11

Papers, Jan. – March 1867

1. State Torricelli's Theorem relating to Spouting liquids. & give the proof as deduced from the range of a jet issuing horizontally from a given point in the side of a reservoir.

2. Describe the vena contracta — its effect on the velocity of the stream, & on the quantity discharged. The influence of adjutages, how determine the coefficient of contraction?

3 Point out the conditions determining the form of the liquid surface in capillary action. State the effects severally of a convex & a concave terminating surface, with illustrations. A mixture of H_2O & CO_2 is contained in a porous vessel in which it does not freely diffuse into the air. What is the precise law?

4. Point out the fallacy of Aristotle's proposed proof of the heaviness of air. State Mariotte's law & the cases & conditions in which it is sensibly departed from.

5. What relation subsists between the density of the air & the height. Give the formula for computing the vertical distance between two stations — with the observations & corrections necessary.

6. Describe with a figure the action of the ~~air~~ double acting air pump. The syphon & the hydraulic ram. In a suction pump the column of water below the piston is A ft. but above it is B ft. ~~the~~ What is the effective load on the piston —

1867.

7 In what wave how generated by a vibrating body? The conditions of motion in different parts of it? Explain the reflexion & refraction of sound waves.

8 State the laws of vibr.n of strings. of columns of air in pipes. Give the intervals in the diatonic scale from C to C. with the numbers. By what compromise are the notes selected from the common chromatic scale. The Rot. Harmonics in strings & pipes. the position of the nodes & loops in an open pipe sounding its second harmonic.

9 An open pipe closed at one end is 4 feet long give the wave length of its fundamental sound & the No of vibn. proper to it, apply in the correction for depth, how by inflating a pipe with a given gas. or vibrating a rod length wise. May be found the vel. of sound in the gas or the solid.

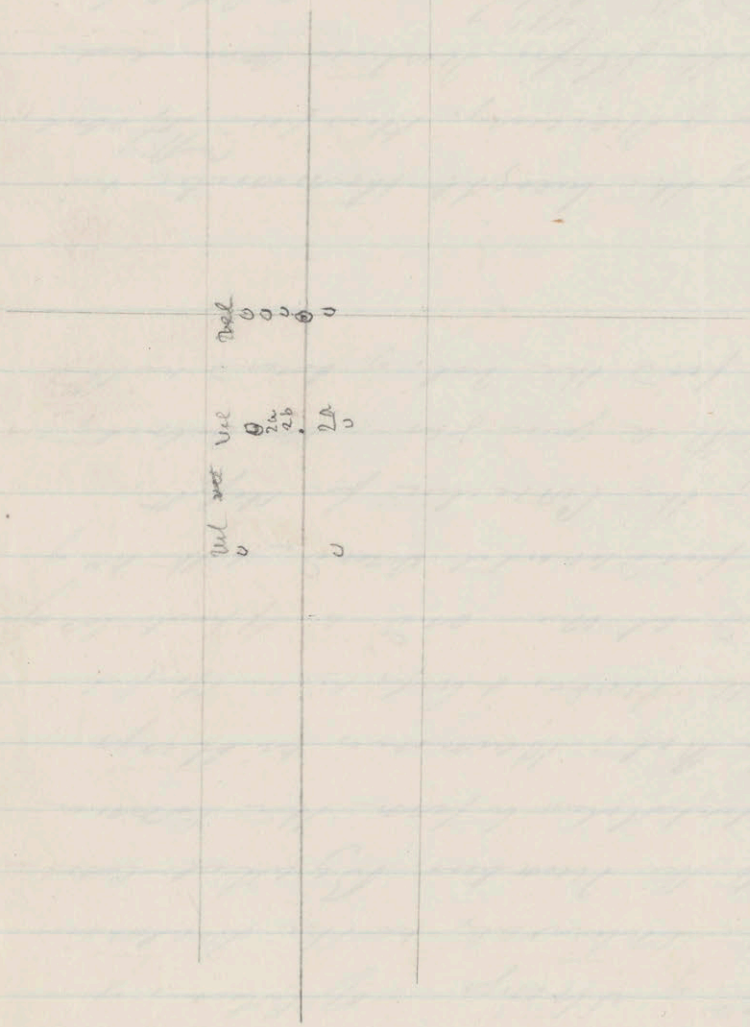
10. Describe the use of the weight thermometer in finding the app: expansion of Mercury. How found its absol: expansion? & the exp.n of the glass. ~~Describe some~~ ~~[illegible]~~ How found the coeff.t of expansion of a solid by Lowitz & Laplace Method. Describe some familiar solids & liquids in the order of expansibility.

11 A mass of gas has the vol. V_1 at temp.t t_1 & pres. p_1 required its vol at temp.t t_2 & pressure p_2.

1857

Notes on Lect. to 2d & 3 years Students

Formulæ for Prob. Int & Lect of Day & Frost Glasses



1. Temple place
Boston Jan. 1
1867.

Dear Madam

In my interview with your son some days ago I promised an early reply to your esteemed letter of the 26th. Ult. It gave me much pain to communicate to you the vote of the faculty although I felt as I do now that their action was prompted by the kindest regard to his & your feelings no less than to his best interests in the future. I fully appreciate the disappointment which this communication gave you, but I am sure you would

never been much more disappointed by his remaining to the examination ~~[illegible]~~ ~~to be withdrawn on account of failure~~, failure at the exams and Dr's consequent withdrawal at that time. That this would have been the result is certain from the ~~[illegible]~~ efforts of his Prof.s. ~~Who [illegible]~~ ~~thinking~~ ~~[illegible]~~ ~~being~~ that there was no hope of his being able to pass the examination.

~~It [illegible] will gratify me very much if I can be of service in advising you as to the future course of your son.~~

It is a great error to regard his withdrawal from the School as the result of a disorganized or impulsive. ~~[illegible]~~ ~~[illegible]~~ But your son has conducted himself with perfect propriety — ~~& is [illegible]~~ & his conduct has appeared [illegible].

It has been his misfortune ~~[illegible]~~ to ~~His disposition, [illegible] withdrawal~~ have had a good ~~[illegible]~~ ~~his [illegible]~~ reputation, & ~~[illegible]~~ ~~[illegible]~~ not to have acquired the habits ~~good & [illegible]~~ ~~be better~~, application for his studies. ~~and~~ ~~But he comes to School with a reputation entirely unblemished.~~ and he has therefore thought it best for him ~~that~~ to ~~[illegible]~~ ~~at the School~~ withdraw, to spare his feelings from the mortification of a failure at ~~the [illegible]~~ School, & a compulsory withdrawal —

New Haven, Jan. 2, 1867.

