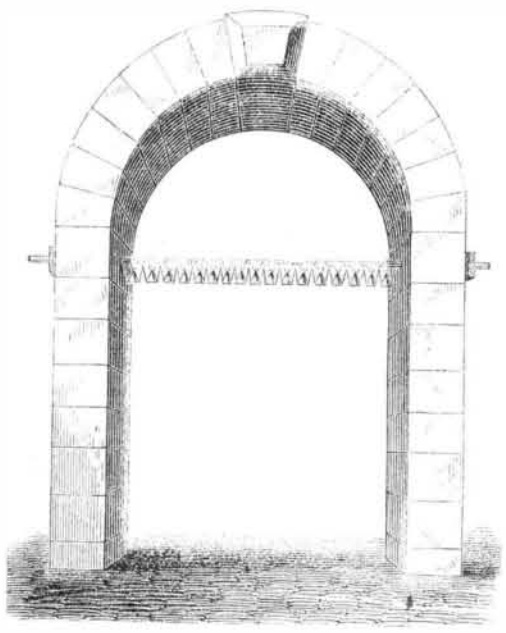
As regards the negotiations for obtaining the site for the tower on the Brooklyn side, it appears that they have so far made but little progress. This tower will, it is understood, be built in the third or upper slip of the Fulton ferry. The Ferry Company lease their ferry property from the City of New York, and the Commissioners of the Sinking Fund of that city are vested with the power of leasing and selling public property. The Brooklyn *Eagle* states that when negotiations were opened by the Bridge Company to obtain possession of the upper slip and section of the adjacent land, the Sinking Fund Commissioners referred the matter to a Commission of Estimate and Assessment, consisting of Wilson G. Hunt, and Thomas R. Agnew, who have not yet made their report. It is understood, however, that this will be forthcoming without much further delay, after which the preparations for the reception of the caisson will be at once proceeded with.

The Force of Contraction Applied to Repairs of Buildings.

The force of contraction is equal to that of expansion, and quite as irresistible. Its immense power was strikingly illustrated some years since in Paris. The two sides of a large building, the "*Conservatoire des Arts et Métiers*," having been pressed out by the spreading of the arched ceilings and the immense weights supported by the floors, M. Molard undertook to remedy the evil by boring holes in the wall at the base of the vaulted ceilings, and opposite to each other, through which strong iron rods were introduced, so as to cross the interior of the building from one side to the other. On the projecting ends of the bars on the outside of the building were placed strong iron plates, which were screwed, by means of nuts, tightly against the walls. The rods were then heated by means of rows of lamps placed under every alternate bar, and being lengthened by the expansion, the



nuts and plates were pushed out to the distance of an inch or more beyond the walls. While in this condition, the nuts were screwed a second time tightly against the wall. The lamps were then extinguished, and the rods, contracting as they cooled, drew the walls together with a force almost irresistible, and to a distance as great as that to which they had been lengthened by expansion. These bars being then left in their new position, the *alternate* bars, which had remained unheated, and by the contraction of the others had been also made to project beyond the walls, were again tightly screwed against the building. These were in turn expanded and lengthened by the application of the lighted lamps, and once more screwed up tightly against the walls. The lamps were then extinguished, and by the contraction of the second set of bars the walls were drawn still further toward each other. These were then left, in turn, to hold the building in its new position, and the first set of bars a second time brought into requisition. And thus the process was continued until the walls were drawn into their proper vertical position; and the bars being left in their places, they have remained firm and upright ever since. In this manner a force was exerted which the power of man could scarcely have applied by any other means. The same process has since been applied to the restoration of other buildings which were threatening to fall.—*Pynchon's Chemical Forces.*

Air in Illuminating Gas.

