POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The regular weekly meeting of the Association was held in their room at the Cooper Institute on Thursday evening, May 22d, the President, Prof. Joy, in the chair.

The President announced the regular subject of the evening to be

ILLUMINATING MATERIALS,

and as he proposed the subject, he proceeded to open the discussion.

Illuminating materials are found in all three forms of matter : solid, liquid and gaseous. They generally contain hydrogen and carbon, and the light is emitted by the carbon while it is in an incandescent state, after it is heated by the burning of the hydrogen, and before it is itself consumed. I have in my hand a list of some 16 or 18 materials which have been used for producing light.

One of these is tallow. This has been used from time immemorial. Some of the vegetable oils have also been used from the most ancient times of which we have any knowledge ; among these are palm oil and olive oil. In Greece, 2,000 years ago, they used lamps essentially the same as those which are used in some countries at the present day. I hold in my hand an earthen lamp that was dug from the ruins of Athens. It has a handle upon this side and this is the place for the wick. The material burned in it was probably olive oil. It differs, you see, but very little from the lamps which we use, and all over Germany the workmen use lamps precisely like this, only their lamps are made of tin.

Dr. STEVENS—Earthen lamps are used extensively in the western part of this country.

Prof. JOY (continuing)—The kind of fat, either animal or vegetable, used for illuminating in any country, is determined by the supply ; it is a mere question of economy.

Besides the hydrocarbon compounds, there is a class of substances of a different character employed for the production of light. Among these are lime in oxyhydrogen light ; the carbon points for the electric light ; magnesium ; and quicksilver.

Magnesium produces one of the most intense lights that we have. It is only necessary to light the end of a very small wire of pure metallic magnesium in an alcohol flame, when the wire is consumed, giving out a very brilliant light. I have tried the experiment, but it is a disagreeable one to perform, on account of the effect of the light upon the eyes. It is some time after looking at the magnesium flame before the eye is able to see ordinary objects in a room. The experiment should not be tried without providing protection for the eyes. The light in this case comes from the oxide of magnesium. The metal combines rapidly with oxygen, generating a heat which makes the oxide formed, the magnesia, incandescent, and it is this white hot magnesia that emits the light. The magnesium light might be utilized by winding a long wire of the metal upon a reel or bobbin, and unrolling the bobbin to feed forward the wire as it is consumed, were it not for the high cost of the metal. It exists in large quantities, especially in this country. At Hoboken there are deposits of porphyry which contain magnesia, and in Westchester county are beds of dolamite, composed to a large extent of magnesia. Magnesium is abundant ; the difficulty is to separate it from the oxygen and other substances with which it is combined.

Quicksilver is used to conduct a stream of electricity. (The speaker then described Way's electric light, the same that was illustrated not long since in the SCIENTIFIC AMERICAN.)

Mr. BABCOCK—I should like to hear the President's account of the Drummond light.

Prof. JOY—I spoke of that in passing. It is very improperly called the calcium light—there is no calcium in it except as lime, the oxide of calcium. The oxyhydrogen light is formed, as you are probably all aware, by heating a bit of lime in the flame of the oxyhydrogen jet. The lime must be chemically pure, and it is consequently necessary to prepare it for the purpose. It is precipitated from a solution, and thus obtained free from silica or any other substance. It is then pressed in a powerful hydraulic press, in order to make it hard enough to be sawed into pieces of suitable size. Lime is used because it cannot be fused, and under the intense heat of the oxyhydrogen jet, it gives out the brilliant light with which you are all familiar.

The oxyhydrogen flame is formed by burning pure hydrogen gas in pure oxygen. The gases are retained in separate vessels, and are mixed just as they issue from the pipes. The hydrogen pipe surrounds that which conducts the oxygen, and the oxygen pipe is now made to protrude a very little beyond the end of the hydrogen pipe. This is the latest improvement in the oxyhydrogen light.

Dr. STEVENS—The President forgot to mention one substance in his list of illuminating materials—bayberry tallow. This is used to considerable extent. It is a vegetable tallow, produced by the bayberry bush.

Mr. STEVENS—The Balm of Gilead tree produces a tallow which has been collected and made into candles. Each bud has a small quantity of tallow, and if the buds are placed in hot water the tallow is melted, and may be skimmed from the surface. I have collected a very little of this myself, and I have heard my mother say that she and her mother collected one year enough to serve for light for several months.

The PRESIDENT—Will Prof. Seely give us the chemistry of illuminating materials?