My dear Sir,

I will willingly undertake to prepare a notice of Prof. Bopp for the Am. Academy, in season for their annual meeting. If it is wanted sooner than that, please let me know.

I remain, with much respect,

Yours truly,

W. D. Whitney

Prof. W. B. Rogers,

Boston.

from Prof. W. D. Whitney

J. 7. 1. 1868

Boston Jan. 2, 1867

I take great pleasure in stating that the withdrawal of Mr. Geo L. Lothrop from the School of the Institute of Tech. has resulted from circumstances wholly unconnected with his deportment which has been uniformly amiable and correct.

William B Rogers
Pres. Mass. Inst. Tech.

To Geo. L. Lattrop
testifying to his
good conduct
while a Student.
June 2. 1867

My dear Sir,

I have now the pleasure to hand you check of the Treasurer of the Lowell Institute for $3000.— your endorsement of which will be the only acknowledgement required

I remain

Yours very faithfully

Augustus Lowell Atty

60 State Street

3 January '67

The Check I
Endorsed &
handed to the
Treas: Wm Endicott.

Jan 4. 1867.

(8)

2/

1. Temple place
Boston Jan. 16. 1867

My dear Sir.

I have delayed thanking you for your much esteemed letter addressed to the Pres: & faculty of the Institute, in the hope of being able to send you our new Catalogue, embodying some changes which we have been contemplating and which harmonize with the spirit of your suggestions. I am entirely opposed to any system of hot-house forcing in Schools & Colleges, & I believe that we shall succeed in so adjusting the studies

of the Institute as to avoid this evil will be secure for our pupils generally thoroughness & steady progress in their work.

Our Catalogue is not yet quite complete – but I shall take pleasure in sending you a copy as soon as it is through the press, and shall be obliged to you for any criticisms or suggestions you may think proper to make in relation to the ~~School~~ practical working of the School.

I feel much interested in your son, and am looking forward with pleasure to the time when I shall resume lectures & have the opportunity of personally helping him in some of his studies – I am dear Sir

Very respectfully & truly
Your Ob.t Serv.t

William B Rogers.
Pres. M. Inst. Tech.

W. D. Bourdet

Jan. 17. 1869

4)

To the Honorable

The Senate & House of Representatives of the Commonwealth of Massachusetts in General Court assembled —

The undersigned President of the Mass: Institute of Technology respectfully represents in behalf of said Institute

That in conformity with an act of the Legislature approved April 27. 1863 making it obligatory on the Institute "to provide" for its pupils "Instruction in Military Tactics", the regular students of the Institute are now organized as a battalion and are steadily drilled & exercised under the direction of an experienced instructor;

Boston Jan. 20. 1867.

The U. S. Old Musket thus far used by the Corps has been found in many respects ill-adapted to the easy & thorough training which it is the object of the Institute to secure, and that the proficiency as well as the general comfort & spirit of the Student in these exercises will be much promoted by allowing them the use of the improved Springfield Musket now generally introduced among the Militia of the Commonwealth but which cannot be obtained for the Institute without a specific authority from your honorable body to that effect.

In view of these facts & ~~from~~ especially of the consideration that the Military Instruction of the Institute has been established ~~by the State in pursuance~~ by legislative enactment — the undersigned ~~begs that~~ respectfully asks your honorable body ~~will see fit~~ to pass an act ~~authorizing the Military Department~~ ~~Proper~~ authorizing the proper officer to provide the ~~use of the~~ Military Organization of the Institute ~~to be~~ ~~the~~ as many of the improved Springfield Muskets & accoutrements as may be needed for the ~~proper~~ of the corps ~~[illegible]~~ instruction in Military Tactics.

All which is respectfully submitted by your petitioner —

William B. Rogers
Pres. Mass. Inst. Tech.

Boston July 20. 1867.

Petition to the
Legislature for
Springfield Municipality
for the use of the
School —

Jan 20. 1867.

(8)

3

1. Temple place
Boston Jan. 24. 1867

Dear Sir.

I am glad to learn that measures are in progress for including in the Mass: part of the great exposition at Paris, a complete ~~exhibition~~ ensemble of the arrangements, furniture & apparatus of instruction of one of our typical common schools. The U S Commissioner Mr. Beckwith will I am sure take great interest in having ~~complete~~ full justice done to this feature of ~~the~~ the exposition, and I think ~~I express the opinion~~ that ~~of~~ all who have had an opportunity

of comparing the efficiency
of school instruction abroad
with that in use in New England,
will open with me in the hope
when I say that this contribution
for me after;
~~part of the exposition~~ cannot
fail to ~~[illegible]~~ help the cause of
elementary education
abroad ~~while [illegible]~~ at the same time
that it shows the good effects
~~which it has [illegible] effects, [illegible]~~
of the commonwealth —

To J. M. Usher,
Mess. Agent.
Pan. Lafayette

About school furniture,

Jan. 24. 1867

Boston, Jan. 30th. 67.

N. Thayer, Esqr.

Dear Sir,

At our interview this evening we stated to you that four ladies, regular attendants of the present Lowell class in Chemical manipulations, wish to continue the study of Chemistry in the Technological Institute.

Relying upon your

kindly presenting our wishes before the meeting of the Committee of Instruction—

We remain
very truly yrs.,
Anita E. Tyng.
Rebecca K. Shepard—

N. Thayer, Esqr.

5/ [1867 ?] 66

Jan. 30

Dear Mr Atkinson.

I believe that you are one of the Board of Instruction of the Institute of Technology, and in that capacity, I want to ask a favor of you. The time of the "Lowell" Class in Chemical Manipulation is drawing to a close; and some of the ladies of the class, who are very much

interested in the
subject, wish to go
on with it.
Will it be possible for
them & me to form
any class now formed
in the Institute, so
to continue our studies?
If so, what would
be the conditions.
as to terms & time?
We hear that there
is to be a Meeting of
the Board of Instruction
this week. Could
you bring the matter
before them & so
very much oblige
Yours truly
58. Pinckney St. A R Curtis.
Jan 30th.

Mr. E. Atkinson, Cambridge, Mass. 66a

Boston Feb 1. 1847

Dear Sir

The enclosed note speaks for itself.