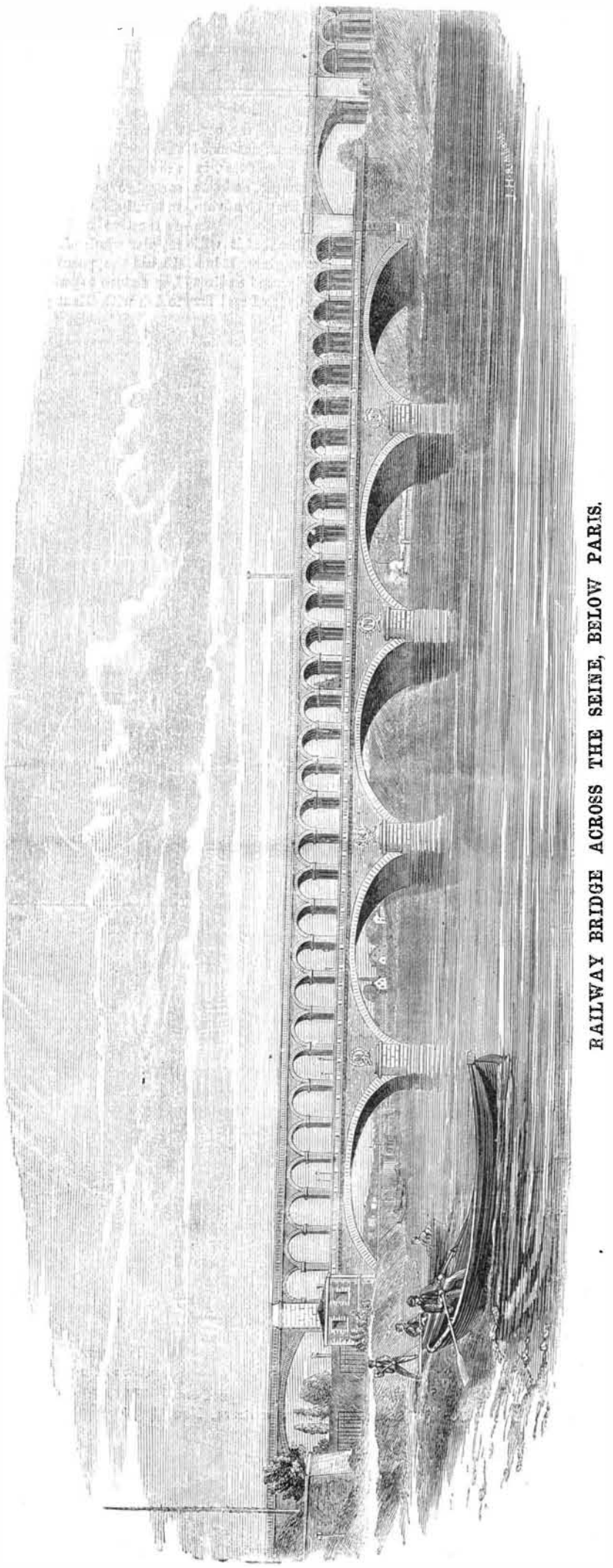
Professors Silliman and Wurtz have been investigating the effects of atmospheric air upon the illuminating power of gas, with, according to the *Chemical News*, the following results:

"For any quantity of air less than 5 per cent, mixed with gas, the loss in candle power due to the addition of each 1 per cent, is a little over six tenths of a candle (0·611 exactly); above that quantity the ratio of loss falls to half candle power for each additional 1 per cent up to about 12 per cent of air; above which, up to 5 per cent, the loss in illuminating power is nearly four tenths of a candle for each 1 per cent of air added to the gas. With less than one fourth of atmospheric air, not quite 15 per cent of the total illuminating power remains, and with between 30 and 40 per cent, it totally disappears.

A BELGIAN report on the preservation of telegraph posts decides that chloride of zinc is the best and cheapest agency to employ, though it does not work equally well in all soils

RAILWAY BRIDGE ACROSS THE SEINE.

