity brought to the proceedings of this convention by our retiring President, it is almost useless for me to hope to be on a scale with him. I will, however, do the best I can and endeavor to do it for the best interests of the Association.

I will now appoint the committees for the coming year:

Advisory Committee.

A. P. Dane, B. & M. R. R., Boston, Mass., Chairman.
C. E. Copp, B. & M. R. R., Lawrence, Mass.
B. E. Miller, D. L. & W. R. R., Scranton, Pa.
C. A. Cook, P. B. & W. R. R., Wilmington, Del.
J. W. Houser, Cumberland Valley R. R., Chambersburg, Pa.

Committee on Tests.

W. J. Russell, Grand Rapids & Indiana Ry., Grand Rapids, Mich., Chairman.
Geo. Warlick, C. R. I. & P. Ry., Chicago, Ill.
H. G. McMasters, Southern Pacific Ry., Sacramento, Cal.
F. A. Weis, C. R. R., of N. J., Elizabeth, N. J.
Chris Clark, N. Y. C. & St. L. Ry., Chicago, Ill.

Committee on Information.

J. D. Wright, B. & O., Chairman.
W. O. Quest, P. & L. E. R. R., McKeesport Rocks, Pa.
J. G. Keil, L. S. & M. S., Buffalo, N. Y.
Geo. Schumpp, L. & N. R. R., Louisville, Ky.
F. A. Gowe, T. H. & I., Terre Haute, Ind.

Committee on Hotel.

J. A. Gohen, C. C. C. & St. L. Ry., Indianapolis, Ind., Chairman.
Eugene Richardson.
R. Walbank.

President Lanfersiek: I want to say to the Chairmen of these various committees that it will be necessary for them to get into communication with the members thereof and apportion off the work, in order that the best possible efforts can be made for the benefit of this Association. Those committees are not appointed simply for the purpose of having their names mentioned on the record, but they are there for the purpose of doing work, and I, myself, as well as the Association, will expect work from them. The Secretary will please notify those committees, in order that they may be officially notified.

It is customary on occasions of this kind to close the convention with a little entertainment. The first number on the program will be a song by Mr. J. D. Wright.

The following program was then rendered:

Song by Mr. J. D. Wright.
Recitation by Mrs. Lynch.
Song by Mrs. O'Conner.
Hymn, "Blessed be the Tie that Binds," sung by the entire convention.
Recitation by Mr. Samuel Brown.

Each number on the program received loud applause.

Adjournment.

President Lanfersiek: I now declare the Thirty-fifth Annual Convention of the Master Car and Locomotive Painters' Association of the United States and Canada adjourned, and according to the Constitution this Association will meet again on the second Tuesday in September at Cleveland, Ohio.

The convention then adjourned.

SOCIAL FEATURES.

The social features were such at all times that we fancy no one was sorry he or she came to the Atlantic City convention. The bathing was, of course, especially fine and participated in by nearly all at times when the convention was not in session. This scribe indulged in it so much that he turned the roof of his cerebellum to a beautiful sesquioxide, and it is now peeling and may result in a growth of hair in that barren field. (Look for it at the next convention.)

Tuesday afternoon, five to six, there was an informal reception in the music room of the hotel. The reception committee were the president and Mrs. Cook, Mrs. Marshall and Mr. Medill, Mr. and Mrs. Little and Mr. and Mrs. Copp. This served to "break the ice" and make people acquainted and bring them together. From eight to ten, same evening, there was a euchre party in the same room, with prizes, participated in generally, though some went to the Steel Pier to hear the band play. At 10 p. m. there was a smoker and vaudeville in the "Grotto" of the hotel, when eatables, drinkables and smokables were at the free service of all who cared to call for them.

Wednesday at 2:30 p. m. there was a trolley party who had an enjoyable ride along the sea coast. In the evening there was a general party to Young's Pier Theater to see the famous David Warfield in "The Music Teacher."

Thursday at 12:45, on adjournment of the convention for the day, all went by special arrangement to the "Inlet Hotel" at the northern end of the board walk, for a fish dinner. This was preceded by a group picture in the grand stand of an adjoining ball field, the one taken earlier on the hotel steps having proved a failure (likely on account of the wet bathing suits some had on.) There was to have been a general sail after dinner, but owing to the storm of the previous night and the roughness of the water, this was abandoned. "A stag party," however, ventured out in one boat, with what results we did not learn. Four ladies also went. In the evening there was a grand ball of the entire convention in the hotel, with refreshments in the dining room. This was a most enjoyable affair, the grand march being led at 9 p. m. by the president and his daughter, Miss Ethel Cook. Instituted at Chicago last year by the indefatigable Wallbank, a prince of entertainers, these occasions of great sociability bid fair to become a convention fixture, if continued under the same auspices and as well managed. The participants were given highly colored paper caps of all designs, during the grand march, suited and unsuited to their beauty. This contributed much to the gaiety of the occasion and served to break up stiffness and formality and make every one feel at ease and acquainted.

Friday afternoon, after the convention was over, there were tickets for all who wished them to "The Johnstown Flood,"

a board-walk attraction, the same being a realistic representation of that memorable calamity. But to hear our Mr. and Mrs. Haynes tell of their experience in the actual occurrence some years ago was quite enough for this writer.

All in all, the social events of the 1904 convention were all that could be desired and the equal in interest and pleasure of any convention in recent years and will long be remembered by all whose good fortune it was to participate in them.

THE SOUVENIRS.

These nicknacks and novelties, both useful and ornamental, without which a convention would be incomplete, were, as usual, in evidence, and rather above the average in worth and beauty, and so far as this writer "sampled" them he will attempt to describe here the gifts and their givers:

Silver handled pocket knife, Glidden Varnish Company.

Silver handled darner for the ladies, and silver stick pin for gents, Wolfe Brush Company.

Ink wells, Standard Oil Soap Company.

Ornamental photo frames, J. B. Hicks.

Twenty-five-foot tape measures, John Lucas Company.

Fob chains and stick pins, J. B. Sipe & Co.

Fob chains, Eureka Rubbing Stone Company.

Dice box (a miniature paint pail), Buffalo Oil, Paint & Varnish Company.

Pocket books and boot-buttoners, the Cleanolo Company.

Hat pins, watch charms and pencils, Dixon Crucible Co.

Match safes, tape measures, paper weights, rulers and cigars, N. Z. Graves & Co.

Tape measures, Heath-Milligan Manufacturing Company.

Gents' and ladies' pocket knives, W. H. Coe Mfg. Co.

Japanese purses, Anglo-American Varnish Company.

Cigar cases, Toch Brothers.

Decorated china plates, Devoe-Reynolds Company.

Swiss clocks, Edward Smith & Co.

Baby match scratches and palette knives, Columbia Refining Company.

CONVENTION NOTES.

There was not a general exhibit of tools and appliances this year, but according to his intention some time ago reported in these columns, our associate, "Sam" Brown of the N. Y., N. H. & H., Roxbury, Mass., shop, had a working model there of his new paint-shop scaffolding for the examination of all in the convention room. But the best way is to try a section of it.

Cleveland it is for the next convention, sure enough, without question, this time; and already, and even before the vote was taken, some say it is a bad move on account of hotel accommodations. This may be, but with the Sherwin-Williams Co., the Patterson-Sargent Co., and others of our friends right on the ground, we shall be surprised if we have to pitch tents out in the country round about to live in during the meeting of 1905. Also our "Jim" Gohen is chairman of the hotel committee, we believe. Mind that.

The venerable Thomas Jones was there from Montreal, still agitating that as a meeting place, though the Canadian Pacific has retired him from active duty by age limit on account of its pension plan. The convention habit is strong with all, but especially so with Bro. Jones. He tells us that he was very kindly remembered by his fellow-employees when retired by the gifts of a twenty-dollar gold-headed ebony cane and a pocketbook containing a generous wad of the needful therein. This was indeed a pleasant occasion and shows how highly "Uncle Tom" is held in the esteem of his shop-mates of the C. P. He is succeeded by one of his own men as foreman, whose name we did not learn.

AMONG THE SUPPLY FRATERNITY.

The supply men were well represented at Atlantic City, and a complete list of the firms and their representatives is given below. Mr. H. J. Kuhn served as president of the Supply Men's Association; Mr. Wolfe as secretary and Mr. Wm. Marshall as treasurer. Mr. R. T. Wolbank was chairman of the entertainment committee. The following is the complete list and is said to be the largest number ever attending any convention of the Master Car and Locomotive Painters' Association:

Acme White Lead & Color Company, Detroit, Mich. Represented by H. N. Turner and B. E. Brown.

Anglo-American Varnish Company, Newark, N. J. Represented by William Marshall and George M. Ballard.

Akron Milling, Mining & Manufacturing Company, Aurora, Ill. Represented by F. L. Harkness and R. B. Kadish.

Berry Bros., Detroit, Mich. Represented by Harry W. Frost and Frank B. Archibald.

Beckwith-Chandler Company, New York. Represented by Harry M. Hubbell.

Buffalo Oil, Paint & Varnish Company, Buffalo, N. Y. Represented by D. B. Vail.

Crockett Company, D. B., ridgeport, Conn. Represented by John B. Hicks.

Chicago Varnish Company, Chicago, Ill. Represented by George S. Bigelow and O. R. Ford.

Cleanola Company, Allegheny, Pa. Represented by F. E. Quest.

Coe Manufacturing Company, W. H., Providence, R. I. Represented by Mr. Bower.

Columbia Refining Company, New York. Represented by F. G. James.

Dixon Crucible Company, Joseph, Jersey City, N. J. Represented by James G. Connor.

F. W. Devoe & C. T. Raynolds Company, New York. Represented by J. C. Conway, William C. Rennolds and A. R. Jettner and Phillips.

Detroit White Lead Works, Detroit, Mich. Represented by John W. Marshall.

Ellis-Chalmers, Dedham, Mass. Represented by R. W. Wastcoat.

Eureka Solvent Company, Chicago, Ill. Represented by J. T. Hartnagel.

Flood & Conklin, Newark, N. J. Represented by H. J. Kuhn, H. S. Shields, D. J. Gilleland and I. H. Mumford.

Glidden Varnish Company, Cleveland. Represented by R. T. Walbank.

Graves & Co., N. Z., Philadelphia. Represented by V. T. Graves.

Heath & Milligan Manufacturing Company, Chicago. Represented by W. R. Parker.

Hildreth Varnish Company, New York. Represented by S. J. Estey.

Imperial Car Cleaner Company, Newark, N. J. Represented by H. F. Marlock.

Kay & Ess Company, The, Dayton, O. Represented by D. O. Klinger.

Lowe Bros., Dayton, O. Represented by Charles Shannon and Nat C. Dean.

Lucas & Co., John, Philadelphia. Represented by M. F. Reese and Burt Lucas.

Mamolith Carbon Paint Company, Cincinnati, O. Represented by Arthur R. Johnston.

Murphy Varnish Company, Newark, N. J. Represented by George F. Kissan, F. O. Brazier and C. M. Baker.

National Paint Company, Williamsport, Pa. Represented by Frank P. Cheesman.

Patterson-Sargent Company, New York. Represented by William Anderson Polk.

Patton Paint Company, Milwaukee, Wis. Represented by James G. Mowry.

Perrin, Payson & Co., New York. Represented by Horace E. Payson and Harry W. Toothe.

Pratt & Lambert Varnish Company, New York. Represented by Joseph Maycock and J. P. Gowing.

Protectus Paint Company, Philadelphia. Represented by Thomas H. Murry.

Roever Company, Henry, Chester, Pa. Represented by Henry Roever.

Sherwin-Williams Company, Cleveland. Represented by John H. Eames, Thomas Madill, E. M. Richardson and W. B. Albright.

Sipe, Joseph B., Allegheny, Pa. Represented by H. G. Taylor.

Smith & Co., Edward, New York. Represented by J. H. Burwell.

Standard Oil Soap Company, New York. Represented by Philip Sussman.

Toch Bros., New York. Represented by Maxwell McGloin.

Tower Varnish & Dryer Company, Dayton, O. Represented by J. C. Kiefaber.

Valentine & Co., New York. Represented by A. Dowdell and W. P. Mellon.

Wadsworth-Howland Company, Chicago. Represented by R. D. Brydon.

Wheeler Company, A., Boston, Mass. Represented by Frank W. Philbrick.

Wilhelm Company, A., Reading, Pa. Represented by E. C. Street.

Wiley C. A., Hunters Point, N. Y. Represented by C. A. Wiley and John D. Hicks.

Wolfe Brush Company, Pittsburg. Represented by W. B. Wolfe.

Established 1878.

RAILWAY MASTER MECHANIC

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THERE seems to be a difference of opinion in regard to heating boilers up quickly. Heating a boiler up quickly does not necessarily cause any damage provided it is done evenly. Great damage results from putting hot water in a boiler on account of heating portions of the boiler first, thus causing unequal expansion. But if steam is admitted into the empty boiler first, it will heat all parts evenly, causing an equal expansion of the metal and thus not injuring the boiler any more than building a fire and heating the water slowly.

WE note that in a round house under construction on one of the trunk lines a system of steam heating by direct radiation is being installed. This system is put in after a trial and investigation of the fan system. The investigation proved that with the fan system the houses were not very warm nor did the fans keep them free from smoke and gases. From this it would appear that the engine houses will have to be kept free from smoke and gases by the proper contour of the roof, and ventilators. Also better heating results can be obtained by direct radiation instead of putting in a fan system and any cheap form of roof.

INCLUDED in this issue is a description of the Rock Island shops at East Moline. A noticeable feature of this shop is the diagonal arrangement of the pits in the erecting shop. This arrangement was followed to avoid an excessive length of span for the cranes. According to the arrangement of the shop engines are brought in at the east end on the longitudinal tracks where the stripping is done. They are then picked up by two cranes carried along the middle aisle to the proper pit. After the repairs are made they are again carried by the two cranes to the west end, where the finishing work is done. Handling the engines with only one crane would seem preferable, as there would thus be obviated any chance of damage as the result of blowing a fuse or any other mishap on either one of the two cranes.

A RECENT editorial in the Railway Master Mechanic brought up the question of the consolidation of the Master Car Builders' and American Railway Master Mechanics' Associations, as suggested by Mr. F. W. Brazier in his recent address before the Master Car Builders' Association at Saratoga. A number of communications which were received and published in a subsequent issue of this paper were from prominent members of both associations, and in nearly every case they were very strongly in favor of President Brazier's suggestion. It is to be regretted that both sides of the proposition were not equally well represented. It is something which has and is exciting no little discussion, and it would seem to be well to take some action in the near future to definitely settle the matter.

Inasmuch as so much has been said in the columns of this publication in favor of a consolidation we are glad to publish something from one very prominent railway official on the other side of the question, and although we are not at liberty to publish his name the following will no doubt be read with interest. Referring to our editorial, he says:

"I do not believe that there is such a community of interest as to the aims of the two associations as to warrant their consolidation. The Master Mechanics' Association is, in its work, largely academic, for the reason that its reports are for information and not for action by agreement. Beyond the fact of the educational influence which the Master Mechanics' Association conventions have on the members, I do not see that the railroads get any special benefit from the association. I am afraid that the only result of the consolidation of the two associations would be to weaken the working capacity of the Master Car Builders' Association by drawing out the conventions, and I cannot see that there would be any compensation for this in strengthening the Master Mechanics' Association, which must have some definite aim before it can accomplish any real good."

AT the last meeting of the Western Railway Club a very interesting paper on "A Marked Advance in Locomotive Boiler Maintenance" was presented. While the paper dwelt principally on a method of charging water in boilers, it again brought up the importance of treating waters before being used in the boilers. One of the principal items in connection with treated water is the length of time a locomotive can run between washings. On some roads where the water treatment has gone into very extensively the number of washings has been cut down from two to three times a week to once in forty-five days. While the boiler has to be washed only once in forty-five days the water will have to be changed as often as the boilers were washed before. This is not on account of scale and mud, but to prevent the water from getting concentrated and thus foaming. In this connection, a system of changing the water in the boiler without losing heat is a very commendable feature. Among some of the benefits derived from treated water are a reduction of engine failures due to leaky boilers of 7 to 20 per cent; decrease in the number of boiler makers and helpers in the round house of about 50 per cent; decrease of coal per ton-mile of 1.2 lbs.; decrease of engines of about 4 per cent. These results have been obtained with an increase of tonnange of about 6 per cent.

With figures of this kind, obtained from actual experience, there is no doubt but what it pays to put in a very extensive system of water softening plants on divisions where the water contains scale-forming solids to any great extent.

HOT driving boxes and crank pins are a never ending source of trouble and probably there are more engine failures resultant from this than any other cause. A great many roads have reduced this annoyance from an epidemic to an occasional hot box or pin. This has been accomplished by the use of grease as a lubricant. One prominent railroad states their experience with grease as follows: "A trial was made on one of our engines which had been giving trouble by main pins heating, no repairs being made to the pin or brasses and no changes made except the application of grease. These bearings ran cool immediately after the application. After this encouraging trial we equipped a number of engines, and now have all of the important engines equipped with grease on pins, and with very satisfactory results. The instances of hot pins which cause three minutes or more delay are very rare indeed. There are some instances of crank pins running hot, even with grease, but the trouble has been reduced to such an extent that we have no hesitation in recommending the use of the grease as standard practice.

MR. A. W. SULLIVAN.
GENERAL MANAGER OF THE MISSOURI PACIFIC.

Mr. Sullivan was born September 17. 1854, at New York. He began his railroad career on November 10, 1870, on the Illinois Central as a machinist apprentice. In this capacity he served five years He then served three years as a mechanical draftsman and four years as chief clerk in the machinery department, when he was appointed assistant superintendent of machinery. After three years in this position he was for two years division superintendent of the lines in Illinois, and on September 3, 1889, was appointed general superintendent. He was advanced to the position of assistant second vice president on January 1, 1901. This position he resigned, to accept the position of general manager of the Missouri Pacific in charge of operation with headquarters at Saint Louis, Mo., effective October 1, 1904.

It was desired to extend the use of grease to the driving box bearings, but no satisfactory means of applying the grease was designed until the device invented by Mr. E. G. Elvin appeared on the market. Permission was obtained to apply this device on one engine for trial; the engine being a consolidation engine with weight on drivers of 118,000 lbs. The result was so satisfactory that the engine was transferred to another division for further demonstration of its benefits, and evidently has been giving good service, as it has not been returned to our division. The trouble from hot driving boxes has been almost entirely overcome by the use of grease. There are, however, occasional instances of hot driving boxes, even on engines equipped with grease, but in every instance investigation has shown that the cause of heating was due to being improperly fitted up, or some cause not directly chargeable to grease.

The boxes run somewhat warmer with grease than they do with oil, making it necessary to set up the wedges when boxes are warm to avoid the possibility of having them too tight by expansion if set up when cold, but they do not run hot. Some criticism has been made that the wear of the bearings is much greater when grease is used than is the case with oil. Investigation of engines taken to the shop has shown that the size of the bearings has not been reduced by wear any more than is the case when oil is used. Furthemore, the instances of bearings which have been cut when grease was used have been very few indeed. When oil is used there is an instance occasionally where large journals have to be trued up on account of having been cut, thus reducing the life of the axle and making the expense for axles greater than if they should be worn slightly more by the use of grease.

We have not kept an accurate record of the cost on mileage basis for labor and material as a comparison between grease and oil, but the amount of work has been very much reduced.

New Shops of the Rock Island System at East Moline, Ill.

A RATHER remarkable record has been made the past year in the lay-out, designing and equipping of a railroad locomotive repair plant and store department of such magnitude as to be notable among recent shop plants.

The main building, comprising the erecting, machine and boiler shops, is thought to be the largest railroad shop building in the country.

The preparation of plans for the buildings was begun in February, 1903, and the shops opened February, 1904. There were but two principles followed in the plans for construction and maintenance of the buildings, efficiency and economy. It is believed that in these buildings both objects have been attained, and while they are of the greatest efficiency desired and of permanent character, the designs are such that the cost of construction has been reduced to a minimum, and as all ornamentation has been eliminated, the cost of maintenance will be light. Simplicity and duplication of design have been followed throughout the entire plant.

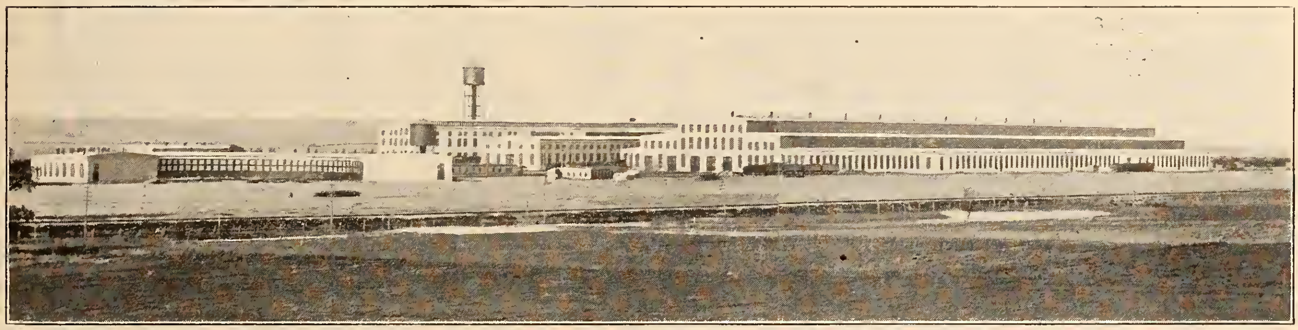


Fig. 1—General View of the New Shops of the Rock Island System at East Moline, Ill.

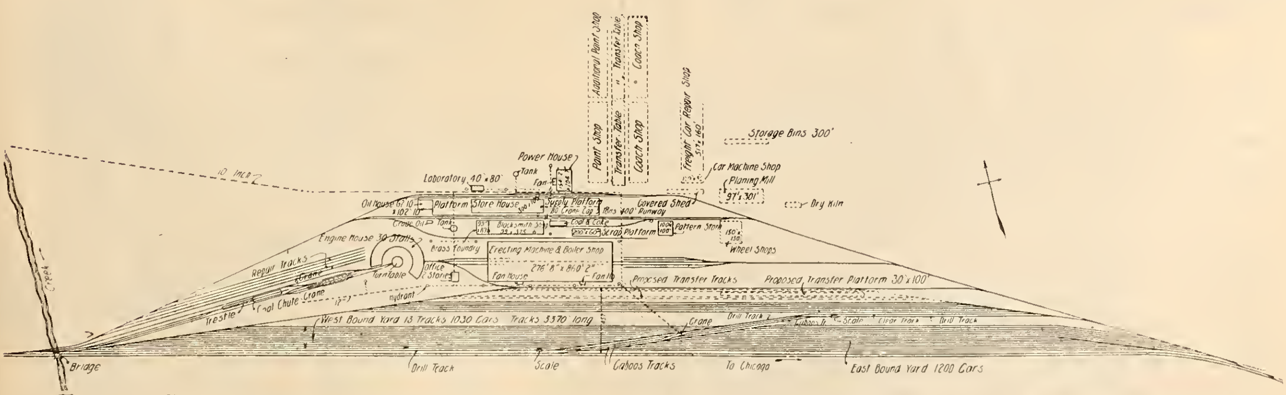


Fig. 2.—General Layout of the New Shops of the Rock Island System at East Moline, Ill.

GENERAL LOCATION.

One hundred and seventy-four miles west of Chicago, near the cities of Moline, Rock Island and Davenport, is the location of the shops. Five miles from this point the Rock Island System diverges in three directions: to the northwest, reaching St. Paul and Minneapolis; to the west, Omaha and Denver; to the southwest, Kansas City and beyond. Eight hundred acres of land were bought at this point for the erection of the shops and freight yard.

YARDS.

The freight yard lies next the main track and is one and one-half miles long. As planned for the present, this yard will have a capacity of 3,000 cars.

Outside the freight yard are the tracks devoted to the use of the shops and storehouse. In this yard are nine miles of track.

Two tracks extend through the erecting shop for bringing in the engines and material, and one through the blacksmith shop. The storehouse is served by two tracks on each side; the power house by one track for coal. At the east end are tracks for storage of wheels and trucks, and at the west end for repairs of cars.

WATER WORKS

Water is secured from the Mississippi river; from the power house to the pumping station is 9,600 feet;

from the station to the river 400 feet, and to the end of the intake pipe 750 feet.

The pumping station is a very neat building of dark red brick, 20x40 feet, with slate roof. Here are installed two triplex pumps, each of 1,000,000 gallons capacity. One direct connected to a 60-horsepower gasoline engine, the other to a 50-horsepower electric motor, receiving power from the power house. The intake is 12 inches in diameter. The main to the plant is 10 inches diameter. There are two tanks, each 100,000 gallons capacity, the high service being elevated 108 feet for fire protection; from this a special line runs serving the exterior and interior of the buildings. The boilers are also connected to the high service line for washing out and for using water from that tank during the winter. The low service is elevated 20 feet to the bottom of the tank, sufficient to only distribute the water over the plant, the intention being to reduce the cost of pumping to a minimum.

SEWERS.

All buildings are drained into a system of storm water sewers, which also takes care of the surface water in the immediate vicinity of the buildings. For the toilet rooms all sewage is carried in a separate sewer system to the sewage disposal plant. This plant consists of two separate tanks, with four filter beds for each tank. Each tank will hold 35,000 gallons, and should be emptied when in full operation every twenty-four hours. The filter beds are each 24 feet square, each designed to be in service one-fourth of the time, being automatically cut in and out, the mechanism for this being contained in a chamber 4 feet square at the intersections of each set of four filters. The beds are filled with front end locomotive cinders 4 feet deep overlaying a layer of 12 inches of broken stone.

BUILDINGS

The buildings erected in 1903 are eight: Machine, erecting and boiler shop, blacksmith shop, storehouse, power house, refined oil house, crude oil house, engine house and master mechanic's office.

The principal building is designed to accommodate the erection, machine and boiler shops under one roof, covering an area of five and one-half acres. The building is constructed of brick with gravel roof, supported on steel trusses. The foundations, pits and conduits are of concrete. The arrangement of windows and clere story lanterns, all glazed with heavy factory ribbed glass, of one size only, makes the distribution and diffusion of light all that could be desired. The building is 276 feet 8 inches by 860 feet 2 inches, divided into five bays, as follows: 39 feet 7 inches, 42 feet 6½ inches, 98 feet 3 inches, 57 feet 2½ inches, and 32 feet 3 inches. In the south bay is 6 inches of concrete below the 3-inch wood floor, which latter covers the whole building. In this bay are the belted machines, electrically driven in groups; a few of these machines have special foundations. In the central bay are the stripping pits, the engine repair pit and riveting pit. In the fourth bay are the hrydraulic-driven boiler

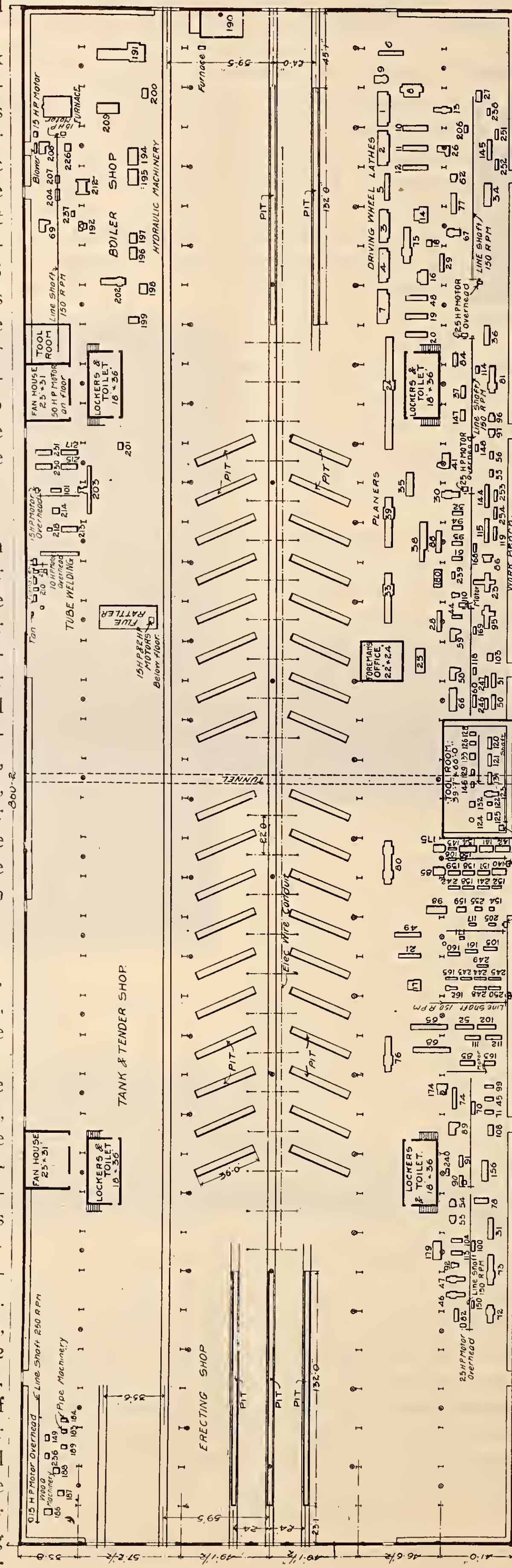


Fig. 3—Floor Plan of the Machine, Erecting and Boiler Shops of the New Shops of the Rock Island System at East Moline, Ill.

List of Tools

Machine Shop.

1. 79-inch double-head driving-wheel lathe, with quartering attachment, motor drive. 15 H. P.
2. 79-inch Niles double-head driving-wheel lathe, motor drive. 15 H. P.
3. 69-inch Niles double-head driving-wheel lathe, motor drive. 15 H. P.
4. 69-inch Niles double-head driving lathe, motor drive. 15 H. P.
5. 84-inch hydraulic wheel press from Chicago shops. 10 H. P.
6. 42-inch Niles hydraulic car-wheel press, motor drive. 5 H. P.
7. 90-inch driving-wheel lathe, Chicago shops, motor drive. 15 H. P.
8. 42-inch Pond steel-tired car-wheel lathe, motor drive. 10 H. P.
9. 42-inch car-wheel boring machine, motor drive. 5 H. P.
10. Special locomotive axle-turning lathe, motor drive. 15 H. P.
11. Double axle lathe, motor drive. 15 H. P.
12. Single axle lathe, motor drive. 10 H. P.
13. Planer type milling machine for cutting keyways in axles. Beaman & Smith.
14. 84-inch double-head vertical boring machine for wheel centers, with direct-motor drive. 10 H. P.
16. 72-inch double-head boring machine, motor drive. 10 H. P.
17. 60-inch double-head boring machine, motor drive. 7½ H. P.
18. Key-seater machine, No. 3, Grant, Mitts & Merrill.
19. 32-inch engine lathe, motor drive, 12-foot bed. 5 H. P.
20. 32-inch engine lathe, motor drive, 12-foot bed. 5 H. P.
21. 32-inch engine lathe, motor drive, 14-foot bed. 5 H. P.
22. Portable crank pin press, Watson & Stillman.
23. Duplex milling machine, Beaman & Smith.
24. 54-inch double-head frame planer, 34-foot, motor drive. 20 H. P.
25. No. 4 horizontal boring machine, Bement drive.
26. 5-foot radial drill press, Niles.
27. 40-inch drill press, Aurora.
28. Double shaping machine, Bement, 20-inch 12-foot bed.
29. Double shaping machine, Bement, 20-inch 12-foot bed.
30. 30 by 30-inch by 6-foot planer.
31. 30-inch engine lathe, 12-foot bed, Chicago shops.
32. 30-inch pillar shaper, Cincinnati.
33. 60 by 60-inch 16-foot cylinder planer, Chicago shops. 20 H. P.
34. 24-inch slotter, Chicago shops.
35. 18-inch slotter, Bement motor drive. 15 H. P.
36. 18-inch slotter, Niles, Peoria shops.
37. 40-inch drill press, Aurora.
38. Locomotive cylinder borer, Bement motor drive. 10 H. P.
39. 72 by 84-inch 16-foot cylinder planer, motor driven. 27½ H. P.
41. 6-foot radial drilling machine, with tapping attachment, Niles.
43. Portable valve seat milling machine.
44. 24-inch Morton draw stroke shaper.
45. 30-inch Morton draw stroke shaper.
46. 30 by 30-inch by 6-foot planer.
47. 30 by 30-inch by 6-foot planer.
48. 36-inch triple-geared lathe, 12-foot bed, motor drive. 5 H. P.
49. 36-inch triple-geared lathe, 14-foot bed, motor drive. 5 H. P.
50. 18-inch back-geared engine lathe, 8-foot bed, L. & S.
51. 18-inch back-geared engine lathe, 8-foot bed, L. & S.
52. 20-inch back-geared engine lathe, 10-foot bed, L. & S.
53. 37-inch double-head vertical boring mill, Niles.
54. 37-inch double-head vertical boring mill, Niles.
55. Niles 30-inch vertical turret boring and turning machine.
56. Niles 30-inch vertical turret boring and turning machine.
58. 5-foot radial drill, Niles.
59. 5-foot radial drill, Niles.
60. 40-inch drill press, Aurora.
61. 24-inch pillar shaper, Cincinnati.
62. 37-inch double-head vertical boring mill, Niles.
65. 46-inch by 16-foot engine lathe, Chicago shops.
66. No. 2 horizontal boring and drilling machine, Bement drive.
67. 36 by 36-inch by 8-foot planer, Belmer.
68. 42-inch by 16-foot engine lathe, Peoria shops.
69. 5-foot radial drill, Niles (boiler shop).
70. 40-inch vertical drill press, Aurora.
71. 24-inch Cincinnati shaper, Davenport shops.
72. 30 by 30-inch by 9-foot planer, Davenport shops.
73. 30 by 30-inch by 16-foot planer.
74. 24-inch by 12-foot engine lathe, Chicago shops.
75. 48 by 48-inch by 12-foot planer, motor drive, Pond. 15 H. P.
76. 48 by 48-inch by 12-foot planer, motor drive, Pond. 15 H. P.
77. 24-inch by 12-foot engine lathe, Chicago shops.
78. Guide bar grinder, Springfield, 84-inch.
79. Portable wrist pin machine, Pedrick & Ayer.
80. Niles rod planer, 38 by 38-inch 18-foot, motor drive. 15 H. P.
81. 38 by 48-inch by 12-foot planer, Chicago shops.
82. 14-inch slotting machine, Niles.
83. 14-inch slotting machine, Niles.
84. 14-inch slotting machine, Niles.
85. 50-inch drill press, Niles.
86. No. 3 Becker-Brainard new model universal milling machine.
87. 20-ton portable bushing press, Watson & Stillman.
88. Pond 32-inch back-gear engine lathe, 12-foot bed.
89. 5-foot radial drill, Niles.
90. 40-inch drill press, Aurora.
91. 40-inch drill press.
92. 24-inch crank planer, Bement.
93. 24-inch Cincinnati pillar shaper.
94. 24-inch Cincinnati pillar shaper.
95. No. 2 vertical and horizontal milling machine, Beaman & Smith.
96. 37-inch boring mill, Chicago shops.
97. 37-inch boring mill, Chicago shops.
98. 58 and 27 inch swing gap lathe, Putnam, 12-foot bed.
99. 24-inch Cincinnati pillar shaper.
100. 40-inch drill press, Aurora.
101. 28-inch drill press, Aurora (tank shop).
102. 20-inch by 10-foot engine lathe, L. & S.
103. No. 5 Becker vertical milling machine.
104. 24-inch Cincinnati pillar shaper.
105. 2 by 24-inch Jones & Lawson screw machine, Chicago shops.
106. 21-inch drill press, Hoefer.
108. Universal grinding machine, No. 1.
110. 24-inch crank planer, Bement.
111. 28-inch by 8-foot compound shaper, Chicago shops.
112. 28-inch by 8-foot compound shaper, Chicago shops.
113. 24-inch Cincinnati pillar shaper.
114. 21-inch drill press, Cincinnati.
115. 24-inch engine lathe, 12-foot bed.
117. 21-inch drill press, Hoefer.
118. 21-inch drill press, Hoefer.
119. 16-inch by 6-foot engine lathe, L. & S.
120. 14-inch Pratt & Whitney tool room lathe, 6-foot bed.
121. 14-inch by 6-foot tool room lathe, 6-foot bed.
122. 16-inch pillar shaper, Gould & Eberhart.
123. 24 by 24-inch by 5-foot planer.
124. Universal tool cutter grinder, Horton.
125. No. 3 Universal milling machine for tool room, Hendey.
126. One Yankee twist drill grinder.
128. One Gisholt tool grinder.
129. 21-inch drill press, Hoefer.
130. Friction drill press, Barnes.
131. 10-inch by 5-foot tool room lathe, Pratt & Whitney.
132. Universal grinder, No. 1.
133. Double wet grinder for tools, Springfield, No. 3.
134. No. 0 brass turret lathe, 24-inch by 8-foot.
137. No. 1 square arbor lathe, 15-inch by 6-foot.
138. No. 1 square arbor lathe, 15-inch by 6-foot.
139. No. 1 brass lathe, 17-inch by 6-foot.
140. No. 1 brass turret lathe, 17-inch by 6-foot.
141. No. 2 brass turret lathe, 18½-inch by 6-foot.
142. No. 2 brass turret lathe, 18½-inch by 6-foot.
143. No. 1 valve milling machine, American.
144. 28-inch lathe, 12-foot 6-inch bed.
145. 22-inch lathe, 10-foot bed.
146. Friction drill press, Barnes.
147. 32-inch drill press, Aurora.
148. 21-inch drill press, Hoefer.
149. 21-inch drill press, Hoefer (tank shop).
150. 21-inch drill press, Hoefer.
151. Oil separator, No. 1, American.
152. Two-spindle centering machine, Whiton.
154. No. 3 buffing lathe.
156. No. 8 Landis plane grinder, 26-inch swing.
158. 14-inch by 6-foot engine lathe, L. & S.
159. Disk grinder, Gorton, No. 6.
160. 2 by 26-inch turret lathe, P. & W.
161. 2 by 26-inch turret lathe, P. & W.
162. 21-inch Grisholt turret lathe, Hoefer.
163. 21-inch drill press, Hoefer.
165. 14-inch bolt lathe, 5-foot bed, Bradford.
168. 25-inch drill press, Hoefer.
171. Friction drill press, Barnes.
173. Six-spindle arch-bar drill, Niles (smith shop).
174. 60-inch boring mill, Niles.
175. 50-inch drill press, Niles.

176 to 178. 200-pound Bradley hammers, Chicago shops (smith shop).

179. 6-foot radial drill, Chicago shops. (For additional grinding machines and small lathes in machine shop see Nos. 235 to 254.)
180. 6-foot radial drill, Chicago shops.
181. 1-inch bolt header, Ajax (smith shop).

182. 1-inch bolt header, Ajax (smith shop).

Boiler and Tank Shop.

183. Pipe machine, 1-inch to 2-inch, Jarecki.
184. Pipe machine, 1½-inch to 4.inch, Forbes.
186. 36-inch band saw, Carse.
187. Combined rip and cut-off saw.
188. One hand jointer, Fay.
189. Single-spindle vertical borer, No. 2.
190. 17-foot gap riveter, hydraulic, Bement.
191. 14-foot bending rolls, Niles, motor drive. 40 H. P.
192. Lenox rotary bevel shear.
194. 60-inch hydraulic punch, Bement.
195. 54-inch hydraulic shear, Bement.
196. 36-inch hydraulic die block punch, Bement.
197. 25-inch hydraulic punch, Bement.
198. Angle shear, hydraulic, Bement.
199. Hydraulic universal shear, Bement.
200. Horizontal flange punch, hydraulic, Bement.
201. Quick-acting 20-inch hydraulic punch.
202. 86-inch bending rolls, Niles, motor. 10 H. P.
203. Power punch with spacing table, Hilles & Jones, 28-foot bed.
204. 40-inch drill press, Aurora.
205. 25-inch drill press, Hoefer.
206. 21-inch drill press, Hoefer.
207. 21-inch drill press, Hoefer.
208. 5-foot radial drill with tapping attachment, Niles belt.
209. Sectional flanging press, hydraulic, Bement.
210. Fergusson flue welder.
211. Fergusson flue welder.
212. Four-spindle flue sheet drill, Niles.
213. Acme 4-inch single bolt cutter.
214. 1-inch triple bolt cutter, Acme.
215. 1½-inch double staybolt cutter, Acme.

Smith Shop.

216. Hydraulic bar shears, 2-foot round, Bement.
217. Acme 1½-inch double staybolt cutter.
218. Bolt pointer, Acme.
219. No. 3 Ajax forging machine, Chicago shops.
220. 1,600-pound long-stroke steam hammer, Chambersburg.
221. 1,500-pound single-stand hammer, Chambersburg.
222. 1,500-pound single-stand hammer, Chambersburg.
223. Hydraulic bar shears, 1¼ by 12, Bement.
224. 20-inch hydraulic punch and shear, Bement.
225. 1½-inch Ajax bolt header.
226. Hegley-Cambria cold saw.
227. 5,000-pound double-stand steam hammer, Chicago shops.
228. 1,100-pound single-stand steam hammer, Chicago shops.
229. 1,000-pound single-stand steam hammer, Peoria shops.
230. 1½-inch double staybolt cutter, Peoria shops.
231. 1½-inch double staybolt cutter, Trenton shops.
232. Allen hammer riveter, 84-inch reach, pneumatic.
233. Portable mud-ring riveter, Pedrick & Ayer, pneumatic.
234. Portable riveter, Pedrick & Ayer, pneumatic.
173. Six-spindle arch bar drill.
176 to 178. 200-pound Bradley cushioned hammers.
181. 1-inch bolt header, Ajax.
182. 1-inch bolt header, Ajax.

Machine Shop.

235 to 240. No. 6 Diamond double emery wheel grinders.
241 to 247. 16-inch by 6-foot engine lathes, L. & S.
248 to 254. 14-inch by 6-foot engine lathes, L. & S.

shop tools, in the fifth the wood-working and boiler shop tools. Four motor-driven chain-connected fans force heat through conduits beneath the floor, from which are uptake pipes suitably distributed.

Eight traveling electric cranes are in the building: Two 3½-ton and one 10-ton in the second bay, two 50-ton in the central bay, and one 10 and one 20-ton in the fourth bay, also a 20-ton crane to serve the riveter pit.