Can there be any objection to ladies entering as special students except possibly want of room in the laboratory

Yours very truly

Edw Atkinson

(2)

4. ~~Resume the~~ Call attention to the position of Mr. Krauss, assist. librn in Mod. Languages, & the high testimony he has received from Prof. Bocher & others in the faculty as expressed in their letters, and ~~ask~~ suggest that Mr. E. C. F. Krauss be made assistant Prof. of Mod. Lang.; with a salary of ——— for the present year. He will receive 500 for the small class.

5. Ask that E. C. Pickering be appointed Assistant Prof. of Physics — & that his salary be increased from 1200 to 1500 dolls.

6. Call to mind the want of a teacher of Nat. History — State the recom. of the faculty that Dr. Kneeland be appointed Prof. of N. Hist. State his qualifs.

He now receives 1200 & might stipulate that be increased to 1500? which with 250 for the small class would bring him 1750. He can be of much use in connection with Paleontology, &c.

[1867?]

I. Ask the Consideration of Salaries for the future.

State Mr. Henry's proposition. See the new possible Sal: or state his postponement until present.

Prof. Mech. & Ch. Mach.s —	2000	500
" Gen. & Indust. Chemistry	2000	500
" Analyt. Chem: & Metallurgy	2000	500
" Desc. Geom. & Mech. Eng.s —	2000	
" Civil & Topogr. Engineering	2000	
" Mod. Lang: —	2000	500
" English Lang: & Lit:	2000	
" Navigation & Nat. Astron. & Assist. Prof. Bell's ...	1500	300
Assist. Prof. Mod. Lang.s.	500?	500
Assist. Prof. Physics —	1500 ...	
Prof. of Mining — Prof. Rockwell	1200	

10. Refer to application of women to attend Laboratory instruction — Letter of Mrs. Hayford. State that we might accommodate them of 10 or 12 women at 50 dolls each for the season. This would enable the Laboratory without expense to Inst. to employ Mr. Eaton? whose services would be valuable at other times in the Laboratory.

6)

70

1. Temple place
Boston Feb. 4. 1867

Dear Mr. Thayer.

In reply to the communication of Misses Tyng and Shepard please say to them that the faculty of the Comm: of Inst: appreciate the earnestness with which they & their associate lady pupils in the Laboratory are desirous to pursue their scientific studies & would gladly afford them such opportunities of systematic instruction as are compatible with the objects & plan of the Institute; but that we ~~[illegible]~~ could not comply with their present request without seriously embarrassing the organization of the Laboratory & the Dept of the School as connected with the regular courses now in progress.

The plan of evening (including afternoon) instruction, forming a department distinct from the so-called regular courses of the School has been incorporated into the general organization of the Institute for the purpose of enabling lady-students as well as gentlemen to have the benefit of systematic Scientific instr.n under the conditions best suited to their convenience & advantage & to the interests of the School at large.

This Dep.t of the Institute embracing the Lowell free instructions as a part will it is hoped be organized in such year as to meet the wants of the ladies whom you correspondent represent & I need hardly add that the fac.y & Committee will gladly welcome them to the classes thus organized—

Yours truly &c

William B Rogers

Matt.w Hayes Esq.

To Nathl. Thayer & al.
relating to
Application of Lady Pupils.
Feby. 4. 1867.

By authority of Comm.
on Instn. at Meeting Feby. 2

Feb. 11

X

Prof W. B Rogers

Dr Sir

What will be the length of time and the cost of tuition for my Son the "Technological School" sufficient to obtain a practical knowledge of Civil Engineering?

He is 17 years of age and has a general education and has been a "roaman" in carrying a RR.

As I am obliged to consult Economy, Can he board at home by attending school from 10½ A.M. to 4 P.M. in your city?

When will it be advisable for

him to commence?

Rest your obl. serv.

W. E. Sparrow M.D.

Mattapoisett

Mass. Feby 11. 1867

Hon D. W. D Spanow
Mottefont
Wyoming Cont Schools
March 1867.

1148

State of New York,

Senate Chamber,

ALBANY, Feb. 14th 1867.

Dear Sir

Pressing duties here have forced me to delay answering your valued letter regarding Mr Carroll.

The Board of Trustees have just appointed Mr Wm C. Russell

to the Dept. of Modern
languages and Adjunct-
Prof. of History - This was
done on account of
the Russells great - general
labor & efficiency in
such an institution as
we hope to establish

But it is quite like-
ly that very soon after
the opening of our
institution we may
divide the labor - giving
History alone to Mr Russell
& electing a new Prof. of
Modern languages - and
for such a place my
choice is decidedly Mr
Carroll.

I intend to go to
Europe again this Sum.

Mrs and would
be very glad to meet-
her Carroll. I leave
probably in July.

You will be glad
to learn that all goes
well with us still

With pleasant-re-
membrance of your
kindness, with thanks
I remain
Most truly yours
Andr. D. White

Wm B. Rogers LL.D.
Presdt &c &c

Boston, Feby. 15th 1867.

Received of Hon. James Savage, five thousand dollars, in payment of his subscription to the funds of the Massachusetts Institute of Technology.

Wm Endicott Jr.
Treasurer.

Rec.d 9th. Endorsed
Treas. to D. T. for
$5000 - Delivered by
Jos. Savage.

Boston Feb. 16. 1867

My dear Madam.

Your request in regard to the connection of your son in the Institute as a special student was duly presented to the faculty at their Meeting this morning, and after a full review of the case it was decided that the previous vote of the faculty requesting his withdrawal from the School should be adhered to.

I sincerely regret that your son's standing in the School, (the Chemical department included), has not been such as, in the minds of the faculty, ~~to~~ authorizes a compliance with your request. ~~But I do regret that~~ Our rules for the admission of

Our rule for the admn. of Special Stand. requires that the candidate should have proved himself to be well qualified to profit by the dep.t. What he proposes to enter & thus to offers has not been disc.d in the case upon Dot.

Much as I deprecate trifling with your in the present Dr. Off.r I am sure that both he & you on full reflection will feel that his Cont. of the Schooling the rest of the Jesuits would have been a very unsatisfactory use of his time.

Mrs. Ingalls claims that I should feel an interest in the body cons. of all our pupils. What I accomplish not in this class, I will therefore be glad to aid you Dot. in the future by such counsel as may be able to give as to his pursuits in life —

J. Phin Gaillard

Washington

Jy. 1867

(x)

Commonwealth of Massachusetts.