Our illustration annexed represents a railway bridge which crosses the Seine, below Paris, at the Point du Jour, on the Chemin de Fer du Ceinture. The bridge, which is rather a remarkable structure, is built in two stories, the lower one consisting of five elliptical, and the upper one of thirty semicircular arches. The span of the lower arches is, in each instance, 99·2 feet; and that of each of the upper arches 15·5 feet. The intermediate piers of the lower arches are each 15·5 feet thick in the direction of the length of the bridge, and those of the upper series of arches measure at the springing of the latter 3·36 feet in the same direction. The upper arches carry the Chemin de Fer du Ceinture, the roadway being 29·5 feet wide, the width of the lower being 131·7 feet, thus affording ample room on each side of the upper viaduct for a carriage and foot-way, the carriage roads being each 24·6 feet wide. The materials used in the erection of the bridge are cut stone and rubble, the parapets and balustrades being of Jura marble. In the large spans the stones are set in cement. The river bed beneath is of clay, chalk being reached under the left abutment, at a depth of about 26 feet, while on the sides of piers and right abutment, sand was met with. In making foundations for the piers, large bottomless wooden caissons were sunk nearly to the chalk, and were then partially filled in with beton, on which the masonry was built by the aid of coffer dams. The ends of the centers of the large arches were supported by dried sand contained in suitable boxes, and they were struck by allowing the sand to escape; the centers were only lowered about one fifth of an inch at one time. The lower story was entirely completed before the upper one was commenced. The bridge was erected about four years and a half since, at a cost of $650,000, from the designs of M. Bassompiere, engineer to the Chemin de Fer du Ceinture.



RAILWAY BRIDGE ACROSS THE SEINE, BELOW PARIS.

Co-operation in Italy.

A Naples correspondent of the London *Times* says:

"One of the most striking features in modern constitutional Italy, is the disposition to form associations. This, of course, is one of the natural results of political liberty, but in the last week or so, we have had a development of it on the co-operative principle, which has probably received an impulse from what is going on in England. A co-operative bank of credit has been formed for the working classes in Naples. One half of its shares have already been taken. The remaining shares are offered to the working classes, and as soon as two fifths are taken the bank will commence its operations. What these are is explained as follows: Limited loans on word of honor, prudently restricted to seventy-five lire; discounting work; discounting bills; receipt of savings, even so low as ten centesimi; deposits in running accounts; advances on public property. Many even of the half who have already taken shares, it is said, are working men, not heads of establishments; and, as this is the first instance of the application of the co operative principle to credit in Southern Italy among the working classes, the experiment is regarded with much interest.

"A bank of the same kind exists in Padua, and has met with considerable success, having with a capital of 30,000 lire conducted affairs in the first year to the amount of 300,000 lire; but without meaning to throw cold water on any effort in a right direction, still it remains to be seen whether the social atmosphere of Southern Italy is as favorable to the growth of such institutions as that of Northern Italy. At all events, the working classes are daily becoming a more important element here; partly, no doubt, from the increased demand for labor, which has been created by private and public enterprise, and as much from the instruction they have received during the last nine years.

"The labor market, I may add, is not sufficiently supplied in this country, and the rate of wages has risen within a few years, in some trades, one half higher than it was before. Another and a novel instance of the application of the co-operative principle, is announced as having been made, not by workmen, but by masters—that is, by the architects of Caserta, with whom those of the neighboring town of Maddaloni have united themselves. Under the title of the 'Association of Architects of the city of Caserta,' they undertake, in their common interest, any commission connected with their profession, and to resolve all questions of art in the meetings of the society. While, therefore, not paying more than would be demanded by a single engineer, it is pointed out as one of the great advantages offered by the association that any person entering on a building or engineering enterprise would here have the benefit of the united study, intelligence, and activity of many. I do not say a word as to the merits or prospects of success of these associations, but report them merely as an indication of that awakening of the public

Italian mind which in many directions and forms is so evident."

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Proposed Industrial Fair at Washington.

MESSRS. EDITORS:—There is now in the Treasury of the United States more than $500,000 of money received through the Patent Office in excess of expenses. The average amount of such surplus that may be calculated upon hereafter will not be less than $200,000 per annum. All the other bureaus are maintained entirely at the expense of the Treasury. But Congress intended that the Patent Office should be in the main self-sustaining, and to the special tax necessary for that purpose the inventors of the world—for whose benefit the Office was created—consent. It seems reasonable, however, that the taxes thus paid by them should be appropriated for their benefit, and that they should not be diverted to other uses, so long at least as there were wants of their own to the relief of which the money might properly be applied.