Almost the entire tool equipment of these shops is new and only such tools are transferred from other shops as are first-class and up-to-date. The tools which have been purchased have in almost all cases been delivered and erected and are 200 in number. All tools which do not require crane service for handling the material to and from them have been grouped and driven from separately-driven line shafts in the south bay. A few of these machines have special foundations, but as this bay has a floor underlaid with concrete, it is deemed sufficient for the majority of the tools. In the second bay are located the heavier tools which require crane service for the material which they do work upon. The majority of these, some twenty-five in number, are individually motor driven; planers with the two-wire variable speed system and lathes, etc., with the three-wire system. In some cases the machines are supplemented by gear changes when additional range of speed is necessary. There is no machinery in the central bay or erecting shop except a 17-foot gap riveter located at an end in a pit and served by a special crane located in the roof framing above the large crane runway. The majority of the tools in the fourth bay are hydraulically operated tools

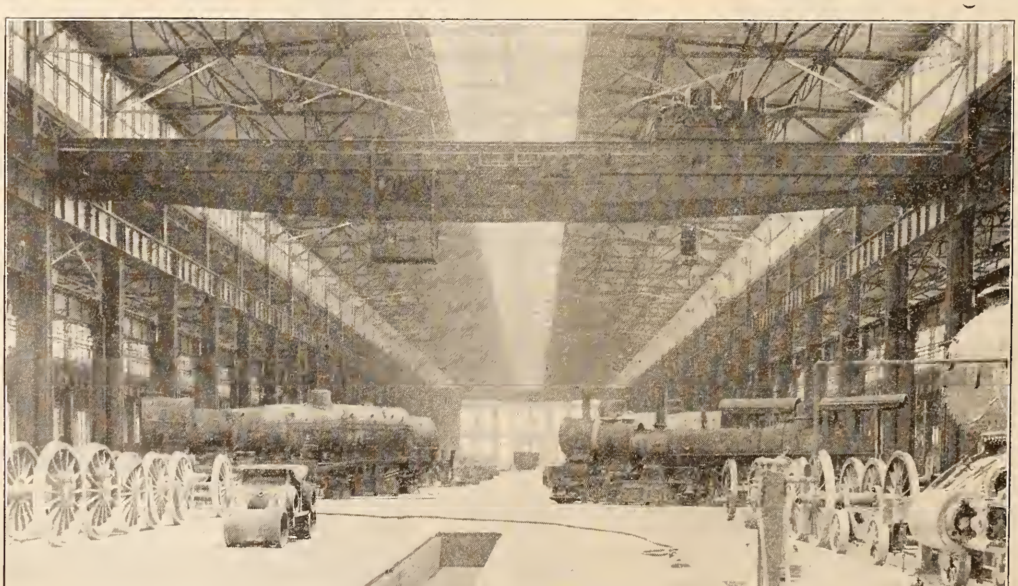


FIG. 4—VIEW OF ERECTING SHOP—NEW SHOPS OF THE ROCK ISLAND SYSTEM AT EAST MOLINE, ILL.

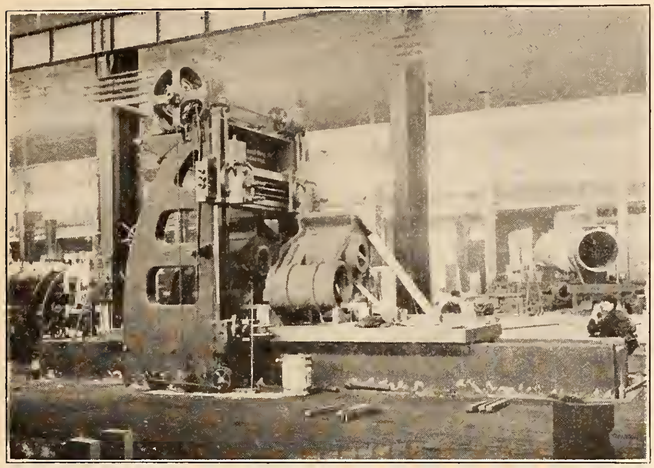


Fig. 5—Cylinder Planer.
New Shops of the Rock Island System at East Moline, Ill.

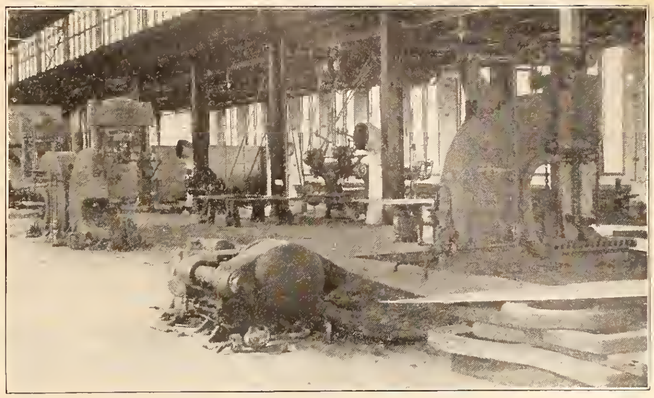


Fig. 6—View of Boiler Shop.
New Shops of the Rock Island System at East Moline.

for the boiler shop. Somewhat of a departure has been made in equipping the boiler shop as the hydraulic principle has been employed for nearly all of the punching, shearing, flanging and riveting machinery.

The north bay has been devoted to belt driven boiler shop tools at one end; there being no cranes to cover this last bay. It will be noted that about 66 per cent of the boiler shop, 100 per cent of the erecting shop and 50 per cent of the machine shop will have crane service, and in some bays a number of cranes will be operated in order to cover the necessities.

The space in the boiler shop side will also be used for various purposes, including a department for bolt cutting, including stay bolts, flue work for which considerable room has been assigned. A Westmark Submerged Flue Rattler with a capacity of 200 flues is to clean the flues; this method being deemed superior to the noisy, dirty, dry rattler process.

Farther along in the department is located a copper, tin and sheet iron tank work, tender trucks and frame work, pipe work and at the extreme end of the shop are located a few wood working tools.

Should the M. M. & M. C. B. Associations Consolidate?

ON PAGE 349 of the September issue of the Railway Master Mechanic there appeared an editorial discussing the consolidation of the American Railway Master Mechanics' and the Master Car Builders' Associations, suggested by President Brazier of the M. C. B. Association, at the recent convention.

On pages 383 to 385 of the October issue there appeared a number of replies from the most prominent railroad men, and to which we wish to add the following letter:

Editor Railway Master Mechanic: It appears to me that you have covered the case quite fully in your editorial referred to, with one exception, which is that provision should be made in regard to taking up the various questions as between the Motive Power proper and the Car Department, and in order to secure prompt attendance of both motive power and car men at all meetings it might be desirable on each day's proceedings to alternate with car and motive power subjects. Otherwise, if each was assigned certain days quite a number of the car department officials might absent themselves while motive power questions were being discussed, and vice versa.

On above lines I would consider it desirable to consolidate the two organizations. Yours truly,

J. F. Dunn,
Supt. Motive Power, O. S. L.

Terminal Handling of Locomotives

IN opening a discussion on the Terminal Handling of Locomotives, I am prompted by the heavy demand for power in recent years and the heavier construction which has a vital influence on the condition of locomotives.

The old type of engine with its small firebox and low steam pressure stood an amount of abuse which the modern engine will not have, and it is my opinion that, in many instances, hostlers and wipers are responsible for leaky flues and other firebox troubles.

When an engine is left at the coal shed by its crew it should have a bright fire, plenty of water in the boiler and all dampers closed. The hostler should take it to the cinder pit and have the fire knocked out with the least possible delay, the use of the blower on cinder pit being avoided to the fullest practicable extent. After fire is out and ash pan cleaned, the dampers should again be closed, and on reaching the house the boiler should be allowed to cool as long as possible before washing out.

The requests of train dispatches for more power cannot be granted with impunity. If a boiler needs washing it should be washed and the work done in a proper manner. Dispatchers dislike an engine failure, and soon learn that if roundhouse men are given time to do the work an engine will go over the road in a far more satisfactory manner and move more tonnage than when needed repairs are slighted.

If flues need caulking, I like to have the work done when boiler is hot as a man can work in, but the work should always be thoroughly done. It is useless to timker the flues, for they will continue to leak and the work must be done over.

The use of auxiliary blower or air blast in the firebox when engine is hot but has no fire should be prohibited. In either case cold air impinges against the flue sheet and bad results follow.

Before firing up, all clinkers should be removed and the grates have a perfect freedom of movement. The fire should be started over all of the grate surface, and given sufficient time to avoid the excessive use of the blower, and enginemen should not leave for the yard until there is a good pressure of steam and a bright fire.

So much, briefly, for the boiler, the work of which should be done first, if possible.

Machinist's work can be so planned that the engine will be ready in the shortest possible time or it may greatly retard it. As soon as an engine is housed the work report should be carefully gone over by the foreman. If there are gauge cocks or boiler checks to be ground, the work should be promptly done. Engines are sometimes badly delayed because such work is left until the last.

If driving boxes are to be packed, shoes, wedges or motion work to be overhauled, have the machinists do their work without interferring with the boiler washer, if he has work to do.

In general, plan all the work so that the engine will be held no longer than is necessary for the longest job.

In a house large enough to admit of such an arrangement of the force, the various details should be looked after by men who are more or less specialists in their line. Mechanics are prone to criticise each other's work and will tear down work well done, merely because it was not done their way. Regular men, therefore, on rods, piston packing, springs, etc., will accomplish more and give better results than men who are given all classes of work.

A man regularly assigned should make daily inspection of couplers, steam hose, and such parts as may cause delay on the road, and if electric headlights are used, the repair man should test the light before engine is put in the house and again after repair or adjustment.

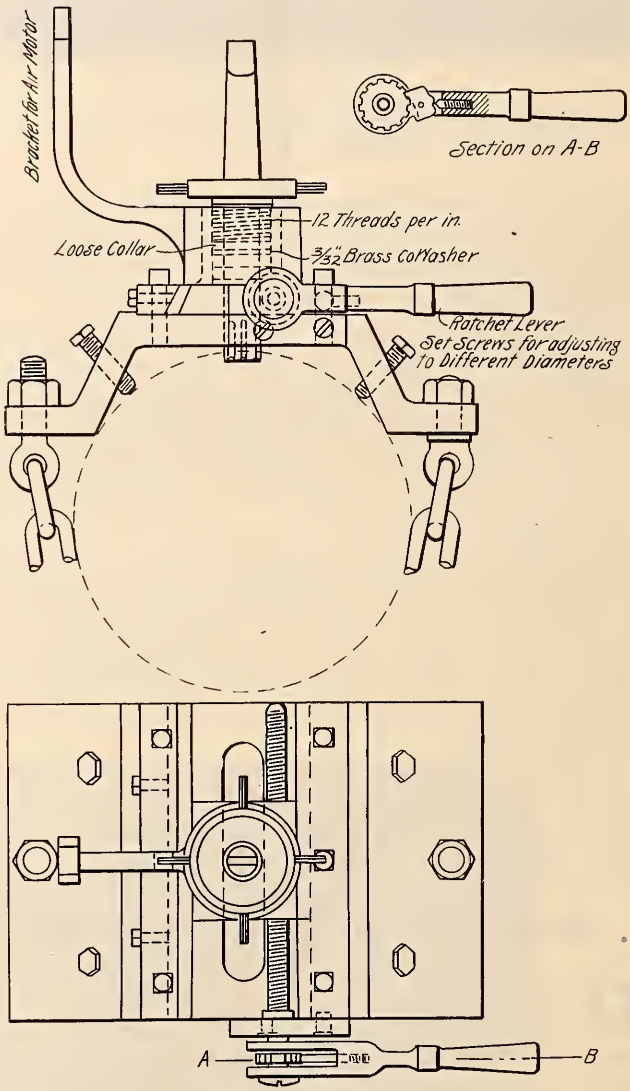
Remarks of T. A. Foque, mechanical superintendent, M. St. P. & S. S. M. Ry., before the North-West Railway Club.

Cutting Keyways on Driving Axles.

IN SHOP practice it is very essential to have as many portable devices, operated by pneumatic tools, as possible, thus dispensing with hand work. Such devices as a machine for cutting keyways on driving axles are especially useful on the erecting side of a railroad repair shop. It will be noted that this machine, as shown in accompanying sketch, is very light and substantial, is operated by one man, and can be used either under engines or anywhere where driving wheels are placed.

Eccentric keyways after being used for some time become badly worn and out of true, on account of eccentrics working on the shaft, and it is necessary in a great many instances to true them up. When applying driving axles it is generally the custom to have the keyways laid off, drilled with a tit drill, then chipped by hand, which is dangerous work, owing to the chips flying out, and it has been the case where some of the best workmen have lost an eye through this operation.

By the device presented herewith, after new axles are



Machine for Cutting Keyways in Driving Axles.

applied valves can be set, if desired, then the keyways marked, eccentrics moved to one side and this machine applied, moving the end mill down and then across.

Near the top of the sketch is the head which feeds down the end mill, which is easily operated by hand having four prongs. To the left is the bracket which receives the handle of the pneumatic motor, the operator having to use only the ratchet lever and the throttle handle on the motor, thus dispensing with any extra help. In the upper right hand corner is a detail of the ratchet lever, which can be operated either way, and which feeds the end mill lengthwise on the axle. The sketch shows the driving axle and how the machine can be adjusted by the set screws on the side to accommodate any diameter of axle and which will allow the end mill to feed in the proper distance. The end mill, or cutter, is made on the top with Morse's taper shank to fit pneumatic motors. End mills of different diameter can be made to accommodate different sized keyways.

One chain is used to fasten this device to the axle, and is tightened by one nut which makes it very easy to apply. This machine has proven to be a labor saving one, as well as turning out accurate work.

We are indebted to Mr. I. C. Hicks, M. M. of the A., T. & S. F. Ry. at Albuquerque for the above information.

Consolidation Freight Locomotive, Canadian Pacific Railway

AMONG the new power recently acquired by the Canadian Pacific Railway Company are ten 2-8-0 type of freight engines. These engines are built by the Canadian Locomotive Company and embody their latest designs for this class of work.

The locomotives are designed to operate under 200 pounds of steam. The firebox is of the wide type for burning bituminous coal and is 96 inches long and 65¼ inches wide; the cylinders are 21 inches in diameter by 28 inches stroke; the valves are of the piston type; and the driving wheels 57 inches in diameter. The boiler, which is fed by two Hancock injectors with Sellers check, is equipped with the Schmidt superheater. Other special equipment consists of straight air brake; Ritter oil pump; Pyle electric headlight; and Washburn flexible pilot coupler.

The general dimensions applied to the usual formula give a tractive effort of 36,800 pounds. The weight on drivers is 163,675 pounds, the firebox heating surface is 161 sq. ft., the tube heating surface is 2218 sq. ft., total heating surface is 2379 sq. ft., and grate area 44 sq. ft. Comparing these figures, the ratio of adhesive weight to tractive effort is 4.45; ratio of tractive effort to total heating surface is 15.5; ratio of total heating surface to firebox heating surface is 14.7; ratio of total heating surface to grate area is 54; ratio of firebox heating surface to grate area is 3.6; ratio of total heating surface to volume of both cylinders is 212; ratio of grate area to volume of both cylinders is 3.9;

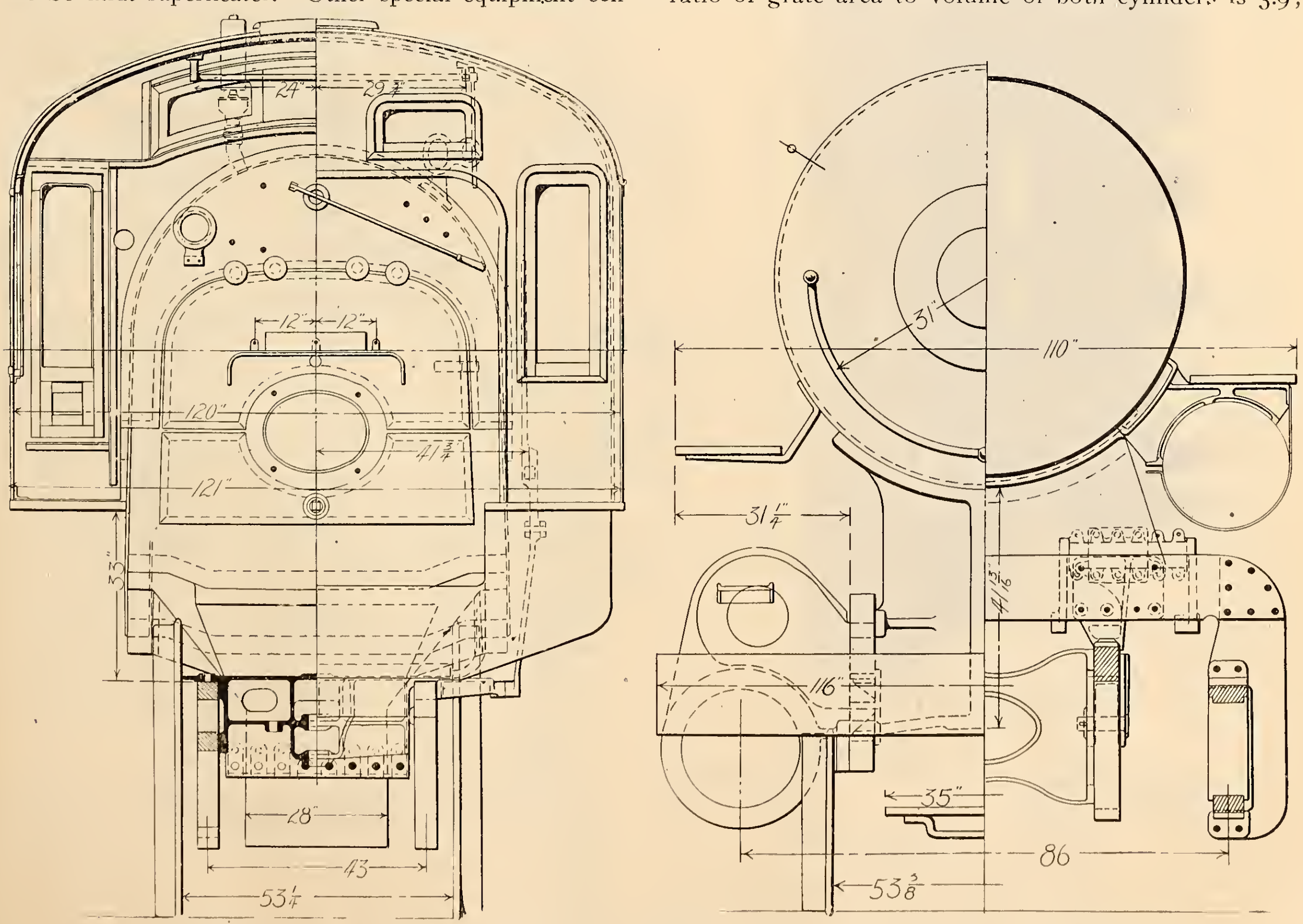


FIG. 1—CONSOLIDATION FREIGHT LOCOMOTIVE, CANADIAN PACIFIC RAILWAY—END ELEVATIONS AND SECTIONS.

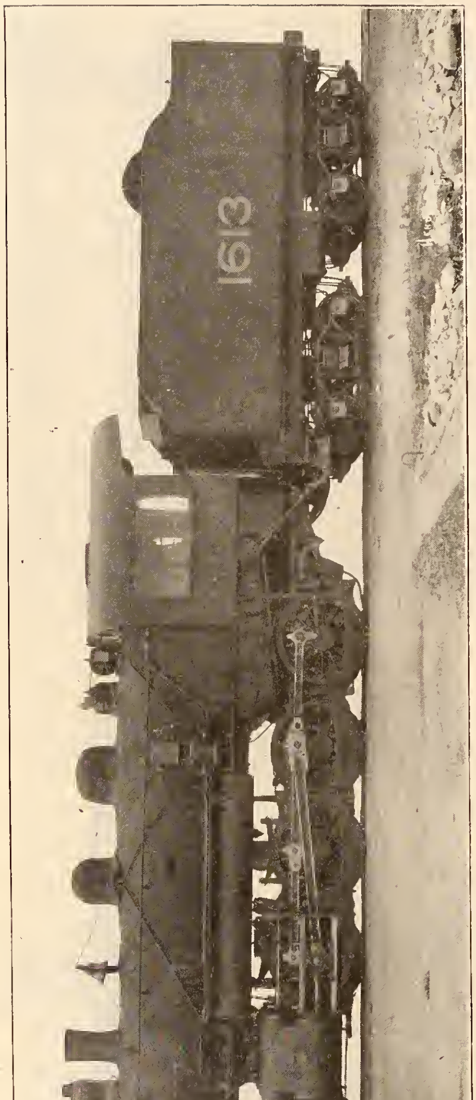


FIG. 2—CONSOLIDATION FREIGHT LOCOMOTIVE, CANADIAN PACIFIC RAILWAY.

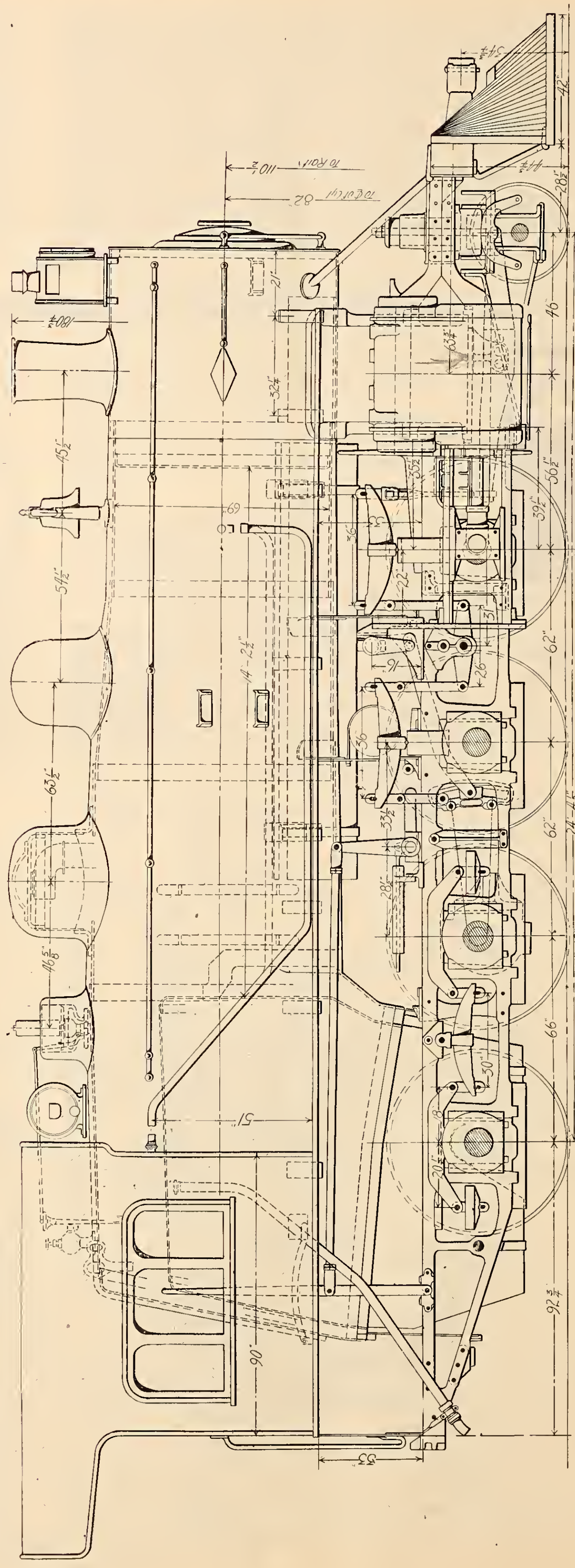


FIG. 3—CONSOLIDATION FREIGHT LOCOMOTIVE, CANADIAN PACIFIC RAILWAY—ELEVATION.

ratio of total heating surface to weight of one cylinder full of steam at boiler pressure, 903.

The following are the general dimensions:

Gauge	4 ft. 8½ in.
Type of engine	2-8-0
Fuel used	Bituminous coal
Weight in working order, drivers	163,675 lbs.
Weight in working order, total	186,200 lbs.
Wheel base of engine, rigid	15 ft. 10 in.
Wheel base of engine, total	24 ft. 4½ in.
Wheel base of engine and tender	53 ft. 3½ in.
Length over all, engine and tender	63 ft. ¾ in.
Width over all, engine and tender	10 ft. 1 in.
Height over all, engine and tender	15 ft. ¼ in.
Length of firebox	96 in.
Width of firebox	65¼ in.
Diameter of driving wheels	57 in.
Material of driving wheel centers	Cast steel
Diameter and length of driving journals	Main 9½ in. x 12 in., I. F., & B., 9 in. x 12 in.
Diameter of cylinders	21 in.
Stroke of cylinders	28 in.
Kind of valves	Piston
Type of boiler	Wide firebox with radial stays
Working pressure of boiler	200 lbs.
Number of tubes and diameter	22, 5 in.; 244, 2 in.
Length of tubes	14 ft. 2½ in.
Injectors	Hancock with Sellers' check
Safety valves	World
Brakes	W. A. B. Co.'s air brakes with straight air attachment
Kind of Packing	U. S. metallic
Superheater	Schmidt
Lubricator	Ritter oil pump
Steam gauge	Crosby vertical reading dial
Bell ringer	Little Giant
Headlight	Pyle electric
Pilot coupler	Washburn flexible
Tender coupler	Tower M. C. B. shank
Weight of tender, loaded	130,000 lbs.
Capacity of tank in imp. gallons	5,000
Style of tank	U-shape with sloping back inside
Coal capacity	12 tons
Style of truck	4-wheel with "Simplex" bolsters
Diameter of wheel	33 in.
Kind of wheel	C. I. chilled, double plate, 750 lbs.
Diameter and length of journal	M. C. B., 5½ in. x 10 in.
Brake beam	"Simplex"

Results of Letters in the M. M. and M. C. B. Association

The secretary of the Master Car Builders' Association reports to the members the results of the letter ballot which closed Sept. 25, 1904. All questions submitted on Standards, Recommended Practice and Rules were adopted with the following five exceptions: Recommended practice; 1, distance between center of bolster and face of end sill; o, hight and width of cars on high trucks; m, use of two belt rails; q, lettering on end fascia boards; and r, specifications for air brake hose.

On the four questions submitted to the members of the American Railway Master Mechanics' Association, the results of the letter ballot, which closed Sept. 16, show that all have been adopted.

The following changes are announced on the Indiana, Illinois & Iowa Railroad Company: Mr. J. T. Flavin is appointed assistant master mechanic, with headquarters at Kankakee, Ill. Mr. George Thomson is appointed general foreman, with headquarters at Kankakee, Ill. He will have charge of all matters pertaining to the car department.

Hydraulic Piston Puller

THE difficulty often encountered in extracting rods and the amount of sledging sometimes necessary in connection with the old wedge method of pulling, renders practical a device by which a powerful and steady pressure may be exerted against the end of the piston rod, in order to force it from its fit in the cross head.

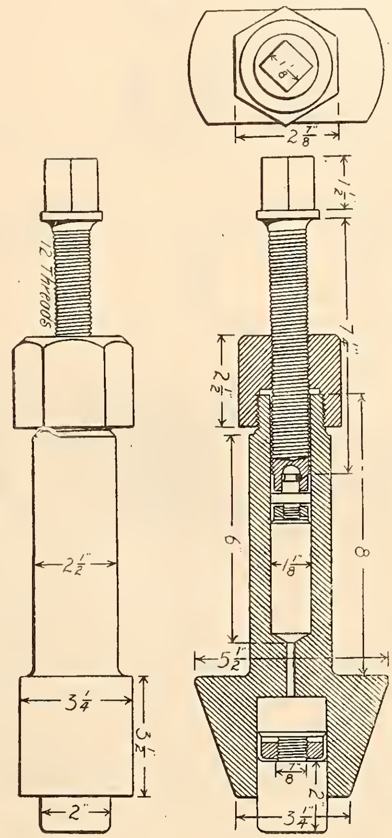


FIG. 1.

The accompanying line drawings illustrate an appliance which has been designed for this purpose. It consists of a small screw hydraulic press for providing the necessary pressure, and a frame for holding the press in position, and supplying the necessary brace. The construction of the press is shown in figure 1, and its application together

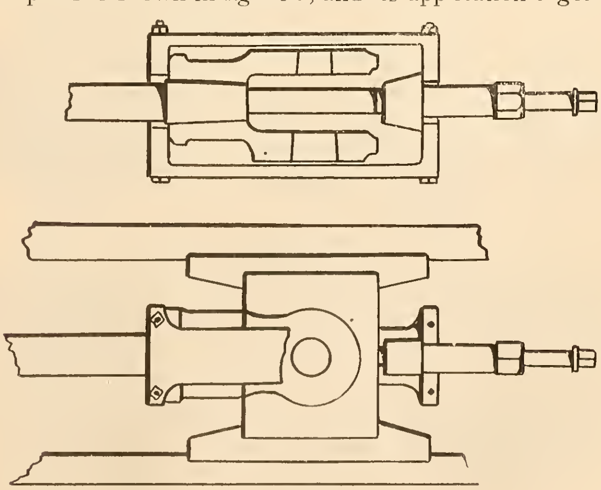


FIG. 2.

with arrangement of the supporting yoke by figure 2. The yoke may be readily taken into several parts in order to simplify its application to the cross head. By reference

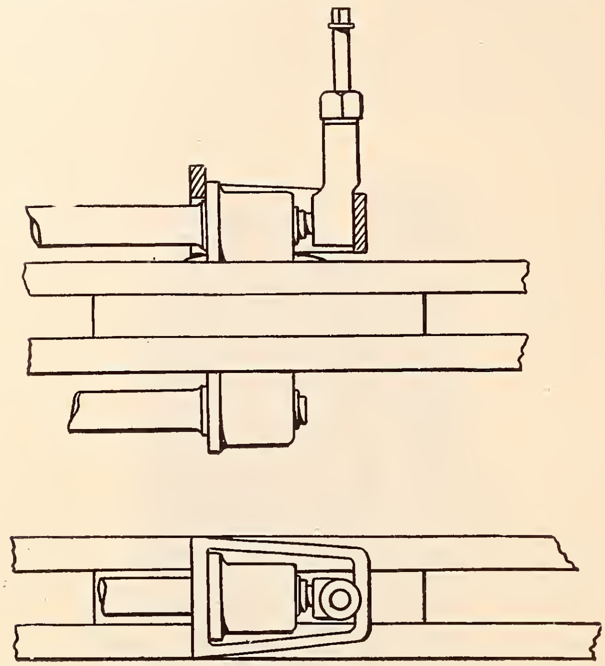


Fig. 4.

to figure 2 it is clearly seen that a pressure is exerted directly between the back collar of the cross head and the face of the rod. After adjusting the apparatus and applying a pressure against the end of the rod by forcing in the screw at the end of the press, a light jar with the sledge hammer against the side of the cross head is usually sufficient to break the hold from the fit between the rod and cross head.

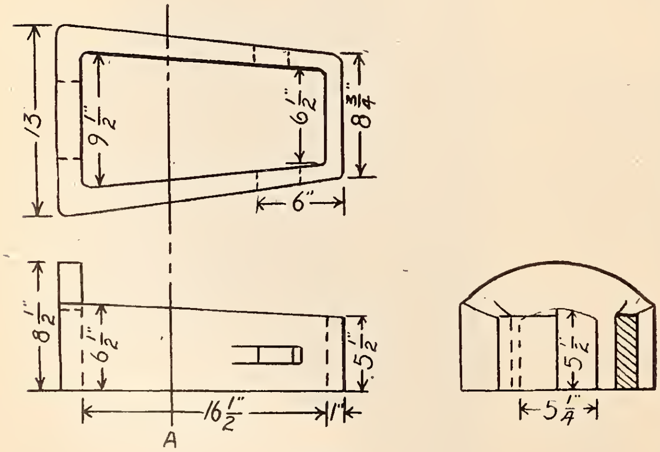
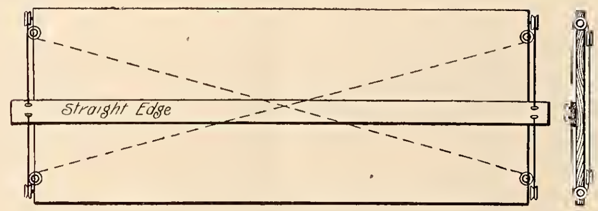


Fig. 3.

Fig. 3 illustrates a yoke for use in connection with Vauclain four-cylinder compounds, and the application of the hydraulic press with the same. It will be noted that the same style yoke may be used with a taper key to extract pistons instead of the hydraulic screw. For the illustrations here presented we are indebted to Mr. J. P. Peach, general foreman of the Fort Madison (Ia.) shops of the Atchison, Topeka & Santa Fe Railroad.

A Kink For The Drafting Room

AN inexpensive and effectual method of arranging a straight edge in connection with a large drawing board is shown by the accompanying line drawing. The idea is to produce a simple method which will maintain the general longitudinal direction of the straight edge when moved transversely across the board, so that lines drawn according to the straight edge when in any position will be parallel to each other. The direction of the straight edge is maintained by two pieces of strong cord, preferably indicator cord which will not stretch, that terminate at each end of the straight edge and pass over several pulleys. Banjo stops are used as the terminating posts of the cords, so that they may be easily tightened



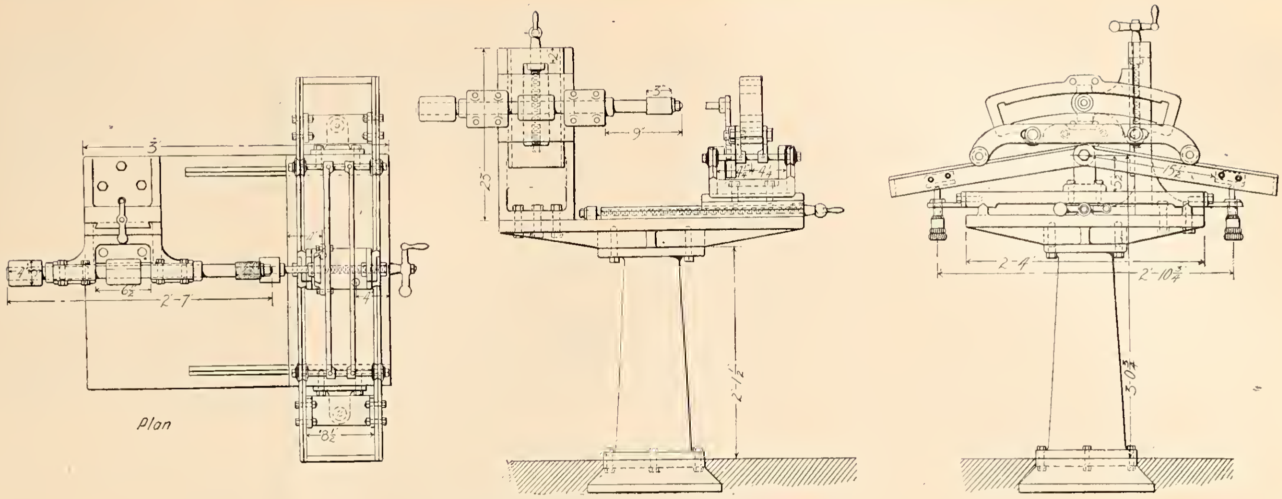
A Kink for the Drafting Room.

and held taut. Each cord passes from the stop to a pulley at the end of the board, and continues to a second pulley which revolves in a plane perpendicular to that of the first pulley. It is then led to the corner diagonally across the board, where it is guided by a similar arrangement of pulleys and continued to a stop in the end of the straight edge opposite to that at which the first end of the cord is attached.

This arrangement has proven satisfactory in place of the usual T square in connection with large boards. It permits the straight edge to be used at a slight angle, but a very great deviation from the horizontal is impossible. The most satisfactory diameter of pulley to be used in connection with this device is equal to the thickness of the board.

Link Radius Grinding Machine at the West Milwaukee Shops, C., M. & St. Paul Ry.

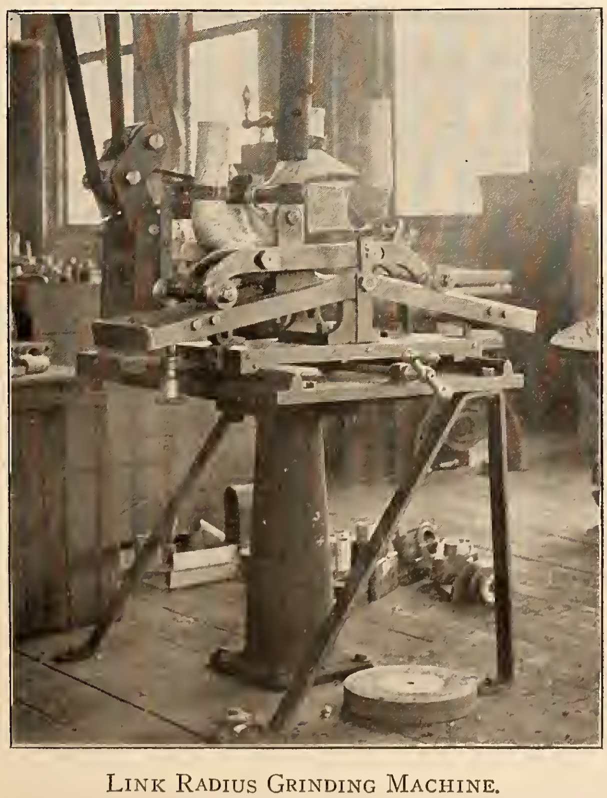
AMONG the several appliances devised in railroad shops for grinding the radii of locomotive links, the machine whose design is illustrated by the accompanying line drawings and photo-engraving appears of much interest. The machine is supported by a cast iron pedestal bolted to the floor, and the several moving parts rest upon a cast iron bed plate, which is firmly secured to the supporting pedestal. The link is bolted to a pair of light brackets, so arranged as to constitute a carriage. This is carried on two pair of rollers, one pair being located at each end. The rollers traverse a set of guides which are supported at the center, about which they may be rotated within narrow limits, and are adjustable at the outer ends by micrometer screws. These guides are carried upon a super bed-plate, which in turn is arranged to slide transversely on guides which are cast to the



Link Radius Grinding Machine.

principal bed-plate. Transverse motion is given thereto by a crank handle and horizontal feed screw.

The holes in the link brackets through which the link is bolted, are made oblong in order to fit the several sizes of links in service on the different classes of locomotives. When the link has been placed in position the roller guides are adjusted by the micrometer screws to obtain the exact radius desired for the link. The super table is then moved transversely to such position that the emery wheel engages the surface of the link. The link bracket is then moved back and forth by hand, rolling up and down along the guides, the motion being such that the link is vibrated in an arc of a true circle. For grinding link blocks a small cast iron bracket is provided. This bracket, when in use, is bolted to the link bracket nearer the emery wheel stand, two holes being drilled in the nearer link bracket to coincide with the bolt holes in the link block bracket.



Link Radius Grinding Machine.

The emery wheel is driven by a belt from the countershaft above and is so arranged that it may be raised and lowered by a hand crank and verticle feed screw. A noticeable feature of this machine is the small amount of space which it covers, as compared with other devices for the same work, which we have seen. The machine was devised by Mr. James F. DeVoy, mechanical engineer of the C. M. & St. P. Ry., through whose courtesy we are enabled to present this description.

D. & H. To Use Electric Power.

FOLLOWING the equipment of the New York Central of fifty miles of its line at the New York end and rumors of plans for the electrification of the West Shore, comes a report that the Delaware & Hudson Company has almost completed preparations to operate electric trains on all of its northern divisions, in order to attempt to regain the patronage which has been going to the electric lines in this territory.

Several months ago this company secured the services of one of the General Electric Company's engineers to work out the problem of electrifying its northern divisions for the local traffic. The engineer was to devise a scheme whereby the company could operate electric cars over the steam road in such a way as not to interfere with the steam trains. It is said that the company has adopted his scheme and will use the side-trolley. This device differs from the regular overhead trolley in that it is fastened to the top of the car at one side, instead of in the middle. In this way there will be no interference nor corrosion of trolley wire with the use of the road by steam locomotives.

The first of the Delaware & Hudson lines to be equipped with electricity will probably be between Albany and Saratoga, and the Adirondack divisions will follow later.

Superheated Steam Trials In Germany

A RECENT report received from the U. S. Deputy-Consul General at Berlin contains some valuable information in regard to further comparative tests of locomotives equipped with Schmidt superheaters. On the division between Sommerfeld and Berlin an accurate record was kept of the performance of a twin locomotive using superheated steam and of two similar compound locomotives using saturated steam, and it was found that the engine with superheater showed an economy in the amount of coal used amounting to 10.9 per cent and of 25.8 per cent in the amount of water used. During these trials the engine with superheater made much better time at starting than the compound engines, as well as in climbing grades. Estimations based on the amount of steam produced showed that the real saving in coal should have been 15.3 per cent instead of 10.9 per cent, the saving actually attained.

According to the report of J. Obergethmann, professor at Aix-la-Chapelle, locomotives equipped with the most perfect form of superheaters and compound locomotives were tested by the Halle railroad directory, and the average economy in the amount of coal used by engines with superheaters was 11 per cent, with 23 per cent less water.

The most exhaustive tests that have been made public were described in a lecture of M. Unger, a railroad inspector, to the Union of German Mechanical Engineers. The management of the Stadtbahn, of Berlin, whose lines run through and around the city, had three engines of types considered best adapted to the service, tested under practically the same conditions. The locomotives using superheaters gave much better results, gathering speed much more rapidly at the start, than the two other engines tested.

The conclusion reached by M. Unger as a result of the trials made on the Stadtbahn was that the three-fourths coupled, four wheels three coupled, locomotive with superheater is, owing to its greater efficiency and economy, the only locomotive worthy of consideration for the hauling of heavy trains in interurban traffic. The saving in coal of twin locomotives using superheated steam, over compound locomotives with saturated steam, varies according to the nature of the service rendered, but the results indicated above will show that 10 to 11 per cent economy may be at present attained under normal conditions of traffic, and it is likely that this economy may be increased by further improvements in design.

The fact that the compound engine can be replaced by the simpler twin engine, with increase of power and lower pressure in the boiler, would seem to warrant the satisfaction of the Prussian railroad authorities with the results obtained by them in the use of superheated steam, even if no economy in fuel is obtained.

Test of Compound For Brazing Cast Iron

A TEST of a new compound for brazing cast iron, which has been invented by Burt Springer, of Des Moines, Iowa, was made in the School of Education, at the University of Chicago on Oct. 27.