Private

Executive Department.

Boston, 28th Feby 1867

My dear Sir,

I think I can give you assurance that you shall have $5,000. If the appropriation falls short of that, another can be availed of to make good this amount.

Yours very truly,

Alex H. Bullock

Prof. W. B. Rogers

The Building Committee of the Mass. Institute of Technology, having completed all the work Entrusted to their charge, would now present this as their final report.

The total amount appropriated for their use previous to January 11, 1867 was $234,356.68
In addition to which there was then appropriated the sum of 20,000.00
making a total of 254,356.68

The sum then reported as expended by them was $246,887.55
There has been expended since 7,943.16
making total Expenditure 254,830.71

Against which we have total appropriation as above.
Leaving a deficit of 474.03
to make up the sum actually Expended 254,830.71
which deficit we would now ask to be appropriated to meet the above expenditure, and would further request to be discharged from all further responsibilities.

William B Rogers.
Ch.

Boston. March 2. 1867.

Final Report of the
Building Committee.
March 2nd. 1867.

Boston Mch 2d 1867

The Committee for furnishing & fitting up the rooms of the Mass. Inst. of Technology have procured such furniture as seemed immediately necessary for the use of the School. & have expended the sum of $5,830.90 in so doing. The appropriation made for this use amt. to $5,000.00

Leaving an excess of expenditure of $830.90 into which we were led unwittingly & would now ask for an appropriation of that amt. to cover the deficiency.

A good deal more work remains to be done, some of which should be done at once, but as we were directed to stop work Feb. 1st & found we had spent all the funds appropriated, we stopped.

We would now beg to be discharged & suggest that the further fitting be put in charge of some one man.

for the Com. Edwd S. Philbrick Chm

Report of the Committee
on Furnishing the
School Rooms.
March 2. 1867.

1. Temple place
Boston March 3. 67

Henry Wood Esq.

My dear Sir.

The Gov. did me the honor last summer to appoint me Commissioner for Mass. at the Paris exposition, & in the hope of benefit to our Institute as well as, in some degree, representing the Scientific industry of the Commonwealth I have consented to serve. He at the same time appointed several Agents to co-operate with the Commissioner, if necessary, & among these your name is enrolled. Mr Usher the Agent who has been most active here has I believe already gone to Paris.

As my Object in attending the Exposition as State Commissioner will be to collect the Materials for a Combined Report of the Scientific & Industrial Objects

COMMONWEALTH OF MASSACHUSETTS.

Ordnance Department.

STATE ARSENAL

CAMBRIDGE March 6 – 1867

Wm B. Rodgers Pres. Mass Inst Tech.y

Sir

I herewith forward you invoice of Ordnance transferred to you and forwarded this day by Jones' Express for the use of your "Institute", agreeably to a resolve passed by the Legislature and approved by His Excellency the Governor, March 2nd 1867.

I am very Respectfully

Your obedient Servt

S E Chamberlain

Col & Dept. Qr Mr Genl.

INVOICE of Ordnance and Ordnance Stores, turned over by Col. Samuel E. Chamberlain Dept. Quarter-Master General Commonwealth of Massachusetts, to William B. Rogers Pres. and Faculty Mass. Inst. Techy — viz.:—

NUMBER.	ARTICLES.
100	Springfield Muskets (Rifled) Mod. 1863 Cal. 58
100	" " Bayonets
100	Tompins
20	Wipers
10	Cone Wrenches & Screw Drivers
4	Spring Vise
4	Thimbles & Wire Punches
4	Ball Screws
100	Cartridge Boxes New American
100	" " Belt " "
100	Waist Belts " "
100	" " Plates " "
100	Cap Pouches " "
100	Bayonet Scabbards " "
100	Gun Slings " "
1	Equipment Case
5	U. S. Arm Chests

State Arsenal, Cambridge, March 6th 1867

S. E. Chamberlain
Col. & Dept. QUARTER-MASTER GENERAL.

DUPLICATES.

INVOICE No.

ORDNANCE AND ORDNANCE STORES

TURNED OVER TO

.....

.....

.....

.....

Quarter-Master Gen. Com. of Mass.

36

Lowell March 6. 1867.

President Rogers;

Dear Sir

I received the inclosed manuscript of my son's examination in Algebra; and now return it, with my thanks to you and Prof. Osborn —

I feel much relieved by examining the work, though I am still much mortified at the extreme heedlessness manifested, and sorry for the apparent ignorance exhibited in some parts of the work. But I find most of his errors resulting from want of due heed, and more than half of his work remarkably well done, showing much skill; even some of his errors are traceable to attempts at condensation —

Please not understand me as complaining of his examination. I presume he was treated as well as his classmates. I confess, however, that I think the principle on which judgment is based, singular, and that the examination does not show the scholar's knowledge of the subject. I understand this principle to be, that allowance is made only for absolutely correct results; so that had this student worked the 5th & 13th problems as he did, and left all the rest unattempted, he would have received the same rank as he did receive!

I copied the problems, except the 7th, which is omitted on the manuscript, and he reworked them previously to seeing his former manuscript — It will be seen that he secured seven correct answers this time, but with much of his former heedlessness and ignorance —

According to my ~~Beats~~ principle of marking, i.e. allowing for all that is right, and well done, his first paper would receive 55. and his second 68. (See top next page) But by Prof Osborn's principle the first paper received 15, and the second would probably receive about 50.

Please indulge me in a short argument – the solution of a problem consists of a succession of steps, an error in any one vitiates the whole, and it is nothing worth; therefore, this examination, consisting of parts, is nothing worth if it contain a single error! – these cases, though not exactly parallel, are sufficiently so to ~~show this~~ illustrate the two principles of judging of an examination.

My son is giving some extra attention to his Algebra, and I hope he will dissipate some of his ignorance; but I have less hope of improvement in his habits of carefulness. I am also less hopeful of his chemistry, as I am unable to teach him there, and he has not yet acquired a fondness for the study, nor has he manliness enough to will success.

I am sorry the paper on Geometry was not sent, would it be too much trouble to favor me with an examination of that also?

Yours, Respectfully,

J. S. Russell

P.S. I would like that Prof. Osborn and Prof Runcle also, should see this note, if you please – J.S.R.