Now the models which are required by law are of great and daily importance, and should not be dispensed with unless from necessity. But the space provided for them is already mainly occupied, and about 5,000 square feet of additional shelf surface is required every year. It would also be of great advantage to the supporters of the Patent Office if opportunity were afforded to exhibit working machinery as well as manufactures and other products.

Two years ago it occurred to me that this surplus, which was then said to be of about half its present amount, might with propriety and advantage be applied to the commencement of a structure that would meet present wants and be capable of indefinite expansion. An eminent architect expressed the opinion that such an undertaking would be perfectly feasible. It was believed that from moderate beginnings the present wants of the Office and its patrons might thus be supplied by an institution that would grow into proportions commensurate with the growing requirements and capabilities of the American people, that international rivalries might also be invited—that it might thus at length become developed into a permanent world's fair, at the same time that it subserved the legitimate purposes of the Patent Office.

Circumstances prevented an effort to carry out that project then, but other circumstances have revived the intention now. At least it has seemed proper that the idea should be presented and discussed, and, if deemed expedient, adopted and urged to its consummation.

An effort is now being made by the people of this district to hold a World's Fair in this city at no distant day. Nearly half a million of dollars have already been subscribed for that purpose, and it is confidently believed that this amount may be increased to $1,000,000. Especially if, instead of being a temporary undertaking, it is made one which contemplates permanency.

Now if these two projects were united, could they not be worked up into what might prove a great mutual as well as general advantage? There is competent authority for saying that with $1,500,000 a permanent structure of iron and glass might be made of a capacity at least equal to that of the entire Patent Office building. Sufficient space for the arrangement and preservation of models would thus be provided as well as for manufactures and machinery of all descriptions. A permanent temple would thus be erected to human ingenuity to which men of genius from all quarters would resort to give and receive new inspiration.

I hope the thought will not be deemed extravagant that under the united influence of the Smithsonian Institution, the Patent Office, and the Agricultural Department, this establishment might at length become the chief center of the arts and sciences of the civilized world.

As far as has been yet ascertained the matter as thus presented meets with favor among those under whose auspices the project of a World's Fair here has been inaugurated. Before making any serious effort on the subject, however, it is thought expedient to know the views of inventors and their friends on this subject. Your position and character render your opinions of great moment, and on that account I now address you.

It is not proposed to ask the appropriation of a single dollar by Congress. All that would be expected from that quarter would be a permission to appropriate funds which rightfully belong to the Patent Office to aid in carrying out the common enterprise which is mainly for its benefit.

I am fully conscious of the fact that, in a mere financial point of view, the "Exposition" would prove a much greater success, if held in some large commercial city. But that is not the question now. The enterprise is already undertaken. It will be carried through, as I am assured. Whether it prove a financial success, or otherwise, to the stockholders is not an element in our present calculation. It is only here that the Patent Office could, with any propriety, connect itself with such an undertaking, for it is only here that this undertaking could yield those advantages that would justify the connection and expenditure. Besides, Washington is not the commercial rival of any other city, and the jealousy that might be excited against most other plans of like magnitude would interpose no obstacle here.

Washington. D. C. CHAS. MASON.

Magnetic Action of Wind Currents.

MESSRS. EDITORS:—I have been making some experiments for the past three months, which, I think, will interest some of your readers. The instrument used consists of a wind vane made of a thin board some four inches long by one twentieth wide, and as thick as a sheet of commercial note paper. In one end are placed four magnets, so arranged that the south poles point down and perpendicular to the vane, which turns freely on a pivot. The instrument is placed in a box so that the air cannot disturb it.

It sounds singular to hear of a wind vane protected from the wind, but, so it is, and I have never, during the entire course of my experiments, found it at fault in indicating the quarter the wind comes from, and that some little time before it comes. The final experiment was made to-day. I placed the instrument at right angles to a meridian traced on the floor, and left it to itself for one hour. When, on returning, I found it had changed its position, and pointed to the southwest. I timed it, and found that in fifteen minutes the wind came from the southwest (number 1 of the Smithsonian table). There had been nothing of note, in a meteorological point of view, for over one week, so that the magnetic currents could not have influenced the vane. ERNEST TURNER, C. E.

Philadelphia, Pa.

Suggestions about Steam Navigation and Steam Boilers.