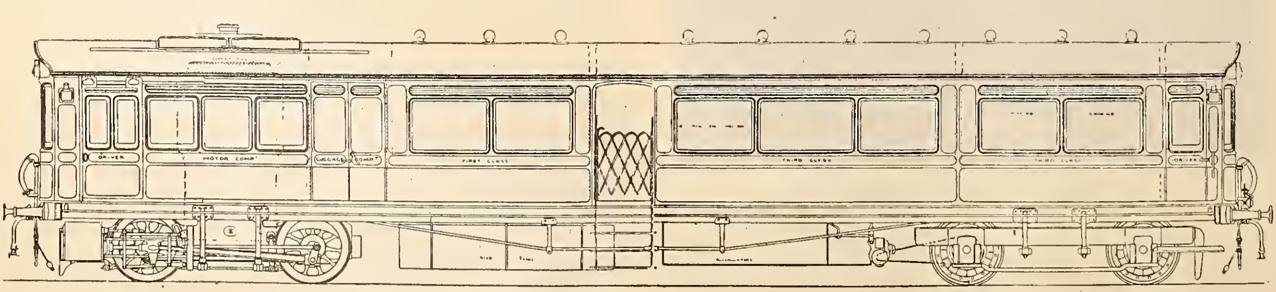
The demonstration was given in the presence of a number of iron-working experts. Two pieces of cast iron were fastened together and heated to a brazing temperature, after which they were treated with a powder which Springer had compounded, having the same effect as a flux in the process of brazing malleable iron. It served the purpose of cleaning the iron and preparing it for the second part of the process.

When the first operation had been completed the inventor treated the iron pieces with a second preparation and brass spelter. The action of the former permits the spelter to flow into the iron on both sides of the break, welding the two pieces. After cooling the iron was broken with a chisel and found to have broken on one side of the original break, indicating that the point at which it had been bound together was stronger than the original metal.

If the experiment can be applied to practical purposes with equal success, it would prove invaluable to the railroad shops. A large number of castings, such as cylinders, etc., which are constructed of cast iron, could be brazed and put back into service instead of consigning them to the scrap pile.

Steam Motor Car

SOME steam motor cars have been designed by Mr. J. G. Robinson, chief mechanical engineer of the Great Central Ry. of England, and are now under construction at the Gorton shops. These cars are to be used on divisions where the traffic does not warrant running a full train. In other words, they are to be used in light suburban business, where better service can be instituted at less expense for operation.



MOTOR CAR—GREAT CENTRAL RAILWAY OF ENGLAND.

Accommodations are provided for twelve first-class passengers and forty-four third-class. The cars are 61 feet 6 inches long over the body. Beginning at the motorman's end, the interior is divided into the motor compartment, baggage compartment, first-class and third-class compartments. Entrance to the car is by means of a side corridor at the center of the car, which opens into the several compartments. The body is of wood, very nicely finished, with an underframe of steel. The interior is ornamented and fitted in accordance with the class of its occupants. The first-class compartment has longitudinal seats of walnut and sycamore, upholstered in green, while the headlining is finished in gold. The third-class compartments are fitted up in teak with pine panels and have transverse reversible seats covered with rattan.

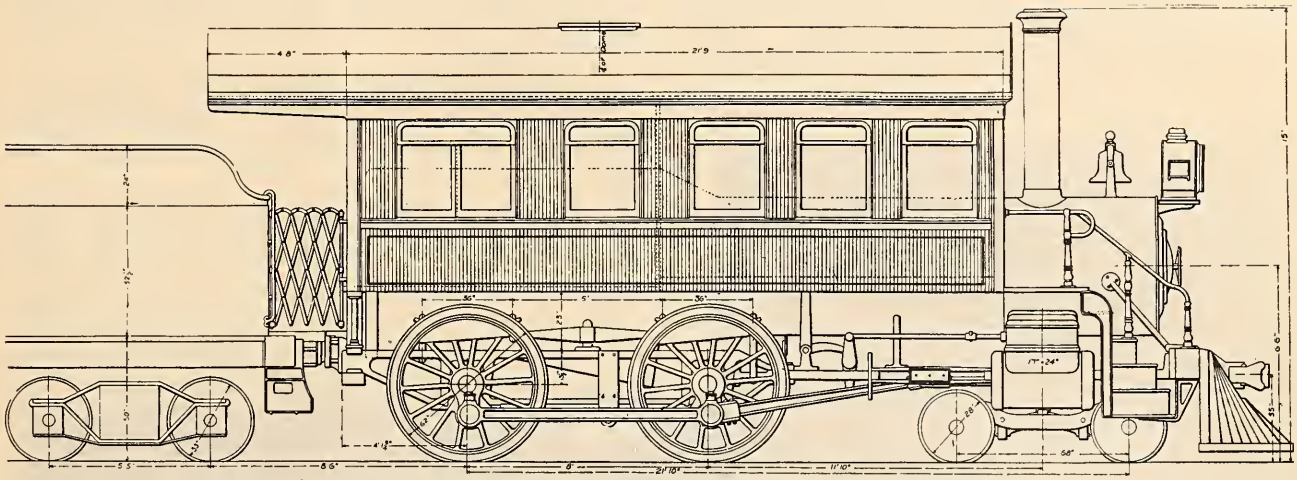
The motor boiler is of the multitubular vertical type. The coal storage is in the motor compartment, while the water supply is contained in tanks carried under the sills. The car is heated by steam from the boiler and lighted by the axle light system. The storage batteries for the lighting are carried under the car. The design is well worked out for this class of traffic.

Inspection Engine

THE engine "Saratoga," illustrated herewith, was recently changed into its present form at the Green Island shops of the Delaware & Hudson Company.

This engine, which has cylinders 17x24, is heavy enough so that in case of an emergency it can be used to take an ordinary passenger train or private cars.

The cab is nicely and comfortably fitted up. The seating arrangement is very desirable and gives a view of the permanent way in every direction. The insulation of the boiler is practically perfect, consequently the occupants are not inconvenienced by the heat. The cab is also provided with a toilet and wash room. Electricity, which furnishes light for the headlight, also lights up the interior.



Inspection Engine—Delaware and Hudson Co.

The principal dimensions are as follows:

Fuel	Lump anthracite
Weight of engine	100,000 lbs.
Weight on drivers	67,000 lbs.
Weight on trucks	33,000 lbs.
Weight of tender, empty	43,000 lbs.
Weight of tender, loaded	102,000 lbs.
Cylinders	17x24 ins.
Diameter drivers	62 ins.
Type of valves	Slide
Heating surface	1,300 sq. ft.
Tank capacity, water	5,000 gals.
Tank capacity, coal	8 tons

A Marked Advance in Locomotive Boiler Maintenance

LOCOMOTIVE maintenance is a subject of interest to all persons connected with the management of railroads, and any changes in design or in methods of maintenance that eliminate troublec and tend to increase the efficiency or to reduce cost of repairs are, we believe, always welcome subjects for discussion and investigation, and if found favorable, for approval.

Some changes have been made by the Pittsburg & Lake Erie R. R. at its McKees Rocks, Pa., roundhouse that are producing valuable results, a description of which may be of interest to the members of this club and also to the vast number of readers of your publications.

This plant has been in successful operation since November, 1903, and by it the foul water is removed from locomotive boilers; the heat is saved, and used in heating the water for refilling, and the boiler is refilled with water having a temperature of about 300 degs. F.; the whole operation requiring from 20 to 35 minutes, depending on the size of the boiler. If the condition of the boiler at the commencement of the operation showed steam pressure of 100 to 125 lbs. per sq. in., and if the fire were "banked," which is desirable, the steam pressure during the process will not have fallen below about 75 lbs. per sq. in. This water change is made without allowing any

*Paper presented before the Western Railway Club by Mr. A. R. Raymer, assistant chief engineer, Pittsburg & Lake E. R. R., on Oct. 18, 1904.

steam to escape in the atmosphere, and also without discharging any water on the floor of the roundhouse or into the pits.

While this work is being done the temperature changes in the boiler are very slight, being not more than 30 degs. —say from 350 degs. F. to 320 degs. F.

It is not necessary to describe to the members of this club the present familiar methods of washing out boilers, but your attention is called to a few of the troubles connected with them for the purpose of emphasizing the comparison.

When the fire is drawn and the new one not built and "banked" the flue sheet and the flues are exposed to cold currents of air passing through, and unequal contraction follows which tends to cause "leaks"; steam is allowed to escape into roundhouse atmosphere, and water is spilled over the floor, depositing mud and scale on it. Cold water is frequently put into hot boilers, causing unequal contraction; great length of time is required to blow off steam, cool the boiler, wash it out, close it up, fill with water and fire up, resulting in considerable cost for labor; the loss of the heat in the water and the steam blown out; the loss of the use of the locomotive due to the great time required in doing the above work. The inability to make repairs to throttle valves, whistle valves, water cocks, etc., many times, at the time when the work should be done, on account of the time required to get boiler in a condition to allow these repairs to be made, and afterwards to restore it to service conditions; and the effect of allowing dirty water to spill on the locomotive machinery.

By the new method herein described the above difficulties are largely overcome, which results in an increased efficiency of the locomotives, a noticeable improvement in roundhouse conditions from a sanitary standpoint, and an appreciable economy in cost of roundhouse work.

On many, and a rapidly increasing number of roads there exist conditions which make it desirable to "change" the water much oftener than it is necessary to remove the plugs to wash out mud or scale. The list of these roads will include those that use water having alkaline and other soluble compounds that are not precipitated in the form of scale in the boilers, others that use waters that make a small quantity of scale that does not cement or adhere to the metal, and lastly the rapidly increasing number that have awakened to the importance, and economy of purifying the water, by removing all scale forming solids, and mud in suspension, before the water is delivered to the locomotive boilers.

In all these cases there is a concentration of the soluble compounds in the boiler as the evaporation continues, which results in a condition that produces what is known as "foaming," "priming," etc. The necessity for "changing" the water varies in time, from once, after each trip each way over a division, where bad alkaline waters are used, to once each round trip, or once in each two, five, ten or fifteen days, depending on the condition of the waters used and the amount evaporated.

The condition of the water on the P. & L. E. R. R. is such that it is necessary to remove the plugs for washing only once in from 20 to 45 days; during this time the water is "changed" whenever necessary, or on an average of about once each five days.

The benefits resulting from the use of treated water, in comparison with the conditions existing when the locomotive feed water was used in the raw condition as pumped from the rivers are clearly shown by a few facts taken from the records. Comparing results in August, 1902, with those of August, 1904: Raw water having been used during the former, and treated water during the latter period.

a. Number of trains given up on the road on account of leaking boilers during August, 1902, was 27, while the number given up for the same cause in August, 1904, was two.

b. Number of trains that had to reduce the loading, by setting off cars, on account of boilers leaking, during August, 1902, was 13—while for August, 1904, none needed to do this.

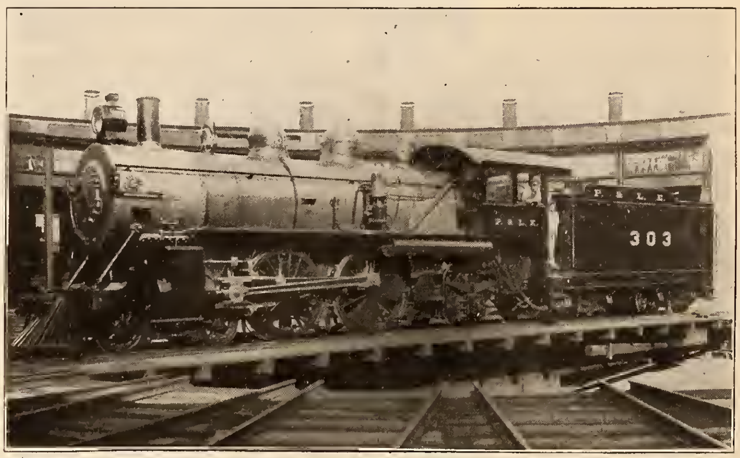


Fig. 1.

c. Number of through trains, during August, 1902, with delays of one hour or more, that had locomotives changed at McKees Rocks on account of boiler leaking, was 31; while the corresponding number for August, 1904, was only three.

Similar comparisons can be made from results already attained which show enormous advantages in favor of using purified water, in the increased life of flues, and of fireboxes, etc., and in the reduction of boiler-makers' wages—in the increased service obtained from the locomotives and the reduction of fuel necessary on account of the removal of scale.

By use of the plant here described—locomotives requiring a "change" of water, have their fires cleaned in usual way and are sent to roundhouse preferably with fires banked and steam pressure at about 100 to 125 lbs. Blow-off cocks have been placed in the left side of the firebox near the bottom, as shown by Fig. 1. An overhead 2½-in. blow-off pipe is located between engine pits, with a pipe coupling located about 6½ ft. above the floor opposite the blow-off cock in boiler, when the locomotive is in proper condition in roundhouse. The other end of the blow-off pipe connects with a manifold on the wall of roundhouse, shown by Fig. 2. A flexible pipe with necessary joints, gage, drip cock, and extension pipes for reaching blow-off cocks, when located in front of boilers, is mounted on a light truck for convenience of operation, is shown by Fig. 3. This flexible pipe truck is placed in position opposite the blow-off cock, and connected therewith, and also with blow-off pipe overhead, after which the valves are opened and the water in the boiler is forced out by the steam pressure in 10 to 20 minutes. When water is all blown from boiler the blow-off valve in the manifold is closed and the "superheated" water (at temperature of 300 degs. F. and with pressure of 125 lbs.), valve is opened in same manifold and the boiler is quickly refilled with this pure water forced into the boiler through the blow-off cock, after which the valves are closed and the flexible pipe truck is disconnected and removed. During this process there remained in the boiler a steam pressure of about 75 lbs. after foul water was fully removed; the pure water is forced in against this pressure.

Manifolds, as shown by Fig. 2, are placed on the roundhouse wall one for each of as many pits as it may be desirable to serve; pipe mains are laid under the floor in an accessible trench one for each branch of the manifold.

It has been found desirable to have the manifolds include the following service pipes:

Live Steam.—At about 150 lbs. pressure.

Blow-off pipe.

Superheated Water.—At temperature of about 300 degs. F. and with pressure of about 125 lbs.

Hot Water.—At a temperature of about 200 degs. F., that is the hot well temperature, and with a pressure of about 125 lbs.

Cold Water.—At supply temperature, say about 50 degs. F., and at about 90 lbs. pressure.

Test Water.—At supply temperature and at any desired pressure up to 300 lbs. per sq. in.

Live steam is used for heating up empty cold boilers; which can be safely done, in about 10 minutes' time, in which time the temperature is changed from cold conditions up to about 300 degs. F. The action of the steam on the empty boiler shell is uniform throughout its mass; it consequently causes no unequal expansion, and therefore no bad results. Live steam is also used for increasing the temperature and pressure in a boiler full of water and under low steam pressure.

The blow-off pipe from the manifold is used to convey blown-off water and steam to the blow-off tank—described later.

"Superheated" water is used for refilling boilers when water is "changed" for filling empty boilers after they have been "warmed-up" by use of live steam.

Hot water is used for filling boilers "whistle full" when hydrostatic test is to be applied by "test water" at proper pressure; hot water is also used to cool down boiler shells quickly and safely. Say a boiler has 100 lbs. steam and it is desired to have it empty and cool as quickly as possible, the water is blown out of the boiler and the steam is allowed to follow until the pressure is not more than 10 to 15 lbs. (The temperature of the metal will still be up to 300 degs.) The valves are then changed, and "hot water" is forced in, which cools the shell gradually, after which cold water can be mixed with the hot water for further cooling.

Cold water is used for removing mud, scale, etc., when necessary by old way of washing.

Test water is used as described above for making hydrostatic pressure in boiler; this is furnished by a pump set to the pressure wanted, which pressure can be held as long as may be desired. As this test pressure on the manifold it and the flexible piping up to blow-off cock, are tested each time pressure is used.

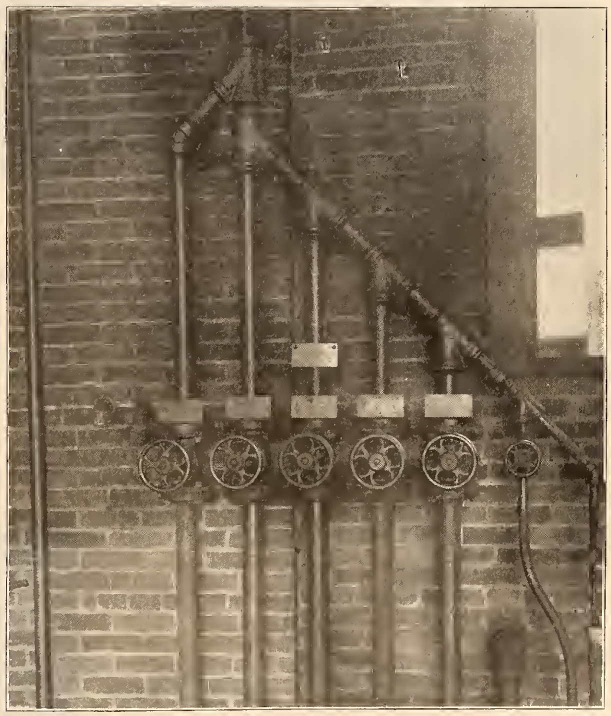


Fig. 2.

See Fig. 4 showing diagrammatic view of the whole plant.

The blow-off pipe B attached to blow-off cock A conveys water and steam from boilers to blow-off tank T; which tank is closed and furnished with a pipe E to convey steam to condenser F, and if in excess to the atmosphere there will, therefore, be atmospheric pressure in the blow-off tank T; consequently the superheated water and steam blown from the boilers will immediately on arrival at blow-off tank drop to a temperature of 212 degs. and all heat above that amount will pass in form of steam through pipe E to condenser.

A hot well is located near, and below the condenser;

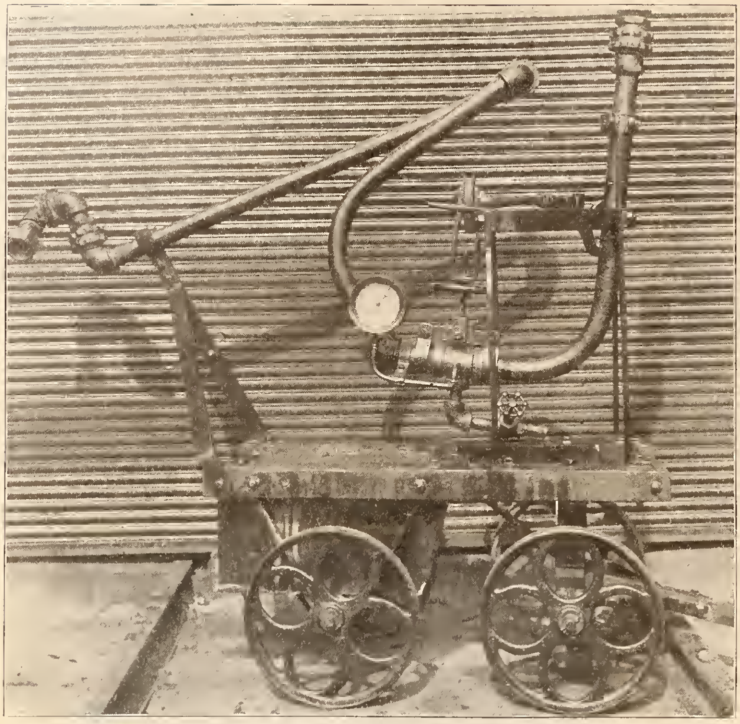


Fig. 3.

it is kept full of pure water from the supply by means of a float valve G. This supply water for hot well flows through a coil in the blow-off tank, thereby extracting considerable heat from the foul water left therein, reducing its temperature below 212 degs.

A centrifugal pump H draws water from the hot well and circulates it through the condenser F, and back to the hot well, thereby condensing the steam and transferring the heat to the water in the hot well. The water of condensation also flows from the condenser to the hot well or to the sewer as may be desired.

A "hot water" pump J is located below the hot well level and draws water from it and forces it by pipe K to the hot water valve in manifold, and by pipe C through a live steam heated L to the "superheated" valve in manifold. This pump is set for constant pressure of 125 lbs.. and is controlled by a steam pressure regulator.

The test pump P is of the usual steam pressure regulated type, easily adjusted for the pressures wanted, up to 300 lbs. per sq. in.

Few persons who have not make this work a special study will appreciate the amount of heat lost when an ordinary locomotive boiler is bliown off and no attempt made to save it.

An ordinary freight locomotive boiler will hold about 2,500 gals. of water when in working condition. This amount of water when at steam pressure of 100 lbs. has in it an amount of available heat above 212 degs. F. equal to 2,600,000 B. T. U. and nearly an equal amount in the metal of the boiler shell and connected parts.

The amount of heat blown off from a boiler of this kind at 100 lbs. pressure will evaporate about 2,700 lbs. of water at 212 degs. F., and this amount of heat along with that saved from the foul water is sufficient to raise the refilling water from an initial temperature of say 60 deg. F.

In delivering this refilling water to the boiler at say 300 degs. F. the additional heat above that of the hot well which is at about 200 degs., is furnished by live steam from stationary boilers. No one will question the economy of drawing heat from a modern power plant with stokers and high efficiency boilers rather than trying to heat up locomotive boilers in the old way by smoky fires, with expensive draught furnished by use of compressed air or steam.

Some of the different kinds of services rendered by this plant taken from actual practice, which will be readily understood from the explanations given, will now be described.

Locomotive No. 302 P. & L. E. 4—4—0 type passenger, with 115 lbs. steam and no fire, was emptied, and 18 minutes' work was done on empty boiler; afterwards boiler was filled, fired up and engine left roundhouse, all in 80 minutes.

8:55 p. m. commenced blowing off—the boiler pressure was 115 lbs.; no fire.

9:18 p. m. water all out—pressure 80 lbs.

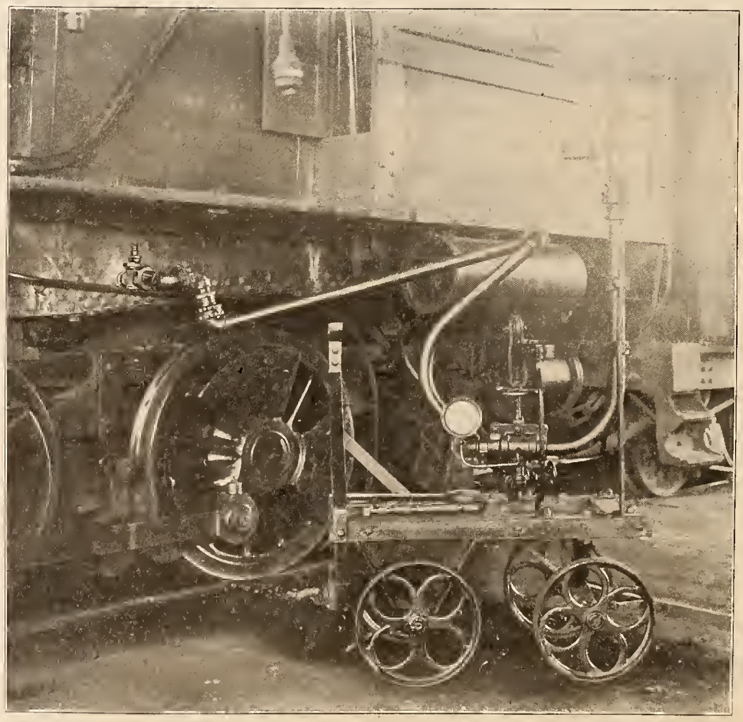


Fig. 5—Showing Truck in Use.

9:21 p. m. steam all out—pressure 0.

Work was done on boiler from 9:21 to 9:39.

9:39 p. m. commenced filling with superheated water.

9:48 p. m. boiler showed 1½ gages water pressure, 50 lbs.

9:46 p. m. started fire.

9:48 p. m. commenced delivering live steam into boiler of water.

10:01 p. m. shut off live steam; boiler pressure then was 85 lbs.

10:15 p. m. locomotive left roundhouse with 140 lbs. steam.

Water Change.—Heavy freight locomotive, P. & L. E. No. 174, fire was banked with steam pressure at 112 lbs., water change was made in 37 minutes, and steam pressure did not fall below 50 lbs.

The above work was done in presence of several Erie R. R. officials on May 6, 1904.

In 46 minutes the pressure in boiler was reduced from 120 lbs. to zero; six minutes' work was done on boiler, and it was filled and heated up to 70 lbs. steam pressure.

Engine No. 199—Class 2—8—0, steam pressure 118 lbs.; no fire; water was changed in 39 minutes.

Engine No. 98.—Passenger; no fire; steam pressure was 90 lbs. Water was changed in twenty-two minutes, and pressure in boiler did not drop below 65 lbs.

Engine No. 167.—Arrived at roundhouse with 95 lbs. steam, and no fire. Engine was marked up for repair shop. Water was blown out and the steam pressure was allowed to drop to 65 lbs. in twenty-five minutes, after which the locomotive was moved to repair shop by its own steam at this pressure.

Engine No. 165, 2—8—0 class, was heated up from empty cold condition by use of live steam to allow locomotive to be moved to another stall.

9:23 a. m., cold; no water in boiler. 9:48 a. m., steam

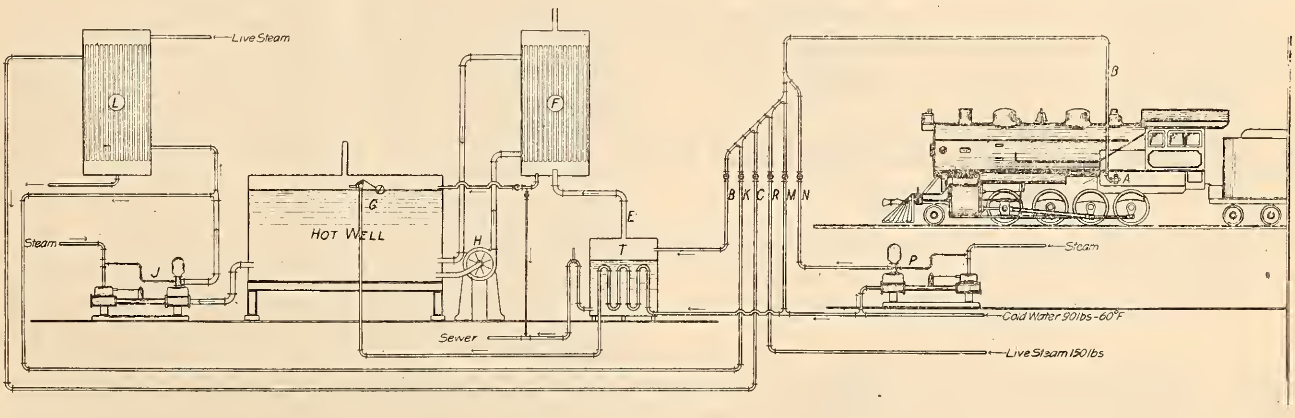


FIG. 4.

pressure was 123 lbs., at which time the steam was shut off. At 9:53 locomotive was moved, and when in new stall pressure was 90 lbs.

From empty warm boiler to full boiler with fire and 100 lbs. steam pressure in 20 minutes.

Passenger engine No. 95, 4—4—0 type, was emptied for boiler work at 3:11 p. m.; work was finished at 4:45 p. m. Boiler was still warm, but empty and under no pressure. Live steam was turned into it at 4:45 p. m. for six minutes, in which time pressure rose to 70 lbs.; at 4:52 p. m. superheated water was started and in six minutes boiler had 2½ gages; pressure was now 58 lbs., and at 5:04 the pressure was 100 lbs. The locomotive left roundhouse at 5:05 p. m.

From cold empty boiler to boiler filled, fired and with 90 lbs. steam pressure in 32 minutes.

Locomotive No. 792 (L. S. & M. S.) from shop: 9:33 a. m. cold and empty, live steam started. 9:43 a. m. boiler pressure was 55 lbs. with no water, excepting water of condensation in it. 9:44 a. m. superheated water was started. 9:56 a. m. boiler showed 2 gages water. 9:56 a. m. fire was started. 9:57 a. m. live steam again turned on. 10:15 a. m. boiler showed 90 lbs. steam, and engine left roundhouse.

Engine No. 89.—No fire; steam pressure was 120 lbs. Engine was needed, and it was found necessary to pack throttle valve before allowing it to go out.

Water Change.

Passenger Engine No. 301—4—4—0 type.

Fire was banked; steam pressure 100 lbs.

Two gages water before commencing.

Water was changed in 37 minutes, and pressure did not drop below 75 lbs.

The pumps, the blow-off tank, the condensers and all of the plant, excepting the parts located in the roundhouse, are under the care of the power house men.

One man in the roundhouse at 18 cents per hour does the work of changing water in boilers, heating and filling boilers, testing, etc., and he can handle two locomotives an hour if they are delivered to him so that he can operate on two or more at one time.

At McKees Rocks roundhouse there are ten stalls equipped for the use of this plant, and four trucks are used in making the connections to the boilers.

In conclusion, some of the advantages resulting from the use of the above plant have been found to be as follows:

1. Work of filling and emptying boilers and of chang-

ing the water is done without causing destructive strains in them.

2. The roundhouse work on boilers is more economically done in regard to labor, fuel and time.

3. Locomotives can be and are maintained in better condition, as work can be done when needed on parts of the boiler not accessible without removal of the contents.

4. The roundhouse conditions can be much improved. The floor will be cleaner and dryer, and the air will be free from smoke and steam, much to the benefit of the employes and of the structure.

5. Great economy resulting from the amount of heat saved from the water and steam blown out of boilers and used in heating water for other boilers.

6. Convenience of method of making hydrostatic tests of boiler strength, and the thoroughness of the operation results in the boilers being maintained in safer condition.

7. On account of the quick service in roundhouse work, passenger locomotives are run on schedules, with shorter time at terminals, thereby increasing the amount of work that can be done by the locomotives.

Equipment for a Modern Blacksmith Shop For Railroad Work.

A paper presented before the National Railroad Master Blacksmiths' Association by A. W. McCaslin, Foreman Blacksmith, P. & L. E. R. R. Pittsburg, Pa.

THE ideal blacksmith shop of today is the one built of structural iron encased in brick, the roof of which has been given due consideration, leaving a large factor of safety after the jarring from the large steam hammers and the support of the masts of the necessary jib cranes carrying from four to five tons each while working under a steam hammer, has been determined. The height of the eaves from the floor line should be about thirty feet. The roof should be of the monitor type, with pivoted windows at each end and the sides. Three-sash windows in the walls are preferred, bottom sash to hoist and top sash pivoted, thus inviting a good current of air in the shop. The accommodations for ventilation and light should be at least 60 per cent. If the ideal shop is being erected with the view of a greater output, the proper dimensions can be determined only by the superintendent of motive power or master mechanic advising with the foreman smith as to the per cent of increase intended over the old conditions. Newness alone will not produce desired results.

In this shop the first consideration as to the necessary dimensions should be that of forges, the design and number necessary and the number of square feet of floor space required for the same. We think double forges preferable, and most economical in floor space when placed on an angle of 45 degrees, with 15 feet from wall to center of the stack and 15 feet from center to center of stacks, allowing 20 feet from center of stack toward center of shop for working room. These two forges and their working room will occupy 525 square feet of floor space, and placed at an angle of 45 degrees will be perfectly adapted to any class of work desired—aside from frames and furnace work. In placing single forges along the walls there should be at least 5 feet of space between the wall and center of stack, and the space between centers of stacks and the working room same as allowed the double forges—15 feet and 20 feet respectively, making 375 square feet of floor space necessary for the single forge against one-half that essential for the double forges, which is 262 square feet, leaving 113 square feet in favor of forges placed back to back, or 225 square feet in favor of each double forge as against two single forges. Should the single forges be placed tight against the wall, which would be an expensive position when convenience of handling the work is considered, for convenience in this case means output, the saving even then in floor space in favor of the double forges against the two single forges would equal 75 square feet, and the number of stacks in the single forge plan and the holes in the roof will be increased 100 per cent; and if stacks are not employed you have not an ideal shop, but rather an ideal smokehouse for the smoking of men; and when stacks are employed, the throat of forge hood at the stack connection, and the stack as well, should be large enough not only to accommodate the smoke and heat in their natural tendency to ascend, but to create a draught that would cause the surrender of all the smoke and a greater part of the liberated heat above the fire to its influence.

In connection with railroad blacksmith shops the writer has nothing to say in favor of arranging the forges in groups of four, if the best results are desired, or in trying, under false pretence, to hoodwink the smoke into traveling in the wrong direction. The writer has visited two new shops where such mistakes have been made, and feels it some one's duty to enter protest as to the propriety of a plan that will produce an atmosphere in the shop that will simply suffocate or stifle the men who are compelled to work in it.

We think the object of railroad companies in building new shops is for better all-round conditions as well as a greater output—progression, not retrogression.

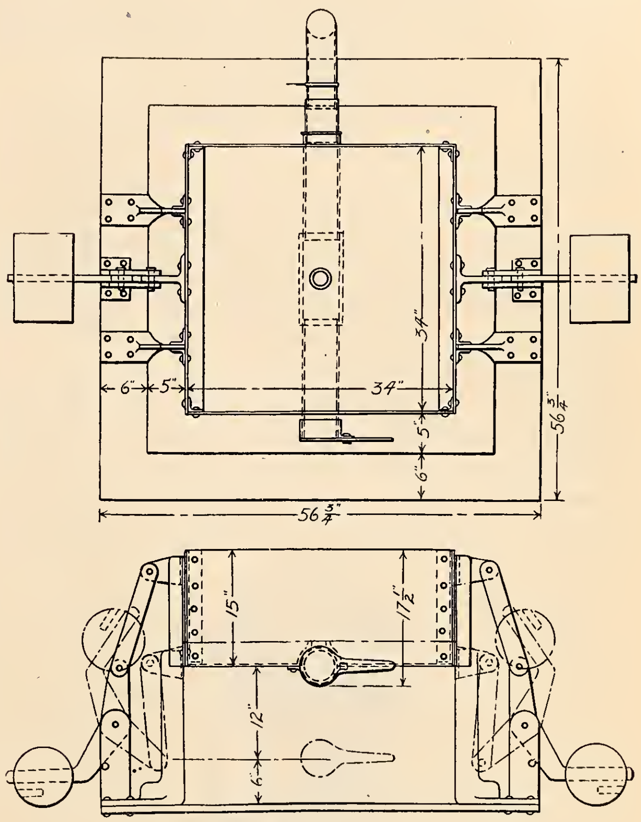
In designing forges some thought should be given to proper dimensions, heating qualifications, storage of fuel, convenience, cleanliness, economy in fuel and shop space, for we know that in many smith shops there is as much valuable space taken up with coal and coke boxes as that occupied by the forge. While we owe much to Tubal Cain, we should not content ourselves today with his style of shop, or a hole in the hillside for a forge. The large or generally termed big forges are preferably made circular in form, and should have sufficient space allotted to them for the convenient handling of heavy work. The frame forge should be about 36 inches square and made to drop about 12 inches. Such a forge can be dropped quickly, and the slow process with the chain hoist avoided, and the fire left in good condition for the succeeding heat. An illustration of a forge of this type is presented by the accompanying line drawing.

In connection with the forge we find quite a difference of opinion among those who should know, as to the proper volume and pressure of blast necessary for the best heating and greatest output without the wasting of fuel, many claiming great volume with a pressure of 5 to 7 ounces productive of the best results; but the writer, through experience, has determined to his own satisfaction that any volume that will fully supply each forge with a constant pressure from 14 ounces to 16 ounces through an upright opening in the tuyere equal in area to two or two and one-half square inches is about the proper thing for railroad smith shops, not only in volume, but in pressure as well. Seven ounces of blast pressure, no matter what the volume, will not heat iron as rapidly as the iron will absorb heat; consequently with that pressure we do not get a maximum output, while with 14 to 16 ounces of blast pressure, regulated to suit conditions and requirements, every heat unit up to the limit of absorption in the iron can be utilized, and the earnings of the employer, as well as the piece worker, increased, and the worry of the honest day worker, through the change from unfavorable to favorable conditions, greatly lessened.

For ordinary work in the railway smith shop the tuyere should be at least ten inches below top of the forge. With this depth to tuyere, and the fire prepared with fine wet slack well-tamped around a stake, the fire will, with possibly the throwing out now and then of a small clinker, last from seven o'clock a. m. until noon, and with this depth to tuyere the slag and clinkers do not drop down and clog it as they will at a smaller depth; besides, we have a body of fuel below the iron sufficient to produce and continue to produce the necessary heat for the best results and lessen the demand for a new fire at 9:30 a. m. and 3:30 p. m.

This shop should be equipped with wrought iron steel-faced anvils, weighing from 300 to 400 pounds each, placed on portable cast iron stands, that the smith may be able to accommodate his work by the position of his anvil. Each forge should have a full equipment of tools. Fifty cents expended in the proper tool will earn dollars for the employer, if in the hands of a competent workman.

In returning to the question of facilities for heating, we merely mention the inexhaustible subject of furnaces. If the accumulation of good wrought iron scrap is sufficient to employ the reverberatory furnace a greater part of the time, its use, from a money-saving standpoint, is absolutely necessary, and in many localities where refined hammered iron of large dimensions cannot be received on short notice, its services are required aside from the money-making qualities accredited to it. It does not take a mathematician to be able to figure a saving of dollars each day in favor of the reverberatory furnace when refined hammered iron in the straight bar is rated at five cents per pound and ordinary forgings at seven and eight cents at the forge. We recognize the fact that steel axles are fast replacing those made of iron, which greatly lessens the supply of wrought scrap for piling purposes, and in time will possibly lessen the demand for the reverberatory furnaces for heating scrap and add to its duties as a billet furnace. The demands for furnaces in the smith shop are many and pressing, as each day calls for a greater output at a reduced cost per item. We should have special furnaces for special classes of work as follows: The large reverberatory furnace and the billet furnace, which may be of similar design, which will also make it useful in heating material for



Modern Blacksmith Shop.

small forgings. These furnaces also answer nicely for heating car work to be formed on the machines. Then comes the case-hardening and spring furnaces and special furnaces for the heading and bolt machines, flue welding furnace, etc. Some of these special furnaces for special classes of work will increase the output over that of the forge from 300 to 400 per cent as far as heating advantages go, but this would be profitless were it not met by an equal shaping capacity of proper machines, a few of which are mentioned above, together with a steam hammer. The enumeration of the possibilities of the steam hammer in forging, bending, upsetting, riveting, shearing, coiling and uncoiling would furnish matter for quite a large volume. It is a universal tool, and few railroad smith shops have more than 50 per cent of what they should have of such power, as a deficiency prevents the use of special dies for the different classes of work, as their use would throw idle those smiths who require plain dies for the work they are engaged upon. Under such conditions the output is slow and unsatisfactory and the profitable or money-earning point not yet reached. This includes the drop and all power hammers.

The service value of a machine or tool is estimated by the difference in the cost of its production against that made by hand. We know that any old steam hammer, with special dies producing any number of duplicate forgings, will show a saving of $10 and up each day over the same class of work produced by hand, and if a 1,200-pound steam hammer can be installed for $1,500, the interest would at 4 per cent amount to $60 per year, or about the profit earnings of the hammer for one week over hand work, and if kept in constant service would mean a saving or gain of about $3,000 annually, and if operated only one hour each day would still be a profitable investment. The loss each year of from $3,000 to $5,000 through the need of a proper tool should surely not only recommend it, but produce it. The installation of steam hammers today calls for greater consideration than it did a few years ago. The adoption by many of our railroads recently of steel for many heavy parts of their engines calls for heavier hammers, larger piston rods, better kept dies and more secure foundations.

The number of cranes should be ample for all requirements, and when possible, placed so as to interchange but not interfere with each other. They should be allowed a large factor of safety over the load intended for them, and should have ball or roller bearings above and below. The pulley over which the real chain runs in frame work should also have roller bearings.

The next tool needed is the bulldozer. Furnished with the proper tools this machine will compare well with the steam hammer in its money-earning capacities, and is entitled to all vacations offered through needed repairs. The up-to-date smith shop of today has steam hammers, bulldozers, heading machines, forging machines, bolt machines, punch and shears, etc., as mentioned above, and the foreman should remember that they were bought for a purpose, and utilize them, for with these tools in the shop his legitimate excuses for a shortage of output in their line, like the old side blast, are gone forever.

The subject of fuel for furnaces requires too much consideration to be incorporated in a miscellaneous paper, so we will pass it over to the coal, coke and oil men.

There have been several ideal smith shops erected on our railroads in the last few years and many others are in contemplation. Railroad companies that have built new shops in recent years have been lavish in the expenditure of money in the interest and comfort of the employe, and by the installation of improved machinery and appliances, such as already mentioned in this paper, much of the laborious work formerly done through compulsion by man is now cared for with little effort; and while the output is increased, the demand for the man is not decreased, and being relieved of the laborious part which was formerly his, should he not feel like increasing his movement just a little?

Ventilation and light in the smith shop are being considered as never before; the lavatory, sanitation and all the conveniences of the hotel have been added, thus inviting tidiness and affording the opportunity for the mechanic to elevate himself and his calling. The question is forcibly presented to us at this point: Does the employe appreciate this beneficence and recognition given him by the employer? There never was a time when the endeavor of the employer to improve the workingman's working condition was as great as at the present time, and the one who will not see or acknowledge the benefactor's best efforts in his favor is an ingrate, and should be relegated to the shop where the only consideration given is that of self.

Finally: Ideal shops are the product of ideal employers, and the natural sequence should be ideal employes. The component parts of the ideal foreman should be brains, common sense, experience, and a large bunch of privileges.

Personals

Mr. Thomas M. Feeley has been appointed master mechanic of the Iowa Central, with headquarters at Marshalltown, Ia., to succeed Mr. W. D. Johnson, resigned.

Mr. C. M. Maine has been appointed general foreman of the Midland Terminal, with headquarters at Divide, Colo.

Mr. W. F. Girten has been appointed general foreman of passenger and freight car repairs of the Central of New Jersey, with office at Elizabethport, N. J., to succeed Mr. R. W. Burnett, who recently resigned to become assistant master car builder of the Erie at Buffalo, N. Y.

Several changes have been made in the master mechanics of the New York, New Haven & Hartford. Mr. C. T. Howe has been appointed master mechanic at South Boston, Mass., to succeed Mr. S. P. Willis, and Mr. C. T. Sheldon succeeds Mr. L. M. Butler as master mechanic at Valley Falls, R. I., and Mr. W. L. Larry succeeds Mr. A. W. Twombley as master mechanic at Taunton, Mass.

Mr. William Hassman has been appointed master mechanic of the Peoria & Pekin Union, with headquarters at Peoria, Ill., to succeed Mr. James W. Hill, resigned.

Mr. Charles Gaspar, who has been chief draughtsman of the Wisconsin Central for about two years, has been appointed mechanical engineer of that company, with headquarters at Fond du Lac, Wis.