(2) $\frac{4}{8}+\frac{4}{8}+\frac{8}{8}+\frac{6}{8}+\frac{8}{8}+\frac{8}{8}+\frac{0}{8}+\frac{8}{8}+\frac{0}{8}+\frac{6}{8}+\frac{8}{8}+\frac{2}{8}+\frac{8}{8}+\frac{7}{8}=\frac{77}{8}\therefore\frac{77}{8\times14}=\frac{11}{16}=.68\frac{3}{4}$

(1) $\frac{4}{8}+\frac{6}{8}+\frac{7}{8}+\frac{6}{8}+\frac{8}{8}+\frac{4}{8}+\frac{0}{8}+\frac{4}{8}+\frac{0}{8}+\frac{6}{8}+\frac{0}{8}+\frac{7}{8}+\frac{8}{8}+\frac{2}{8}=\frac{62}{8}\therefore\frac{62}{8\times14}=\frac{31}{56}=.55\frac{5}{14}$

1. $\underbrace{3a-[b+(2a-(b-c))]}_{=a-c}+\frac{1}{2}+\frac{2c^2-\frac{1}{2}}{2c+1}=a-c+\frac{2c+1+4c^2-1}{4c^2+2}$

$\frac{4ac+2a-4c^2-2c+2c+1+4c^2-1}{4c+2}=\frac{4ac+2a}{4c+2}=(a)$ Ans

Same as before $\frac{4}{8}$

a = Ans

2. $\frac{1}{x^2-y^2}+\frac{1}{(x+y)^2}-\frac{1}{(x-y)^2}=\frac{1}{(x+y)(x-y)}+\frac{1}{(x+y)(x+y)}-\frac{1}{(x-y)(x-y)}=\frac{(x-y)(x+y)+(x-y)(x-y)-(x+y)(x+y)}{(x+y)(x+y)(x-y)(x-y)}$

Same as before nearly $\frac{4}{8}$

1 = Answer

3. $\frac{\frac{a}{a+b}+\frac{b}{a-b}}{\frac{a}{a-b}-\frac{b}{a+b}}=\frac{\frac{a^2-ab+ab+b^2}{a^2-b^2}}{\frac{a^2+ab-ab+b^2}{a^2-b^2}}=\frac{a^2+b^2}{a^2-b^2}\div\frac{a^2+b^2}{a^2-b^2}=1$ Correct $\frac{8}{8}$

1 = Ans

4. $(a+x)(b+x)-a(b+c)=\frac{a^2c}{b}+x^2=ab+ax+bx+x^2-ab-ac=\frac{a^2c}{b}+x^2$

$bax+b^2x=a^2c+ac$

$x=\frac{ac(1+a)}{ba+b^2+ac}$ Ans

Same as before nearly $\frac{6}{8}$

5. $\frac{3x-5y}{2}+3=\frac{2x+y}{5}$ & $8-\frac{x-2y}{4}=\frac{x}{2}+\frac{y}{3}$

$15x-25y+30=4x+2y$

$30=27y-11x$ & $96-3x+6y=6x+4y$

$96=9x-2y$

$9x-2y=96$

$-11x+27y=30$

$99x-22y=1056$

$-99x+243y=270$

$221y=1326$

$y=6$

$x=12$ Ans

Correct $\frac{8}{8}$

6. $\sqrt[3]{\frac{5}{8}}+\sqrt[3]{\frac{5}{25}}+\sqrt[3]{\frac{1}{200}}=\sqrt[3]{\frac{625}{1000}}+\sqrt[3]{\frac{320}{1000}}+\sqrt[3]{\frac{5}{1000}}$

$\frac{1}{10}(\sqrt[3]{625}+\sqrt[3]{320}+\sqrt[3]{5})=\frac{1}{10}(\sqrt[3]{5}\sqrt[3]{5}+4\sqrt[3]{5}+1\sqrt[3]{5})$

$\frac{1}{10}(10\sqrt[3]{5})=\sqrt[3]{5}$ Ans

Correct $\frac{8}{8}$

7. Problem unknown.

$\frac{0}{8}$

8. $\sqrt{a+x} + \sqrt{a-x} = \sqrt{2b}$

$$a + x + a - x + 2\sqrt{a^2 - x^2} = 2b$$
$$2\sqrt{a^2 - x^2} = 2b - 2a$$
$$4a^2 - 4x^2 = 4b^2 - 8ab + 4a^2$$
$$x = \frac{\sqrt{8ab - 4b^2}}{2} \text{ Ans}$$