Prof. SEELY—The more I think of the matter, the more am I amazed at what chemistry enables us to do. If you bring us a candle we do not need to light it in order to tell you what it is worth. A hydrocarbon, to give the most light, should have the hydrogen slightly in excess. If the carbon is in excess there will be smoke. It has been frequently talked over here and is now generally understood, that the light comes from the carbon, heated to a white heat. It may, perhaps, be more easily comprehended if it is presented thus : Suppose we had a quantity of carbon, in the form of coal for instance, which we wished to burn in the way to get the most light from it possible, how should we wish to arrange it? We should want it in a thin stratum so as to expose a large surface, and we should wish to keep it hot as long as possible before it was burned, for as soon as combustion took place it would be converted into invisible gas, and would cease to give out light. Finally, we should want it in small pieces, so that the light might be soft to the eye. We have no means of arranging carbon in this way. But nature makes the arrangement beautifully. By combining atoms of carbon with atoms of hydrogen, which separates at a lower temperature than carbon will burn at, the carbon is heated before it is burned ; and as the hydrogen occupies much more space than the carbon, the carbon atoms are enveloped by the hydrogen, and thus kept from burning until the hydrogen is consumed. The burning, too, is confined to an exceedingly thin film on the outside of the blaze, and thus the illuminating power of the carbon is fully utilized.

Mr. President, we have had a very grand exhibition this afternoon of combustion of illuminating materials. Some 18,000 barrels of petroleum oil have been burning in Williamsburg, and if it had occurred in the night, I have no doubt that we should have had the finest illumination that has ever taken place. As it was, the smoke as seen even from the lower part of the city, made the most magnificent spectacle that I have ever seen. The *Express* says that the fire originated from an explosion which occurred in one of the vessels which were lying at the wharf discharging petroleum. The account says that after the explosion in the vessel, a barrel on the wharf exploded, and the word explosion occurs half a dozen times in the account. I have no doubt that we shall have a discussion in the papers whether petroleum will explode. Some people seem to think that if you touch a match to a cask of petroleum it will go off like gunpowder, and there is quite a common notion that rock oil will explode. It will not do it. The explosion occurs in this wise : Petroleum has the property above all liquids of passing through capillary tubes. If you put it into a wooden barrel it will go right through the staves, and the barrel will be greasy directly on the outside. The most volatile portion passes through the most readily, and when this, in the form of vapor, is mingled with the atmosphere in a confined place, as the hold of a vessel, an explosive mixture is formed. Petroleum is not explosive ; but a mixture of the vapor of petroleum with atmospheric air is explosive ; and this mixture can be formed only in a close chamber. The question is similar to the famous one, "Will Saltpeter explode?" and the answer is analogous. Saltpeter alone will not explode, any more than a stick of wood or a brick ; but when saltpeter is mixed with any combustible, the mixture is explosive.

Mr. CHURCHILL—I understood Prof. Seely to say that many of the hydrocarbons in burning would necessarily smoke. I made a great many experiments with lamps while on the committee last winter, and I have continued them since, and I think there is no fat that can not be burned without smoke in a still atmosphere, if the lamp is not moved about.

Prof. SEELY—You must have misunderstood me ; I agree with you entirely.

The PRESIDENT—There are a few minutes left, will any one make any remarks or ask any questions ?

I will inform the Society that I shall leave the country in a few days for Europe, and I shall regard myself as a sort of traveling agent of the Society at my own expense. I shall try to learn everything of interest to this association, especially the working of similar societies, which I shall communicate to you on my return, as occasion may offer. Since I have had the honor to preside over your meetings, I have become exceedingly attached to the work. I shall be absent five months, and perhaps you ought to take some steps to provide a presiding officer during my absence.

Mr. DIBBEN—Mr. President, during the summer months it has been our practice to discontinue our meetings, and in the few meetings that we shall hold during your absence, we can choose a chairman *pro. tem.*

On motion of Mr. Fisher, the thanks of the Society were voted to the President for the firm and satisfactory manner in which he had presided over the meetings.

The subject of superheated steam was chosen for the next meeting, and the Society adjourned for two weeks.

Matters of Interest in the English Exhibition.

We extract the following from the *Mechanics' Magazine*:—

In 1858 Messrs. Harvey and Co. erected, for the Southwark and Vauxhall Water Company, at Battersea, a pumping-engine, the cylinder of which is 112 inches diameter, and weighs 36 tuns. This engine, though the largest and most powerful ever built for such a purpose, is of the most simple construction. The steam valves are all on the equilibrium principle, and the arrangement of parts is throughout such that this colossus of engines, so to speak, is as completely under the control of a pigmy, but intelligent engineman, as is the small engine in a factory.