Mr. C. F. Richardson, heretofore road foreman of engines of the Baltimore & Ohio at Lorain, O., has been appointed general road foreman of equipment of the St. Louis & San Francisco, with headquarters at St. Louis, Mo.

Mr. Thomas M. Feeley has been appointed master mechanic of the Iowa Central, with headquarters at Marshalltown, Ia., to succeed Mr. W. O. Johnson, resigned, effective on October 3.

Mr. F. P. Hickey has resigned as master mechanic of the Seaboard Air Line at Raleigh, N. C., and for the present will be located at Roanoke, Va.

Mr. A. H. Gairns, formerly master mechanic of the C., R. I. & P., at Trenton, Mo., has been appointed general foreman in charge of the San Bernardino shops of the A., T. & S. F.

Mr. S. King has resigned as master car builder of the Intercolonial to become assistant master car builder of the Canadian Pacific.

Mr. G. H. Bussing, formerly assistant superintendent of motive power, has been appointed superintendent of motive power of the E. & T. H.

Mr. R. M. Boldridge has been appointed master mechanic of the Mississippi Central, with headquarters at Hattiesburg, Miss., succeeding C. H. Welsh, resigned.

Mr. S. J. Campbell, formerly roundhouse foreman of the L. S. & M. S. at Collinwood, has been appointed master mechanic of the Western division of the C. & A., with headquarters at Slater, Mo., to succeed Mr. F. P. Roesch, resigned.

Mr. Wm. White has resigned as master mechanic of the Lake Erie & Western, to accept a position with the Chicago Pneumatic Tool Company.

Mr. John Hill has been appointed master mechanic of the L. E. & W., at Lima

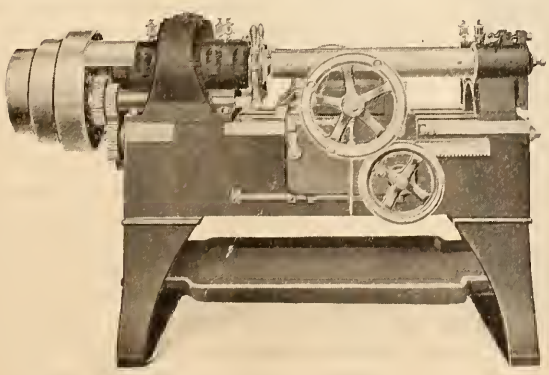
Mr. John Howard, hitherto superintendent of motive power and rolling stock of the B. & A., has been appointed superintendent of motive power of the N. Y. C. & H. R., with headquarters in New York City.

Mr. A. L. Rossetter has been appointed master mechanic of the Chicago, Peoria & St. Louis, with headquarters at Springfield, Ill.

Mr. W. G. Humphrey has been appointed general storekeeper of the Midland Valley, with headquarters at Excelsior, Ark.

Mr. F. F. Gaines has resigned as master mechanic of the Wyoming division of the Lehigh Valley at Wilkesbarre, Pa., to engage in other business. He has been succeeded by Mr. Charles Wilson, heretofore general foreman. Mr. John H. Rice, heretofore erecting shop foreman, has been appointed to succeed Mr. Wilson as general foreman.

The following changes are announced on the Lake Shore & Michigan Southern Railway: Mr. L. G. Parish is appointed assistant superintendent of motive power, with headquarters at Cleveland, Ohio. Mr. I. S. Downing is appointed master car builder of the Michigan Southern division, and will also have jurisdiction over the Indiana, Illinois & Iowa Railroad, with headquarters at Englewood, Ill., vice Mr. L. G. Parish, promoted. Mr. T. H. Goodnow is appointed general foreman at Air Line Junction, Ohio, vice Mr. I. S. Downing, promoted. Mr. Joseph Chidley is appointed assistant master mechanic of the Michigan Southern division, with headquarters at Elkhart, Ind., vice Mr. Peter Maher, resigned to accept service with another company. Mr. Chidley will have charge of engines, round-houses and engineers and firemen.



CAR BRASS BORING MACHINE.

Car Brass Boring Machine

The accompanying cut shows a car brass boring machine as built by the Pittsburg Machine Tool Company, of Allegheny, Pa.

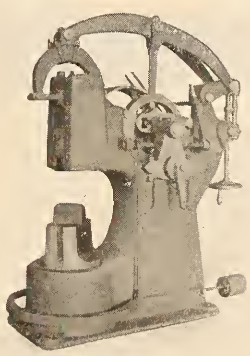
This is a solidly built machine. It has two boring bars and two carriages, and is usually supplied with a feed of ¼ inch per revolution. The feed is positive, being of a crew and gear. The bead spindles are steel and the tail bearings are bushed with bronze. There are conveniences provided for taking up the slack in the tail spindles so that the cutters will be held solidly up to the cut. Two sets of boring bars are furnished with each machine for different size brasses. The brasses are chucked quickly by working the band wheel at the front of the machine either back or forward, and an eccentric arrangement to raise and lower the chucks as may be necessary to center up the brasses.

The Thor Power Hammer

The accompanying cut shows the "Thor" power hammer as manufactured by the American Machine & Manufacturing Co., 970-972 Hamilton street, Cleveland, Ohio.

This hammer is composed, as usual, of a frame, an anvil, a hammer head, a lever, to which the hammer head is attached by means of the spring, and a crank shaft, acting on the lever. In the plane of the lever there is supported in the frame a ring of comparatively large diameter, through which the crank shaft passes. To the ring is joined an arm, which is connected to the crank of the shaft by being provided with a slot, in which it reciprocates during the rotation of the crank, a journal or sliding block embracing the crank. The arm is oscillated by this movement and is connected to the lever by means of links. The length of the stroke is adjusted by revolving the ring.

If the ring be rotated toward the right, the angle formed



THOR POWER HAMMER.

between the arm and the perpendicular through the shaft will be decreased. The stroke of the arm and consequently that of the lever and the hammer head, will thus be smaller. When rotating the ring toward the left, the angle mentioned will increase and the stroke of the arm and hammer head will be greater. By means of the screw and hand wheel at the rear, the operating arm or lever is kept horizontal, when changed from small to large work, thereby keeping the full force of the blow in a horizontal plane.

The advantage of this construction is that the hammer ascends slowly and descends quickly, as the crank at the rotation of the shaft acts on the outer part of the arm when the hammer head ascends, but on the inner part of the arm when the hammer head descends.

As will be seen by this description this construction will give a belt-driven spring power hammer, that during full running is variable for different strengths of the blow and sizes of forgings to be handled. It has an attachment for stopping the drop at the top of stroke in case of die and tool forging. It is practical, easily handled, many sided and durable. It is applicable as well for big as small work. It gives strength to the blow compared with the power required. It is a spring power hammer that during full running can be changed for different strength of the blow without danger to the workman.

The capacity of one blow, type "Ca" is 801.8 foot pounds. In consequence of this it will in many places make a good substitute and a cheap one for the steam hammer, and is far superior to the old cushion and rubber hammers.

It is made in two sizes.

DIMENSIONS AND CAPACITY.

	Style Ca	Style D
Weight of drop, lbs	170	95
Captaciy of forging, lbs	8 in. sq.	4 in. sq.
Capacity of forging, general lbs	4 in. sq.	3 in. sq.
Drop, max.	9 in.	5 in.
Revolutions per minute	175	225
Horse power required	4	1.5
Total weight	4,200	1,725

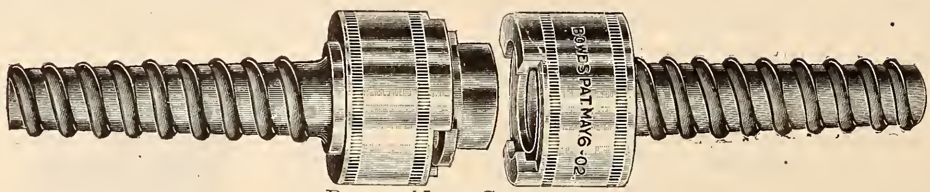
Sherwood Manufacturing Company

The Sherwood Manufacturing Co., of Buffalo, N. Y., have just opened their new office and factory at 1702 to 1712 Elmwood avenue. This is an elegant plant and will interest all engineers. It provides them with every advantage, such as adequate space conveniently arranged, good light, every convenience for employes, such as metal lockers for the workmen and is equipped with the best known appliances for the accurate and economical production of their work. In 1888 they commenced in a small way the manufacture of Buffalo injectors, oil cups, oil pumps, flue scrapers, and other supplies for engines and boilers. The business gradually increased and new specialties of their own invention or design were added from time to time, all of which gained in favor with the trade. With the advantage of greatly improved facilities they are now in position to promptly fill all orders from old as well as new customers. They not only carry a large line of engine and boiler supplies and specialties, but are also in position to make brass, bronze and aluminum castings and special brass work. A good view of the plant is shown in the accompanying illustration.

Office and Factory of the Sherwood Manufactur ing Company.

Bowes Patent Hose Coupling

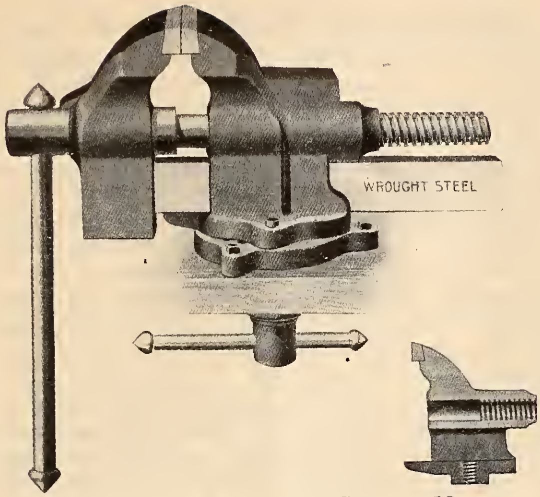
The Cleveland Pneumatic Tool Co., of Cleveland, O., are placing on the market the Bowes patent hose coupling for air, steam and water. The coupling, which is illustrated herewith, is a very simple device and should appeal to the mechanical men. It is automatic, quickly connected, and the higher the pressure the tighter the joint. The U-shaped rubber gasket is easily replaced when worn out. The thread on the shank of the coupling makes it easy to screw into the hose, and is also beneficial in holding the hose on the coupling. A very good point is that all couplings up to and including ¾-inch are interchangeable. One inch and 1¼ inch sizes are also interchangeable.



Bowes Hose Coupling.

Wrought Bars Parallel Swivel Vise

The vise shown by the accompanying engraving is the result of years of experience to manufacturing and using a vise which will stand the wear and tear of hard work. The jaws being extra heavy cannot be broken with a hand hammer, making it an excellent chipping vise. They are faced with carefully tempered tool steel pieces, which can be easily replaced should they become worn or injured. The wrought bar is machined perfectly square and parallel, and is well fitted into the pocket in the back jaw. It will be noticed that the plain part of the screw extends well into the back jaw, which enables the vise to be opened far enough for ordinary use before the thread is exposed. The screw is large in diameter, with a strong, square thread, well fitted into the back jaw, the threaded part (or nut) being as long as the jaws are wide. The vise swivels on a large washer, and can be turned to any position and securely held there by the bottom screw and the pin through a lug on either side of the



Wrought Bar Parallel-Swivel Vise.

base. For strengthening rods, etc., the anvil at the back will be found very useful.

Attention is directed to the following table of weights and dimensions:

Width of Jaw.	Open.	Weight.	Size of Wrought Bar.	Diam. Screw.
4	8	70	1⅛x2⅛	1⅛
5	9	94	1⅛x2⅛	1⅜
6½	10	141	1⅜x2⅜	1⅝
8	12	212	1½x3	1⅝

This vise is manufactured by Merrill Brothers, of Brooklyn, N. Y.

A New Design of Gas Engine

The Adams Company, of Dubuque, Ia., have brought out a revolving cylinder, air cooled, gasoline motor which is claimed to have distinctive advantages because of its compactness, its perfect balance, light weight, wide range of speeds and power and air cooling qualities.

It reverses the ordinary practice, in that the engine cylinders revolve and the crank shaft is stationary. Three units, each being a complete sylinder, with cylinder head and one-third of a central crank case cast in one piece, are bolted together and bolted to a top and bottom cast steel flange which has bronze bushings, forming bearings around the vertical stationary crank shaft. This forms the revolving unit and the fly wheel of the motor.

The three pistons are connected to a single crank wrist pin of very large proportions by bronze pitmans. The pitmans, with the pistons at their outer end, swing around the stationary wrist pin. The wrist pin being eccentric with the axis of the revolving cylinder unit causes the pistons to reciprocate back and forth in the cylinder at each revolution of the cylinders. This does not change or stop and return the mass of pistons at each dead center as with an ordinary engine. It is, therefore, susceptible to a very perfect mechanical balance. The action of the exploding charge is practically the same in this engine as in the ordinary kind.

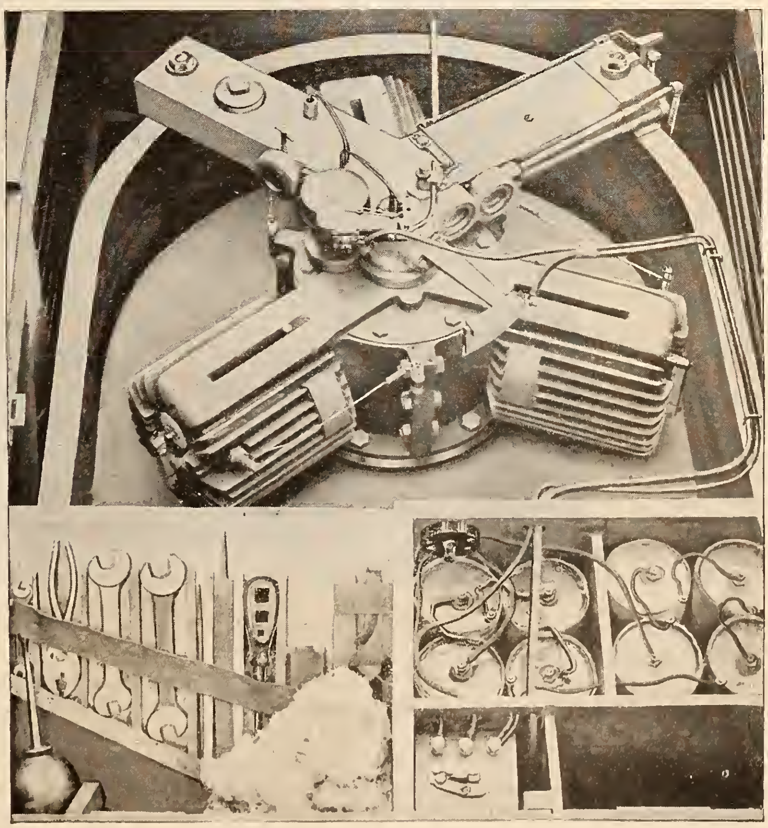
All engines exert a force or torque in two directions during the explosive or power stroke. A force or torque tends to turn the crank and with it the fly wheel, ever in one direction, and an equal force or torque tends to turn the engine cylinders, etc., in the opposite direction. The ordinary engine has the cylinders and case secured to a foundation and the crank is free to turn. The Adams-Farwell has the crank shaft secured so it cannot turn, but the cylinders are free to turn. The ordinary engines transmit their power from the crank shaft; the Adams-Farwell transmits power by bevel gear from the revolving crank case.

The light weight of the motor, as compared with the three cylinder motor of the ordinary type having the same power and cylinder size, is brought about by eliminating many parts found necessary in the engine of the ordinary type. A single central crank case answers for the three cylinders. A single throw crank of about one-third the weight of the three throw crank on the other type is employed. A single valve operating cam opens both inlet and exhaust valve. As the entire engine revolves except the crank shaft and base, the engine is its own fly wheel.

No muffler is employed. Auxiliary exhaust ports, which let out the high terminal pressure against the rapidly receding volume of air, are used. There is no back pressure, the auxiliary exhaust ports reduce the pressure to that of the atmosphere before the exhaust valve in the head of the cylinder is open. The gases that pass out of the exhaust valve are, therefore, comparatively cool.

Air cooling is accomplished by the cylinder revolving at a rapid rate, drawing in the air at the center and expelling it with great rapidity at the ends of the cylinders. The cylinders are provided with longitudinal ribs which provide a large radiating surface.

The speed of the motor is controlled entirely by their variable compression system, which consists of allowing that part of the charge not needed to give the motor the required power to escape back by the inlet valve which is me-



A New Design of Gas Engine.

chanically held open for a part of a compression stroke; that part of the charge so escaping being drawn in by another cylinder. When the maximum power is required the inlet valve is closed at the end of the suction stroke and the full charge is compressed to about 95 lbs. per sq. in. When minimum power is wanted the inlet valve is not closed until the completion of the compression stroke; an exceedingly small part of the charge is retained and ignited at atmospheric pressure, giving a gentle expansion. Variable compression is the entire source of control.

The carburetter is entirely automatic. Gasoline is pumped through the upper pipe into a constant level reservoir, which is a small cavity covered with a watch crystal enabling the gasoline being seen. The surplus gasoline flows back into the pump well through the lower tube.

The spark is regulated automatically by their automatic spark regulator. This is a device employing a centrifugal governor which not only advances the spark when the speed of the engine increases, but it also increases the length of the contact of the primary circuit. A contact of the primary circuit for 1-36 of a revolution of the engine gives sufficient time for the spark coil to become saturated and give a good spark when the engine is running 150 revolutions or less. This contact is automatically increased to about 1-12 of a revolution of the engine when running at 900 revolutions per minute. This is claimed to be a great saving of battery current and contact breaker points

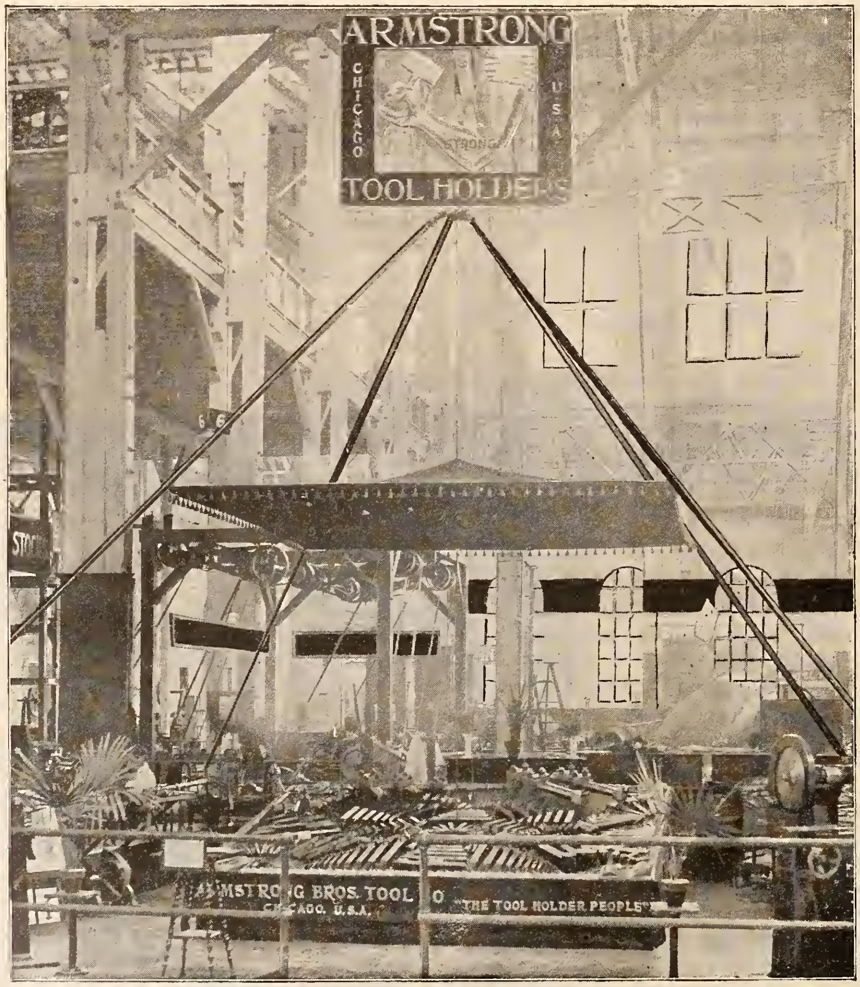
Armstrong Bros.' Exhibit, World's Fair

Herewith is shown a view of the St. Louis World's Fair exhibit of the Armstrong Bros. Tool Company, Chicago. The exhibit comprises a complete line of tool holders using inserted cutters for all operations on the lathe, planer, shaper and slotting machine, universal ratchets, planer jacks, clamp dogs and drill holders, also a complete line of lathe tool cabinets. The Armstrong cutting-off and grinding machine, especially designed for cutting off and grinding self-hardening steel cutters for use in Armstrong tool holders, which is exhibited for the first time, is declared by many visitors to be the only novel metal working machine in the palace of machinery.

Until the year 1890, when the Armstrong tool holder was placed upon the market, tool holders had been an unimportant factor in shop practice. With the introduction of the self-hardening steel, which is more expensive, the increased amount invested in the steel was a big item, and the "stub end" when the tool grew too short represented a great deal more money. The Armstrong system of tool holders has changed all this. The amount of capital tied up in tool steel is reduced 90 per cent.

A strong feature of the Armstrong system of tool holders is that the self-hardening steel cutters are of stock sizes and shapes which are readily obtainable in the bar.

The system includes tool holders for turning, boring, plan-



Armstrong Bros. Exhibit, World's Fair.

ing, slotting, threading, cutting-off and drilling, with over 100 modifications of shape and size, all embodying the same fundamental idea of an inserted cutter in a permanent supporting shank or holder.

Notes of the Month

On July 13, 1904, a perpetual injunction was granted the Kennicott Water Softener Co., of Chicago, against the Industrial Water Co., of New York, for infringement of the Kennicott patent.

The Erie Heating Company, whose offices have formerly been at 34-36 West Monroe street, moved into their new offices at 225 Railway Exchange Building on Oct. 20.

The Chicago Car Heating Co. have just issued a new catalogue describing their vapor system of car heating. The catalogue is handsomely illustrated with cuts and line drawings which fully illustrate the system.

Mr. H. L. Kinsley, who has been with Messrs. Manning, Maxwell and Moore for the last five and a half years, and was formerly with the Hopedale Screw Company, is now representing the Warner and Swasey Company in the East.

The Oliver Machinery Co. have just issued their catalogue "A," the first half of which is devoted to detailed descriptions and illustrations of "Oliver" woodworking machinery, the balance describing a general line of small machines, tools and supplies. The whole forms a very handsome 216 page reference book comprising everything required for the equipment of a pattern shop.

The Chicago Tool & Supply Company, of Chicago, has been incorporated in Illinois for $15,000 for the purpose of manufacturing the "Green" pneumatic hammer, and "Hayes" electric breast drill, and dealing in air compressors, all kinds of pneumatic tools, appliances, supplies, etc. The organizers are: Geo. H. Hayes, Carl R. Green and F. W. Buchanan, who were formerly connected with the Chicago Pneumatic Tool Company.

Neponset insulating paper, manufactured by F. W. Bird & Son, East Walpole, Mass., is being used in the new refrigerator cars being built by the American Car & Foundry Company, for the Pennsylvania Railroad. Hydrex Waterproofing Felt, manufactured by the same company, was used to waterproof the foundations of the new shops at Sayre, Pa., being erected by the Lehigh Valley Railroad. Hydrex is also specified for the Pennsylvania Railroad tunnel under the North and East rivers, New York City.

An unusually well arranged and attractive catalogue has just been issued by the Cleveland Twist Drill Company, Cleveland, Ohio. With its publication all previous editions are cancelled. The high grade tools, drills and reamers of all kinds, etc., manufactured by this company are illustrated in a concise and practical manner, so that a careful examination will give a good acquaintance with the company's product. The Cleveland Twist Drill Company will be pleased to forward copies to interested parties, upon request.

The Cutler-Hammer Mfg. Co., of Milwaukee, Wis., recently had occasion to purchase electric equipment for its works. As manufacturers of starters, controllers and rheostats, this company disposes of its product to most of the manufacturers of electric machinery in the country. Therefore, its position in buying electric machinery was of necessity very delicate, and in order that none of its customers might feel offended, the selection was placed with Messrs. Sargent & Lundy, consulting engineers. This firm selected the equipment manufactured by the Northern Electrical Mfg. Co., of Madison, Wis.

The new catalogue of the Bettendorf Axle Company, Davenport, Ia., illustrates and describes the trucks, bolsters, tank cars, underframes and railway specialties manufactured by this company, directing attention to many of their interesting details. The general offices of the company are in Davenport, Ia., and sales offices are located in the Old Colony Building, Chicago; 42 Broadway, New York City; Columbia Building, Louisville, Ky., and Commonwealth Trust Building, St. Louis, Mo.

At a meeting of the American Boiler Manufacturers' Association, held at St. Louis on Oct. 4th to 6th inclusive, the principal report presented was by Mr. E. D. Meier, chairman of committee on Uniform Specifications. The report covered the work of the committee which is attempting to create a law to increase the efficiency and safety of the mercantile marine of the United States by creating a commission to revise the laws relative to construction, installation and inspection of marine boilers, to provide uniformity of inspection of marine boilers in the United States and insular possessions and for other purposes.

Wm. H. Armstrong, recently New York manager of the Chicago Pneumatic Tool Company, and W. Kearns, southern sales agent for the same company, and previously connected with the Standard Railway Equipment Company, have gone into business under the firm name of Kearns & Armstrong, with offices in the Chamberlain bldg., Norfolk, Va. We learn that the firm of John F. Allen, New York, has just entered into agreement with them for the exclusive sale of the Allen riveters in the District of Columbia, Virginia, North and South Carolina, Florida, Georgia and Alabama. The builders esteem it a great compliment to the Allen machines that Messrs Kearns & Armstrong sought the agency for these riveters, unsolicited, considering that the Chicago company make a riveter on the same lines.

The Northern Electric Mfg. Co., of Madison, Wis., have just issued bulletin No. 37 on their single voltage variable speed motors. The scope of their variable speed motor can be well indicated by the fact that Figure 3 of the bulletin illustrates a variable speed motor equipment shown in their World's Fair exhibit in the Palace of Electricity, operating from the Exposition company's two-wire single voltage circuit and affording speed variation as high as 5 to 1. Their variable speed motors are especially well suited to machine shop work as they do not necessitate any wiring other than that required for the constant speed motors. Thus their illustration in plants wired for power distribution to constant speed direct current motors does not involve any alteration in or addition to existing power circuits.

The firm of John F. Allen, 370-372 Gerard Ave., New York City, have recently entered into agreement with John Turnbull, Jun & Sons, 190 W. George St., Glasgow, Scotland, whereby they are to handle the Allen riveters for one year in Great Britain.

Negotiations were completed by Mr. Campbell Turnbull, who is now in this country looking over American methods and arranging for the agencies of several tools which his firm believes can be sold largely in England, if properly introduced.

Mr. Allen also has signed a five years' contract with Fenwick, Freres & Co., 21 Rue Martel, whereby they are to have the control of the Allen tools in France, Italy, Spain, Portugal and Belgium. They intend to carry the Allen machines in stock in their various branch houses and are confident of meeting with great success after the usual primary difficulties, all foreign tools must expect, have been overcome.

To take himself to a picturesque and delightful place for a vacation is the one motive of every vacationist and where will be found a greater selection than on the North Jersey Coast. First to reach the Jersey resorts is a delightful harbor trip on one of the palatial steamers of the Sandy Hook line. The voyage down the harbor is delightful at all times and especially so on a hot summer's day. When Atlantic Highlands is reached, one takes the train and from there on there is one successive outlook of pretty homes, vast estates and gay beaches and at all times the traveler is in sight of old ocean. The resorts which cater to the tourist are Atlantic Highlands, Normandie, Seabright, Monmouth Beach, West End, Hollywood, Long Branch, Elberon, Allenhurst, Deal Beach, Asbury Park, Ocean Grove, Belmar, Avon, Spring Lake, Manasquan and Point Pleasant. If you want to know about their charms and beauties send 6c. in stamps to C. M. Burt, G. P. A., New Jersey Central, New York City.

When and where to go for a vacation is a question which perplexes us all. There are beautiful places in every section of the country, but to reach them at a moderate rate and within a reasonable time is a great barrier. New Jersey has bounded to the front as a summer resort and well she might since her shore is within reach of all. Her attractions are too numerous to mention, and the accommodations provided for the tourist being unequalled anywhere in the land. The famous beach resorts of New Jersey are Atlantic Highlands, Seabright, Long Branch, Asbury Park, Ocean Grove, Belmar, Spring Lake, Sea Girt, Point Pleasant, Atlantic City, Ocean City, Cape May and Beach Haven. Each is unique in environments and caters to the best class of summer travelers. Every convenience is at hand for genuine enjoyment and each can be reached by rail or boat, the lines are both operated by the New Jersey Central and C. M. Burt, G. P. A., 143 Liberty street, New York, has issued an illustrated brochure detailing the beauties and advantages of the above resorts and a hundred others. This book will be sent to any address upon receipt of six cents in stamps, and one looking for a vacation region would do well to send for it.

A passenger coach, after being painted and varnished, standing upon a track ready to be sent away on its run, is a thing of beauty. After being in service for six weeks it is a stained, dust and cindered-clouded looking object. During this time the car-wiper has performd his duty faithfully, but he can get off the very light dirt only by the use of dry waste. A gang of men are then put to work on the car with a liquid car cleaner. In nine cases out of ten the dirt cannot even then be removed without the use of curled hair brushes or mineral wool. The cleaner, that will make an old car new, and is put on the market at from 30 cents to 60 cents per gallon, must call into play the aid of muscle, that even at that price the cleaning becomes an expensive matter. The car is cleaned but leaves a dull, flat surface. The wet oil, which cannot be wiped dry, gives a little transparency and brilliancy. From this time the car takes on dirt quicker, for the reason that the moisture from rain, etc., finds its way into the pores thus opened and deterioration follows.

This condition has led some to give up the so-called cleaners and gone back to the old methods; yet an efficient car cleaner that does not harm the varnish nor require brushes to remove dirt is manufactured, but costs more than 30 cents to 60 cents per gallon.

A car cleaner should remove dirt quickly and without scouring. It should be so constituted that after being wiped with dry waste a clean, dry, polished surface is left. The oil used in the cleaner should act upon the varnish as a feeder. It should leave in the body of the varnish an oily filler to prevent moisture entering. A car cleaner and varnish preservative that is claimed to do all this is manufactured by the Beacon Paint & Varnish Preservative Co., of Philadelphia, for $1.75 per gallon.

Technical Publications

Mechanical Drawing—A treatise with illustrations by Linus Faunce, bound in cloth, 146 pages. Published by Hinds, Noble & Eldredge, New York. Price, $1.25. This book is a treatise of mechanical drawing for beginners taking up in detail instruments and their uses, geometrical problems, inking, projections, shadows, isometrical drawing, working drawings and a number of examples.

The new edition of Webster's International Dictionary, recently issued, brings Webster again abreast of the growth of the language and again confirms it in its position as the one great standard authority. A supplement of additional words has therefore been added to the International to include the thousands of new words that have come into literary use, the old words that have changed their meanings, and the obsolete words that have been revived.

Architects' and Builders' Pocket-Book—Fourteenth Edition Rewritten—A practical treatise with illustrations by Frank E. Kidder, C. E., Ph. D., bound in morocco, 1,656 pages. Published by John Wiley & Sons, New York. Price, $5. In presenting the new edition of this work the publishers announce that the book has been thoroughly revised and in large part rewritten. There is a vast amount of useful information in this book, making it a reference book with information on every subject (except design) likely to come before an architect, structural engineer, draughtsman, or master builder, including data for estimating the approxmiate cost. In order to present all information in as simple and convenient a form for immediate application as is consistent with accuracy, a great many new tables, arranged and computed by the author, have been inserted making it cover the subject of architectural engineering as far as is practical in a hand book.

"Self-Propelled Vehicles." A practical treatise, with illustrations, by J. E. Homans, A. M. 8vo, pp. 672, bound in black vellum, gilt top, gold titles. Theo. Audel & Co., educational booksellers, New York. $2.

In presenting the new edition of this work the publishers announce that the book has been thoroughly revised, and in large part rewritten. The general principles of automobile construction and operation, including steering devices, underframes, wheels, tires, bearings, lubricators, are included in the opening chapters. Then follows an exhaustive account of the theory, construction and operation of gas engines, occupying over 100 pages. The explanations of the governing devices are clear and valuable, while the discussion of ignition, including the hot-tube and the primary and secondary sparks, cannot fail to prove of the utmost value. Probably the most interesting feature of the entire work is the extensive chapter devoted to the description of leading types of gasoline vehicles, including the most important of American build. In this chapter the reader is informed as to the details of the transmission and control apparatus in each case. The chapters on electric vehicles are also full and certain to prove of practical use to the owner and chauffeur. Electricity meters are described and illustrated in a brief chapter, and the principles underlying storage batteries, their construction and care, are outlined. All necessary information is given, and the merits of several types of steam carriage are fully set forth.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

Reflections of an Absent Member

Marquette, Mich., October 20, 1904.

Editor Railroad Paint Shop: I did not have the pleasure of meeting with the fraternity at Atlantic City, or at Boston, but please permit me to say, by way of preface, that the secretary's books will show that I am in good standing up to date. I have given the "ROAST" of Bro. Gohen a careful perusal in regard to the delinquents, and in the main what he says about the meanness of some, justifies any of his strictures. But there is one phase of the "dues" question which was not taken into consideration. As far as the "roast" applies to "members" (?) attending the convention, and not being decent enough to pay the fiddler is concerned, I've not a word to say against it; but some of us who are enrolled and do not get the privilege of attending the conventions only every two years, or perhaps at longer periods, find it hard enough to keep up "home industries," and it is with no cheerful spirit that a loyal member under these circumstances digs up $3.50 per, to send to our good secretary for dues (?) when he is really getting no benefit but the report of the convention.

Now, is it right to blacklist a member for non-payment of dues when he cannot attend the conventions and can only chew the cud of reflection after it is all over, because he does not send on the cash? And is it right to demand dues of a man irrespective of his attendance?

A man "held up" for back dues, when he has not been to the convention for several years feels the hurt severely! And I venture to say it has a tendency to make him exceedingly shy of the secretary; and he gets more comfort on the board walk than in the convention hall. Could not the next convention take up this matter again, and make the "switch-out" penalty applicable only to those who are in attendance, and do not "pony up" and "frank-ly" forgive delinquents who have not participated in the forementioned festivities, by squaring themselves on the spot, for that occasion only? I believe this plan would bring about a greater willingness on the part of all to pay for the fun when they get it.

What do you say, Bro. Copp?

W. G. KING,
Foreman Painter, D., S. S. & A. Ry.

[Editor's Note.—It really looks as though Bro. King has some ground for his grievance. It is gratifying to know, however, that Bro. Gohen's cudgel is stirring up the lions. It will not hurt the innocent. What have you to say to this, Bro. Gohen?—C. E. C.]

Convention Changes

There was some talk out of session of changing the manner of choosing the next place of meeting, and also the time of holding the convention, but nothing was done. A theory was broached to the writer to the effect that a popular expression of choice might be taken the last day of convention on the next place of meeting by nominations, or by an informal ballot, but that this should not decide it. It should rather be left, our informant said, to an executive board composed of the officers elect, and a committee of three or five chosen by ballot annually to decide definitely where the next place of meeting shall be, on account of conditions that may arise between the day of ballot and the day for the next meeting to convene. There is something in favor of this plan we are ready to admit. It is similar to the method employed by the M. C. B. and M. M. Associations. We have had two dissensions over trying to change the meeting place after its selection by ballot, resulting in failures in each instance to change it. Then, again, it is easy to "stuff" the popular ballot in favor of holding the convention at a certain place. We have known of votes to be cast by persons not qualified to vote, and counted, if indeed more than one vote has not been deposited by the same person. This scribe could certainly have voted twice at the late convention, had he so wished, and he presumes others could have, and possibly some actually did vote twice. So there are evils connected with a popular ballot where a check-list is not used. And why not have a check-list for this purpose and let no one vote but once, and no one vote at all unless his dues are paid and otherwise eligible? Some remedy, we think, might be well prescribed in this matter; and we would not be averse to giving an executive board, as before described, a trial in this way. Yet perhaps their acts would cause dissatisfaction; and as Dooley says to Hinnissy, "there ye are." Some will always try to settle every trouble that arises, whether with paint in the shop, or business of this character, by the old chestnut: "Well, we have always done it that way, and why isn't it well enough?" If the world had been run on that basis we should be still using pod-au-gurs.

As to changing the time of meeting from September to August, which one leading member suggested to us, we will say that has been tried and failed. The shop-work situation in the east would not be affected by the change; but as August is a hot month that one likes to get away from cities into the country for a little respite from toil, and stretch out in a hammock beneath the shadow of the wide-spreading tree, and as everybody is supposed to begin to do something in September, we think there is no better way for the painter to begin than in attending the annual convention. So we would prefer to let the meeting time remain as it is. Still, we are only one among the many, and will be content with the will of the majority; we merely take this opportunity to state the case as we see it, thinking that possibly others may have been considering it.

Mr. Bishop's Paper Reviewed

Mr. Bishop appointed himself a committee of one to prepare and read a paper at our late convention on the ethics of its proceedings that we did not consider worthy of notice at the time, not paying as strict attention as we might have done to its reading; but, having read the same in the report, we have come to the conclusion that had we felt then as we do now we should have objected to its being made a part of the proceedings. First, because it was out of order, and second, because it is a reflection upon the personal honor of the editor of these columns in his capacity as Chairman of the Test Committee, whose report was presented at the Chicago convention last year. That report appears to be the animus of his paper, from the fact that before a half of the first paragraph is finished he unbosoms himself as follows: "I have in mind a paper read at the last convention, held at Chicago, in the form of a report that has since been printed wholly and distributed broadcast over the entire country as advertising matter, and besides this making use of the pages of our reports of proceedings for individual gain." As the report of the Chairman of the Test Committee at Chicago is the only one that will answer those specifications, it is plain to all members whom he means. We are sorry we did not pick up the gauntlet that he threw down upon the floor of the convention, but as his paper has passed through these columns, it is not impertinent to reply to it here.

Now if Mr. Bishop had been better posted in the modern history of his own association he would have known that it freed its mind on the super-sensitiveness of advertising people's goods in its convention papers at the Philadelphia convention in 1899, having threshed the matter out somewhat at the St. Paul convention the previous year when Mr. Bruning's Test Committee report was under fire. At Philadelphia it was voted (page 43 of proceedings) that any member had a right to name in his paper anybody's machine, name or trade-mark, or material reported upon. Nevertheless, we waived this right when making out our report to be presented at the Chicago convention, and reported by number twelve varnish removers. And the "advertising matter" to which Mr. Bishop objects, "sent broadcast over the entire country," is a duplicate of that report, save a few typographical errors, and contains the name of nobody's material! Wonderful advertising matter that! It does, however, have the following imprint on the inside of the cover: "Compliments of Blake & Andros, 28 Portland St., Boston, Mass." That is all it advertises. And who are they? Dealers in steamheating apparatus and its kindred appliances only. Mr. Blake, whom we had not seen before, we know only; and as he was then (but is not now, we believe) interested in one of the removers (he let an office above to its inventor) reported upon and was going to be in Chicago in the interest of steamheating goods, he wished to attend our convention and represent the remover referred to, and asked our permission to print our report, or a portion of it, to give away there with his samples, as being a novice he could not talk varnish removers, and wanted these reports to do it for him. We granted his request without compensation of any kind, with the understanding that his printed matter should be a duplicate of our report and not to be given out until after the report had been read in convention; and that no one was to know the key without correspondence with the writer, all of which was carried out so far as we know. This report, made with much painstaking and research, was the work and property of the writer, and he had as much right to give a copy of it to any one he wished as others have done in the past, after the courtesy of the association had been protected by first presenting it to them. That the association's mind was not "visibly affected" in this matter was evident, for no one spoke on it and no action was taken, other than in a routine way of receiving it and making it a part of the records.

That whole transaction was as clean as the Bible—and so was Mr. Dane's, another case probably alluded to, when he referred in a former convention to "Prince's Metallic Paint" in a convention paper of his, and which was also printed and "distributed broadcast over the entire country." We had no intention a week ago of reviewing this matter, but as one fellow-member has called our attention to it and named us as the public culprit, we have concluded to set ourself right before the whole association. As to "individual gain" in this matter, if Mr. Bishop will correspond with Mr. Blake, as above, he will doubtless learn how much he lost out of the transaction; and, as to the writer, he got a present of a fountain pen the Christmas following, not from Mr. Blake, but from one of the inventors of one of the varnish removers reported upon. That's all. If any one has a lecture for us on the ethics of our conduct there are opportunities enough to do it without addressing the whole convention about it, unless we have sinned more than they all.

The Atlantic City Convention

The above convocation of the brethren of the brush (and air-painting machine) is now among the good things that were, it is sad to relate, but it would be sadder if there were not another as good to come. Space running over with its proceedings in last month's issue forbade any editorial opinion, or comment, save a few notes, etc. We think that worthy gentleman who presided over its sessions, who some time ago was filled with forebodings as to what its attendance might be, went home more than satisfied with the results, in this direction at least. While there were a few notable absences, their places, so far as numbers are concerned, were filled with new attendants who were made members; and one, at least, whom we had not seen at our meetings for nine years was there. Altogether it was one of our best conventions in every way. Whatever flurry there may be over the meeting place, or any other issue, our folks can safely be counted on to be there when the time comes. There is, notwithstanding some differences that may arise from time to time, a strong bond of friendship and brotherhood (and sisterhood) among them and of loyalty; and our meetings and these occasions have got to be so enjoyable and profitable that they cannot well be missed, except for the best of reasons in individual cases. Let us not have any more flurries over the meeting place, or anything else, but take a strong pull, a long pull and a pull altogether for peace and prosperity, and bury the hatchets, handles and all.

As to the discussions, the proceedings will speak for themselves, which by the way, judging of the stenographer's work, were the best reported that we have seen for some time, and it would be well to have the same party thus well broken in for another year, rather than a new man, provided he can be employed at about the same rate as a man on the spot. The painting of steel cars continues to be a live issue, of course, and brought out the most discussion, while "front-end black" and varnish removing from car interiors were close "seconds" and "thirds" in the contests. Steel car painting is a subject that probably needs to be continued in some form for some time to come, not to wrangle over, but to candidly and earnestly seek after the best methods and materials to solve this vexed problem. In the east here it has not assumed such importance as it has in the middle west among coal-carrying roads, where this kind of car has well-nigh superceded every other, especially when orders are given out for new construction, and they must be taken care of or perish, and that speedily. This car is said to be a great saver of general repairs, and this may be so in other lines than that of painting; but here it must exceed the wooden car by far. The protective paint problem is of the greatest concern in their maintenance. To neglect them in this respect—to go to the extreme of letting them go unpainted—is suicidal to the best interests of the equipment of an up-to-date and progressive railroad. Like the "liberties" of Andrew Jackson's time, they "must be preserved or we perish in the last ditch."

