THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN---PROGRESS OF THE WORK ---ITS PRESENT CONDITION---SOME ACCOUNT OF THE METHOD OF PROCEDURE.

We give herewith some engravings, showing various operations in the interior of the caisson at the Brooklyn terminus of the East River Bridge.

This caisson is now only nine feet from its permanent bed, and the sinking is progressing at the rate of about one foot per week. The interior is lighted by the oxyhydrogen light, or rather a light produced by the burning of jets of oxygen, and common illuminating gas in contact with pencils of magnesia.

Col. W. A. Roebling, the Engineer-in-Chief,informs us that these lights are almost absolutely essential to the rapid progress of the work, as they emit neither smoke nor odor, and the air in the caisson is in consequence kept pure and wholesome.

Three gangs of men—one hundred in each gang—and working eight hours each, are employed in the caisson, and the work proceeds without intermission night and day.

It will be just one year on the 1st of January since the first ground was broken, and the rapidity with which the work has proceeded is evidence that it is conducted by a man who is fully competent to conduct this greatest engineering feat of modern times to a successful issue. It is hoped that before the extreme cold weather of mid winter the caisson will have been sunk as low as necessary.

The caisson for the new York side is about one third done, and will be placed in position as soon as possible after completion.

Our readers have already been made acquainted with the nature and use of the caisson. It may be said to be a huge diving-bell from which the water is excluded by forcing into it air from a series of powerful air pumps worked by steam.

In this bell the men work in safety and comfort, excavating and blasting, and sending the broken and excavated material to the surface in a manner hereinafter to be described.

Fig. 1 represents the entrance to the caisson. It is a hollow iron shaft, having a vestibule or chamber communicating with the external air through a hatchway. Upon entering this vestibule the hatchway is closed, and the air from the caisson admitted through a hatchway in the floor of the chamber. To those unaccustomed to it, the pressure produces a series of very disagreeable sensations, which diminish somewhat after remaining a short time within the caisson. The lower end of the entrance shaft or "air lock," as it is technically called, is shown in Fig. 2.

The caisson in its descent requires the removal of a hard yellow clay in which are embedded large boulders which have to be broken up by blasting. Fig. 3 shows the workmen drilling one of these boulders situated under the shoe of the caisson. It not unfrequently happens that these boulders project some distance beyond the external edge of the shoe, and necessitate the passing out of workmen beyond this edge. This is done without danger, as the superimposed earth is of sufficient thickness to sustain the water resting upon it, the shoe of the caisson being now a considerable depth below the bottom of the river.

Our readers have been informed in previous articles, and in the report of Col. Roebling published in this journal in our issue of July 2, 1870, that the interior of the caisson is separated by partitions into chambers, from either of which the water may be expelled independently of the others.

Fig. 4 represents the interior of one of these chambers and the door which leads from it to an adjoining chamber of similar character. Through these doors the broken stone and soil are wheeled over plank-ways to the mouth of the water shaft at the bottom, shown in Fig. 5.

This shaft extends to, and below the general level of the bottom, a hole or "pocket" being dug out around and beneath it, and filled with water by hose. The pressure of air in the caisson causes the water to rise in the shaft, and the dredges are lowered through this water to clutch and scoop up the material to be removed, the clay, broken stone, and earth being dumped from the barrows into the pocket, and shoved under the foot of the water shaft by men with iron bars, as shown in Fig. 5.

The caisson with its load of masonry, now weighing upwards of 20,000 tuns, does not rest upon its shoe, and is only in part sustained by its floating power. The greater portion of the weight is sustained by timber frames, the uprights of which are sustained by blocks and wedges. To lower the caisson the wedges are driven partly out, and as the impact of the enormous weight in its descent often crushes the blocks and wedges, it is necessary to supply their place by new ones. This necessitates the use of considerable timber, which is sawn by hand in the interior of the caisson, as shown in Fig. 6.

The interior of the structure, with its manifold operations, all progressing with the utmost regularity, the whole illuminated by the brilliant oxyhydrogen light, forms a scene which, once seen, will not soon be forgotten.

Extraction of the Perfume of Hyacinths.

At a meeting of the Polytechnic Society of Berlin it was mentioned that the extraction of perfume from the flowers of southern France was at the present time only rarely effected by means of rectified bisulphide of carbon, and then only in the case of very fine perfumes, as in that of hyacinths, which cannot be extracted in any other way.