Correct $\frac{8}{8}$

9. $\frac{x+2}{x-1} - \frac{4-x}{2x} = \frac{1}{3}$

$6x^2 + 12x - 3x^2 - 15x - 12 = 2x^2 - 2x$ About the same $\frac{0}{8}$

$x^2 - x = 12$

$4x^2 - 4x + 1 = 49$

$2x - 1 = \mp 7$

$2x = -4$ Ans

10. $x^{4/3} + 7x^{2/3} = 44$

$4x^{4/3} + 28x^{2/3} = 176$

$4x^{4/3} + 28x^{2/3} + 49 = 225$

$2x^{2/3} + 7 = \mp 15$

$2x^{2/3} = 8$ or -22

$2x^{2/3} = 8$ or -22

$x^{2/3} = 4$ or -11

$x = \sqrt[3]{16}$ or $\sqrt[3]{121}$ Ans

Same as before $\frac{6}{8}$

11. Form the equation whose roots are $a + 2b$ & $-a + 2b$

$$x^2 - 4bx = (a^2 - 4b^2) \text{ Ans}$$

Correct $\frac{8}{8}$

12. $(x+y) + \sqrt{x+y} = 6$ & $x^2 + y^2 = 10$

Set $x + y = a$; then $a + \sqrt{a} = 6$

$x + y = 4$ $\quad x = \frac{4}{y}$

$x^2 + y^2 = 10$

$y^2 + \frac{16}{y^2} = 10$

$4a + 4\sqrt{a} + 1 = 25$

$2\sqrt{a} + 1 = \mp 5$

$\sqrt{a} = 2$ or -3

$a = 4$ or 9

Not as well $\frac{2}{8}$

13. $\frac{x+y}{x-y} + \frac{x-y}{x+y} = \frac{10}{3}$ & $x^2 + y^2 = 80$

$3(x^2 + 2xy + y^2 + x^2 - 2xy + y^2) = 10x^2 - 10y^2$

$6x^2 + 6y^2 = 10x^2 - 10y^2$

$6x^2 + 16y^2 = 10x^2$

$x^2 = 4y^2$

$x = 2y$

$x = 2y$

$x^2 + y^2 = 80$

$5y^2 = 80$

$y = 4$

$x = 8$ Ans

Correct $\frac{8}{8}$

$y^4 + 16 = 10y^2$

$y^4 + 10y^2 = 16$

$y^4 + 10y^2 + 25 = 41$

$y + 5 = \sqrt{41}$

$y = \sqrt{41} - 5$

14. $l = ar^{n-1}$ & $S = \frac{rl - a}{r - 1}$ given to find a & l

$l = (rl - rS + S)r^{n-1}$

$\frac{l}{r^{n-1}} = rl - rS + S$

$\frac{l}{r^{n-1}} - rl = -rS + S$

$l - r^n l = -r^n S + r^{n-1} S$

$l = \frac{-r^n S + r^{n-1} S}{1 - r^n}$ = Ans

$rS - S = rl - a$

$a = rl - rS + S$

$a = \left(\frac{-r^{n+1} S + r^n S}{1 - r^n}\right) - rS + S$ Ans

Ans. true but not well reduced. $\frac{7}{8}$

(X)

James W. Russell.
Feby 2d 1869

only two of the fourteen (5th & 13th) have correct answers, and the errors in the others are generally of a serious character indicating ignorance of principles

[3/6/1867 encl.]

James B. Russell.

Seby 2d '67.

1st $3a - [b + (2a - (b-c)] + \frac{1}{2} + \frac{2c^2 - \frac{1}{2}}{2c+1}$ $\quad [b + (2a - (b-c)] = 2a + c$

$3a - (2a + c) + \frac{1}{2} + \frac{2c^2 - \frac{1}{2}}{2c+1} = a - c + \frac{1}{2} + \frac{2c^2 - \frac{1}{2}}{2c+1} = \frac{(2ac + a) - (2c^2 + c) + (2c+1) + 2c^2 - 1}{8c + 4}$ wrong

the cancellation of the quantity (2c+1) is manifestly wrong

$\frac{2ac + a + c}{8c + 4} = \frac{a(2c+1) + c}{4(2c+1)} = \frac{a + c}{4}$ Ans

2d $\frac{1}{x^2 - y^2} + \frac{1}{(x+y)^2} - \frac{1}{(x-y)^2} = \frac{1}{(x-y)(x+y)} + \frac{1}{(x+y)(x+y)} - \frac{1}{(x-y)(x-y)}$

$\frac{(x+y)(x-y) + (x-y)(x-y) - (x+y)(x+y)}{(x-y)(x-y)(x+y)(x+y)}^{-1} =$ Ans. unfinished

3d $\frac{\left(\frac{a}{a+b} + \frac{b}{a-b}\right)}{\left(\frac{a}{a-b} - \frac{b}{a+b}\right)} = \frac{\frac{(a^2 - ab) + (ab + b^2)}{a^2 - b^2}}{\frac{(a^2 + ab) - (ab - b^2)}{a^2 - b^2}} = \frac{(a^2 - ab) + (ab + b^2)}{(a^2 + ab) - (ab - b^2)} = \frac{a^2 + b^2}{a^2 + b^2}$ Ans

$= 1$ ans.

5th

Solve $\frac{3x-5y}{2}+3=\frac{2x+y}{5}$ & $8-\frac{x-2y}{4}=\frac{x}{2}+\frac{y}{3}$

$15x-25y+30=4x+2y$

$11x+30=27y$

$\frac{27\left(\frac{9x-9b}{2}\right)-30}{11}=x=\frac{27y-30}{11}$

Superfluous

$9x-9b=12$

$9x=108$

$x=12$ Ans

$9b-3x+by=bx+4y$

$2y+9b=9x$

$y=\frac{9x-9b}{2}$ or $\frac{9\left(\frac{27y-30}{11}\right)-9b}{2}$

$22y=9(27y-30)-105b$

$22y+105b=243y-270$

$221y=221326$

$y=b$ Ans

24th

$(a+x)(b+x)-a(b+c)=\frac{a^2c}{b}+x^2$

$b\left[(a+x)(b+x)-a(b+c)-x^2\right]=a^2c$

$b\left[(ab+ax+bx+x^2)-(ab+ac)-x^2\right]=a^2c$

$b\left[x(a+b)-ac\right]=a^2c$

$x=\frac{\frac{a^2c}{b}+ac}{a+b}=\frac{ac(a+b)}{b(a+b)}=ac$ Ans

6th $\left(\sqrt[3]{\frac{5}{8}}\right) \times \left(\sqrt[3]{\frac{8}{25}}\right) \times \left(\sqrt[3]{\frac{1}{200}}\right) = \sqrt[3]{\frac{40}{40000}} = \sqrt[3]{\frac{8}{8000}} = \frac{1}{20}\sqrt[3]{\frac{1}{8000}}$ Ans

wrong

I didn't understand whether they were to be multiplied or added

$\sqrt[3]{\frac{5}{8}} + \sqrt[3]{\frac{8}{25}} + \sqrt[3]{\frac{1}{200}} =$

they were to be added, and every other student so understood it

unattempted

7th

unattempted

8th.

$$\sqrt{a+x} + \sqrt{a-x} = \sqrt{2b}$$

$$(a+x) + 2\sqrt{a^2-x^2} + (a-x) = 2b$$

$$(a+x)+(a-x)-2b = 2\sqrt{a^2-x^2}$$

$$2a-2b = 2\sqrt{a^2-x^2}$$

$$2(a-b) = 2\sqrt{a^2-x^2}$$

$$4(a^2-2ab+b^2) = 4a^2-x^2$$

$$x^2 = 4b^2-8ab$$ inconsistent with previous eq. as it was

$$x = \pm\sqrt{4b^2-8ab}$$ Ans.