The convention this year, by its new president, Mr. Lanferseik, made an entirely new deal in the matter of its advisory committee and its probable place of meeting. An eastern committee was chosen to meet at New York, instead of as formerly, one from the west to meet at Pittsburg or Cleveland. Now we are not at all disposed to say that the results will be any better for this change, but we think it is a move in the right way by breaking up the notion that none could be elsewhere held than as formerly—it makes it appear better for our association anyway. Our advisory committees have generally done good work, and there is, nor has there been any "ring" in its work. Still, we believe in passing this important committee's work around as far as the association's best interests will allow, as well as the honors of office. Why would it not be well sometime to make a southern committee to meet at some southern point? Also a western one to meet at Chicago, or farther west There's no north, south, east or west in ours. At any rate, this committee should be chosen from not too large a radius, and should meet at some point easy to reach by all, and in all cases by courtesy all local members should be invited to come in and take part in the proceedings. All others should be asked to send in questions to the chairman by mail to be considered.

Mr. Gohen struck a Key-note good and hard in his stirring speech arraigning those dead-beats who come to our conventions to take in their enjoyment without paying their dues. Good for Gohen! May he wax still more valiant in this needed fight. Every loyal member will back him up in it. Solomon said there were seven evils he had seen under the sun; he had not seen this, if he had he would have named it and made it eight. More stringent measures may have to be resorted to yet to correct this evil.

We do not wish to particularize papers for comment; they were all good; but Mr. Gohen's essay especially hit salient points about car interiors and furnishings, as may be seen by the discussion that followed, which, by the way, was the first essay that we remember of hearing discussed at all. The painter has been screwed down to plainness in his work from economy or something else. Now let it go all around and let the brass go off the car vestibules as well as it has gone from the engines, which costs so much to keep polished, and let the wood-work be constructed on sanitary lines, instead of so much filagree of blocks and mouldings and carvings to collect dust to later be blown into the nostrils of passengers and breed disease as well as discomfort.

Barring possibly the matter of hotel accommodations—and those will doubtless be adjusted all right—we think Cleveland was a wise choice for next convention. It is a good, long step toward meeting the western men half way. Talk about a split in our ranks and a western and an eastern association with two conventions—bosh! We can't stand that. "In union there is strength." That would be suicidal. Let us all meet together on common ground somewhere; and Cleveland, Chicago, Buffalo and Niagara Falls seem to be central points, so far as the center of our membership goes and the ease or difficulty with which transportation can be obtained. This was not one-sided this year, gentlemen. If the meeting was at the Atlantic coast; for, be it known, that it cost this scribe $18 for fare to get to and return from this convention with his spouse; and the other two representatives of the B. & M. likewise, not to mention other eastern men. In 1892 western men on Vanderbilt lines came to Boston free. So, you see, what's sauce for the western goose is not always sauce for the eastern gander. There are some places that are "so near" as convention places and "yet so far" as the matter of free transportation goes, on account of the non-exchange of these coveted courtesies. It would be interesting, if it would in all cases do to put it in print, to know who paid fare to get to Atlantic City, and how much, as some guide for a choice of meeting place in future.

The deportment at Atlantic City, our first convention at a fashionable watering place, was of the best. The sessions did not suffer on this account any more than at any other point we might name. The natural sight-seeing might not have been much, but the surf-bathing and other healthful and social pastimes more than made up for any lack in this regard. If two or three hotels the size of "The Rudolf" were near each other, we should advise the M. C. B. and M. M. Associations to try a convention at Atlantic City. But on account of hotel accommodations a farther eastern point—Saratoga—seems to be the only point that the 2,000 or more that attend these conventions can assemble and be taken care of.

M. C. & L. P. A. Portrait Gallery

OBITUARY.

J. P. WAGGONER.

Sometime ago we wrote for the photo and sketch of associate J. P. Waggoner for these columns, but they came too late for him to see them here. He died suddenly of apoplexy Sept. 26. We do not remember of meeting him at our recent convention, but he was with us last year at Chicago.

Mr. Waggoner was born in Waynesboro, Franklin county, Pa., and began his painting career in 1868. He served an apprenticeship of three years as a sign and carriage painter and learned every detail of the work in a most thorough manner. He followed his trade in various communities for years. He moved to Hagerstown, Md., where for several years he was engaged in general painting. In 1886 he went to what is now Shenandoah, Va., to accept a position as foreman of the paint shop of the Shenandoah Valley R. R. He next went to southwest Texas, where he had charge of the paint shop of the Mexican National R. R. at Laredo, until

J. P. WAGGONER.

1891. In that year he returned to Roanoke and engaged with the Norfolk & Western Ry. Co. as assistant foreman, under C. A. Pilsbury. He was transferred to Lamberts Point, near Norfolk, Va., in 1895, where he remained until 1897, when he returned to Roanoke and was placed in charge of the stock and mixing room. A few months later, in the same year, he was made foreman of the paint shop, succeeding Mr. Pilsbury, which position he held until the time of his death, and had about 75 men under his superintendence. He resided at 716 Dale avenue, S. E. Roanoke.

Fraternally, he was a member of the Heptasophs; I. O. O. F., of which he was Past Grand; Masonic Blue Lodge, of which he was at one time secretary; and Knights of the Golden Eagle. He was a member of the M. E. Church South, of which he was a steward. He was a member of the School Board of Roanoke, having been elected in July, 1901, for a term of three years.

Among the things "not down on the program" was the terrific storm of Wednesday night, when Old Boreas and Father Neptune got their heads together to make it interesting for our folks. Blinds and shutters at 2 a. m. Thursday were flying like autumn leaves about the hotel with glass crashing everywhere, and the more timid were leaving their rooms and descending to the office, while nearly all arose and partially dressed. Even this writer had to do it, to "keep peace in the family." About fifteen feet of metallic cornice of the hotel was blown away after flapping about and breaking the windows of roomers. Of course even this menacing storm brought its amusing incidents. One old veteran member was seen striding about the lobby with overcoat on and his suspenders dragging on the floor! A supply man arose to shut the window of his room and the strong draft drew his night robe through the window in time to be caught by it when shut down, and there he was—he could not release himself and cried to his room-mate for help! Another, concluding that the floor was giving away under the awful strain of the storm, as his bed was already out of level, hastily dressed and descended to the office and remained up until daylight, when, on returning to his room, he saw that the chambermaid had accidentally dropped two casters from the side of his bed when making it the day before!

One melancholy accident occurred to mar the pleasure of the convention. The elevator got out of order and dropped with the dull thud of a stifled explosion from the first floor to the bumpers in the basement. It contained Messrs. Graves, Whitworth, Vail, McCracken and Carpenter, all of whom escaped injury except "Johnny" McCracken, who was seriously injured and had to lie in bed during the greater part of the convention. It appears that when the elevator struck the bottom the operator announced that it was out of order and, opening the door leading to the cafe, directed his passengers to take another elevator. Messrs. Graves, Whitworth and Vail got out safely and Mr. McCracken was in the act of emerging when the elevator, relieved of its load, shot up and caught him by the breast and shoulders against the first floor and was with difficulty released. Mr. Carpenter crouched in the corner of the elevator and was unharmed. All were, however, more or less jarred by the fall.

Mr. Robert T. Wallbank well deserved the vote of thanks and the cheers and "tiger" that he received during the intermission for his work in getting up the ball, Mr. William Marshall being the spokesman for the occasion. Big, fat and swimming full and over with good nature, Wallbank seems to be the ideal man for this task. Mr. W. C. Reynolds was floor manager.

They do say that the darkies beat in the game of ball at the "Inlet" (to which, by the way, all were invited after the fish dinner), by the dialectic "rooting" for them by J. B. Hicks of the D. B. Crockett Co. and C. A. Willey concerns. It was said to be witty and amusing, and so closely imitated the darkey himself that he mistook Hicks for numerous friends of his own nationality. Hence, his inspiration and victory.

The songs and recitations of the opening and closing exercises always add much to the convention's pleasure and detract nothing from its business, and are usually all by our own talent. Our Mr. J. D. Wright of the B. & O. at Baltimore, is a good singer and favored us with several songs well rendered. Also young Thomas Cowan, of the C. P., sang sweetly during the recess at the ball. The irrepressible "Sam" Brown delighted us with characteristic readings at both opening and closing exercises; but perhaps the best of all was Mrs. Lynch's rendering of how "Mrs. Casey" learned to play euchre and how she won the first prize at the party. Her modest and quiet rendition of this, amidst great applause, was especially commended. Mrs. Connor sang well at the closing, playing her own accompaniment on the piano.

Notes and Comments

The record is held so far for age in the paint shop by Harry Smith, of the Boston Elevated Ry. shops, Bartlett and Washington streets, Boston, Mass. He is 85 years old and works at lettering in the sign room every day for Mr. H. L. Libby, superintendent B. E. shops, and is by no means "a back number" yet, being "a young old man" in actions and looks. We would like to hear from any one who can break this record.

The only meeting of the Master Car & Locomotive Painters' Association ever held in Cleveland, O., was Sept. 12, 1888. There were 44 members present. There ought to be three times as many at the meeting to be held there next year. It ought to be an occasion for celebration to Mr. Sam'l Brown, should he be alive and well and attend, for he was president of the meeting held there that year.

The Boston & Maine starts up its various passenger equipment paint shops during the week ending Oct. 22, but they will scarcely get into running order before Nov. 1. This is rather late, and leaves but about seven months in which to do the work before summer travel again arrives, and necessitates putting through about 215 cars per month in order to complete its equipment of 1,500 cars.

There is doubtless something praiseworthy waiting for somebody who will concoct a car cleaner that will clean the elevated equipment of the Boston Elevated Ry. It becomes coated with an iron rust that gets so embedded into and amalgamated with the varnish that nothing will stir it—not even the shop cleaning preparatory to varnishing; so they sandpaper them instead and paint them. When new the cars were a beautiful claret color, decorated with gold; now they are a Pullman shade. It was impracticable to maintain the former color.

Just before starting for the late convention we received the following note from Fred. W. Bowers, foreman painter Erie R. R., Kent, O. This explains his absence from the convention. He should have the sympathy of us all in the loss of his son: "On account of our late bereavement in the death of our son, Fred, it will be impossible for me to attend the convention at Atlantic City, as much as I had planned previous to this occurrence to go. I performed all duties required of me during the past year, as a committee on questions and hope the results are satisfactory. Thanking you for past favors and hoping that this annual convention will be a great success and with best wishes for you and all members of this association."

We are pleased to know that we have some latent material in our membership that has not been much developed yet in the line of office-holding in the association. We refer to Mr. S. H. McCracken, of the L., H. & St. L. R. R., at Cloverport, Ky. Mr. McCracken is out for the office of representative of Breckenridge county. Editorially both the Breckenridge News and the Breckenridge Democrat speak highly of him. We make the following extract from the News of Aug. 17 and hope Bro. McCracken will be elected if he is a Democrat and we are a Republican. He is or has been a member of the city council and school trustees: "We announce in this column the candidacy of S. H. McCracken for the office of representative of Breckenridge county. Mr. McCracken is a home man, self-made, progressive, aspiring. He is a 'shop man' and master painter at the railroad shops. He entered the shops several years ago as an under-painter and, by close attention to his business, has reached his present position as boss in the paint department. His work shows for itself. All the handsomely painted coaches you see on the Henderson route is the work of his hands and brain. He is a man of progressive ideas. He stands for good schools, good roads, home and state development. He is not a kicker against railroads and corporations. He has worked for corporations long enough to find out that they are not soulless and that if you treat them fair and right like they were people, you can get along with them."

The Phenoid Varnish Remover people are after their imitators, we learn, with proceedings for infringement of their letters patent. As those who manufacture, buy, or sell, are equally culpable it would be well for all to "keep off the list," as they say, of those against whom they are to bring suit. Legal proceedings are already under way in several instances. Users of an article infringing a patent are also liable, consequently a word to the wise should put them on their guard. They have patents in the United States, Canada, Germany and France and are fully protected by them in the business of manufacturing "Neutral Paint and Varnish Removers." They claim only Neutral Removers. Their patent does not apply to caustic potash, or carbolic acid removers. There are, however, some successful removers on the market which are very close imitations of "Phenoid."

Established 1878.

RAILWAY MASTER MECHANIC

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INCLUDED in this issue is the continuation of the description of the new shops of the Rock Island System at East Moline, Ill. A very good point in connection with the stores department of this plant is the traveling crane over the casting platform and adjacent track. This feature in handling material is usually overlooked in building shops, but it can readily be seen that every storehouse handling castings of any size should be supplied with some form of crane service.

GRINDING machines in a locomotive repair shop are getting to be more useful every day. In the same way as the milling machine is being used in place of the planer the grinder is now replacing other machines for finishing. It is hard to take finishing cuts on bearing surfaces, as it requires a great deal of time, and they have to be filed for smoothness. With a grinding machine the article in question can be cut down with a roughing cut and then ground to the true size and a good finish in one-third to one-sixth the time that it would require to finish it with an ordinary tool.

Some of the parts that can be finished to good advantage by grinding are piston rods, valve rods, axles, crank pins, guides, links, etc. It is not only in new work that these parts can be finished in this way, but also when they are repaired. Here they can be trued up perfectly by removing a very small amount of metal and thus not impairing the strength as much as with regular machining.

Another useful task of the grinders is for sharpening tools, facing nuts, bolt heads, etc. For this purpose a number of wheels distributed in the erecting and boiler shops can be used to good advantage. Machines so placed are a good investment in that the workman will keep his chisels sharp when he does not have to walk the whole length of a shop to grind them. In this way he will accomplish more and better work in less time. They are also a great saving in grinding nuts, bolts and small miscellaneous pieces of work in place of the old method of filing.

WE note that in nearly all foreign electric locomotives operated from an overhead wire, some form of bow trolley pole is used. The superiority of this form over the standard American practice is very apparent. It is not jumping the wire continually nor does it require a man to hang on to the rope in taking a switch or rounding a curve. The bow trolley consists of a trolley pole with a contact surface about 18 inches wide in place of the narrow wheel. It gives a sliding contact, which is claimed to have no worse wearing qualities on the wire than the wheel. It would be well for the railroads that are equipping their roads for electric service to consider this form of trolley pole.

WHILE the advantages of cleanliness and maximum amount of light and good ventilation in railroad shops are generally recognized, the visitor frequently observing such establishments is impressed with the difference in their appearance. Such observation leads one to unconscious mental comparison of the several conditions noticed casually, and finally results in careful reflection upon the appearance of shop interiors and the immediate yard space. Recent new repair shops, built to meet the demands of the constantly increasing motive power, have been supplied with large windows and the consideration of especial care in this direction is very evident. The erection of well lighted buildings is not, however, the final solution. It is necessary to keep the glass free from accumulation of dirt and dust—not clean at intervals only, but constantly so.

While it is making a broad statement to say that the cleanliness and amount of light admitted affect the quality of work produced, this is really a fact. And the suggestion applies to all of the shops constituting a railroad repair plant, whether the round house, back shop, blacksmith shop, or what not. Speaking of cleanliness not only refers to the amount of grease upon the machines or dirt upon the floor, but also to the amount of litter allowed to accumulate, which should have been carried to the scrap yard and there sorted and the good parts to be replaced in service well cleaned and carefully piled where they may be readily found when the engine parts are to be reassembled.

In a dark, dingy shop a workman is unable to judge his work so finely as in a position where he is supplied with ample light. The influence upon the individual is also undesirable, tending to make him careless, inducing indifferent workmanship rather than first class results.

ACCORDING to Thurston's "Growth of the Steam Engine," Newcomen was the first to make any practical use of steam by building a pumping engine in 1705, which was the development of a combination of earlier ideas. Thurston says: "It was the engine of Huyghens, with its cylinder and piston as improved by Papin, by the substitution of steam for the gases generated by the explosion of gunpowder; still further improved by Newcomen and Calley by the addition of the method of condensation used in the Savery engine. It was further modified, with the object of applying it directly to the working of the pumps of the mines by the introduction of the overhead beam, from which the piston was suspended at one end and the pump-rod at the other." Their method of operation was to fill the cylinder full of steam and condense it by surface condensation, which was later improved by turning a jet of water into the cylinder. "They used to work with a buoy to the cylinder, inclosed in a pipe, which rose when the steam was strong and opened the injection to make a stroke; thereby they were only capable of giving 6 to 10 strokes in a minute, till a boy named Potter, in 1713, who attended the engine, added a catch. that the beam always opened. This increased the strokes up to 15 or 16 per minute."

MR. E. A. JAMES.

GENERAL MANAGER CANADIAN NORTHERN RAILWAY

Mr. James was born in 1865 and began his railroad career in 1880 as a telegraph operator on the Grand Trunk at Madoc, Ont. During the following year he went to Winnipeg to accept a similar position on the Canadian Pacific. He was then relieving agent for the same road for a time and later was train dispatcher at Winnipeg and Regina until 1891, when he was appointed chief train dispatcher of the Canadian Pacific at Winnipeg. In 1896 he was made superintendent of the Manitoba division and in 1901 was promoted to the position of superintendent of transportation of the Western division. He left the Canadian Pacific on November 1, 1903, to become general superintendent of the Canadian Northern, and his promotion to the position of manager of that road was made on January 2d of this year.

The principle of the steam engine was successfully applied to the locomotive by George Stephenson. His greatest success was attained when he built the "Rocket," to run between Manchester and Liverpool. "After their introduction on the Liverpool & Manchester road, the locomotives of the firm of Robert Stephenson & Co. were rapidly modified, until their gradual increase in weight compelled the builder to place a larger number of wheels beneath them, and make other changes which finally resulted in the creation of distinct types for special kinds of work. The valve gear developed then was practically the same as the Stephenson link motion of today."

Since then many improvements have been made on stationary engine valve gears, notably among these being the Corliss valve. Some attempts have been made to apply the latter form of valve and gear to the locomotive; but until very recently they were not successful. The first application of this gear to a locomotive was made by Mr. Corliss, who was successful in getting a good theoretical indicator card; but it had to be abandoned on account of the large number of parts to the gear. The French railways have made the most extensive experiments in the use of the Corliss valve as applied to locomotives. They designed a locomotive cylinder and valve gear with rotary valves for steam in the top ends and exhaust in the bottom ends similar to the Corliss cylinder. These were applied to some high-speed locomotives which were operated for several years. They showed that there was little wear of the valves, but the arrangement was abandoned on account of the valve mechanism being too complicated.

The most recent invention for the application of the rotary valve to the locomotive is that of Mr. Young. This consists of a rotary valve of the Corliss type, as explained elsewhere in this issue. Mr. Young simplified the valve gear and reduced the valve friction to such an extent that there is very little wear in the motion work. The valve motion is so changed as to get a more rapid opening of the steam ports and a more gradual closing of the exhaust ports. This gives practically an ideal shape for indicator cards at high speeds. The engine to which this valve and gear was applied gave a mean effective pressure of 48 pounds per square inch when running 63 miles per hour; 49 pounds per square inch at 75 miles per hour; and 37 pounds per square inch at 95 miles per hour. Valve gears like the Young or Alfree Hubbel which give a small amount of friction and high mean effective pressure, tend to give a reduction in wear of valve motion, rods and driving boxes. Furthermore, the more even distribution of power results in a larger hauling capacity of the locomotive and a lower water rate per horsepower. which gives a saving in coal.

80,000 Lbs. Capacity Steel Underframe Box Cars---Illinois Central Railroad

AMONG the interesting designs of steel underframe cars recently developed is a lot of 250 80,000 lbs. capacity box cars now being built by the Illinois Central Railroad at their Burnside shops. The underframes for these cars are built by the American Car & Foundry Co. at their Detroit works. The most interesting and noticable features apparent in the construction is the form of sills and end posts.

Standard structural angle irons riveted to plates are used in the construction of the sills. This makes a very light sill so shaped as to get the deepest section in the middle of the car and at the point where it is most needed. It also does away with the flanging of sheets. The body bolsters are riveted directly into the sills and form a very solid construction. The flooring and framing are attached to oak pieces, which are bolted to the sills.

The trouble of ends bulging, caused by the shifting of loads, is well taken care of in these cars by reinforcing the end posts with iron.

Another noticable feature of the construction is that the purlines are bolted to the carlines.

The design of car is clearly shown in the accompanying half-tones and line drawings.

The special equipment of the cars is as follows:

Fig. 1—80,000 Lbs. Capacity Steel Underframe Box Cars—Illinois Central Railroad.

Perfection grain door, Chicago roof, Security side-door fixtures, Miner draft rigging, Buckeye coupler, New York air brake, Simplex brake beam, outside hung, Kindl 40-ton truck, Woodman patent journal boxes and plain side bearings.

The following are the general dimensions:

Length over end sills	36 ft. 8 in.
Width over end sills	9 ft. 2 in.
Length inside in clear	36 ft.
Width inside in clear	8 ft. 6 in.

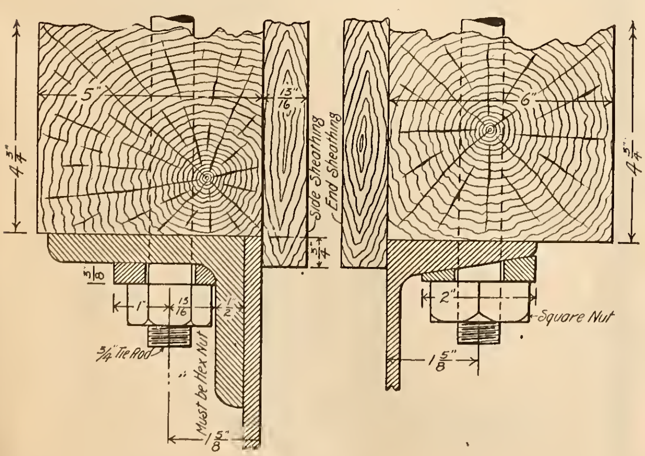


Fig. 2—Method of Fastening Timbers to Underframing—80,000 Lbs. Capacity Steel Underframe Box Cars—Illinois Central Railroad.

Fig. 3—80,000 Lbs. Capacity Steel Underframe Box Cars—Illinois Central Railroad.

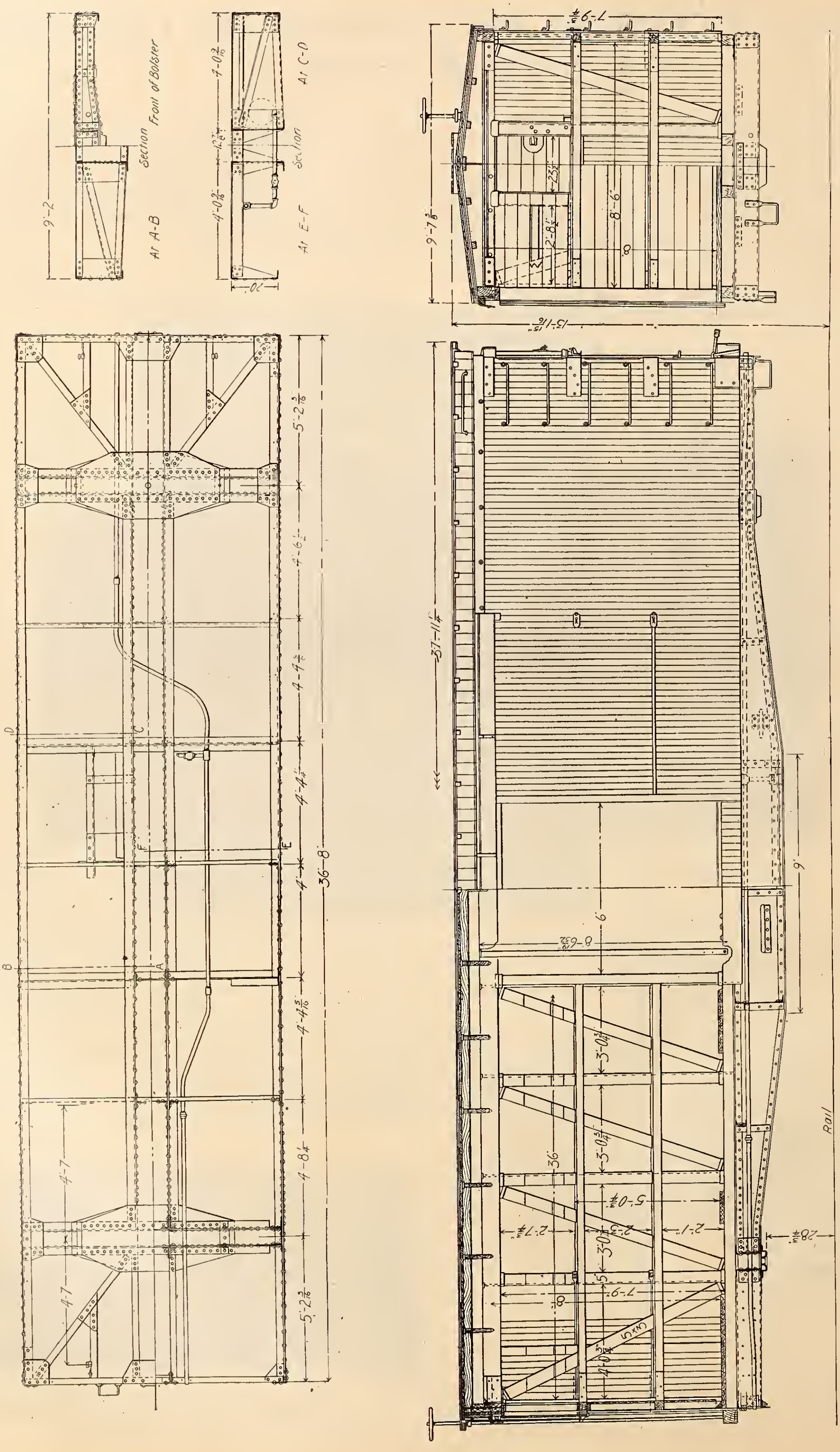


Fig. 4—Plan, Elevations and Sections—80,000 Lbs. Capacity Steel Underframe Box Cars—Illinois Central Railroad.

Height inside in clear ....8 ft.
Height between sill and plate ....7 ft. 9¾ in.
Height from rail to top of floor..........................4 ft.
Height from rail to center of draw bar..........2 ft. 10½ in.

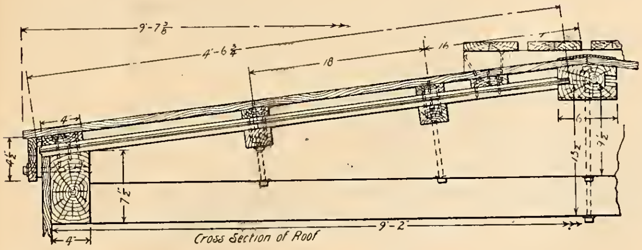


Fig. 5—Section Through Roof—80,000 Lbs. Capacity Steel Underframe Box Cars—Illinois Central Railroad.

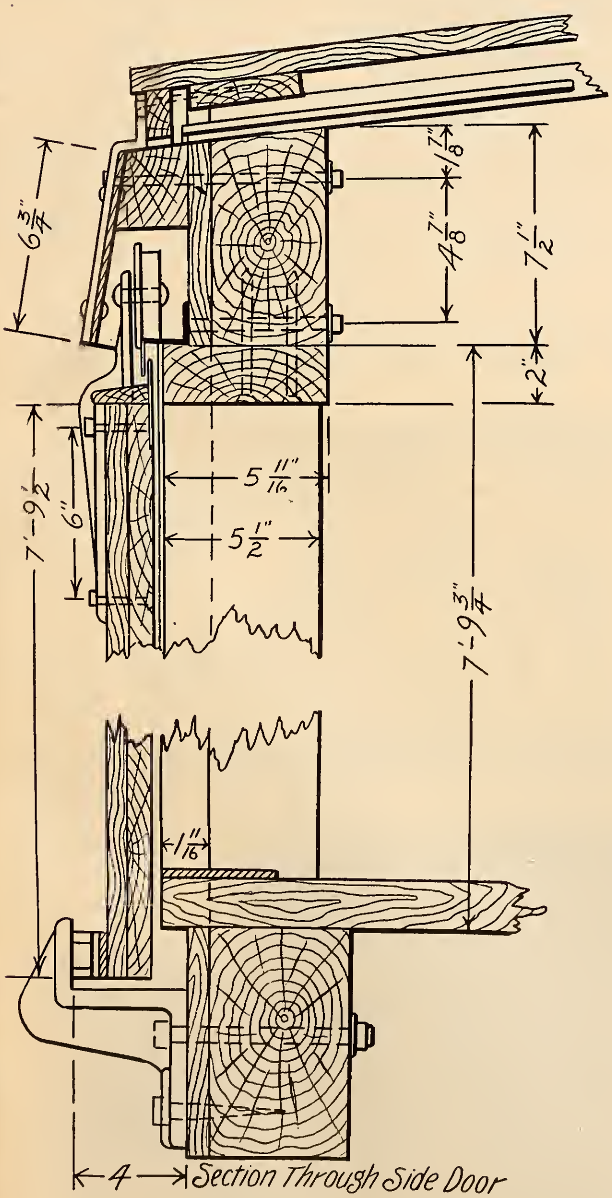


Fig. 6—80,000 Lbs. Capacity Steel Underframe Box Cars—Illinois Central Railroad.

Railway Mechanical Training as Viewed by a Technical Graduate

Editor, Railway Master Mechanic:

The discussion given to the question of the special apprentice in the mechanical department of railroads has always attracted my attention for the reason that I am a technical graduate, having served a special apprentice course, and am now following railway mechanical work. Therefore I have a selfish interest in the advancement of technical men in the railway mechanical field.

Nearly any one will admit that there are two sides to a question, and I am inclined to agree with Oliver Wendell Holmes when he said that most questions are hexagonal. This special apprentice question certainly has several sides, and in my opinion, views from more than one standpoint are necessary if the technical graduate is to be used to advantage by railroads.

First of all, the young man entering railroad service must realize at the start that his success depends upon his own efforts and capacity. Railroads are looking for ability and are not out hunting for hot-house plants to nourish for three or four years and then use to decorate a desk in a nicely furnished office.

Many young men take up the special apprentice course with the idea that they wish to be railroad men, and are honest in their convictions that such is the line which they are cut out to follow during life's work. At the same time, however, they have no real, definite idea of the process of transformation through which they should or must pass before reaching their goal. They naturally aim high and wish to become mechanical superintendents or general superintendents of motive power. They are under the impression that upon the completion of their courses, the company will offer them something—a position of responsibility—and then something better, until finally they are among the prominent members of the Master Mechanics' Association. Their ideas of that something are vague, and right here I believe is a serious stumbling block. Many young graduates lean to the testing department, because the work is more in keeping with that of their college training and less irksome than that of the daily routine of the machinist's trade. While the experience in the test department is good and will prove of value, I believe it a mistake for a man to permit himself to be held too long by its comparatively attractive work, for it is my opinion that, in most cases, this department ultimately proves to be a side track, or minor branch line, and that one will eventually reach a higher and more satisfactory position by sticking to the round house or machine shop to receive sufficient training as a machinist to fit himself to be entrusted with a foremanship. His idea should be to climb from one foremanship to another until he is general foreman, and then if he evidences sufficient ability it is not unreasonable for him to expect to be appointed master mechanic when a vacancy occurs. Casual glances at the personal columns of railway papers show the selection of master mechanics to fill the office of superintendent of motive power

Again a young man who has exhibited executive ability and has shown that he is not afraid of the hard knocks encountered in the lower position may be selected as mechanical engineer—actual instances have occurred—a position in which he has an opportunity of using to advantage both his technical school training and his experience from the school of hard knocks. Several mechanical engineers have succeeded their chiefs.

In connection with the consideration of a definite plan of action, so to speak, I was much impressed with the paper by Mr. R. D. Smith, superintendent of motive power, C., B. & Q. Lines West, presented at the last meeting of the Master Mechanics' Association, and which I notice you mentioned editorially in addition to reprinting in abstract. Mr. Smith suggests arranging the special apprentice course so that a man who has completed it successfully has laid the foundation on which to build a foreman instead of giving such a general and loosely connected experience that the special apprentice, upon its completion, is capable of "just working for the company," but can not be entrusted with any position of responsibility. This, I think, is a point worthy of no little consideration by those endeavoring to train the special apprentice as well as by the young technical graduate himself.

During the discussion of Mr. Smith's paper, at Saratoga, so much was said on the special apprentice question that the president of the association was obliged to close the discussion while it was yet at its height. Before it was closed, however, Mr. A. O. Berry made a very pertinent suggestion, in effect that better results would be accomplished if motive power men would devote some little time to consider their special apprentices and not confine their thoughts along this line to a time when the question is brought up at a meeting.

In order that your readers—those entering railroad work as a profession and those who are interested in developing technical graduates into good railroad men—may obtain some information regarding the progress of technical graduates in railway mechanical work, I would suggest that you request a number of communications from men who received their early training as special apprentices and from officials who have instituted special apprentice courses in their departments. I think you might consistently request the former to outline their promotions, give a synopsis of the class of work done while serving as apprentices and offer suggestions of improvements in their courses which would have resulted beneficially in their particular instances. It would be interesting to have a number of mechanical officials advise what success they have had with technical graduates, whether or not they developed any good material by this process and outline the work included in special apprentice courses.

Yours truly, "Q."

New Shops of the Rock Island System at East Moline, Ill.

(Continued from page 459.)

BLACKSMITH SHOP.

This building, which is 99 feet x 465 feet, is constructed of brick, with gravel roof, supported on steel trusses. It is located 50 feet north of the machine shop. Eighty-five feet of the west end is reserved for a future brass foundry.

The shop machinery is new to a considerable extent, consisting of additional steam hammers, forging and boiler machinery, punches, shears, etc., The steam hammers are served by jib cranes. A large number of Furgeson type oil furnaces furnished by the Railway Materials Company are installed.

STORE HOUSE.

This building, which is 100 feet x 500 feet, three stories

FIG. 1—POWER HOUSE OF THE NEW SHOPS OF THE ROCK ISLAND SYSTEM AT EAST MOLINE, ILL.

high, is constructed of brick with gravel roof. The first floor is four feet above the rail and is three inches thick on cinder foundation. On each side is a 16-foot platform 132 feet x 400 feet. An 80-foot crane spans a part of this platform and the track next it. This crane travels the full length of the platform and twenty feet beyond it. On the second floor are offices for the storekeeper. The building contains two elevators of two and one-half tons capacity.

Two fans heat the building.

POWER HOUSE.

The power house which is constructed of brick, with gravel roof, supported on steel trusses, lies 59 feet 8 inches north of and 94 feet 11 inches east of the storehouse. It is 154 feet 6 inches x 104 feet 11 inches and is centrally located to provide for future building. It has a basement 9 feet 6 inches deep. The boiler and engine rooms are each 150 feet 8 inches x 49 feet 10 inches. A

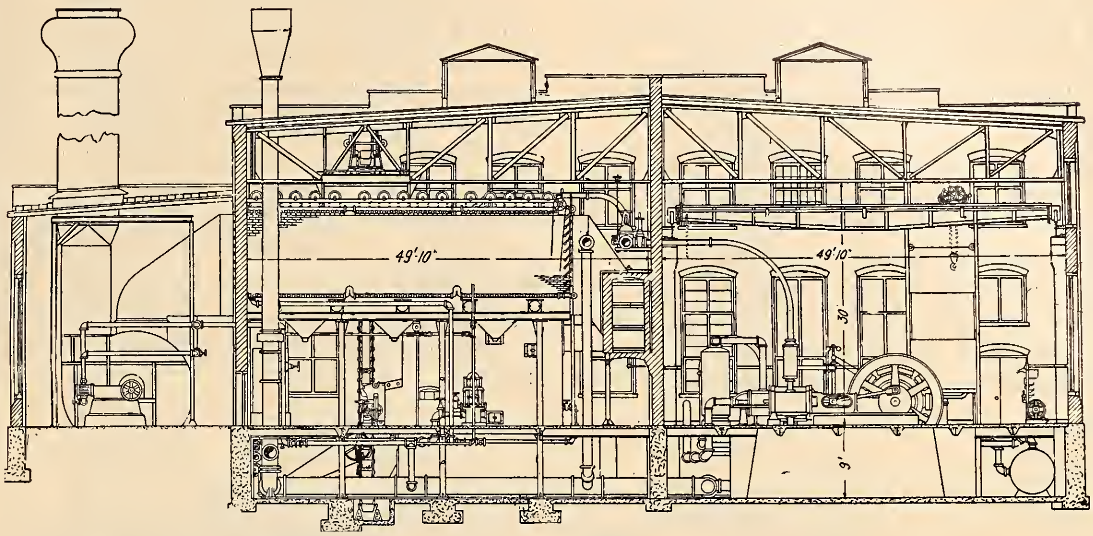


FIG. 2—POWER HOUSE CROSS SECTION—NEW SHOPS OF THE ROCK ISLAND SYSTEM AT EAST MOLINE, ILL.

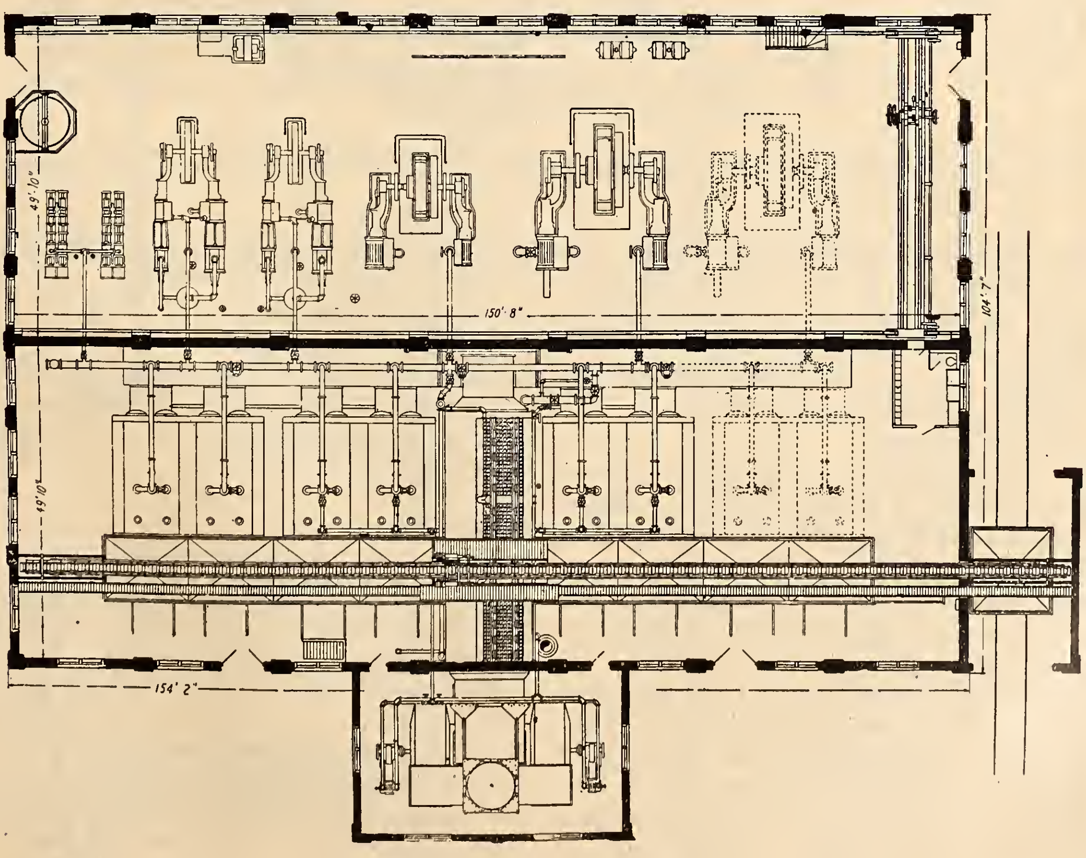


FIG. 3—POWER HOUSE PLAN—NEW SHOPS OF THE ROCK ISLAND SYSTEM AT EAST MOLINE, ILL.

ten-ton traveling hand crane is in the engine room. On the south is an addition 18 x 33 feet; through this the coal track runs, below the track is a coal hopper and above an ash hopper. The interior appearance of the engine room of the power house has been somewhat ornamented by the use of buff pressed brick, except at the base, when white enameled brick are used for a wainscoting seven feet high.

In the boiler room there has been installed six 300 h. p. Babcock & Wilcox Water Tube Boilers, making a total present capacity of 1,800 h. p. with additional room for an increase up to 3,000 h. p.

The coal is handled by a C. W. Hunt & Co. conveyor, which also takes care of the ashes. The conveyor has a capacity of thirty tons per hour and the coal hoppers located in the roof framing are thirty-six tons each in type. There is a sufficient floor space for such additional units as may be required for future expansion of the plant when the car departments shall have been added.

Compressed air will be furnished for this plant by two Ingersoll Sergent Class "G" compressors each of 1,500 cubic feet capacity. Water at 1500 pounds pressure for operating the hydraulic tools in the boiler and blacksmith shops will be supplied by two 100-gallon Worthington pumps which deliver to an accumulator also located in the power house.

The electrical service for the shops will be direct current three-wire system and for this purpose there has been supplied two 25 k. w. balancer sets. The switchboard is very neat and complete and made with a view of extension when additional electrical apparatus is installed.