MESSRS. EDITORS:—One of the greatest benefits your valuable journal confers is, that its columns afford a means of ready communication between all classes of inventors—those of the hand as well as those of the brain; and thus the floating, useless visions of the theorist meet, fructify, and utilize the barren though vigorous growth of the man of practice alone. The mechanic sets his wheels and gear, and calls for assistance; a spirit is breathed upon them which animates the mass. Encouraged by such reflections, I venture to send you some of my random ideas for publication. They *might* be flint to some ones steel. Concisely and briefly, then, in regard to steam navigation:

Robert Stevenson said, the problem here was how to diminish the friction of the vessel and the water; not how to increase the power of engines. Among others, two systems might accomplish this: The discovery of a new instrument, or new application of the old; or a change of naval construction.

First—taking it for granted, I am not quite sure, that the resistance is as the square of the depth, then a lessening of depth in the water, with same power, would increase speed. We need, therefore, as it were, to raise the vessel. If gas raises a balloon, it should raise a ship, and naturally suggests itself as the means. A ship contrived by the aid of gas, to draw only one, or a few feet of water, with a powerful engine, would seem, in theory, to solve Stevenson's problem. My objection is, the vast bulk of gas; but my calculations may be wrong. I suggest the use of gas, in this manner, as a subject for reflection.

I believe ships are now modeled after the fish because nature is supposed to have suggested it. They are made sharp and deep. I suggest, ships do not go through the water like a fish, but over the water like a duck. The water fowl is nature's model for those things which go over the water, flat, broad, and rounded. The objection of the effect of waves is futile. The center of gravity is at our disposal.

Another problem is to lessen the consumption of fuel. Now, a steam boiler consists of water in a metal vessel. When fire is applied, the metal absorbs a vast amount of heat, radiates, deflects, and otherwise destroys the effect of the fuel on the water. This is entirely due to the material of the boiler. What we want, then, is some agent which will hold the steam and water, while it will allow the direct action of the fire on the water—a substance which shall pass rays of heat as fully as glass does the rays of light—a heat-glass. Rock salt does so perfectly, so far as the heat is concerned, but is soluble and combustible. Can not some chemist give us a silicate of sodium which will answer? GEO. R. PHELAN.

Memphis, Tenn.

The Tidal Wave.

MESSRS. EDITORS:—The SCIENTIFIC AMERICAN, of November 13th, contains an article on this subject, copied from the London *Spectator*, and your readers are admonished editorially against overwhelming you with remarks on the same. It is, therefore, with hesitancy that I venture the following.

The drift of the paper quoted, is to show that by the tidal action, the rotation of the earth on its axis is retarded in consequence of the friction of the water, following the wave in its westerly and opposing direction to the earth's rotation. This is substantially the sum of the proposition.

Since the friction of the water is the retarding cause, how would the case stand if there were no water, or if solidified, and itself became friction, leaving a dry earth.

Trivial as this assigned cause, friction, appears, to disturb the precision of the earth's rotation, remaining undetected for ages, does it even exist, in an appreciable degree, or if so, is not its tendency to accelerate the rotation?

If we start with a swell or wave under the moon, the western course of her attraction would keep up the swell from the advancing or western side, and the eastern side would be constantly receding, *i. e.*, the source of renewal to the swell would be drawn from the advance and its decline eastward, by the retiring attraction of the moon. Hence, the friction of the water, both to and from the swell, would be in favor of acceleration. THOS. W. BAKEWELL.

Pittsburgh, Pa.

RAT POISON.—Recent experiments have shown that squills is an excellent poison for rats. The powder should be mixed with some fatty substance, and spread upon slices of bread. The pulp of onions is also good. Rats are very fond of either. —*Journal de Chimie.*

[For the Scientific American.]

THE SPECTROSCOPE AND AURORA BOREALIS.

BY DANIEL KNODE WINDER.

In a report of the proceedings of the Royal Astronomical Society, published in May last, there is a record of several interesting observations, concerning the spectrum lines of Aurora, which it is interesting to compare with several observations made on this side of the Atlantic Ocean. These observations promise to be useful in aiding us to determine the nature of the Northern Light.