In all others the old process is still in use. Large plates of felt saturated with olive oil are put one above the other and covered every morning with the flowers, while the oil absorbing the perfume drops into a vessel below, the strength or the concentration of the perfume depending on the time during which the oil had been exposed to the flowers. It is strange that until now no perfume could be extracted from the flowers of mignonette.

Correspondence.

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

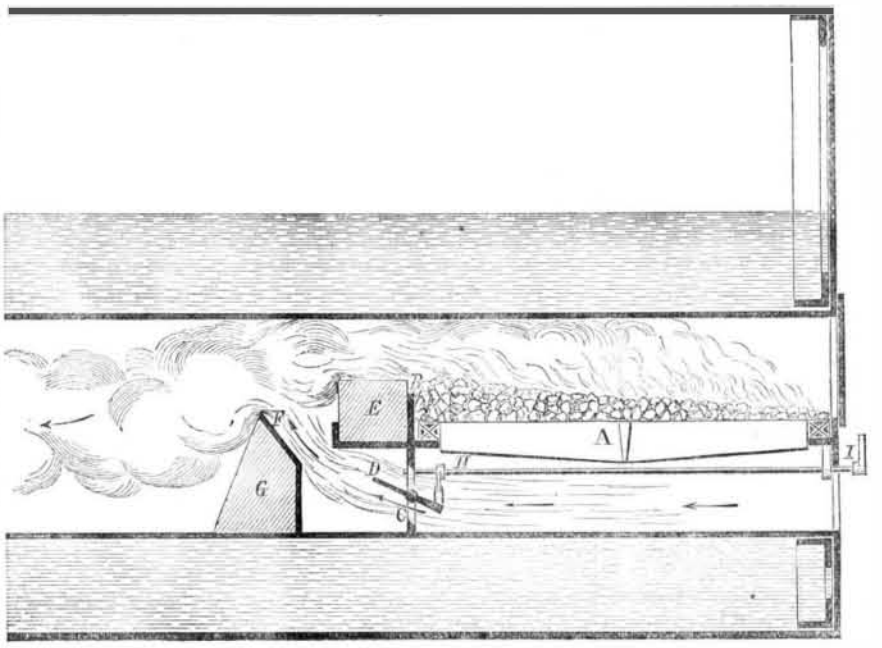
Smoke Consumption.

MESSRS. EDITORS:—In No. 17 of your paper you refer to the importance of a cheap and simple device for preventing smoke in furnaces and for the consumption of the same.

The accompanying sketch shows a simple and effective apparatus for this purpose, which I personally attached to a great number of boilers in Lancashire and Yorkshire (Eng.) a few years ago with perfect success.

The main feature of this smoke consumer is the admittance of warm air behind the fire-bridge, and at an angle to the smoke that comes from the fuel, when combustion of the smoke and gases takes place, and a colorless gas passes from the top of the chimney.

The following is a description of the drawing: A is the grate, the bars resting at each end on bearers. In the rear of the grate bars is secured a cast-iron plate, B, having an



opening, C, in its lower part. A movable damper, D, turns around a central pivot, by which arrangement fresh, warm air gets access to the space behind the fire-bridge, E.

Behind the bridge, E, is another cast-iron plate, F, the upper part of which is inclined so as to throw the fresh, warm air from C, suddenly into intimate contact with the smoke and gases from the fireplace. The combustion of the smoke and gases takes place immediately after the contact with the warm air, the result being an almost colorless gas.

By means of a simple lever arrangement, H and I, the damper, D, is connected to the hinge pin on the fire-door in such a manner that when the door is opened for the purpose of stoking up the fire or throwing in additional fuel, then is also the damper, D, opened automatically, and closed gradually, as it is found that a greater amount of air is necessary when fuel is added than what is needed when the coals are thoroughly ignited.

With this simple contrivance I have cured some of the worst smoking chimneys in Liverpool and Manchester (Eng.) from emitting black smoke, thus preventing a grievous nuisance besides saving from 10 to 15 per cent of fuel. Two men can easily fit an old flue with this apparatus in six hours.

ALBAN ANDREN, Constructing Engineer.

Boston, Mass.

Deflection of Beams.

MESSRS. EDITORS;—On page 230 of the current volume of the SCIENTIFIC AMERICAN, is a quotation from the *Builder*, in which the writer says that "Beams or girders of any kind, are acted upon by weights placed on them at stated places, inversely as the *squares* of the distances of such places to the supports."

Now every educated engineer in Christendom knows that the strain on beams and girders, resulting from a weight laid on them, at different points, varies as the *rectangle* of the segments into which the weight divides the length of the beam.