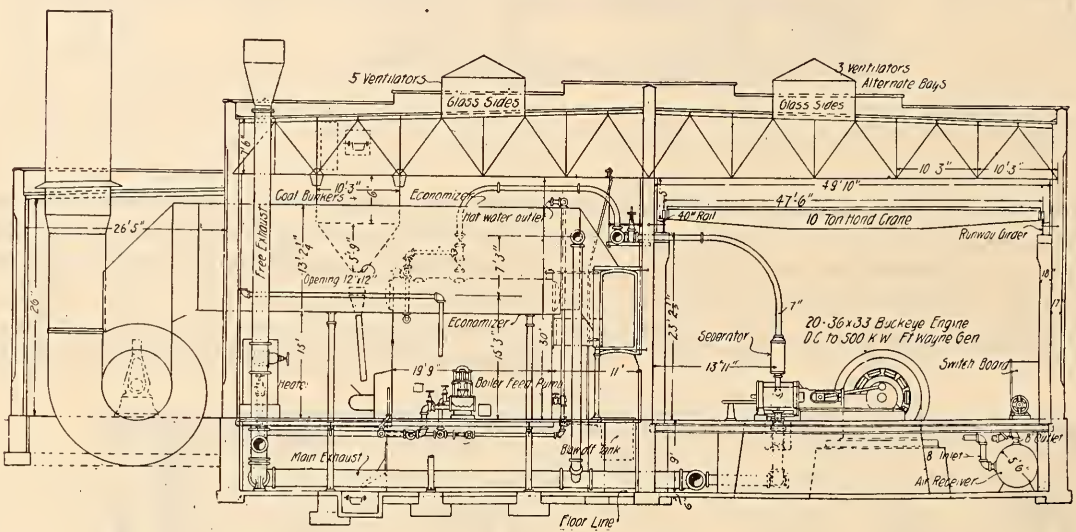


FIG. 4—POWER HOUSE CROSS SECTION—NEW SHOPS OF THE ROCK ISLAND SYSTEM AT EAST MOLINE, ILL.

capacity. The coal is discharged from these hoppers onto Green chain grate stokers which are driven by steam engines located in the basement. The flue gases traverse a Green economizer and are handled by duplicate Buffalo forge induced draft apparatus with a stack 60 feet high instead of a large permanent stack. The induced draft room is 41 x 25 feet 6 inches.

The boiler feed pumps are all Admiral type vertical Worthington make and in the boiler house are located two Marsh vacuum pumps for the heating system. The entire boiler house equipment is arranged with a view to a minimum of labor and attention with all fittings, fixtures, pipe work, etc., arranged in first-class manner and for positive and continuous service.

In the engine room there has been installed two direct current units of 500 k. w. and one 250 k. w. for direct current 250 volts. The generators are made under contract with the General Electric Company at Fort Wayne Electical Works. The engines have been furnished by the Buckeye Engine Company and are the cross compound non-condensing direct connected

On account of the distance of the pumping plant from the power house and the desirability of using electric power for pumping there has been installed a 50 k. w. rotary converter and step-up static converter for changing station current to 2,200-volt alternating.

The power house is equipped with hand power traveling crane of ten tons' capacity for use in erecting and repair work in the power house.

OIL HOUSE.

The refined oil house is 102 feet 10 inches x 62 feet 8 inches, it is 260 feet west of the storehouse. It has a basement 59 feet 2 inches x 59 feet 4 inches, in which are nine storage tanks, six with a capacity of 12,000 gallons each and three of 6,170 gallons each.

The floor of the building is four feet above the rail. The shipping room is over the oil room, oil being forced from below by compressed air. Next to the shipping room is the barrel room 60 feet x 20 feet, and next this the waste room 60 x 28 feet. The rooms are entirely separate from each other. They are steam heated.

The crude oil house is 89 feet south of the refined oil

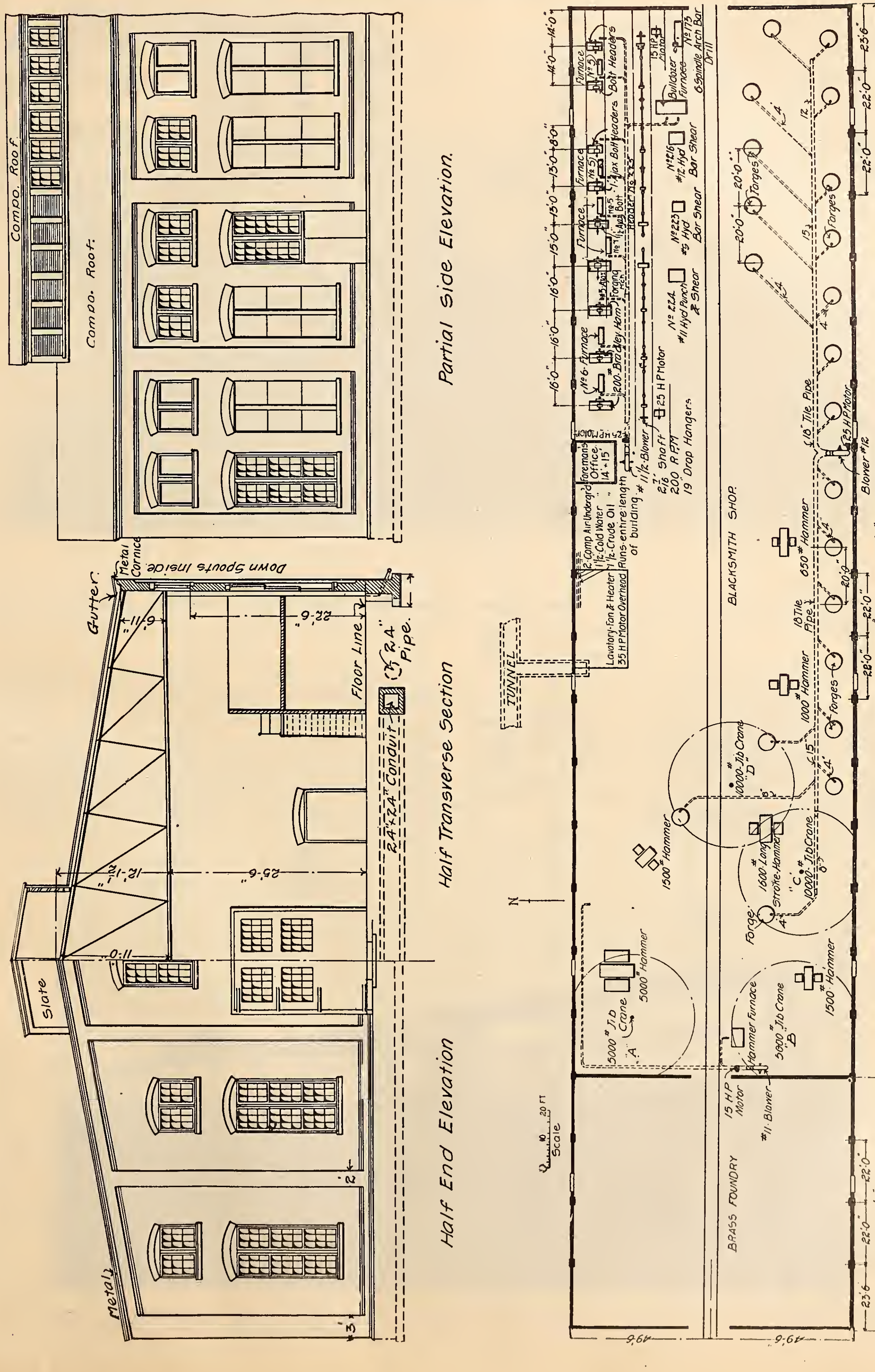


Fig. 5—Plan and Elevations of the New Blacksmith Shop of the Rock Island System at East Moline, Ill.

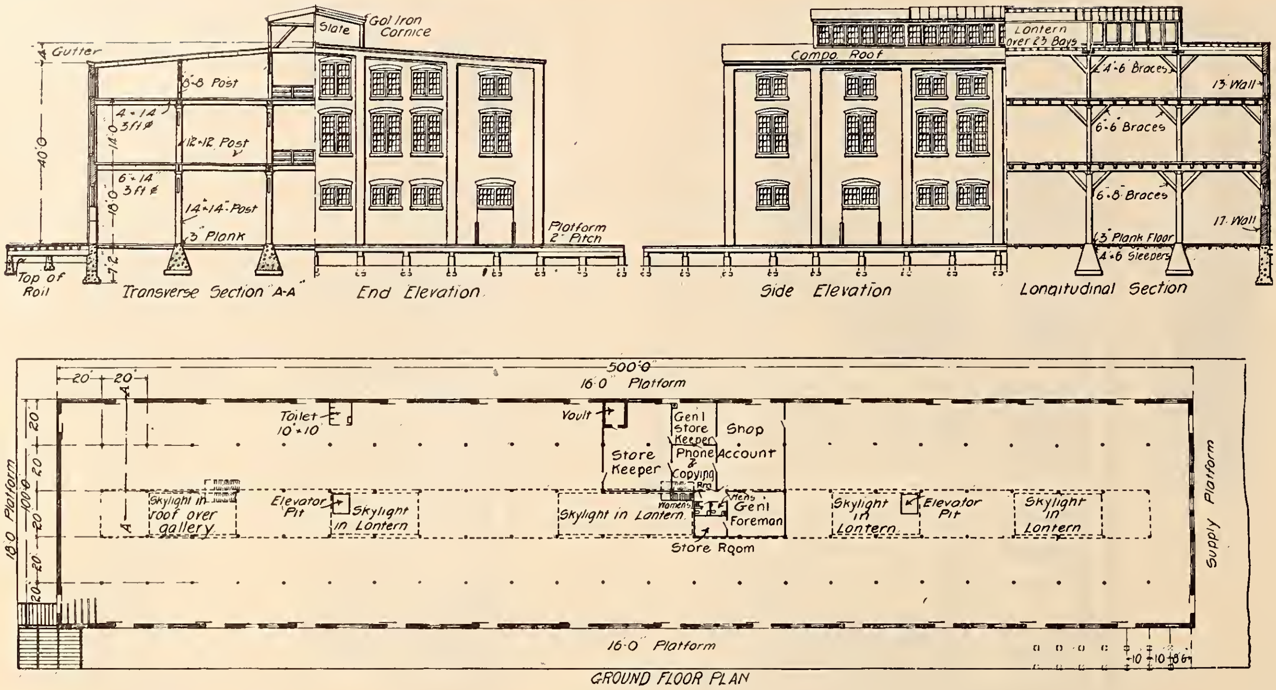


Fig. 6—Plan and Elevations of the Store House of the New Shops of the Rock Island System at East Moline, Ill.

house and is 35 feet x 21 feet. The floor is 6 feet 3 inches below the surface of the ground. It contains two 2,330-gallon tanks. Oil is forced by compressed air through pipes to the points where needed.

ENGINE HOUSE.

The engine house has thirty stalls. It is 80 feet deep in the clear and when completed will have forty-eight stalls.

The turntable is 75 feet in diameter and motor-driven. The center is 107 feet from the house.

The engine pits are 60 feet x 4 feet. A heating conduit extends around the inside of the building on the rear from which tile pipe conveys the heat to the engine pits.

TUNNELS.

From the power house a tunnel 6 feet 6 inches high and 6 feet wide leads to the various buildings, diminishing in width to five feet and four feet where less capacity is required. The tunnel is of concrete, the roof six inches thick reinforced by expanded metal. On each side are brackets, supporting the electric cables on one side and the piping on the other. The total length of tunnels is 2,120 feet.

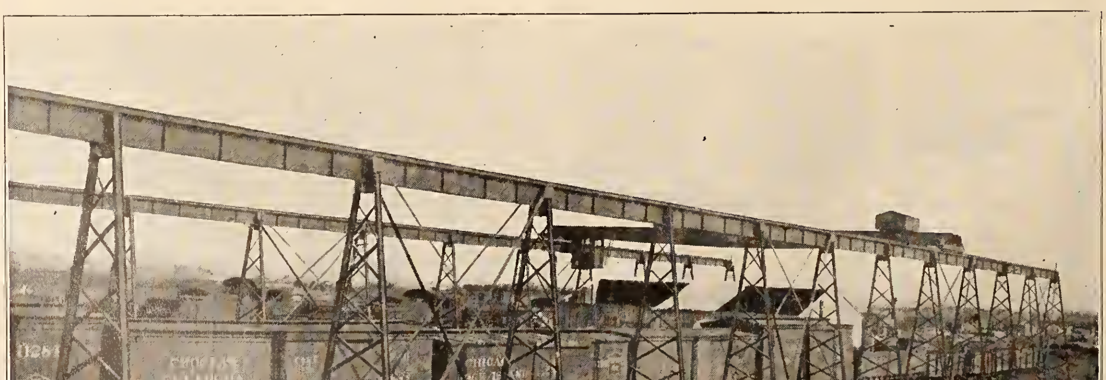


Fig. 7—Store House Cranes—New Shops of the Rock Island System at East Moline, Ill.

The Young Rotary Valve Gear for Locomotives

THE Chicago & Northwestern Railway has been experimenting since June, 1901, with a new rotary valve and gear applied to locomotives, under the supervision of Mr. O. W. Young, the patentee. The results have been very successful and we are now permitted to give complete illustrations and account of its application and performance.

The Young valve and gear is an adoption of the Corliss principle to suit the requirements of locomotive practice. It consists of two valves for each cylinder, operating alternately as inlet and outlet and driven by the Corliss wrist motion, as applied in connection with the Stephenson link. An original device is provided for correcting the irregularities in lead. Either no increase or a

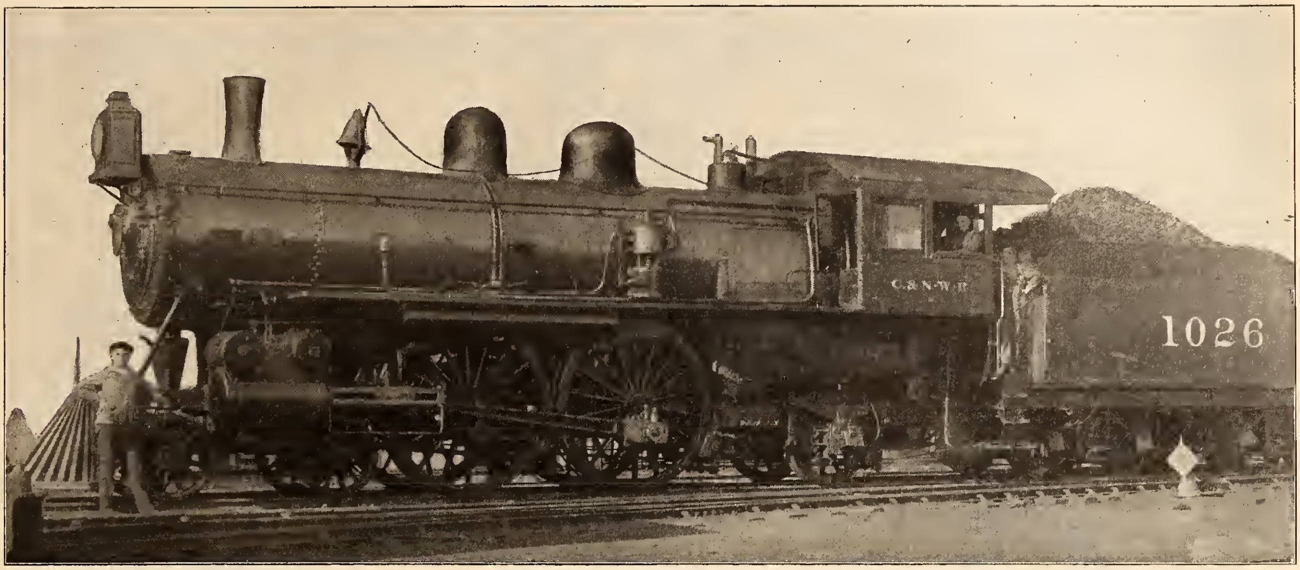


Fig. 1—C. & N. W. Engine Equipped with Young Rotary Valve Gear.

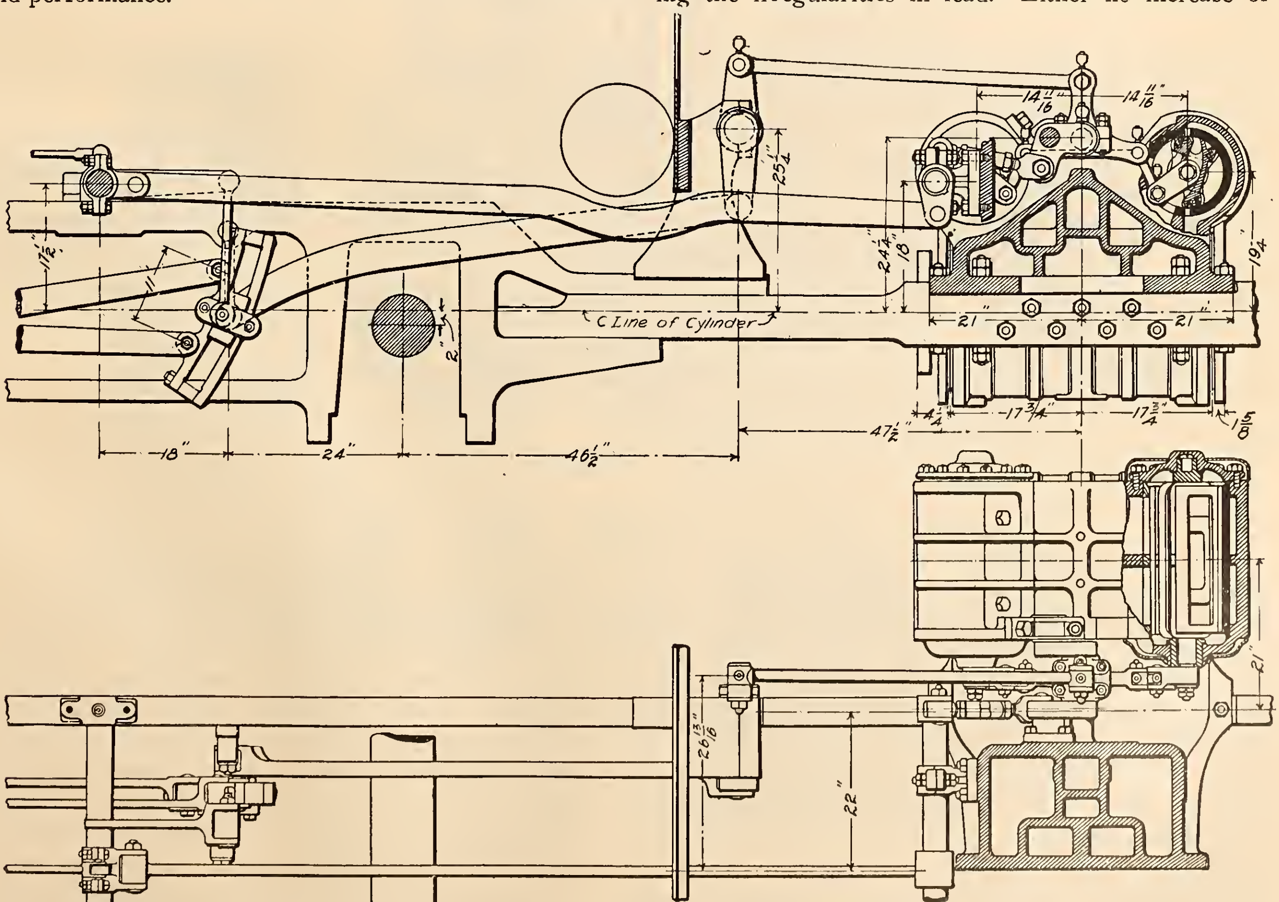


Fig. 2—General Plan and Elevations—Young Rotary Valve Gear for Locomotives.

slightly increased steam lead for the shorter cut-off can be obtained, and an excessive pre-admission of steam avoided. The exhaust lead by this device increases as the cut-off is shortened. This secures a maximum power while starting and a sufficient late compression to prevent the terminal pressure from exceeding the initial pressure at high speeds without by-pass or compression valves.

The valve gear makes use of the Stephenson link, eccentrics and rocker arm as far as the end of the valve ing about one-eighth inch more lead for the shorter cut-off.

The steam chests are fitted with a ten-inch bushing and the valves have cast iron packing strips which are free to move and adjust themselves to any irregularities in the seat, thus reducing the leakage. The illustrations of the bushing shows two steam ports in a vertical line ⅞ inch wide. The exhaust port is 1⅝ inches wide and the steam inlet from the chest 2 inches wide. The valve body

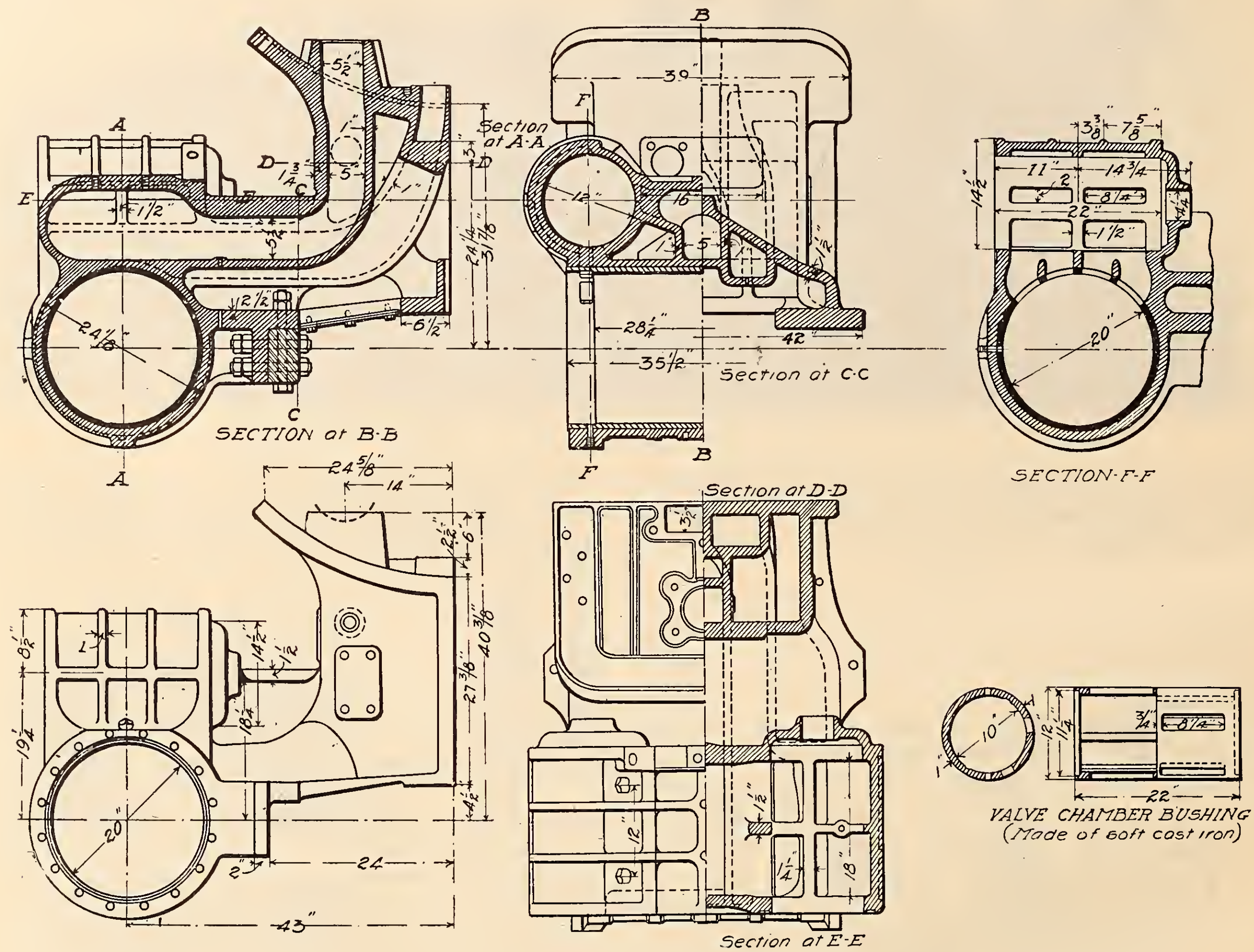


Fig. 3—Detail of Cylinders and Steam Chest—Young Rotary Valve Gear for Locomotives.

stem. This is connected to the wrist plate which has hinged attachments to a crank arm on the rotary valve spindle. The wrist plate rotates on a crank bearing which is trunnioned between the cylinder saddle and the steam chest. Referring to Figure 2 it will be seen that a horizontal shaft extends across the back of the cylinder saddle, and this shaft is fitted with two cranks which connect with the bearings of the wrist plates. From the center of the shaft a long connecting rod extends back to a short crank on the tumbling shaft, so that when the link is raised or lowered from the central position, the wrist plate is raised to regulate the lead. It has been found by experience that the best results are obtained by allow- is journaled in the heads of the steam chests and its weight is supported entirely clear of the valve seat. The only weight on the seat is the weight of the strips. The valve friction is thus materially reduced. This reduces the excessive wear of the valve seats with a reduction of lubrication. The valve spindles in their passage through the end of the steam chests have a shoulder which forms a steam tight bearing and requires no lubrication or packing. It has been found that they continue to be steam tight and require no attention in taking up lost motion between times for general repairs. The valve renewals are confined to the substitution of an occasional new packing strip.

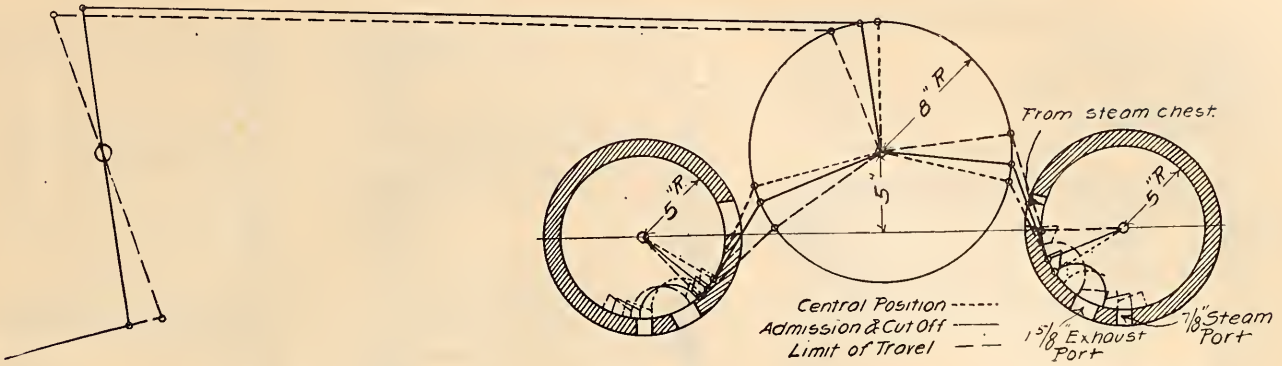


FIG. 4—VALVE MOTION DIAGRAM—YOUNG ROTARY VALVE GEAR FOR LOCOMOTIVES.

The clearance in the cylinder of the first locomotive equipped with this device was 3 per cent and in the second engine 6 per cent. Experience thus far gained shows that 5 per cent would be the best figure.

Mr. Robert Quayle, superintendent of motive power of the Northwestern, gives the following account of the valve and gear:

"There are at present on the Chicago & Northwestern Railway two locomotives equipped with the Young valve and gear, which is a system of rocking valves operated by the usual eccentrics and links of the Stephenson motion. The construction of the valves requires a special cylinder casting and therefore cannot be used without a complete change.

"The actual cost of these cylinders, including the valves and changes in the motion, should not exceed 30 per cent more than the cost of cylinders, valves, chests, etc., for a D or piston-valved locomotive. If, however, the cylinders were made standard to a road, I do not think their extra cost would exceed $150 per locomotive.

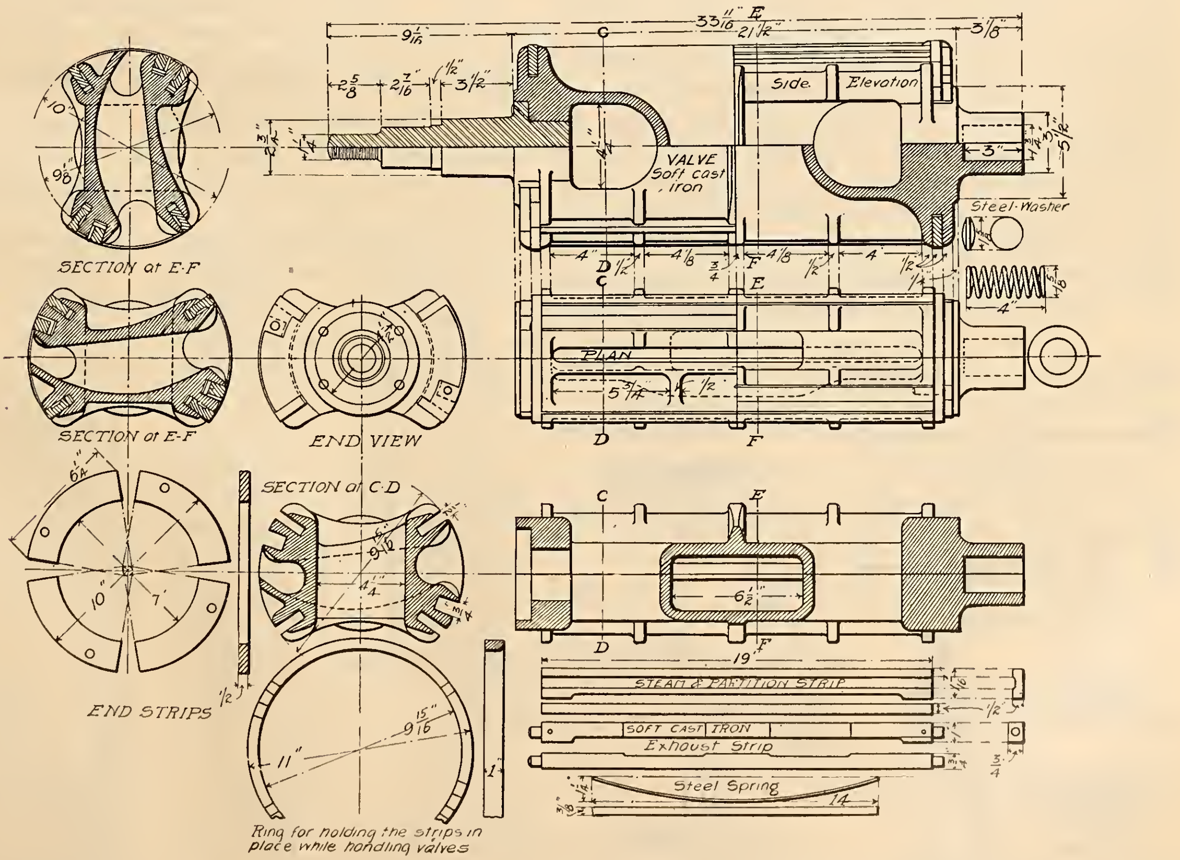


FIG. 5—DETAILS OF VALVE AND PACKING STRIPS—YOUNG ROTARY VALVE GEAR FOR LOCOMOTIVES.

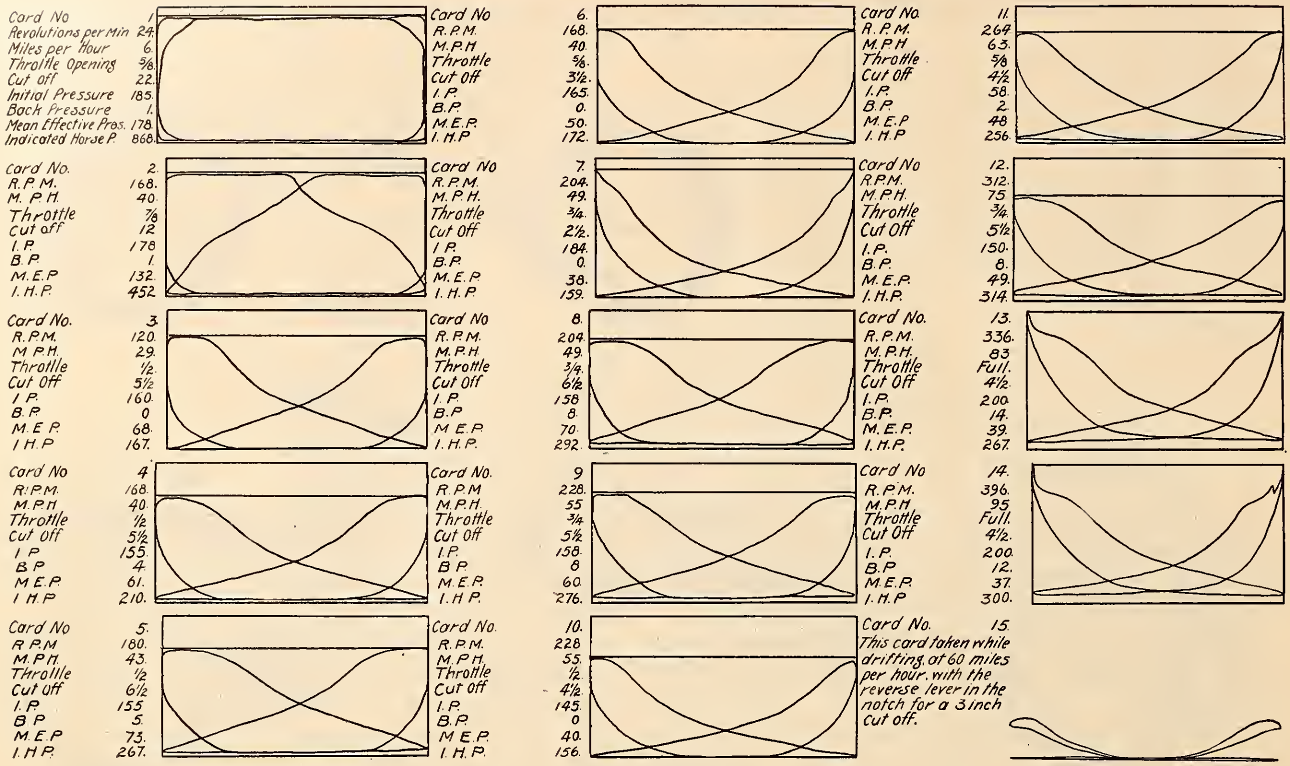


Fig. 6—Indicator Cards from Locomotive Equipped with Young Rotary Valve Gear.

"In June, 1901, the first engine was equipped and, like all first attempts, there were certain details shown up which needed improvement. The general results with this engine justified a second trial, and in September, 1903, a set of cylinders with the special valves and their motion were applied to a 20 by 26 inch Atlantic type (passenger) engine with 81 inches over the tires and 91,000 pounds on the drivers. The experiments with this engine lasted some six or eight weeks and in November, 1903, the engine was put regularly into service on the Galena division. The engine had been a "tramp" up to a very recent date; has had all kinds of service, all kinds of engineers handling her, and practically continuous service. It has so far made approximately 90,000 miles. The tires have not been turned, the eccentric straps have been closed once about 1-16 inch each; there is no pound in the boxes and the tool marks are still on the motion pins. These results are especially interesting to the motive power official, demonstrating as they do that the wear and tear on the machinery is so remarkably less than

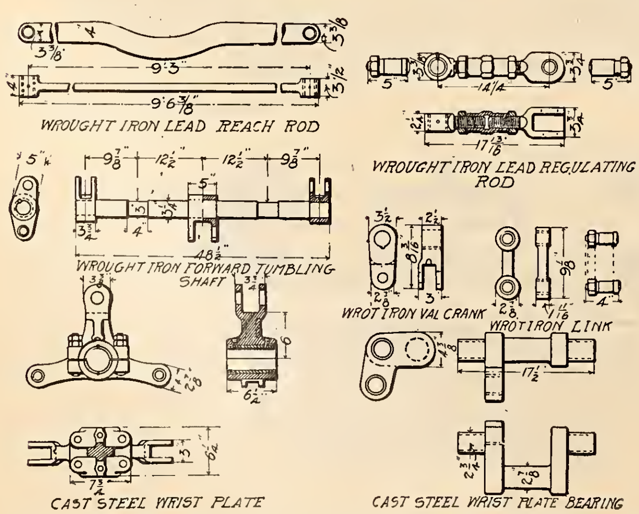


Fig. 7—Details of Valve Motion—Young Rotary Valve Gear for Locomotives.

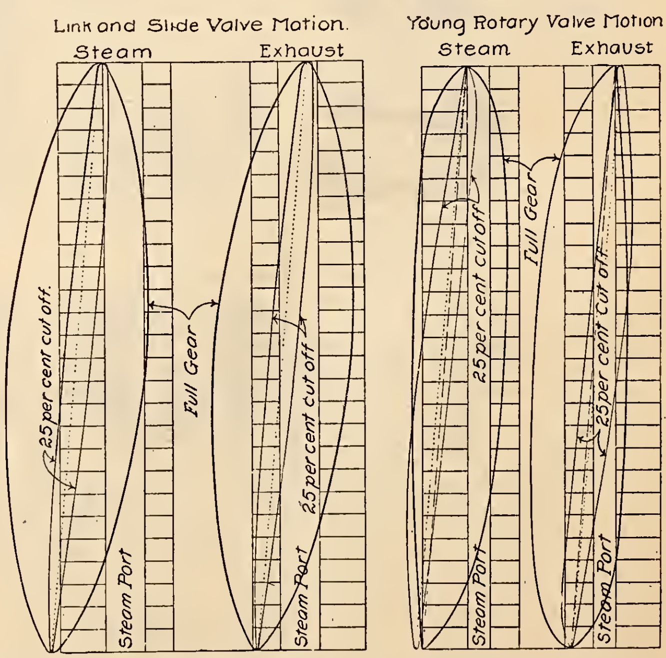


Fig. 8—Diagrams of Port Openings—Young Rotary Valve Gear for Locomotives.

that on the engines with the D or piston valves. The engine is always ready for service, the roundhouse foreman reporting that for his part of it, five of this type would easily equal seven of the piston valve engines. There is one run between Chicago and Clinton, with usually ten heavy cars, on which this engine is the only one that can make the time.

"The train dispatchers know the value of the engine and they do not hesitate to rely on it to make up time or take an unusually heavy run. As a consequence the improvements shown by the indicator cards are not entirely realized in actual performance records. In a series of comparisons made by the indicator the water rate per indicator horse-power was reduced from 22.9 to 19.3 pounds. The indicator cards also show the cause for the slight wear on the machinery, as they are remarkaly full, the expansion lines being clear and distinct at all points of cut-off. Most of the work in passenger service is done at less than 6-inch cut-off. On account of the high and full cards it is evident that the crank effort is more uniform and higher than with a slide valve engine. Besides causing less wear on the machinery, this gives a more even torque when starting, and the consequent less slipping.

The engine is one which will bear thorough investigation. While our experiments have been made in passenger service, I consider that the performance in freight service will show even better results from both an operation and economical standpoint."

An Automatic Air Discharge For Refuse Water

So many instances have come to our notice where the bottoms of drop pits, floors of pump rooms and other points about a railroad shop or roundhouse are below the level of the drainage system, that a device whereby water which has accumulated in such places may be automatically discharged to the drains appears of interest. We therefore present herewith a number of line drawings illustrating a pneumatic cess pool in use at the Grand Crossing roundhouse of the C., B. & Q. Railway.

Several views of the apparatus are shown by Figs. 1, 2 and 3, and the operating valve by Fig. 4. A compartment has been constructed and located at such a level that all water drains thereto. In the bottom of this compartment is located the circular tank T, which is closed both top and bottom, except for the connections to be further described. Water drains into the compartment through the pipe A and when it has risen to a sufficient height, it passes through the pipe C C and valve B to the tank T. As the tank fills with water the float B rises, guided by an iron frame until it finally reaches the top of the tank, when it lifts the frame. This frame is connected by a rod to the lever A, the lever being in such position that the small valve c c, shown in Fig. 1 is open. Opening valve c c admits air into cylinder D forcing piston valve E forward, and closing communication to the atmosphere at F F. This movement opens communication to the air reservoir through the pipe G, which passes through cylinder H and connection I into the tank T. The pressure of the air is sufficient to close the valve B and to force water through the discharge pipe K to the drainage system. As water is discharged the float gradually lowers until it again encounters the bottom of the frame, its weight thereon being sufficient to close the valve c c. When this valve is closed, air in the cylinder D is allowed to exhaust to the atmosphere through a small port L. Cylinder H is always charged with reservoir pressure through the port O and this pressure will force piston E *back* to its original position shown in the figure, closing the passage between the air reservoir and tank T, at the same time opening communication at F to allow the air to exhaust through opening P to the atmosphere.

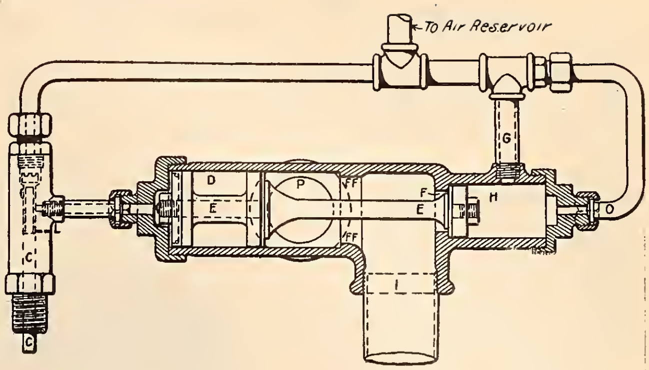
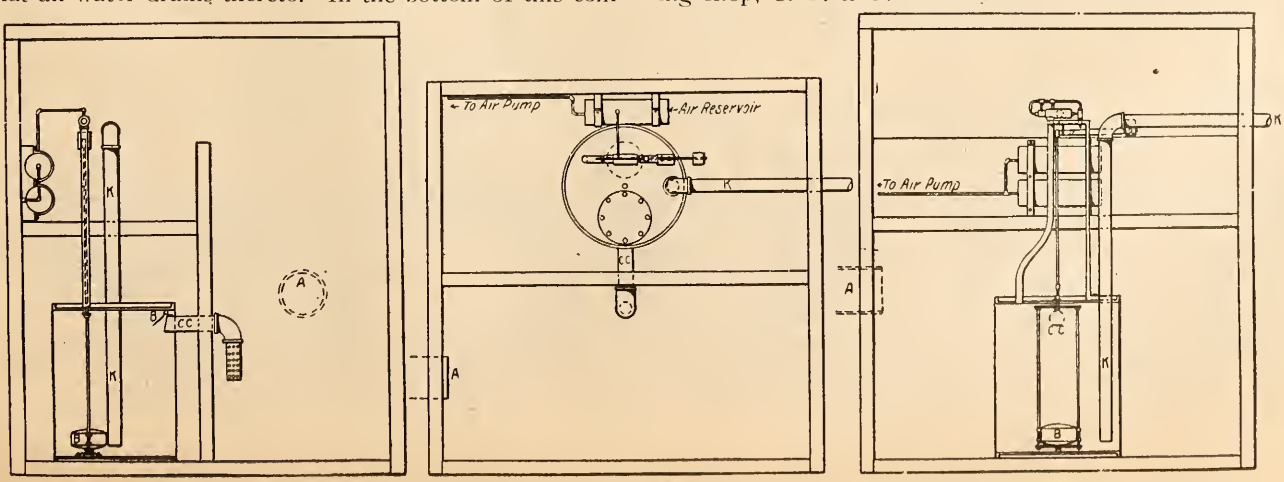


FIG. 4—AUTOMATIC AIR DISCHARGE FOR REFUSE WATER.