9th.

$$\frac{x+2}{x-1} - \frac{4-x}{2x} = \frac{7}{3}$$

$$6x^2+12x+3x^2-\overset{15}{\cancel{9}}x+12 = \overset{14}{\cancel{28}}x^2-14x$$

$$28x^2-17x = -12$$ should have been +12

$$4x^2-\frac{17x}{7} = \frac{-12}{7}$$

$$4x^2-\frac{17x}{7}+\frac{289}{784} = \frac{11431}{5488}$$ should have been $-\frac{7385}{5488}$

(the work is inconsistent throughout)

$$\overset{2}{\cancel{4}}x - \frac{17}{28} = \cancel{7}\sqrt{\frac{11431}{5488}}$$

$$x = \frac{\sqrt{\frac{11431}{5488}}+\frac{17}{28}}{4}$$ Ans

10th. $x^{4/3} + 7x^{2/3} = 44$

$4x^{4/3} + 28x^{2/3} = 176$

$4x^{4/3} + 28x^{2/3} + 49 = 225$

$2x^{2/3} + 7 = \pm 15$

$2x^{2/3} = 8$ or -22

$x^{2/3} = 4$ or -11

$x = \cancel{\sqrt[3]{16}} = 2\sqrt[3]{2}$ or $\cancel{-\sqrt[3]{121}}$ Ans

$= 4^{3/2}$ or $(-11)^{3/2}$

11th. Form the equation whose roots are $a+2b$ & $-a+2b$

$x + 4bx = -a^2 + 4b^2$ Ans

should be

$x^2 - 4bx = a^2 - 4b^2$

12th. $x + y + \sqrt{x+y} = 6$ & $x^2 + y^2 = 10$

$x + y = 4$

$4(x+y) + 4\sqrt{x+y} = 24$

$4(x+y) + 4(\sqrt{x+y}) + 1 = 25$

$2\sqrt{x+y} + 1 = \mp 5$

$2\sqrt{x+y} = 4$ or -6

$x = 4 - y$

$\sqrt{x+y} = 2$ or -3

$x + y = 4$ or 9

$y^2 + 16 - 8y + y^2 = 10$

$8y = 6$ wrong

$y = \frac{3}{4}$ Ans

$x = 3\frac{1}{4}$

13th. Solve $\frac{x+y}{x-y} + \frac{x-y}{x+y} = \frac{10}{3}$ & $x^2 + y^2 = 81$

$3(x^2 + 2xy + y^2) + 3(x^2 - 2xy + y^2) = 10x^2 - 10y^2$

$6x^2 + 6y^2 = 10x^2 - 10y^2$

$4x^2 = 16y^2$

$2x = 4y$

$x = 2y$

$x^2 + y^2 = 80$

$2x = 2y$

$4y^2 + y^2 = 80$

$5y^2 = 80$

$y^2 = 16$

$y = \pm 4$

$x = \pm 8$ } Ans

To find a & l

12th. $l = ar^{n-1}$ $\quad b = \frac{rl - a}{r - 1}$

$rb - b = rl - a$

$l = \left[\frac{S(r-1)}{rl}\right] r^{n-1}$

see above

1st Ans $a = \frac{rb - b}{rl}$ wrong or $\frac{S(r-1)}{rl}$

$l = \left(\frac{S(r-1)}{rl}\right) r^{n-1}$

$rl^2 = \left[S(r^{n-1})\left(r^n - r^{n-1}\right)\right]$ wrong

$l = \sqrt{\frac{S(r^{n-1})\left(r^n - r^{n-1}\right)}{r}}$

Ans.

606

1. Temple place
Boston March 16. 67

H. L. Wayland Esq.

Dear Sir.

I must beg you to excuse my long delay in replying to your letter of Nov last, which reached me ~~at a time~~ when I was just recovering from a severe & long illness & when the duties ~~connected with~~ of the opening season of the Institute engrossed ~~all~~ my strength & time. Not being able to reply at once, I unfortunately suffered your letter to be put ~~under~~ away in a place where it has since been overlooked.

I am ~~pleased~~ to learn

Hutty

that you are engaged on a Biography of your father for whose great abilities & distinguished services in the cause of education & human progress I have a sincere admiration.

I wish it were in my power to give you any valuable aid in this interesting work. But President Wayland's visit to the University of Virginia in company with Mr. Zachary Allen was a very brief one, and as it was a visit of enquiry I remember no incidents connected with it further than the interest which he inspired among the members of the faculty, and ~~especially~~ ~~among the students at~~ the enthusiasm with which he was greeted by ~~the students~~ ~~with~~ the students upon making a short address ~~which he made~~ to them from my door-step.

I have not a copy of your father's report of 1850 within reach, but I remember that at the time of its publication we at the U.S.V. regarded it as recommending a system analogous in its main features to that founded by Mr Jefferson which at the time of your father's visit ~~Prof. Lathrop mentioned~~ was to be more (remodeled) practical shape by the experience of the faculty.

In regard to the success of the method I have no hesitation in pronouncing it to have been great, whether we consider the

the ~~numbers~~ number of students attracted to the School, (more than 700 at the breaking out of the rebellion), or the really substantial training & attainment of the graduates of the University.

You ask "how far is the Institute of Tech? a result or carrying out of the plan adopted in the Univ: of Berg:" To this I would answer that while my experience at the Univ: aided me in framing the scheme of the Institute, the scope & objects of the latter have required in ~~many~~ most respects a different organization.

I had no correspondence by letter with your father, though I had the pleasure of meeting him on various occasions in Boston & elsewhere after my removal from Berg. [Unfinished].

Finale Marina, (Riviera di Ponente),
near Genoa, March. 17. 1867.

My dear Mr Rogers.

I enclose a note — a rather letter — I have had for some days on the stocks, and a long time in contemplation, which covers ground in which some of our friends are interested, and which I have thought you might like to show to a few of them. I have accordingly not answered, exactly, your kind note, and add this supplementary sheet for that purpose.

I was not at all disappointed in regard to the action of the Government in respect of my representations. I thought it worth while to make them however for two reasons, first because I thought there was a possibility of their acceding to my suggestions, not knowing what changes might have taken place in the financial state of things, and secondly because if they did not, I wished them to distinctly

perceive that it would be a reasonable thing to do if they could & that what they did do was a minimum and not a maximum of performance — People are so apt, in such a position, to conceive that they are acting very handsomely when there is no sufficient ground for such an opinion that I was desirous to disabuse them of such a notion in this case. I wanted to have them understand that they were rather under an obligation to me for undertaking at my own expense work, where chances they might reasonably be expected to treat. I enclose my report & my doings thus far and you will see that I have bonded myself even more than I expected to their service, and of course have sacrificed more of my funds. Of this I do not complain. Having undertaken the thing I am willing to put it through at what it costs.