[By the former proposition, the strain on a beam, resulting from a weight at one fourth of the length of the beam from one of the supports, would be to that of the same weight on the middle of the beam as *one* to *four*; while modern engineers would tell us the strain at the two points would be as *three* to *four*, which makes a wide difference.

Again, in the next paragraph the *Builder* gives us to understand that the *strength* of beams varies inversely as the *square* of the length, while all writers and experimenters on stress and strength of materials, concur in telling us that the *strength* of beams varies (the other dimensions remaining the same and alike) as the *length*, inversely—not as the square of the length. By the *Builder*, a beam ten times the length of another, of the same size in other respects, would have but $\frac{1}{100}$ of the strength of the shorter one; whereas by the principle now unanimously recognized by all educated engineers, and which are as thoroughly established by experiment and analysis as are any of the truths of experimental philosophy, the strength of the longer beam would be $\frac{1}{10}$ that of the shorter one.

Can the *Builder* explain his anomalous statements?

Ferrysburg, Mich. H. C. PEARSONS.

[The criticisms of our correspondent on the statements made in the article from which he quotes, are just, and anticipate some remarks we intended to make on the subject, but which by mistake were not published in connection with the article referred to at the time of its publication. As Mr. Pearsons has covered the ground fully, we recommend a careful comparison of his statements with the false teaching of the *Builder*.—EDS.

Auroral and Magnetic Periods.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of Oct. 22, you quote from Prof. Langley the statement, that the magnetic needle moves responsive to the great changes that transpire in the sun; and that our winter sky is lit up by auroras more frequently when the solar action is most violent. The fact, he says, is certain, though the cause is still wholly unknown to science. That is, we have Prof. Langley for authority, that the scientific world regard the fact as established, that auroras depend upon, or are, in some way, influenced by physical disturbances in the sun, and that the magnetic needle is, also, directly or indirectly influenced by the same cause. But how this influence is produced, he says, is as yet wholly unknown to science. It may not be amiss, therefore, to attempt a possible explanation or answer to the question.

How do physical changes in the sun produce auroras, and influence the magnetic needle on the earth?

Light and heat are now universally admitted to be sensations produced by vibratory motion of a material body, the luminiferous ether; and, from the known phenomena of light and heat, we infer that this body, the ether, possesses elasticity and inertia, but not gravity. (See "Brande's Encyc., Art. "Light.")

We may assume, therefore, that infinite space is pervaded by an inert, but non-gravitating, elastic fluid; and that it is through the medium of this fluid that all our knowledge of the universe, outside the little world we inhabit, is derived; and, also, a very large portion of the knowledge we get of our immediate surroundings. The ether being inert, elastic, and non-gravitating, will, necessarily, be less dense within and immediately around revolving bodies, than at a distance from them; for, being inert, it will, from centrifugal force, recede from the center of rotation; there will, therefore, be a continual tendency to the formation of an ethereal vacuum along the axis of rotation, and an equilibrium along the center of rotation can only be sustained by an in-flowing current of ether from the polar regions of the revolving body. We have, therefore, of necessity, within and about all revolving bodies, not only the phenomena of light and heat, from ethereal vibrations, but, also, an ethereal motion of translation, and this motion of translation will always be outward about the equator and middle latitudes, and inward about the poles. We might, *a priori*, be led to expect some tangible indication of this ethereal motion of translation about the earth, as the earth has a tolerably rapid rotary motion. Have we any such indications? I answer, we have in the phenomena of magnetism and the auroras.

Science has hitherto failed to assign any rational cause for the phenomena of magnetism. In order that we may understand how a motion of translation of the ether may produce the phenomena of magnetism, we must assume that, though the vibratory motion of the ether is arrested or reflected by all opaque bodies, yet, in its motion of translation, it passes freely through most bodies, but the molecules of a few bodies, such as iron and steel, may be so arranged as to be impervious to the ether in one direction, and yet transmit it freely in a direction at right angles with the impervious axis. Let such a body be balanced on a pivot, and, like a vane, it would indicate the direction of an ethereal current by the impervious axis assuming a direction at right angles with such current. We have here, obviously, a possible physical explanation of magnetism.

When the atmosphere flows through a forest of trees, we hear an audible sound, which is the result of vibratory motion of the air produced by interference with the trees. So in the upper regions of the atmosphere, an ethereal current might encounter sufficient interference from the molecules of the atmosphere to produce vibratory motion of the ether of sufficient intensity to be recognized by the eye as the auroras.

Let it be granted, now, that we have assigned the true cause of magnetism and the auroras, should we expect these phenomena to indicate any great physical movements in the sun?