This appliance works automatically, requires little or no attention, and gives very good satisfaction. For the illustration and description we acknowledge the courtesy of Mr. John Rusche, general foreman of the Grand Crossing shop, C. B. & O. Railway.



Electric Locomotive for the Philadelphia & Reading

THE Baldwin Locomotive Works recently built for the Philadelphia & Reading Railroad an electric locomotive for use in freight and passenger service. The motors were furnished by the Westinghouse Electric & Manufacturing Company. There are four 500-volt street railway motors, each of 50 horse power. The cab is fitted

FIG. 1—ELECTRIC LOCOMOTIVE FOR THE PHILADELPHIA & READING.

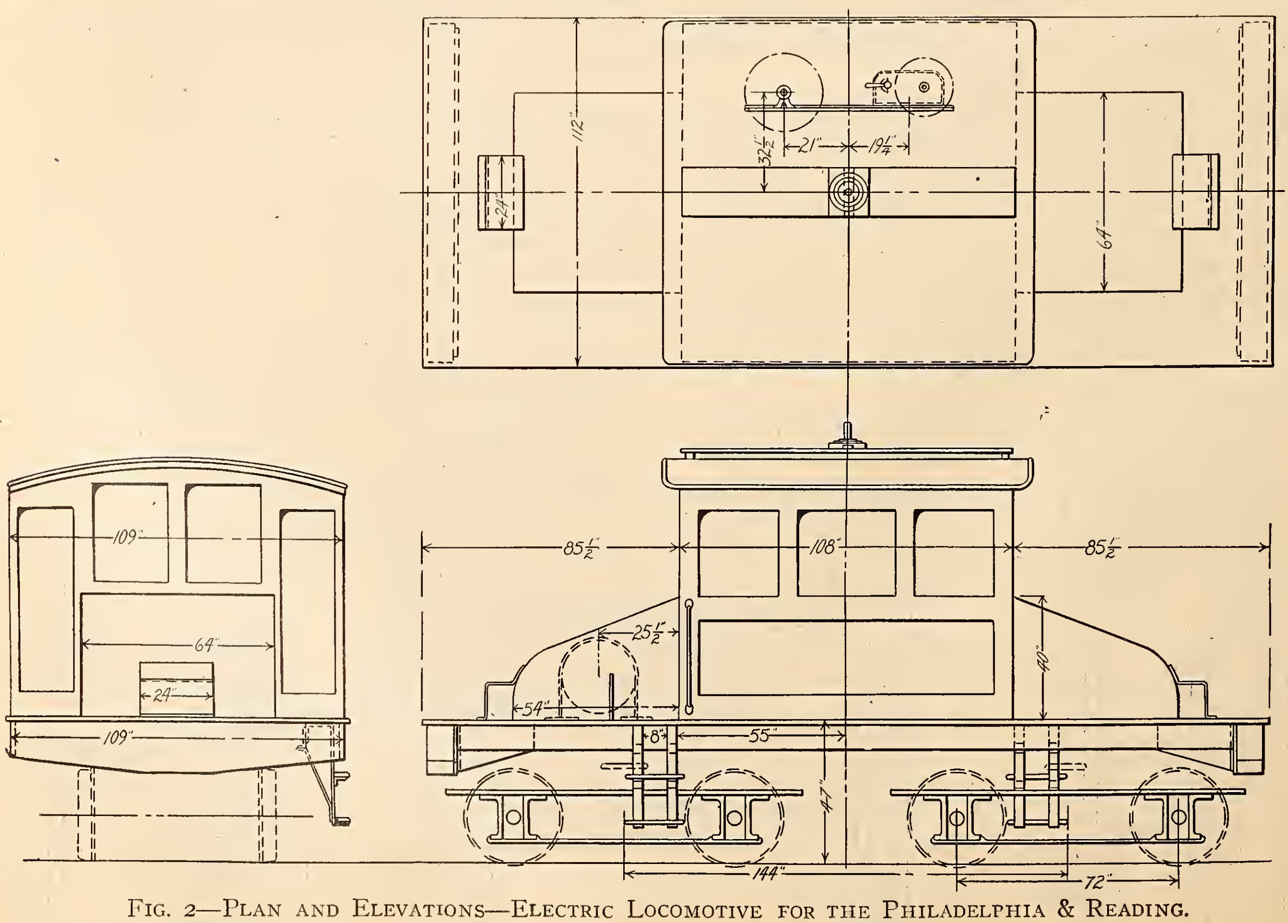


FIG. 2—PLAN AND ELEVATIONS—ELECTRIC LOCOMOTIVE FOR THE PHILADELPHIA & READING.

with electric heaters. The driving wheels are 30 inches in diameter, steel tired and arranged on two four-wheel trucks with six-foot base. The journals are 3¾ x 7 inches. The total wheel base is 18 feet and the length of frame over end sills 23 feet; width over all 9 feet 4 inches. The locomotive is equipped with Westinghouse air brakes and both M. C. B. and standard street car couplers, so that trolley cars can be handled as well as regular steam road equipment. The total weight is 40,000 pounds. The starting draw bar pull is 8,000 pounds and the running draw bar pull 6,000 pounds. The locomotive is illustrated herewith from photograph and line drawings.

The following are the general dimensions:

Use	Passenger and Freight.
Gauge	4 ft. 8½ in.
Motors	4—38B 500 volt.
Speed	10 M. P. H.
Running D. B. pull	6,000 lbs.
Starting D. B. pull	8,000 lbs.
Diameter of drivers	30 ins.
Total wheel base	18 ft.
Rigid wheel base	6 ft.
Length	23 ft.
Width	9 ft. 4 ins.
Height	11 ft.
Journals	M. C. B. 3¾ x 7
Weight	40,000 lbs.

Combustion or the Source of Energy in the Locomotive

IN this planet every form of energy can be traced to one of three sources: First, the heat of the sun; second, the rotation of the earth; third, the internal heat of the earth.

The most important of these is the first, which is the heat of the sun. The kinetic energy coming from the sun, which is the center of all motion, is very difficult to utilize for industrial purposes. All the heat or energy pouring out from the sun which man so far has been able to commercially utilize is the potential energy stored in the form of fuel.

The second is of very little importance to us, as it is represented only by the rise and fall of the tide, and, so far, has not been successfully used as a source of motion. The utilizing of the third belongs to the future generations; its energy is produced every time there is an earthquake.

The application of the laws of motion and force to objects in nature or contrivances in the arts form the branch of natural philosophy usually treated under the head Mechanics, Mechanical Powers, or Elements of Machinery.

The original signification of the word "machine," which is the root of the various terms "machine," "mechanical," and so on, was art, contrivance, or ingenuity. When the term "machine," or "mechanical," is applied to the action of force as mechanical powers, it is meant that certain powers are extended, or motion produced, by the action of particles or masses of matter, solid or fluid, one upon the other.

Thus mechanical action applied through action of force produces no change in the construction of bodies, and is therefore distinguished from chemical or any other species of action. In natural philosophy, machines are spoken of as being of two kinds, simple and complex. A simple machine is a tool or instrument, and a complex machine is an engine. It is the latter with which we will deal.

Engines are, under all circumstances, only instruments through which power may be made to act. They only convey, regulate, or distribute the force of power which is communicated to them from some source of motion. They never create or generate power, or give more power than they have received; they practically apply the power which has been communicated to them in so convenient and easy a manner that the result ensuing seems almost as surprising as if they had actually generated the whole or a part of the power they exhibit. The main purpose required in mechanical operation is to overcome, oppose, or sustain a certain resistance or force. This purpose is obtained by applying another species of force.

According to the usual phraseology, the resistance to be overcome is called the weight, and the force which is applied is called the power. At the present time there are only five powers known to science, which are as follows: Wind-power, tide-power, water-power, the power of combustion, and the power of vital action. Of these five powers, the ones which interest us most are the power of vital action and the power of combustion. The power of vital action, or ability to apply force by hand-power, is very limited. All the instruments which mankind have adopted for their use act upon certain fixed principles in nature, and are known as mechanical powers. They are three in number—the lever, the pulley, and the inclined plane. From the lever and the pulley we get the wheel and axle, and, from the inclined plane, the wedge and screw. The six in all form the parts of every species of machinery, however complicated it may be.

The lever, being the most important of all mechanical powers, and the leading principle in all machines, we will devote a little time and space to its analysis. A lever is a bar of iron, wood, or any other material, which is movable upon a fulcrum, or around a fixed axis. It derives its name from a French word meaning to raise. Three things constitute the operation of a lever—the power, the weight, and the fulcrum. The power is the force applied, the weight is the resistance, and the fulcrum is the support. There are three kinds of levers,

*A paper presented before the Pacific Coast Railway Club by T. J. Henderson, on October 15, 1904.

first, second, and third class. In the first class, the fulcrum is between the weight and the power. In the second, the weight is between the power and the fulcrum, and in the third class the power is between the fulcrum and the weight.

By the proper mode of applying power through the lever, we may cause a weight of 10 pounds, by moving through a space of 10 feet, raise another weight of 100 pounds through a space of 1 foot, or vice versa; but by no mechanical power can we, by moving a weight of 100 pounds through a space of 1 foot raise 10 pounds through a space of 11 feet; nor by 1 pound moving through a space of 9 feet can we raise a weight of 10 lbs. through a space of 1 foot. Furthermore, by no mechanical powers can we increase the power which is applied; or, in other words, the quantity of power expended is exactly the amount of power which has been accumulated. All we can possibly do to procure mechanical advantages is to regulate the velocity, force, or direction of the power to the use or purpose we have in view.

In every machine, simple or complex, besides the power required to balance the resistance, there must be some additional power applied in order to produce motion, or overcome the inertia of rest of the body.

The power of combustion, which is the second power of interest to us, and the first power of interest to railroad companies, is the power which transports all trains on railroads, steamboats on the ocean, and turns 99 per cent of the wheels of commerce in all branches of trade. It is the most expensive of all powers for commercial purposes outside the power of vital action, and, in railroading, cuts the largest hole in the bill of expense.

Consider the large amount of money expended every year by railroad companies for coal, oil, and other fuels, and how much of this fuel may be wasted if the men whose duty it is to use it are careless and indifferent in its use. Many railroads are offering inducements to the enginemen to save or economize in the use of fuel. Some figure that if a saving of only one shovelful of coal, or a gallon of oil, on each engine every day, could be made, at the end of the year many hundreds of dollars will be to the companies credit which would otherwise be lost.

I venture to say that there is not a single engine running today but that a saving of not alone one, but many shovelsful of coal, and gallons of oil, may be saved if the enginemen only will try. "We can all do better if we try."

It is a generally known fact that, in England, the English locomotives will do almost twice the amount of work on the same quantity and quality of fuel that our American engines will (or do) do.

Here is what an English engineer says of an engine-driver: "There is," he says, "an idea abroad that unless the steam is blowing off madly through the safety-valve there can be no great demonstration of skilled enginemanship." There can be no greater mistake, for, when steam, water, and fuel are blown away through the pop-valve, it is a positive proof of the existence of either one or both of the following evils: The engine is too small for the work, or it is too great for the men.

Let us see what this waste through the pop-valve amounts to. By an actual test on a locomotive at the Purdue University, it was found that, by blowing off steam through the safety-valve for four consecutive minutes, six cubic feet of water, 336 pounds, was converted into steam and blown away, being at the rate of 84 pounds of water per minute, 1 2-5 pounds per second. In ordinary work, 6 pounds of water are converted into steam for each pound of coal consumed, and about 12 pounds per pound of crude oil. The amount of coal wasted in four minutes was 56 pounds, ¼ of a pound per second. In forty seconds, 10 pounds, or one shovelful of coal would be wasted. We shall see what this means later on.

To get a proper understanding of the fuel economy question, many things we must consider in order to intelligently discuss the subject:—

First, a well-designed engine, properly adjusted draught appliances, with the cylinders not any larger than the boiler; second, a well-kept engine; third, properly supplying the boiler with water and the fire with fuel; fourth, smooth, steady running; and last, but not least, not too great a distance between the engineer and conductor.

If an engine's cylinders are too large for the boiler, the boiler too large for the firebox and heating surfaces, the draught appliances improperly adjusted, cylinders, valves, steam pipes, and joints blowing valve motion out of order, it is next to impossible for any kind of engineer or fireman to make a good record with her. Smooth, steady running—two-thirds of a good coal record can always be traced to the engineer who is intelligent and takes an interest in performing his duties well. If the engineer takes no interest, the fireman will be compelled to take things as they are, and will very likely be blamed for the engineer's ignorance or carelessness.

There are two kinds of engineers, and likewise two kinds of firemen; therefore, there are two ways of running and two ways of firing a locomotive. Some men would not make good, economical engineers with unlimited experience; others will try to make up all the time they are behind in the first two or three miles, and will try hard to make it up before they get out of the yard limits; others, again, will leave on time, on a moderately fast run, and will run as fast as they can to the next town, but finding, by consulting their watch, that they are going to arrive too soon, they shut off, regardless of the high steam pressure and big fire, and away goes the steam through the pop. The process is repeated between every station. The fireman has to fire the engine so that when they are leaving town he will have a fire that will stand the conditions; he is determined to keep her hot, if it takes all the coal in the coal-pit; then, when the throttle is again shut off, the safety valve screams with joy.

There is another kind of engineer that does not prove a success at the business; he may not be a hard hitter, but will let the balance-packing blow pistons and rods leak, steam pipes and joints leak, nozzles got loose or choke up, and so on, and should the fireman make any suggestions as to the cause or cure, he will likely be told he is firing her too heavy, the first is full of holes, or something else; perhaps he will be informed he is not paid for running the engine, or he knows too much. Such an engineer will be afraid to make a report, for he may not know what to report. His engine runs down and becomes a poor steamer, and will burn all the coal a fireman can shovel into the firebox. Others will have no confidence in themselves, or their engine's ability, and on a hill or heavy train will want her popping all the time, claiming they can not pull cars with cold water. Others will make a run for a hill like a boy running a mile to jump over a two-board fence, and are out of wind when they get there.

The economical engineer is one who will do the right thing at the right time with the least possible amount of steam going through the cylinders, and has confidence in his engine's and his own ability, never gets in a hurry and is generally on time. He does not condemn the Traveling Engineers' Association on the form of examination it has adopted; he reads and keeps up with the times, and is not afraid to discuss questions with his fireman.

FUEL AND COMBUSTION.

Coal is composed of several ingredients, as follows:—

Carbon, oxygen, nitrogen, hydrogen, sulphur, ash, or incombustible substances. In bituminous coal the proportions vary as the coal varies, but, in good, soft coal, are about as follows:—

Carbon, 50 per cent (gases); moisture, 35 per cent; ash, etc., 15 per cent.

Carbon forms the solid portion of the coal, and is the chief element in its composition. It is one of the most abundant elements in nature, and is found in various states or conditions, such as graphite, charcoal, the diamond, and so on. The difference between graphite and a diamond in appearance is as day is to night, but, when analyzed, they are found to contain nothing but pure carbon.

In burning carbon, if the process of combustion is complete, it will give out 14,500 heat units. Next to carbon comes hydrogen, which exists only in a gaseous state. It is the lightest known substance in nature. One atom of hydrogen gas uniting with one atom of oxygen gas produces water, and, in the burning of a fire, forms the moisture which, together with the other gases, forms the gaseous substances in the coal. One pound of hydrogen gas yields 62,032 units of heat, and is the greatest heat known produced by the combustion of one pound of any known substance. The ashes, or incumbustible matter in the fuel, come from the impurities contained in the vegetation from which the coal or fuel originated. Sulphur is one of the elements of coal, and is the chief element in the formation of clinkers. It exists only in a solid state.

Combustion, or fire, is the result of the rapid union of oxygen with carbon when uniting at a high degree of temperature, producing light and heat. It simply means decay in a rapid form. For example, take two pieces of wood, coal, or any other substance that will burn, set one piece on fire; in a few minutes it is all consumed, leaving nothing but a few ashes. The other is thrown on the ground, and remains there to rot or decay; it may take years before the second piece is reduced to ashes, but the process is identical, and the heat units produced are exactly the same in both cases. The first we call fire; the second, decay. In reality, it is all decay, the first being the rapid process caused by the rapid union of oxygen with carbon, or fuel at a high degree of temperature. The second, the slow process of decay on account of the slow union of oxygen with the carbon or fuel, producing no light and no perceptible heat, but heat is produced just the same.

Combustion, as we understand it, is produced by the rapid union of oxygen with carbon, and is always accompanied by light and heat. It has been found upon examination that not only is the heat of combustion a fixed quantity whether the union of oxygen with carbon takes place slowly or rapidly, but that the heat evolved in any given chemical reaction is always the same, and is always accompanied by an evolution of heat.

Any substance which has the power to unite with other substances has power to do work and possess chemical energy; therefore all combustible material can do work. By uniting with oxygen, it produces heat, and the heat in turn is transformed into motion. Thus we see the source of power in the steam engine is chemical energy produced by the burning fire in the firebox.

The power of combustion, as I stated before, is one of the five primary powers, and the one which is most interesting to all railroad companies, men included. The question now is, Where does this power or pent up energy come from, or how and where did it originate? In ages gone by, no one knows how long, the rays or heat of the sun caused the trees and plants to grow and flourish in the atmosphere, which was abundantly supplied with carbonic acid gas; this acid or gas in the atmosphere entered into the growing trees and vegetation, and was stored there for man's use and bentfit; as time went by, the vegetation, through the action of the elements, took a new form; just how or what was the cause is not known, but the result is coal with which we are all quite well acquainted.

The sunbeams building up the trees and plants expended a great amount of heat, and the heat expended equal to the amount of work done in producing the growth; the heat produced by one pound of coal is no more and no less than the amount of heat stored in the coal when in the form of growing vegetation. It absorbed the heat from the sun, consequently all motion produced by combustion through caloric or heat engines comes from the sun and planets. Having arrived at the source of power in all caloric engines, we will endeavor to utilize the power to the best of our ability.

One unit of heat equals 722 foot-pounds of work, or, to put it a little more clearly, will raise 772 pounds one foot high; 140,000 units of heat, which is the result of the perfect combustion of ten pounds of coal (one shovel full) will raise 772 pounds 100,000,000 feet high, or 100 tons 526 feet high; 33,000 pounds raised one foot high equals one horse power; 100 tons raised 526 feet equals 3,187 H. P. Imagine that much power lost for every shovel of coal wasted.

Practically it is impossible to obtain these results even with our best mechanical appliances, on account of the many avenues of waste connected with the operation of a locomotive, such as unskilful running and firing, loss by radiation, condensation, loss of heat, loss by smoke and unconsumed gases passing out of the smoke-stack as a result of imperfect combustion caused by bad or unskillful firing, poorly designed fireboxes, and ash-pan appliances, and badly adjusted draught appliances, etc.

When a fire is lighted in a locomotive firebox, the burning is slow at first, and shortly after the fire begins to burn, water is seen to ooze out of the cracks and joints in the front end very often. Thus we say the front end is sweating; this is a mistake. Webster defines sweating as moisture issuing from the skin. This water we see coming out of the front end is the result of the process of combustion going on in the firebox.

When oxygen unites with the fuel and hydro-carbons at a certain degree of temperature, it produces hydrogen gas, one atom of hydrogen gas combining with one atom of oxygen produces water, and this water passes off from the fire in the form of vapor. This gaseous vapor passing along through the flues of the front end, condenses as it comes in contact with the cold sheets of iron, forming little pools of water, which find their way out through the joints.

Great care should be taken when starting a fire to prevent this formation of water in the front end, as it prevents the fire raising of steam by stopping up the netting, thereby shutting off the draught and supply of air necessary for good combustion, and is also a source of much waste of fuel.

When steam has been raised, and the engine being prepared for the trip, care should be taken to have as much water in the boiler as it will hold without priming when the throttle is opened; in this we will have a great amount of heat stored; then, when we start out, it will not be necessary with the injector on, which we would have to do with low water. We can run along for some distance before we start the injector, thereby giving our fire a chance to burn good without crowding it. Care should also be taken to have a good fire in before starting, so that when the engine is working hard it will not be necessary to open the firebox door. We can wait until the lever is cut back and a light exhaust acting on the fire; then, when the door is open, there will not be such a rush of cold air going in the firebox through it.

I am not going into detail as to how many cubic feet of fire-air are necessary to produce one pound of oxygen, or how many hundred cubic feet are necessary to burn one pound of coal, or how much passes through every square foot of grate area per minute, and so on; all this can be obtained by referring to Steele's book on chemistry, or Augus St. Clair's book on combustion, which can be had for ten cents by sending to the "Locomotive Engineer."

It is really not necessary to be a chemist in order to be a successful fireman. But there is a whole lot of pleasure in being posted on the subject of combustion and all elements pertaining thereto. Still there are some things that we should know if we wish to become successful firemen and competent engineers. We should know something of the nature of our fire, and the gases being formed therein.

In a firebox one or two gases are being formed at all times during the process of combustion, and it is very essential that we know which of these two gases is being formed, as the formation of one is accompanied by great loss of fuel, while the other makes the hottest and most successful fire that can be produced by the burning of fuel in a locomotive firebox.

When our fire is light and the proper amount of air is being admitted to it, so that one atom of carbon unites with two atoms of oxygen, the result of their union is carbonic acid gas. In burning carbonic acid gas, one pound of carbon yields 14,500 heat units. When this process is going on, the fire will have an incandescent appearance, and the inside of the firebox will have a whitish gray color. When the fire is heavy or clogged by ashes or clinkers, so that the supply of air is restricted, and two atoms of oxygen are not present to unite with one atom of carbon, then one atom of oxygen will combine with one atom of carbon, and the result is carbonic oxide gas. In burning carbonic oxide gas, one pound of carbon yields only 4,550 units of heat. In this case the fire will have a heavy, dull appearance, and the inside of the firebox will have a black, sooty appearance, and heavy clouds of smoke will roll out of the smoke-stack.

Test of High Speed Electric Locomotive, N. Y. C. & H. R. R. R.

THE official exhibition and trial of the powerful high-speed electric locomotive designed and built for the New York Central & Hudson River R. R. by the General Electric Company and the American Locomotive Company took place at Schenectady, N. Y., on Saturday, November 12.

The trial was most successful in every way. A train of nine Pullmans containing the Electric Traction Commission of the railroad company and a large number of invited guests, attained a speed of 72 miles per hour for a short distance and maintained a speed of 63 miles per hour for a considerable distance. Everything worked very smoothly and those present expressed themselves as being much surprised and pleased at the work accomplished in so smooth and easy manner by the locomotive.

Comparative Trials of Locomotives Using Saturated Steam and Moderately Superheated Steam

THE advantages obtained by using even moderately superheated steam in the case of stationary engines, have led the management of the Prussian State railways to make trials with locomotives using moderately superheated steam.

The Breslau management fitted two express locomotives with the Pielock superheater, shown in figure 1, in order to compare them, both as to water and coal consumption, with the other locomotives of the same type, but without superheaters.

This superheater can be fitted to the ordinary locomotive using saturated steam, without altering the boiler or the mechanism. It is exactly for this reason that it is specially suitable for comparative trials, and in this way it has afforded valuable information. The following table gives particulars of the locomotives and of the superheater, as well as the observations made and the results of the trials:

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*Abstract of paper by Mr. Strahl, railway engineer, Royal Prussian State Railway, Breslan District, in the Bulletin of the International Railway Congress.

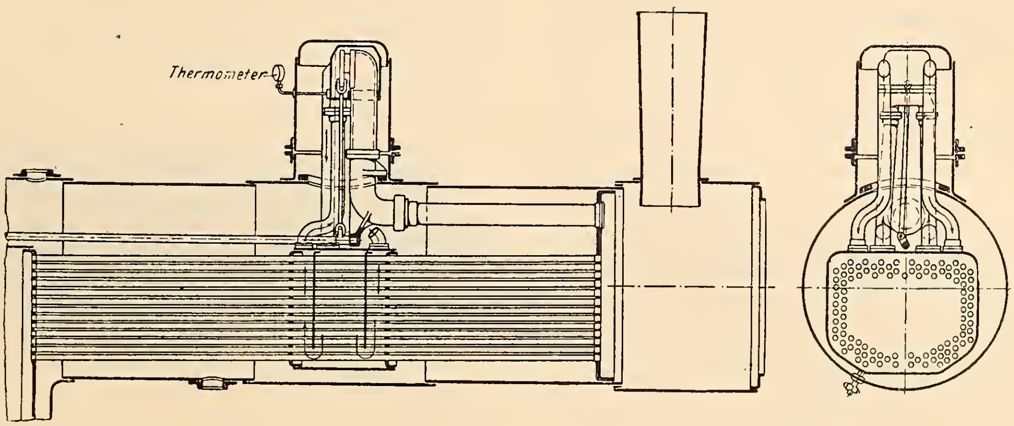


Fig. 1—Pielock Superheater Applied to Locomotive Boiler.

Index No.	Dimensions and Particulars.	Non-compound express locomotive, eight wheels, four coupled, Erfurt type. No. 4 without superheater.	No. 9 with superheater.	Compound express locomotive, eight wheels, four coupled, Hanover type. No. 60 without superheater.	No. 54 with superheater.
1.	Diameter of cylinders, in inches	16 15-16	16 15-16	18 1/8x26 25-32	18 1/8x26 25-32
2.	Piston, length of stroke, in inches	23 5/8	23 5/8	23 5/8	23 5/8
3.	Diameter of driving wheels, in inches	72	72	72	72
4.	Heating surface of boiler, in contact with water, in square feet	1,348.77	1,122.72	1,270.19	1,044.14
5.	Heating surface of superheater, in square feet		226.05		226.05
6.	Area of grate, in sqpare feet	24.43	24.43	24.76	24.76
7.	Average weight of train, locomotive and tender included, in tons	238	238	309	309
8.	Distance run by trial trains, in miles	1,193	1,193	2,360	2,360
9.	Working pressure of boiler, in lb. per square inch	170.67	170.67	170.67	170.67
10.	Temperature of superheated steam in dome, in degrees Fahrenheit		500		446
11.	Temperature of feed water, in degrees Fahrenheit	50	50	50	50
12.	Average consumption of steam per hour, in lb	9,563	8,069	11,618	10,459
13.	Average consumption of coal per hour, in lb	1,195	1,047	1,574	1,519
14.	Economy of water, per cent		16		10
15.	Economy of coal, per cent		12.3		3.5
16.	Coefficient of evaporation, lbs. of water evaporated per lb. of coal	8.00	7.70	7.70	6.88

The special object of the trials was to obtain comparative and reliable results. For this purpose it was enough to determine:

1. The work done by the locomotive.
2. The quatity of water evaporated per hour.
3. The pressure in the boiler.
4. The temperature of the feed water.
5. The temperature of the superheated steam.

The calculation of the extent to which the reduction of the losses enters into the total economy leads to the following conclusions:

1. The reduction in the loss by conduction and radiation is not the only reason for the economy of steam in locomotives using superheated steam. On the contrary; the improvement of the theoretical cycle (steam utilized in adiabatic expansion) becomes more and more important as the degree of superheat is increased. At 572° Fahr., it already accounts for 51 p. c. of the total economy.

2. If only little superheat is applied, the reduction of the losses through the cylinder walls accounts for the greater part of the economy; thus at 446° Fahr. it accounts for 84 p. c., and at 500° Fahr. for 61 p. c.

3. In adiabatic expansion in the high pressure cylinder of the compound locomotive, steam would remain superheated up to the end of the stroke with a cut-off at 65 p. c.; the same would be the case with a non-compound having the cut-off at 50 p. c. With the cut-off at 36 p. c. in the high pressure cylinder, the point of saturation is reached at 55 p. c. of the stroke; in the case of the non-compound, with a cut-off at 20 p. c., it is reached at 40 p. c. of the stroke. In consequence of the large area of the cooling surface, saturation actually occurs rather sooner, so that the principal advantage is that no condensation occurs during admission (no initial condensation).

A brief summary of the principal results of the trials are as follows:

1. With steam having a temperature of 500° Fahr. when leaving the superheater, economies can be realized which on the average amount to 16 p. c. in the water evaporated and to 12 p. c. in the coal consumed. An average temperature of steam of 446° Fahr. in the dome gave an economy of steam of 10 p. c.

2. The locomotives compared consumed the same amounts of steam for the same work done.

3. The weights of water evaporated varied directly as the specific weights and inversely as the specific volumes of the two kinds of steam. The economy of steam was proportional to the increase of the specific volume of the steam, produced by the superheat.

4. The economy of steam only depends on the superheat and therefore, for an equal amount of superheat, is the same in the case of compounds and of non-compounds, assuming that the trials are made on locomotives of the same type.

5. With suitable lubrication by mechanical lubricators, flat slide-valves worked satisfactorily up to 522° Fahr., the highest temperature reached.

6. In order to profit by the increased power resulting from superheat, the size of the cylinders must be increased to an extent proportional to the amount by which the consumption of heat (or of coal) by the ordinary locomotive exceeds that of the locomotive using superheated steam, when both do the same amount of work.

Personals

V. U. Powell has been appointed master mechanic of the Ilinois Central R. R., with headquarters at Mattoon, Ill., vice Isaac Rova, resigned. Effective November 1st.

Mr. George D. Brooke, formerly superintendent of machinery and equipment of the Iowa Central and the Minneapolis & St. Louis roads, has been appointed a member of the engineering staff of the Panama Canal Commission.

Mr. F. W. Brazier has been appointed superintendent of rolling stock of the New York Central & Hudson River, with jurisdiction over the Boston & Albany. Mr. Brazier was formerly assistant superintendent of rolling stock of the New York Central.

Mr. Peter Maher, formerly assistant master mechanic of the Lake Shore & Michigan Southern at Elkhart, Ind., has been appointed superintendent of motive power and equipment of the Toledo, St. Louis & Western, with headquarters at Frankfort, Ind., to succeed Mr. G. W. Taylor, resigned.

Mr. F. F. Gaines, formerly master mechanic of the Lehigh Valley, has been appointed mechanical engineer of the Philadelphia & Reading and Atlantic City Railroad Co. Mr. Gaines' headquarters will be at Reading, Pa.

Effective November 1st, Mr. D. H. Deeter is appointed master mechanic of the Reading Locomotive Shops of the Philadelphia & Reading, vice Mr. R. Atkinson, resigned. Mr. H. S. Hunter takes Mr. Deeter's former position as master mechanic of the New York and Philadelphia divisions, with the exception of the Port Richmond shops.

Mr. Chas. R. Powell, formerly chief clerk in the office of superintendent of machinery of the Illinois Central Railroad, has been transferred to Burnside shops as assistant general foreman of the car department.

Mr. J. R. Bissit has been appointed master mechanic of the Seaboard Air Line at Raleigh, N. C., in place of Mr. F. P. Hickey, resigned.

Mr. C. H. Welsh has been appointed master mechanic of the Midland Valley, with headquarters at Fort Smith, Ark., vice M. H. McGlasson, resigned. Mr. Welsh was formerly master mechanic of the Mississippi Central.

Mr. O. M. Foster, road foreman of engines of the eastern division of the L. S. & M. S., has been appointed general foreman of engines, with jurisdiction over the Lake Shore, D. A. V. & P. and the L. E. & W.

Mr. F. M. Whyte has been appointed general mechanical engineer of the New York Central Lines. Mr. Whyte's jurisdiction now extends over the New York Central & Hudson River, Lake Shore & Michigan Southern, Boston & Albany, Lake Erie & Western, Indiana, Illinois & Iowa and the Lake Erie, Alliance & Wheeling.

Mr. C. H. Cory has been appointed superintendent of motive power of the Chicago, Cincinnati & Louisville Railroad, with headquarters at Lima, Ohio.

Mr. W. H. V. Rosing has resigned as assistant superintendent of machinery of the Illinois Central to accept the position of mechanical engineer of the Missouri Pacific. Mr. Rosing's headquarters will be at St. Louis, Mo.

Mr. W. J. Davidson has been appointed general storekeeper of the Algoma Central & Hudson Bay Railway, with headquarters at Sault Ste. Marie, Ont , to succeed Mr. Harriwell.

Mr. C. L. Hinsdale has been appointed general foreman of the shops and roundhouse of the P. & L. E. at McKees Rocks, Pa.

Mr. Frank T. Hyndman, superintendent of motive power of the B. R. & P., has resigned to become general master mechanic of the Now York, New Haven & Hartford.

Mr. Grant Hall, formerly assistant superintendent of rolling stock of the lines east of Fort William, has been appointed assistant superintendent of motive power of the lines west of the Canadian Pacific. Mr. Hall's headquarters will be at Winnipeg, Man.

Mr. C. H. Welch, formerly master mechanic of the Mississippi Central, has been appointed master mechanic of the Midland Valley, with headquraters at Fort Smith, Ark.

Cushions

The Cincinnati Cushion Co., of Cincinnati, O., are putting on the market a large variety of cushions. One of their specialties are the enamel goods coverings. These cushions are made from 24 to 34 inches in length and 14 inches wide. Other coverings that they carry in regular stock are muslin, drill, duck, leather, etc. These goods are welted around the

Cushion of the Cincinnati Cushion Co.

top and covered on the top and bottom with black japanned buttons. However, they make cushions filled with hair, moss, cotton, etc., and covered with any material wanted. The accompanying illustration shows one of the enamel cushions.

The Locomotive and Machine Co. of Montreal, Limited

The American Locomotive Company has recently acquired the plant of the Locomotive & Machine Company of Montreal, Canada. This Montreal plant is operated under its original corporate name (The Locomotive & Machine Company of Montreal, Limited); there is a local manager and staff at the works, and a city office at Montreal, while the general offices are located at New York.

The plant is located some six miles to the eastward of the heart of the city of Montreal, being actually in the parish of Longue Pointe, Quebec.

The lay-out shows that the plot extends from the St. Lawrence river on the south to the right of way of the Great Northern Railway and the Montreal Terminal Railway at the north. The property covers an area of about sixty-eight acres. The plant is provided with a complete system of tracks, connecting the various buildings with the two railways mentioned, and through them to all the lines which radiate from Montreal. The government is constructing a dock and basin on the river front, from which water shipments may be made and at which supply materials may be received.

The plant is seen to comprise a main building (including five principal departments), a power plant, a carpenter and pattern shop, a pattern storehouse, a structural shop and a scrap house. It is the most compact locomotive building works in America, the arrangement of the several departments of the main building securing the free interchange of material and minimum distances to be traversed.

The main building (shown by Figure 1 in plan and by Figure 2 in section) includes a machine shop, 132x420 ft., also a forge and smith shop and erecting shop, a boiler shop and a foundry, each 66x380 ft. The machine shop is divided into two bays by a central line of columns. Electric traveling cranes are provided as follows: Machine shop, four, 10-ton; erecting shop, two, 60-ton; boiler shop, one, 20-ton; foundry, two, 15-ton. In addition to these there are in the riveting tower of the boiler shop two 20-ton and one 10-ton hydraulic traveling cranes. All departments are provided with ordinary swing cranes, the provision of cranes of this class being extremely liberal.

The power plant is subdivided into engine room and boiler room and is conveniently located for the transmission of power to all departments.

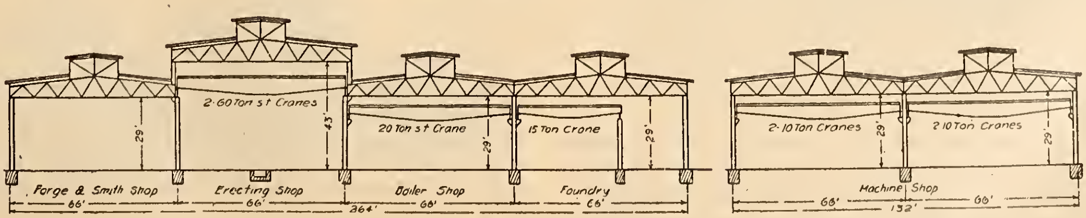
The pattern and carpenter shop is 66x100 ft. and is of two stories. The pattern storehouse, adjacent to this building, is of the same size, but of one story.

There is a storehouse and office building located at the southwest corner of the main building, as shown in layout plan.

There is also a large structural shop, 200x300 ft., with but two posts within the entire floor area. Conditions existing in Canada justified the expectation that a structural shop, operated in connection with this locomotive building plant, would be a profitable enterprise. It is especially designed and perfectly adapted to general structural work, either the building of bridges or trusses, steel work, etc., for steel buildings, and a great deal of work of this character has already been done and is now under way.

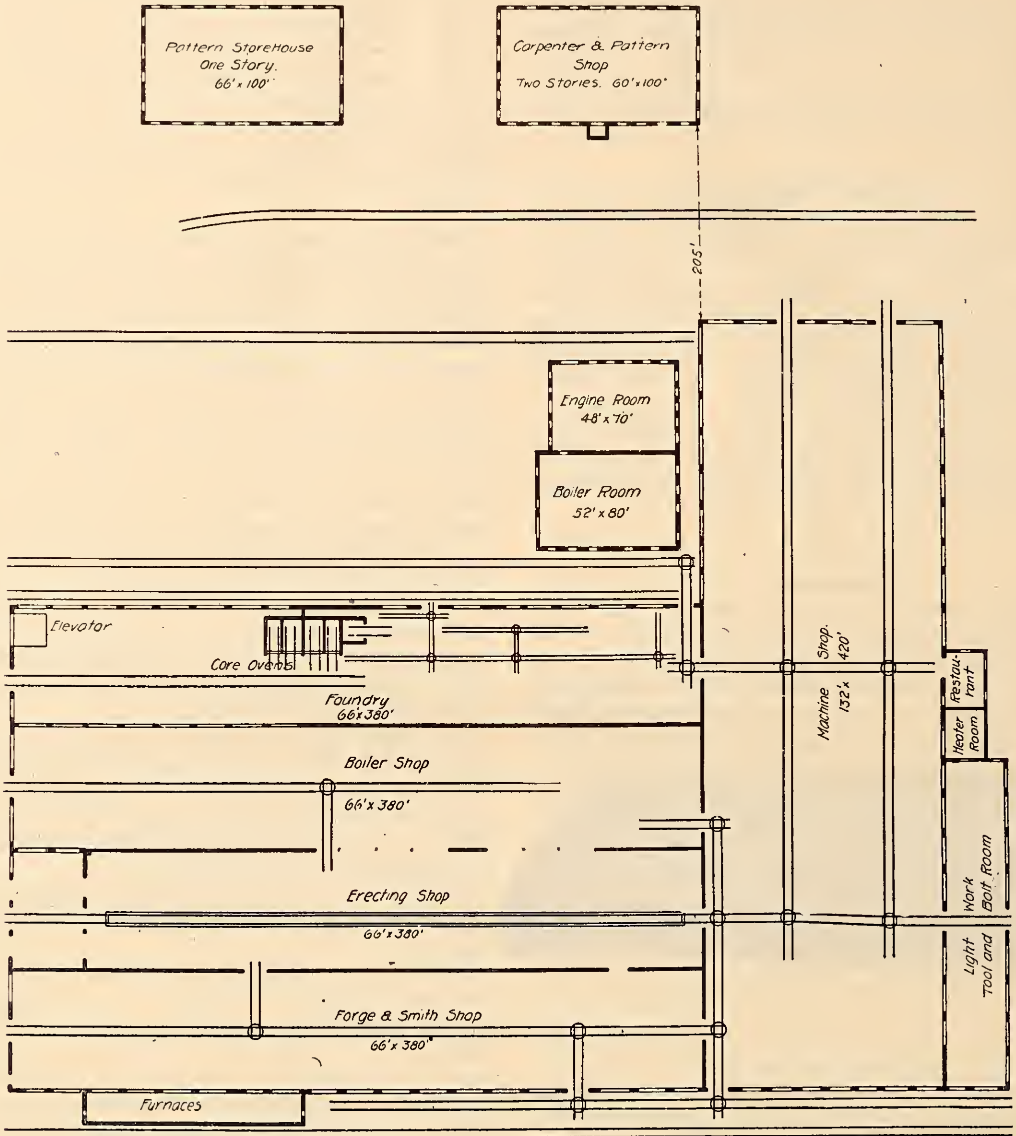
The buildings are thoroughly modern, the outer walls being of stone up to the window sill line, and above that of brick. The roof trusses are of steel throughout. Many of the interior partitions are formed by studding, supporting expanded metal sheets and surfaced with plaster on both sides. Such partitions serve every purpose in the way of dividing the different departments, and are also cheap to construct and occupy a minimum of floor space.

The tool equipment of the plant was very carefully selected



Section of Main Building of the Locomotive & Machine Company of Montreal, Limited.

and is modern throughout. It is being amplified and enlarged, and a very liberal policy is in force, under which new tools or appliances which facilitate work or accelerate output cottages to accommodate many of the skilled workmen. These will be located on the company's land near the St. Lawrence river.



General Layout of Plant of the Locomotive & Machine Company of Montreal, Limited.

are always installed as soon as their merits have become known.

The exterior appearance of the buildings of this plant shows them to be substantial and generally pleasing, but without any unnecessary ornamentation.

As regards output, it may be said that under present conditions the works may be expected to turn out about 150 locomotives per year. With the additional tool equipment which has been ordered, and with the improved methods and organization which are being perfected, this output can be advanced to about 175 locomotives per year, when the force is on day work only, or to about 200 locomotives per year when working overtime. The boiler shop has a capacity in excess of the other departments, and can probably turn out about 300 boilers per year, but this excess capacity can be used to good advantage, as many railways order new boilers to replace the boilers of old locomotives which they modernize.

The company is building a large hotel and a number of

Farlow Draft Gear

Last September another test of the Farlow draft gear, as manufactured by the Farlow Draft Gear Co., of Baltimore, Md., was made at Purdue University on the M. C. B. drop-testing machine. The single spring style, as applied to wooden draft sills, gave the following results:

The drop, weighing 1,640 pounds, was first made from a height of 5 feet, then 7, 10, 15, 20, 25 and 34 feet, this being the capacity of the machine. From this height seven blows were given it. After each blow and at the conclusion of the test a thorough examination of the condition of the gear was made by Prof. W. H. Hatt, who found the gear practically undamaged and fit for service, this being the third test of the Farlow gear at Purdue this year, the twin and tandem having been tested last June, when each stood a much greater test than had ever been made. On November 11, at the D., L. & W. shops at Drifton, Pa., under the supervision of J. H.