I have however spent more time also than I expected, & though I may reasonably expect to get through my work in the school so as to return in August & begin operations in October, it will be at the sacrifice of the personal ends I have had much at heart. I set my much to have enough time for study in France & Germany to improve my pronunciation & to make some sufficient acquaintance with their languages. My other engagements may, & probably will, prevent this. If not, shall I consider myself bound or free as regards the school? It was pretty distinctly intimated to me that the authorities, though glad to lay the foundations, were in no hurry to really open a new department, on account of the expense. The expense would be considerable, involving, besides running expenses, the salary of a drawing-master and of an assistant. I should be very glad to have a year to work up my materials & prepare

my lectures. I should indeed be very glad, if that were not advisable, to begin the first, or experimental year, in January or February. Please let me know just how this seems to you, or really stands, and I shall be much obliged if you will send me an answer on this point as soon as may be, as my plans must of course be affected by it.

I had a very satisfactory letter from Longfellow, about the drawing classes. I trust his ministrations have been as satisfactory as they seem to me. What you say concerns what he says of the time & temper of the school. I had no doubt the new building would improve it.

I do not care to have my letter much handed about, it is not meant for that, but I should like to have you send it if you please to Mr A. P. Ridder, who was one of our principal benefactors in this enterprise. I promised to inform him how I got on. Please say that I asked you to do so. I should like also to have Mr Van Brunt and my sisters at Milton see it, bye and bye. He will convey it to them.

Please do not say anything to anybody about my wishing to stay away longer. It might be very injurious if such a notion should get about. If it is necessary to make any mention of the matter, please raise only the question when my classes shall be opened. Whether I stay here or come home I shall be glad to have that decided.

Yours truly W. R. Ware.

[3/17/1867]

The casks to be consigned to me by Mr John Edwards shipping agent 37 Chapel walks So: Castle St Liverpool. Inland charges to be paid by mare. Freight & ocean Charges this side by WBR. "Mr E will let me know his arrangements & forward invoice" "I have also directed Stevens Bro: 17 Henrietta St Covent Garden to send a box or boxes containing 40 parcels they will write to you of their shipment"

Those for his sisters to be forwarded to Milton Rogers Esq: 35 So: Market St.

1. Temple place
March 19. 1867

To His Exc.
Gov. Alex. H. Bullock

Dear Sir.

One of my assistants will set out for Paris this week & I shall soon have other charges to meet relating to the same object. I must therefore request that you will as early as practicable place at my command a part or (if you think it best) the whole of the fund ($5000) appropriated to the Centennial.

W. B. R.

To Gov. Bulloch

March 29

1867

(X)

1 Tenfer place
Boston March 21. 67.

M. M. Beckwith Esq.

Dear Sir.

As Commissioner from the State of Mass: I beg to request that you give your such facilities as you may deem proper to the Bearer Mr. D. Jay Brewer, who now goes to Paris in anticipation of myself & the rest of my Party, for the purpose of making some special preliminary examination & collecting documents to aid me & my assistants in

having a Report for our ~~the~~ Legislature –

I am aware that Contributions from the Individual States will not be recognized Officially in the Exposition & I think the rule a wise one – Still I trust that through your kindness & that of other friends of progress & men of Science in Paris I shall be able to get my Copy of working apparatus to make one visit to the Exposition instructive & profitable to our State.

7)

University of Rochester

Rochester N.Y. Mch. 29. 1867

Prof Rogers

Dear Sir

In company with several gentlemen, I propose to make a strictly scientific expedition to the Cordilleras of Ecuador, South America. We embrace in our object the several departments of Geology, Botany, Zoology & Astronomy. I propose to study particularly the 17(?) volcanoes which are said to environ Quito, taking photographs of the cones, examining their mineralogy &c.

I write for any suggestions which may occur to your mind. What particular observations would you desire me to make?

Any hints you may give me in the Geological line, will be gratefully received.

I am with high respect

Your obt Servt

James Orton

Acting Professor of Natural Sciences

P.O. Box 1125.

Stevens Bro.
17. Henrietta Street, Covent Garden,
London. 30 Mch 1867

Wm B. Rogers Esq.
Mass. Institute of Technology
Boylston Street
Boston

Sir
Complying with instructions from Prof William R Ware we have consigned to your Institute two cases of Books & the particulars of which we presume have been communicated to you by Prof. Ware. We suppose the two cases are shipped by the "Asia" which also takes this letter. The cases in addition to your address are marked
X 650/651. In No 651 are some very small presents for the Mass Historical

Society, American Antiquarian Society - a book for Charles Deane Esq Mass. Hist. Soc. and a lithograph for J D Welles Esq son in law of Hon R. C Winthrop —

The catalogue intended by Prof Ware to be indicated as package No 31 could not be found —

The Royal Institute of British Architects have sent in No 651 case four packages for the American Institute of Architects -

There being sufficient space in the case we thought it better economy to send these packages to Boston than to keep them back till we pack for New York

Yours very truly

B. F. Stevens

(x)

1. Temple place
Boston Apr: 26. 1867

My dear Boy.

I have but a few minutes before the Mail for N. Y. will be shut — & Brent keeping confusing hurriedly to a brief acc^t of business matters.

The Common Council have agreed that you should postpone the opening of your Course in Architecture until Oct. 1868. & that you may continue to employ a substitute as at present until Jany next — your salary of $1200 p^r ann: being continued.

The two boxes for Stevens have arrived — & have unpacked at the Rest. The contents in good order. Your brother will forward and an opinion for the

packages directed to Miller & Mr. Van Brunt will receive his share as soon as he ~~send~~ may choose to send for them. I have informed him of the arrival of the boxes.

The packages for Lewenfeld to which you refer have not arrived. Nor have I yet rec^d any notification of their shipment.

I have been greatly interested by your acc^t of your anti-mission, & travels & of the kind aid with which you have been favored in England. This corresponds with my own experience of the hospitalities & the solid friendships of the Mother land.

We are working satisfactorily in our new building, & begin to think of the final exercises to come off four weeks hence. Judging from present indications we may I think look for two hundred students, next season.

Should you be in Paris during the summer I shall hope to see you often. The Cephise, leaving Boston on the 5th of June will take quite a large party including Elliot & Stone, Myerly & several of our friends. I hope to get Mrs Rogers to reach Paris about the 22d of the month.

Wishing you a continuance of the pleasant sympathy in your research, which you

Enclosed in G. Boland
I remain in haste
Yours faithfully
William B Rogers

The packages for Miller have been sent by Express, & your Brother letter has been rec^d by him.

Prof. W. R. Ware.

I was too late for the Mail