In the report alluded to, Mr. Plumber tells us, that in the spectrum of Aurora, he saw one bright line in the green, near E.

Mr. Angström saw it as one bright line in the yellow, near D, and several faint bands, near F.

Mr. Struve observed one bright line, near D, and traces of two others in the green.

Professor Winlock has seen six lines, the brightest of which was near E.

The writer has frequently seen one bright line in the yellow, near D (coincident with one of a group of lines which appear in the solar spectrum, when the sun is near the horizon), and one faint line in the green. On one occasion there was visible one additional line in the red.

It has always proved a difficult task to determine, with certainty, the position of the spectrum lines of Aurora, and as the value of observations with the spectroscope rests principally upon our ability to do so, I am glad to find that the locations of eight lines have been announced.

The wave length of M. Angström's bright line is 556·7.

The lines seen by Mr. Winlock, he determines, micrometrically to be as follows: the bright line 1474, the other five lines, 1280, 1400, 1550, 1680, 2640, Kirchoff's scale.

The bright line seen by myself I found to be very nearly 557.

Now we learn from these observations: First, that the light of Aurora gives a spectrum consisting of bright lines; secondly, that the same number of lines are not always seen; thirdly, that the lines are fixed in their positions; fourthly, that the same line is not always the brightest; lastly, that one line in the spectrum of Aurora is coincident with a dark line, which appears in the solar spectrum, when the sun is near the horizon.

I was much pleased to find in No. 15, current volume, SCIENTIFIC AMERICAN, an interesting letter from Professor Vander Weyde, criticising the conclusions reached by M. Angström, and, also, those resulting from my own observations. To the objections which he urges against my hypothesis I will reply briefly, and, I trust, in the same kind spirit which he has shown in his criticism.

First, he objects because the spectrum seen by me is different from the spectrum of oxygen.

I reply, that this is a weighty objection to the opinion I have expressed, that Polar light is principally incandescent oxygen. But I have been led to this conclusion from the coincidence of the bright line in Aurora, with a line in Solar light, which I think it probable, is produced by oxygen, because of the density of that gas. The difference between the spectrum of oxygen and that of Aurora, does not seem necessarily to prove my opinion incorrect, for it is a well-known fact, that the spectra of elements vary according to the circumstances under which they are produced. For illustration, potassium usually gives a spectrum of only three of the seventeen lines of which it is known to consist. Again, the position of the hydrogen line, F, in the spectrum of Sirius is changed by the movement of the star, as it recedes from the earth. Again, carbon gives six differing spectra, according to the circumstances under which they are produced, and in these the same line is not always the brightest.

Secondly, Professor Vander Weyde objects, because of the presence of a line, in the spectrum, that has not been identified. I confess that I am at a loss to comprehend this argument, as I have only expressed the opinion that Auroral light is, principally, not exclusively, incandescent oxygen.

Lastly, he objects to my explanation of the change of the bright line to a black one. I reply, that I accept the common theory, explaining the change of solar lines from bright to dark ones; I never, for a moment, doubted it; but the line under consideration is not an ordinary solar line, but one that is seen only when the sun is near the horizon. and, therefore, seems to require a different explanation, and as it is not seen at midday, I conclude that it is darkened by absorption in its passage (morning and evening) through the earth's atmosphere.

I am happy to find so many distinguished scientific gentlemen interested in the subject of the nature of Aurora Borealis, and I entertain a hope that the observations made before the present season of Auroral displays shall have passed away, will enable us to explain more fully the nature of its phenomena.

Toronto, Ont., Nov. 15, 1869.

A NEW WHITEWASH FOR WALLS, recommended by the Boston *Journal of Chemistry*, is as follows: Soak one fourth of a pound of glue over night in tepid water. The next day put it into a tin vessel with a quart of water, set the vessel in a kettle of water over the fire, keep it there till it boils, and then stir until the glue is dissolved. Next put from six to eight pounds of Paris white into another vessel, add hot water and stir until it has the appearance of milk of lime. Add the sizing, stir well, and apply in the ordinary way while still warm.

"Paris white" is *sulphate of baryta*, and may be found at any drug or paint store.