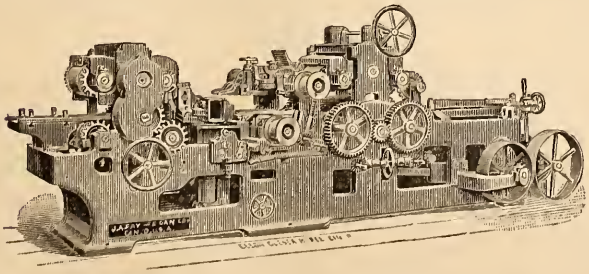
Pennington, S. M. P., the twin spring design, applied to wooden draft sills, was again tested by dropping an iron ball weighing 2,750 pounds twenty-one times from a height of 12 feet 4 inches, the capacity of the machine. At the conclusion of the test the gear was taken apart by one man in three minutes and found to be in perfect condition in every detail. The gear was then assembled and put together ready for service by one man in six minutes, showing beyond a doubt that the Farlow draft gear is the strongest and simplest gear ever put on the market. Since the incorporation of the company, last March, the gear has been applied on eighteen different roads.

This gear was the winner of the silver medal at St. Louis.

A New Style Floorer

We know our readers are progressive enough to be interested in all tools designed for their particular work, and so are ever on the outlook for new and original machines continually being built to answer their most exacting requirements. It gives us pleasure therefore to invite their notice to the machine shown here, and doubly so when it has the earmarks promising it unqualified success wherever it may be used. The makers have made a specialty of flooring machines, which for years have been recognized as the standard throughout the lumber fraternity. This is due to the reason that they have made a careful and exhaustive study of the needs of makers of flooring, and keep in continual touch with the results obtained from their machines so as to better know how to improve them where this is found possible or desirable. The new machine here shown has all the advantages and conveniences which have made the older ones so useful and universally satisfactory in the past, and over these an array of still newer ones, fully covered by letters patent, that enable the machine to now be absolutely one of the finest ever built, and one possessing to the fullest possible extent the three requisites that make the machine strictly first-class and up-to-date in every respect: economy of time, labor and attention in making the various adjustments; efficiency in the high class of work it will turn out, and these two giving a large output, thus giving the machine the trinity of points every lumberman and woodworker looks for in a modern machine. It is designed to enable its user to stand and hold the pace in face of the most strenuous competition.

The machine was patented March 20, 1900; November 12, 1901, and May 27, 1902, and is especially recommended to large makers of flooring, ceiling, casing, siding and other work of that character. Its capacity for turning out much work will be better understood by the word "Lightning," which means that the output depends more on the ability of the operators, and is only limited by their quickness. It will work the four sides of material 15 inches wide and 6 inches thick, matching as narrow as 1½ inches, and every working part of the machine is interchangeable, and all so compactly and strongly built together as to make the machine very powerful and substantial, and capable of standing up to full pressure without strain or vibration. It will work twisted or warped lumber with facility. The machine is also made with the lower cylinder cutting first, being then called No. 107, or with a third cylinder placed below the upper, and called No. 108. In this last the upper cylinder is placed between the two lower ones, and the stock is worked face down, and is given an extra fine finish at a very high speed. This is an advantage readily appreciated by makers of hardwood flooring.



A NEW STYLE FLOORER.

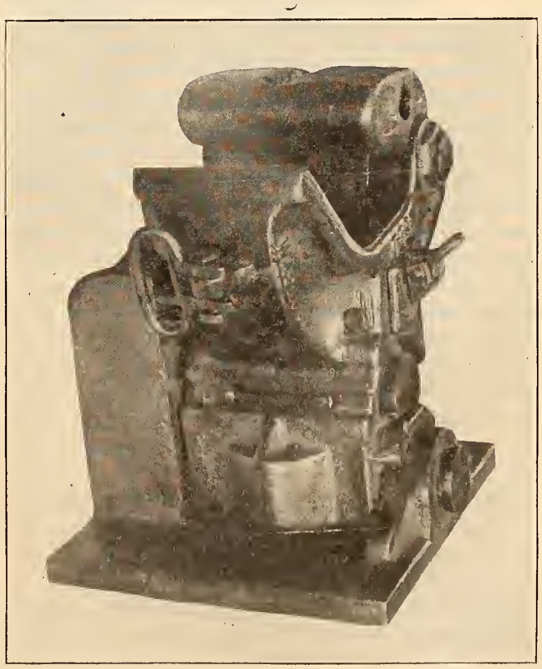
This machine has too many points to be adequately enlarged upon here, and to cite some would be to leave out others equally important, and yet it is necessary to know all to thoroughly understand its merits. So we would advise any of our readers who would like to investigate this tool to drop a postal card to the makers for full particulars. Also ask for their new illustrated catalogue of woodworking machinery, which shows many other first-class tools they build for lumbermen. Address J. A. Fay & Egan Co., Nos. 145 to 166 W. Front street, Cincinnati, O.

The Washburn Coupler

The Washburn Coupler Co., of Minneapolis, Minn., have recently brought out a new form of a flexible head coupler. One of its chief characteristics is a double joint to secure a greater degree of flexibility. The coupler is designed for both switching and road engines.

The coupler head is pivoted to a block which, in turn, is pivoted to the buffer casting. The block is held in normal position by coil springs located in pockets on each side of the pin. When small curves are encountered the coupler head alone swings, but on very short curves both the coupler and block will turn by compressing the spring.

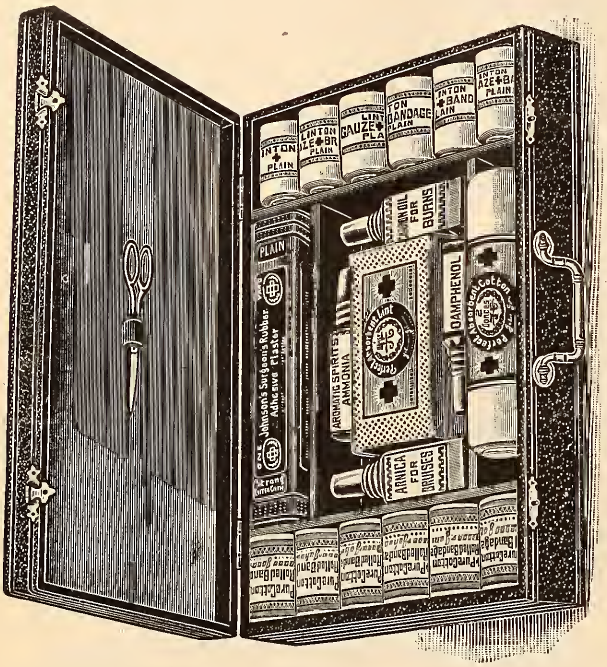
Other points about the coupler, as shown in the accompanying engraving, are: the shelf underneath the head and upon which the latter rests, thus relieving the strain upon the joint; handles on the sides to draw the head to one side; and the slot in the outer face of the knuckle to take a link, but which does not go through the knuckle.



NEW COUPLER—THE WASHBURN COUPLER CO.

Standard Accident and Medicine Cabinets

Putnam & Company, 244 Water street, N. Y., are putting on the market a line of accident and medicine chests. The cabinets are designed for use in factories, shops, mills, yards, or any place where labor is employed. It is a complete outfit ready for use in any conceivable accident. There is sufficient material for a large number of accidents, and the articles contained in the cabinets can be replaced at any time. These cabinets contain just what the surgeon or physician needs when he arrives. When no skilled aid is at hand, any one can properly care for the injured. Any intelligent fore-



Accident and Medicine Cabinet.

man by the aid of these cabinets can render sufficient first aid in any emergency.

The chest illustrated herewith is made especially as a traveling case. Its contents are:

6 2-inch linton gauze bandages.
6 2-inch pure cotton.
1 roll absorbent cotton.
1 package absorbent lint.
1 package adhesive plaster.
1 bottle aromatic spirits of ammonia.
1 bottle arnica.
1 bottle carron oil (for burns).
1 bottle campherol (antiseptic wash).
1 pair scissors.

This case complete in black leatherette costs only $5.

The New Belt Management

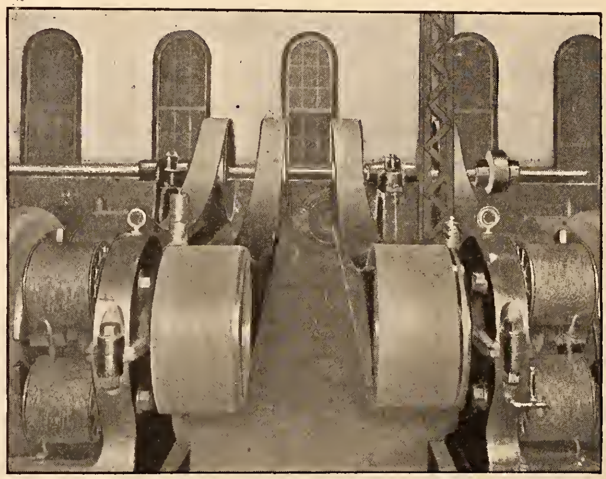
The rule governing belt management has always been that a belt must be run tight to transmit power. In other words, slipping is overcome by tension.

This has been a most expensive practice, as every practical man knows. It means a tension of from 45-750 lbs. per inch of width for every belt run. This has added a great dead drag on the engine, has destroyed the belts, heated and ground out the bearings, required frequent changes of babbit and much oil, has pulled shafting out of true, has burned quantities of fuel to carry and drive this load and has needed constant attention to keep this tension up and wasted time in the doing of it and that of operatives, idle during these stoppages.

But it has been the only alternative.

A new method of running belts has been gradually spreading, however, and that is the slack or easy running of belts. This has been advocated by the Cling-Surface Co. of Buffalo, N. Y., and they have based their method on the results of Cling-Surface.

Cling-Surface is described as a belt and rope filler and preservative. It is fed to the belt or rope in small quantities and makes and keeps it pliable, elastic, water-proof and preserved. They say it doubles and trebles a belt's life. Furthermore it stops slipping better than tension can and thereby re-



The New Belt Management.

moves the necessity for tension. Belts are running in many plants slack and easy and carrying full loads.

If a belt does not slip it need not be run tight. If it runs slack the dead drag is off and the more it wraps the pulleys the more it transmits. Bearings keep cool, are not ground out and less oil is used. Belts last longer and need very little attention and practically no taking-up. Shafting is relieved and fuel is burned only to make power for work and not to overcome friction, while the engine is freed from dragging along this high friction load.

It is very easy to realize the reduction in a plant's friction load which easy belts would make and the economies in the operation of it and the subject merits careful thought, for it is in these operative savings that the margins are often made.

The Cling-Surface Co., of Buffalo, N. Y., have some very interesting matter which they are mailing to inquirers.

Notes of the Month

The new isolated plant installed in the 23rd Regiment Armory, Brooklyn, N. Y., will contain two 75 kw. generators, manufactured by the Northern Electric Mfg. Co., of Madison, Wis., direct connected to Harrisburg engines operating at 275 r. p. m. They also have a 35 kw. 600 r. p. m. Northern generator belted to a Nash gas engine.

Many of our readers will be glad to learn that the railway, steamship and mill supply business carried on for a quarter of a century by the late H. A. Rogers, at 19 John St., New York, will be continued at the old stand by the H. A. Rogers Company. The new concern expect to merit the same liberal patronage that the painstaking efforts and conscientious fulfillment of obligations which characterized the transactions of the late Mr. Rogers secured for him, and which he so fully merited.

"Forged and Rolled Steel Work" is the title of a booklet issued by the Standard Steel Works, describing the requirements of wheels to meet the demands of the heavy rolling stock equipment of present day service and the process of manufacture to meet these requirements. The pamphlet is attractively illustrated with engravings of the works, the output of the establishment and views within the different departments.

The facilities of the Warner & Swasey Company, Cleveland, O., for manufacturing high-grade machine tools are outlined in a handsomely illustrated pamphlet entitled "Machine Tools." This booklet illustrates a large number of the machines manufactured by the company and each illustration is accompanied by a descriptive table of the machine represented. The energies of the company have been principally directed to turret machinery and such information not readily obtained from the catalogue will be cheerfully furnished in addition, including photographs, detailed information, prices, etc. The company intends to keep in stock or in process of construction a complete line of the machinery and tools described, except those specified as made to order.

The Lee Paper Company of Vicksburg, Mich., has just ordered a 200-k. w. Northern generator from the Northern Electrical Mfg. Co., of Madison, Wis., for the equipment of its new mill. This is the most recent in a long series of sales of Northern apparatus in paper mill work, the most prominent installation being the plant of the Consolidated Water Power & Paper Co., of Grand Rapids, Wis., in which are operated a quantity of Northern motors of all sizes as well as two 300-k. w. direct-current generators. The Consolidated Water Power & Paper Co.'s plant contains, among other motors, two large single voltage variable speed motors operating from the mill power circuit and giving speed variations from 300 to 500 r. p. m., corresponding with machine speeds of 50 to 500 feet per minute.

The annual meeting of the stockholders of the Locomotive Appliance Company was held at their offices in the Chemical Bldg., St. Louis, Mo., on Thursday, August 11th, at 2 o'clock p. m., and the following board of directors elected: Mr. W. J. McBride, St. Louis; Mr. J. J. McCarthy, Mr. F. W. Furry, Mr. Edw. B. Lathrop, of Chicago; Mr. J. B. Allfree, of Ironton, O.; Mr. Clarence H. Howard, Mr. C. A. Thompson, Mr. W. C. Squire, Mr Ira C. Hubbell, of St. Louis, Mo.; Mr. B. F. Hobart and Dr. G. W. Cale, Jr., of Springfield, Mo. Out of 8,704 shares of stock issued and outstanding, practically 8,500 shares were represented at the meeting. The Locomotive Appliance Company now has Allfree-Hubbell locomotives in successful operation on six of the prominent railway systems, and all are making a desirable record in speed, hauling capacity, and the economy of fuel and repairs.

The Falls Hollow Staybolt Company of Cuyahoga Falls, Ohio, are in receipt of an order from the Kinshin Ry. Co. of Japan for 28,000 pounds 1⅛ inch outside diameter by ⅛ inch inside diameter; 18,000 pounds 1¼ inch outside diameter by ⅛ inch inside diameter, and 1,200 pounds 1⅜ inch outside diameter by ⅛ inch inside diameter, Falls Hollow round bars, 10 feet long, to be made of the same quality charcoal iron as previous shipments.

The Kinshin Ry. Co. have made service tests of their staybolt iron, which have resulted satisfactorily, consequently are now ordering the product in car lots.

The Falls Hollow Co. is also shipping large quantities of their hollow bars to other railroads of Japan and the Japanese government. The Norwegian State Ry. Co. are using their iron exclusively for staying the fireboxes of their locomotives.

The J. A. Fay & Egan Co., of Cincinnati, the great manufacturers of wood-working machinery, have made many important improvements in wood-working machines; for instance, they have been allowed 200 new patents in the last three years alone.

They find several firms infringing their new patents, particularly on band rip saws, band resaws, gang dovetail machines, planers, etc., and are now getting evidence and preparing papers for a few law suits, which will soon be launched.

The Joy Line, between New York and Providence and between New York and Boston, announces that, commencing October 10th, the fare between New York and Providence will be $1.50, and between New York and Boston $2.50 one way, $4.50 round trip, via direct steamer. Although rates are reduced, there will be no reduction in service. Summer schedules will be maintained during the fall and winter as usual, the Joy Line being the only line providing a passenger service between New York and Providence all the year round. Steamers from New York to Providence every week day at 5 p. m., and from Providence 5:30 p. m., reaching destination about 7 the following morning. The elegant, large and fast passenger steamers "Larchmont" and "Edgemont" are in commission, providing a first-class, safe and reliable service. Between New York and Boston direct, all the way by water, has a tri-weekly service, leaving New York Tuesday, Thursday and Saturday at 6 p. m., leaving Boston same days at 5 p. m. This is the most delightful trip in America.

We are in receipt of a notice from the Morse Twist Drill & Machine Co., of New Bedford, Mass., announcing that they have placed with J. L. Osgood, of Buffalo, N. Y., a full line of their manufactures. The Morse Twist Drill & Machine Co. are manufacturers of arbors for drill chucks, shell end mills and shell reamers; Beach, Stetson and center drill chucks; counterbores; countersinks; solid and adjustable counterbores with bit point drills; dies; bit point and bit stock drills; increase twist and constant angle drills; three and four groove drills; drills with grooved shanks; hollow drills for deep drilling or long holes; jobbers' drills; letter drills; drills with oil holes; taper square shank drills; wire drills; gauges; mandrels; metal slitting saws; milling cutters; concave and convex cutters; cutters for grooving taps; cutters with radial grooves; screw slotting cutters; T slot cutters; gang cutters; adjustable hollow mills; end mills; shell end mills; taper pins; reamers with oil holes; bit stock taper reamers; shell reamers; expanding shell reamers; fluted chucking reamers; Rose chucking reamers; taper pin, bridge and locomotive reamers; three-groove chucking reamers; screw plates with dies; sleeves; sockets; hand, machine screw, nut, patch bolt, pulley, pipe; staybolt and stove bolt taps; tap wrenches; tools for turret head machines.

We are in receipt of a new catalogue describing the many famous graphite lubricants manufactured by the Joseph Dixon Crucible Co., Jersey City, N. J. The introduction deals in a general way with the growth of the graphite industry, the theory of graphite lubrication, the special advantages of flake graphite in contrast to amorphous graphite and the practical relation of graphite to the theory of lubrication. "It is a fact worthy of greatest emphasis that bearings absolutely cannot 'seize' or cut whenever an infinitely thin film of flake graphite coats the friction surfaces. If Dixon's Flake Graphite could do nothing else for the operator of machinery its importance in averting troubles and shut-downs and perhaps disasters, due to the seizure of bearings, cannot be over-estimated." The book further describes the various lubricating graphites and graphite lubricants of the Dixon Company, including their general uses and the retail prices of the different sized packages. Among them are mentioned Dixon's Ticonderoga Flake Graphite, Special Graphite No. 635, Heavy Graphite Machine Grease, Waterproof Graphite Grease, Graphite Cup Greases, Axle Grease, Automobile and Cycle Lubricants, Handy Graphite Rope Dressing, and Graphite Pipe Joint Compound. Copies of this interesting catalogue will be freely sent upon request to the Joseph Dixon Crucible Co., Jersey City, N. J.

Technical Publications

Smoke Prevention and Fuel Economy by Wm. H. Booth and John B. C. Kershaw, 194 pages, 75 illustrations. Published by The Norman W. Henley Pub. Co., 132 Nassau St., New York. Price $2.50.

This interesting book on smoke prevention and fuel economy describes in detail the following subjects: the chemistry of the combustion process; the present methods of burning fuel and their defects; improved methods of burning fuel; and the examination of the waste gases and the control of the combustion process. The appendix gives abstracts of English, German and U. S. patents; full analysis, losses and costs, and other miscellaneous extracts.

World's Best Poetry, in ten volumes. Publishers, John D. Morris and Company, Philadelphia.

The World's Best Poetry contains about 2,500 poems with the tenth volume devoted to poetical quotations, and indexes, with which the work is copiously supplied. There are several translations from French, German, Italian and Oriental poets included in this work, while all the best English, Irish, Scotch and American poets are represented.

Some of the authors and their work are as follows: Bliss Carman, "The Purpose of Poetry"; Prof. William D. MacClintoch, "Young People and the Poets"; John Vance Cheney, "The Future of Poetry"; Lyman Abbott, "Poetry as an Interpreter of Life"; Charles G. D. Roberts, "The Poetry of Nature"; Professor Charles F. Richardson, "The Place of Poetry in Life"; Richard Le Gallienne, "What is the use of Poetry-"

The work is beautifully illustrated with fine engravings in color, rich photogravure, portraits and half-tone engravings of portraits of famous poets and poetesses with many pictorial scenes illustrative of poems and themes.

Mechanical Appliances, Mechanical Movements and Novelties of Construction, by Gardner D. Hiscox, M. D., 400 pages, 970 illustrations, bound in cloth, price $3, published by the Norman W. Henley Publishing Co., 132 Nassau St., New York. This book is a complete work and a continuation as a second volume of the author's work, "Mechanical Movements, Powers and, Devices." The ten editions through which the first volume of "Mechanical Movements" has passed is more than a sufficient encouragement to warrant the publication of a secone volume, more special in scope than the first, inasmuch as it deals with the peculiar requirements of various arts and manufactures, and more detailed in its explanations, because of the greater complexity of the machinery selected for illustrations.

The machines incorporated cover so vast a mechanical field and have been so carefully selected to supply the needs of the student seeking general information, that they will be found fairly representative of the power devices used in old and modern industries. Mechanical intelligence may well be deemed to have found its highest expression in the contrivances that are illustrated and described in these pages.

Although the author has not the slightest desire to encourage the hopeless pursuit of perpetual motion he has, nevertheless, thought it advisable to dwell at some length on the exceedingly ingenious means devised by misguided inventors in their endeavors to solve an unsolvable problem. The pages in which perpetual motion machines are described may induce those who still believe in this ignis fatuus to bend their energies in causes more worthy of their zeal. Moreover, it may be that some of the mechanical movements which have been evolved by the perpetual motion inventor, although they may not attain the end sought by him, may still be applied with profit to his instruction in true mechanical principles and to avoid the errors committed in the search on the lines of this folly of past centuries. This in itself is a sufficient justification of the insertion in this volume of the section on perpetual motion.

LOCOMOTIVE OPERATION. A Technical and Practical Analysis, by G. R. Henderson, M. Am. Soc., M. E. The Railway Age, Chicago. Cloth, 6x9 inches, 536 pp., 142 illustrations and five folding plates. Price, $3.50.

A long-felt want has just been supplied to the railroad fraternity in Mr. Henderson's book on locomotive operation.

The first chapter includes under the head of Inertia the fundamental laws relating to weight and velocity and their effect upon acceleration and retardation, centrifugal force, reciprocating parts and counterbalance. Under Steam Action, the operation of the steam engine is thoroughly discussed, especially as it relates to locomotive valve motion and steam distribution. This chapter includes a treatment of rotative force and the stresses induced in rods, crank pins and axles in a manner which is quite original, and it is illustrated by numerous examples from modern locomotive practice. The section on Resistance gives a full discussion of the extent and effect of friction in the various parts of the engine, and train resistance has the full share of attention which its importance demands. The chapter on Braking gives in concise form all that is necessary for the solution of the problems connected with the operation of the automatic brake, and an unusual feature is the application of the Zeuner diagram to determine the resistance obtained in cylinder brakes of the Le Chatelier form.

Under Steam Capacity, the various conditions affecting the amount of steam generated by the boiler are analyzed and special attention is given to draft action and maximum horsepower. Formulæ for tractive force are developed for simple and compound engines, and diagrams are given from which the size of cylinders can be obtained for different types of compounds and their equivalent simple cylinders. The tonnage rating of freight trains is developed by reference to the best methods, and the effects of speed and momentum to grades are important parts of the analysis. Tractive force and speed as represented by horsepower are adequately treated under the heading, "Horsepower Characteristics." The closing chapters relate to the amounts of material required to keep the locomotive in operation and these are considered under Water Consumption and Coal Consumption. The water rate per horsepower hour can be estimated by reference to diagrams which are given, but for exact data the author prefers to refer to the results of carefully measured tests. The economy which should be expected from different degrees of superheating is defined, and results from the application of superheating to locomotives are reported from recent experiments.

The chapter on Fuel Consumption deals, first, with the composition of both coal and oil and their thermal value, and next the rate of evaporation as affected by speed alone and the modification of boiler proportions. A diagram is also introduced for estimating the fuel consumption of a locomotive under various conditions of speed and tractive force, which is extremely novel.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

The Steel Car

"Steel Cars as Adapted for New England Railroads," a paper by John F. MacEnulty of the Pressed Steel Car Co., was the subject for consideration at the N. E. R. R. Club at its October meeting. The life of such a car and its carrying tonnage as compared with the wooden freight car, were the principal points in the discussion that followed the reading of the paper. The painting of this kind of a car was scarcely touched upon. Had this part of the subject come up we might have had something to say. We had our thoughts as it was. We could but think that the life of the steel car was largely dependent upon its preservation from decay. Without a protective coating of some kind it is the rottenest thing this side of Denmark. We could not help contrasting it with the wooden car in this respect. There is a popular impression that anything made of wood and exposed to the weather will soon rot unless preserved with paint, all of which has some truth in it; but, relatively speaking, when compared with steel structures, wood is not so perishable as might be supposed. We wanted to suggest to what few steel car friends there were present—and by the discussion they seemed to be few—that if they would take an hour's ride with us we might be able to show them some wooden houses built prior to the revolutionary war—a matter of some 125 to 150 years ago—and still standing, though never painted; and we would leave it to their own conjectures as to what they might look like if built of steel at that time and never painted. There would probably be a mound of rusty earth to mark the spot and that is all.

Now to the application: We venture the assertion that wooden cars need not be painted at all for their preservation. They would last their allotted life-time without it. They are painted for appearance sake—they have to be painted on account of maintaining numbers and initials in a readable manner for billing clerks and others whose business it is to look after their contents in transit. On the other hand, it is imperatively necessary that steel cars should be painted for their preservation from decay, regardless of the question of their appearance and the matter of their ready identification by initials and numbers. It is doubtless true, however, that as compared with the carrying capacity of a wooden car, or with its life even, a steel car may in some instances pay for itself, even in a short life without paint, by the great tonnage that it carries on a line so situated that it is blessed with heavy traffic both ways. But these instances are rare.

We are not, however, an enemy of the steel car by any means. They are the coming car for the reasons of their great carrying capacity and the saving of repairs, and have come to stay if they can be painted to stay; and there is no reason in the world why they cannot be so protected and preserved at no great outlay over and above the usual treatment of the wooden car. It is up to the chemists, manufacturers and painters to do this, and they can be depended upon to perform their parts.

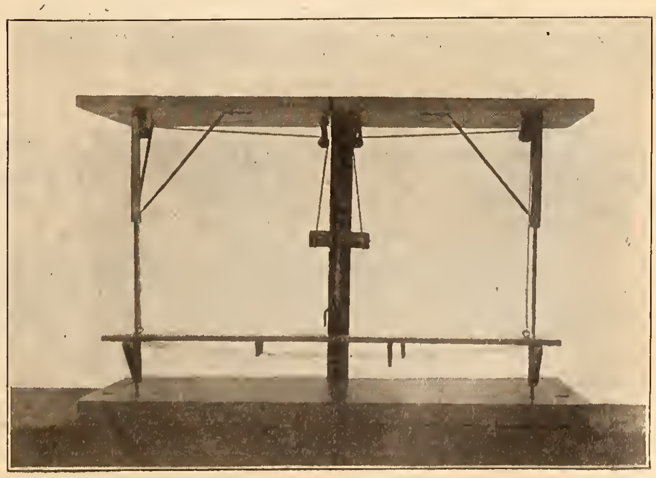
Cleaning Steel Before Painting

It is as important to thoroughly clean steel before painting, licking out all the rust pits as well as cleaning the surface of rust and mill scale, as it is for a dentist to clean the cavity in a tooth before he applies the filling; and in the case of the steel whose surface has been pitted with rust there is nothing that will do it as it should be done except the sand-blast. Those who have ever had the misfortune—and who hasn't?—to sit in a dentist's chair for this purpose know what a painstaking—and painsbearing—job it is to have the cavity all scraped out clean with various tools before the gold filling is applied. This reminds us of the little girl who was accustomed to say her prayers before retiring, and having been to the dentist's that day varied it that night as follows: "Forgive us our debts as we forgive our dentists." Now the good dentist knows that unless the decayed matter is all removed from that cavity and a healthful surface presented to come next to the filling, decay will go on and all his work will be for naught, and all your expense and pain will be in vain; he does not willingly afflict his patient with pain; he would be as glad to get along without it as his patient would be.

So the steel painter must take pains with his work, if he would have it lasting, and properly cleanse the entire surface—the pits as well as level surface—before he applies the costly paint. He would be glad to get along without this trouble and expense of time, but he cannot in justice to his calling and his employers, for he knows that to do otherwise, while he might make a greater showing for a time, is to do superficial work that the teeth of time and rust will speedily undo. Therefore he concludes that whatever is worth doing at all is worth doing well, and, like the wise master builder, digs deep and lays a good foundation for the superstructure that he is going to build thereon. He realizes that good painting is that which is done to last; and that steel structural work will not endure without it, however well done; that it is of no use to temporize in the matter, or to make excuses, but to get right down to it and do the work as it must be done to stand.

A New Scaffold

Herewith is a view of a working model of Mr. Samuel Brown's new paint-shop scaffold that he had on exhibition at the Atlantic City Convention, which we reproduce for the especial benefit of those unable to be there to see it. Mr. Brown, an old veteran railway painter himself, has seen the need of a rigging of this character in the new shops of his own company at Readville and has given the matter much thought and set himself to work to evolve his ideas into tangible shape. The result therefore may safely expected to be something practical and useful. We had the pleasure, some months ago, of seeing a full-size working section of it and it strikes us that it ought to supply a long-felt want, even in some up-to-date shops in other respects.



MR. SAMUEL BROWN'S NEW SCAFFOLD.

Annual Dues in the Association

Letter from Sec'y McKeon.

Secretary's Office, Kent, Ohio.
November 14, 1904.

Editor Railroad Paint Shop:

On reading Mr. King's article in the November Master Mechanic, I concluded it would be advisable to make a statement regarding the payment of annual dues in the association. I have never heard of any society excusing members from paying dues on account of their inability to attend meetings, and we certainly can not afford to do so. If all members were loyal and paid each year, we might be able to reduce the dues, as we only want to raise enough money to run the association.

This year, out of 196 active members, but 96 were present at Atlantic City (this we take from our receipt book, as only those who pay are given credit for being present), and if none of the absent members had sent in their dues we would have been short of funds.

As provided by the constitution, all members in arrears were notified, and many responded. Several did not wait for this notice; but when they decided they could not attend the convention, forwarded their dues to the secretary.

All active members in good standing receive the Railway Master Mechanic, which is paid for by the association, and a copy of the bound volume of proceedings is sent to all members, so they can keep in touch with the workings of the association, and have the benefit of the papers read and the discussions on them, although they are compelled to miss the social features of the convention.

We feel that the association is beneficial to all, and every member should be enough interested in its prosperity to be willing to contribute to its support, even if they are not able to attend all conventions.

In connection with this I wish to state that I frequently receive replies from delinquents, saying their dues are paid; but they overlook the fact that our year ends Sept. 1st, and that dues are payable in advance.

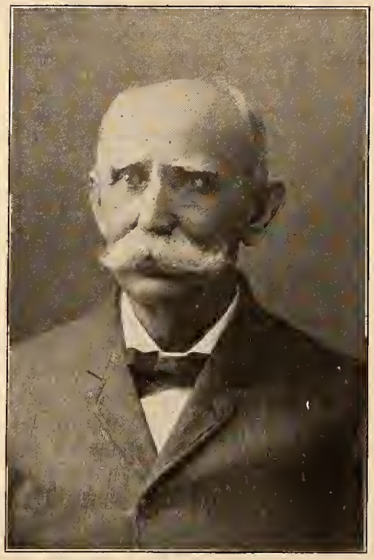
Fraternally yours,
Robert McKeon, Secy. and Treas.

M. C. & L. P. A. Portrait Gallery

William B. Getchell.

Herewith appears the photo of Mr. Wm. B. Getchell, the successor of the late Geo. H. Worrall at the Somerville Shops of the Boston & Maine. With the exception of a snap-shot of him in the Dec. 1902, issue, supplemental of the Boston convention, his picture is presented for the first time.

Mr. Getchell is one of the old veterans. Though not an active member in our association, he was one of the few present when it was organized in Boston in November, 1870, being then in charge of engine painting at East Boston for the Eastern R. R., now a part of the B. & M. At about that time he was offered the foremanship of the car paint-shop of that road at Salem, but refusing it, Mr. Worrall was appointed (coming from Wilmington, Del.), and in course of time Mr. Getchell went to the N. Y., N. H. & H. R. R. at New Haven in that capacity, where he broke the record for "Jim" Denver, then M. C. B. (who had a new foreman painter about every year), and remained three years, and later went to the



Wm. B. Getchell.

Worcester, Nashua & Rochester R. R. at Worcester, and when the B. & M. leased that road he was afterward transferred to the East Cambridge shop (formerly Boston & Lowell) and on the demolition of that shop to extend the Union Station yards, he was made assistant to the late Mr. Worrall at Somerville, who passed away so tragically last May, the latter having been transferred there from the Salem shops some years previously. Mr. Getchell was at once appointed foreman painter, which position he now holds, being assisted by James Beede. Though well advanced in years, Mr. Getchell is one of the "young old men" of the times, and bids fair to be active for years to come, being one of our most hustling foremen.

From the Second President of the M. C. & L. P. A.

Concord, N. H., Oct. 7, 1904.

To the Editor, Painting Department:

Accompanying this note is a little gem—of its kind—"The Art of Conviviality," which I hope to see in the painting department of the Master Mechanic. I hardly think it just

Large Stencil of Mr. Ginther.

the thing for a technical journal, but I do think the painters who attend our conventions could profit by heeding its teachings. The author is unknown to me, or I should be glad to give him credit for writing one of the best things of the kind known to me.

Yours truly,

Warner Bailey.

THE ART OF CONVIVIALITY.

Real conviviality is an art. It never dissipates nor inebriates. It rejuvenates the body—cheers the mind.

A word of greeting—a friendly hand-shake—the passing of the pipe of peace from lip to lip (cigars if preferred). A few jokes, the swapping of harmless gossip by which no neighbor is hurt, no friend estranged. Before parting, a glass may chink a neighbor's glass in which something old and smooth and red resides, garnished with a row of glistening beads. Once, maybe twice.

Conversation sparkles, interest grows, zest increases, witticisms scintillate, hilarity approaches, it is time to part. With a "So-long, old fellow," they separate, each one feeling quite sure the world is a good place to live in. This is the art of conviviality.

True conviviality does not wither with age nor cloy with repetition.

It grows younger every year,
Broadens life and brings good cheer.

Conviviality is good for busy men only. The loafer cannot understand it or profit by it. Conviviality is the spice of life—not bread. Spice, as a seasoner, gives life.

Here's to the man of work and play,
The man who uses both each day,
Who works and thinks and sometimes drinks—
But never in over-indulgence sinks.

A New Book

"The Up-to-Date Hardwood Finisher" is a new book that has lately come to our table, consisting of some 200 pages, illustrated, and gotten up in the best style of the printer's and binder's art. Part one, comprising about half of the volume, relates to the woodworker's part in wood-finishing and the necessary tools and how to care for them. Part two treats of filling, staining, varnishing, polishing, gilding, enameling, and finishing all kinds of woodwork. It also treats of renovating old work, repolishing, re-varnishing, etc., with many receipts. A handy and useful volume for the mechanic and painter. By Fred T. Hodgson, Architect, and published by Frederick J. Drake & Co., Chicago, 1904.

Stencil Patterns

Editor Railroad Paint Shop:

I am sending by mail today two stencil patterns which I designed for our Y. M. C. A. building. I thought they had rather a pleasing effect on the wall. If you consider them worth space in your columns you may use them. I had the wall tinted a pale flesh tint, the ceiling almost white, having a little of the wall tint in it; the dado a dark salmon. The small stencil was used above the dado, the large one on frieze. Stencil color was the salmon used on dado with carmine added to give rich effect. All the work was done in oil

Small Stencil of Mr. Ginther.

color flatted. I am sorry I had to miss the convention this year—too busy to get away.

Very truly yours,

Gus J. Ginther,
Wabash R. R.

Moberly, Mo., Oct. 22, 1904.

Twenty-Fourth Annual Convention of the Sherwin-Williams Co.

All the managers and traveling representatives of the Sherwin-Williams Co., the well-known paint and varnish makers, met for the twenty-fourth time in annual convention at the company's Chicago plant during the week of October 31st. All former conventions have been held at the home plant at Cleveland, but it is an evidence of the greatness of this concern that their wide organization makes them equally at home in practically all the large centers of the continent. The conventions of the company are not holidays nor pleasure jaunts. They are conferences of business men who meet to study seriously trade conditions and to devise plans for further expansion. Daily sessions are held morning and afternoon, and they are business sessions from start to finish. The work is lightened, however, by the optimism and enthusiasm that prevails.

There is a sound basis for the optimistic tone this year. During the last twelve months, despite the quietness of trade and the tendency toward depression in several localities, the company's business has steadily increased and the year just closed was by far the largest in their history. There has been no slackening or retrenching, but a continual extension. A new paint plant was completed at Montreal, which is the largest of its kind in Canada; new general offices were completed at Cleveland; another factory was erected at Chicago; the warehouse capacity at Newark was increased; large extensions are now being made to the linseed oil mill at Cleveland; a new distributing point has just been opened at Portland, Ore., and other depots are to be established shortly at Cincinnati, and at Savannah; thirty-six new representatives have been added to the selling staff. This is surely a good record for a year that some business concerns have found dull.

Social pleasures during convention week are not neglected. A most delightful automobile trip was taken through Chicago's park system on Wednesday afternoon and a banquet

Automobile Ride—Twenty-Fourth Annual Convention of the Sherwin-Williams Co.

was held at the Auditorium Hotel on the evening of the same day, at which after-dinner speeches were made by President Sherwin, Vice-President Cottingham and many of the managers and representatives of the various divisions.

Notes and Comments

The Boston & Maine is turning out four new 60-ft. baggage and two new mail cars at its Concord shop; also one 60-ft. mule-end mail with six-wheel trucks at its Lawrence shop.

We are pleased to insert some stencil patterns and an explanatory note from our associate, Mr. G. J. Ginther, master painter for the Wabash R. R. at Mobile, Mo. These came just a bit too late for our November issue. Mr. Ginther's absence from the convention was regretted. Trust he will be with us at Cleveland.

The Boston & Maine R. R. is preparing to put its vestibuled equipment that runs to the seashore and mountain resorts of Maine and New Hampshire in first-class shape this season. (Western and southern patrons please note.) These cars, built by the Pullman Company in '93 and '95, will have their interiors scraped with varnish removers and refinished, ceilings redecorated, plush renewed, continuous bag-racks applied in place of the short ones discarded, besides other improvements internally. The exteriors will also be repainted and varnished.

Our esteemed cotemporary, A. Ashman Kelley, editor of "The Master Painter," has been engaged as instructor of the painting and decorating class at the new Winona Technical Institute of Indianapolis, Ind., and assumed the duties of that position Dec. 1, 1904. Mr. Kelley has our congratulations on his elevation to office and our best wishes for his success in his new sphere. We cannot see as we can do any better than to turn him over to Bro. Gohen. Mr. Kelley was years ago connected with the "Painters' Magazine," and with "Painting and Decorating," as editor, and used to attend and write up our conventions. His address, formerly Malvern, Pa., will now be 118 Monument Place, Indianapolis, Ind.

A change has been proposed in our "Portrait Gallery," and will be carried out, so far as we are able, beginning with the January, 1905, issue. We have been publishing for years the photo and sketch of some railway master painter until we have nearly exhausted the list of those obtainable. It has now been thought wise to change, for a while at least, to that important adjunct of our annual conventions, the railway supply men of the paint and varnish fraternity; and the change will doubtless be welcomed by all. This feature will be attended to largely by the advertising manager and will be a welcome relief to the editor of these columns.

In a note from associate D. A. Little, written at St. Louis Nov. 2, he mentions of being in company with J. A. Gohen for the day and both having the good fortune of seeing the air ship and it was a great success. He says he saw "Bob" Scott and he looks well and is doing fine. Mr. Little promises us for a future issue an article concerning what he saw in results of painting steel tanks, removing scale, etc.

Business is good at all B. & M. shops, with a full complement of help. Lighting facilities are being brought into use to work full time, which has not been done in years, if ever, at some of the car shops on its line.

This scribe hereby acknowledges with thanks the receipt of an invitation to attend the first annual convention of the Association of Maintenance of Way Master Painters of the United States and Canada, announced to be held at the Hotel Marlborough, New York City, Nov. 29th and 30th. An interesting program was received and doubtless a good and profitable meeting was held at this the "baby" convention of another association born into the world for the railroads to take care of. This reminds the writer of his eldest boy's remark when a sister arrived on the scene—"Another one to buy stockings for." That boy then was scarcely out of skirts, but he is now manager of a paint works in Cleveland, Ohio, and has one of his own "to buy stockings for."

In the November issue we said the only meeting of our association ever held in Cleveland was in 1888. Sec'y McKeon corrects us by saying there was one held there in 1878, D. D. Robertson, President; headquarters at the Forest City Hotel, 24 members present. It was our oversight in scanning the convention list. When it comes to the history of the M. C. & L. P. A., Sec'y McKeon is "it." He also writes that he sees that the Committee on Resolutions at our late convention stated that J. T. McCracken was not on our books, and adds that he is a member in good standing. As the official organ goes only to those in good standing, Sec'y McKeon reports that he has sent in only 124 names to receive it as against 158 last year—34 less—and says this means a large decrease in receipts.

The Boston & Maine has made a change recently in the lettering of its locomotives. Heretofore "Boston & Maine" in 9-inch Roman letters appeared on the sides of all tanks, with numbers of same size and style on the back ends; and the numbers of engines on the side panels of cabs in 6-inch Roman. All were in gold for all classes. Now the change has been made to aluminum for all, with 20-inch (24-inch may yet be adopted) Egyptian numbers on sides of tanks in place of the words "Boston & Maine"; also same on back ends. On the engine the words "Boston & Maine" appear in 5-inch Egyptian letters on the cab side panels, and the number on the sides of sand box. This is a radical change indeed for this conservative road, and has been brought about, we learn, by the operating department for the better information of those who have to report passing engines.

We note with pleasure the promotion of Mr. L. G. Parish, since the Atlantic City Convention, to be assistant superintendent of motive power of the Lake Shore & Michigan Southern, with headquarters at Cleveland, Ohio. Mr. Parish was formerly master car builder at Englewood for that road, and has attended and taken an active part in the last two conventions of the M. C. & L. P. A. and was elected an honorary member at Chicago last year. Here's wishing him all success in his new and enlarged sphere. "Come again!" He won't have to come, for we will be with him next year in Cleveland.

The Boston & Maine output of cars from its paint shops was only 35 cars for the month of October, two of which were electrics. However, as they are (Nov. 14) fairly into pace, though with a somewhat reduced force, it is expected that the monthly output now will even exceed the normal of previous years, as they are waked up to recover recent losses. The total output for four months of all shops from July 1st to October 31st, was only 81 cars, some shops not putting out a single car during August and September.

Unfortunately a whole train was recently raked on its side the entire length, being in too close contact with a freight car on a siding, necessitating the resheathing of one side of a Pullman chair car and two of the 15 new coaches received from the Pullman shops about three months ago. 'Twas ever thus with a new car instead of an old one.