The quantity of water pumped up for the supply of London daily amounts to 115,000,000 gallons. Of this enormous quantity 79,000,000 of gallons are pumped by means of single-acting engines on Harvey's plan. In fact, the reputation of this firm for gigantic pumping-engines is world-wide. Those who have time to visit Battersea and Lea-bridge, where the originals of the models referred to exist, would find that they were amply repaid for their trouble by an inspection of them.

The American steam fire engine, forwarded by Mr. Hodges, of the Lambeth Distillery, we have before spoken of, but why it should be placed in a corner, where it is difficult for its merits to be disclosed, is a question for the Commissioners, whose ways are difficult to comprehend or account for.

Of traction engines and highway locomotives there are several varieties. Those of Robey & Co., of Lincoln, are not the least excellent of them.

JUST now the civilized nations of the world derive their chief revenue from tobacco. Without it the Pope would be bankrupt in a month. Last year the English government derived $28,000,000 revenue, and the French $36,000,000, from the weed that vanishes in smoke. Tthe greater part of the tobacco which yields to foreign powers their chief revenue is grown in America.

THE number of horses in the world is estimated at about 27,000,000 ; of this number, the United States have 5,000,000. The general estimate has been eight to ten horses in Europe for every hundred inhabitants.

One of the New Explosives.

At a recent meeting of the Royal Institution of Great Britain, F. A. Abel, Esq., F. R. S., delivered a lecture on some of the causes, effects and military application of explosives, from which we make the following extracts :—

Here is an explosive substance belonging to this class, of very recent origin, a member of a most interesting family, one of the derivatives of that remarkable substance, aniline, to which we are indebted for those beautiful new colors, mauve and magenta. It is curious that this body, aniline, which has become of such importance in connection with arts and manufactures, should also exhibit what may be called "warlike tendencies." By the action of nitrous acid at a low temperature upon aniline, the explosive substance to which I refer is produced. This singular body rejoices, I am happy to say, in the comparatively simple name of *nitrate of diazobenzol* ; compared with the names which are possessed by some of the members of this family, this is certainly not a hard one. [A small quantity was exploded on copper foil, which was shattered.] You see that it appears quite equal in its explosive power to fulminate of silver. I cannot help devoting a few moments to a comparison of its explosive properties with those of fulminate of silver. The silver compound explodes with a slight touch given by a hard substance ; whereas this new compound can actually be rubbed between hard surfaces without exploding ; at least, I have found it so on frequent occasions, although I have finally exploded it in that way. Some time is necessary, however, for producing, by friction, the requisite heat for its decomposition. The slightest touch, you observe, explodes fulminate of silver, and it does not admit of being rubbed. The *nitrate of diazobenzol*, when compared with the fulminate in this way, appears to be the less explosive substance ; and yet, when directly exposed to heat, it is certainly the most sensitive of the two. If we expose the fulminate of silver in this little tin tube to the heat of boiling water, I think we shall find that it is not affected. [The experiment was performed with the result anticipated.] But if I heat, in the same manner, a little of this fulminate of aniline—if I may use the term—(although there are one or two compounds, also derivatives of aniline, still more recently discovered by Dr. Hofmann, which may claim the title), if I similarly heat this *nitrate of diazobenzol*, you will find that it will undergo decomposition as soon as the tube has reached the temperature of the water. There we have a very violent explosion ; the tube is shattered, and has been thrown out of the water-bath by the force of the explosion. The fulminate of silver has not exploded, but we had better get rid of it. I shall be able to explode it by exposing it to this source of heat [the flame of the spirit lamp], for it explodes at more than double the temperature of boiling water, or about the temperature of melting tin, so that as soon as the tube begins to melt, the fulminate of silver will explode. [The explosion shortly ensued.] We see, therefore, that this fulminate of silver appears far less sensitive, when exposed direct to heat, and more sensitive when submitted to friction, than the derivative of aniline.

A very slight examination into the effects of fulminate of mercury and of gunpowder, employed under the same circumstances, will illustrate the difference in the effects produced by substances which explode with different rapidity. Let me first compare the rate of combustion of those two substances. Here is a small train of fulminate of mercury, and here is a similar train of gunpowder. You observe that the flame travels much more rapidly along the train of fulminate than along the gunpowder. This difference will prepare you to believe that the effect of the two when confined in vessels must be different. Here are the fragments produced by the explosion, in a small shell, of 100 grains of fulminate of mercury ; the number (amounting to one-seventh of the weight of the shell) were, however, so small that they could not be recovered after the explosion. Here are the fragments of a shell of the same size exploded by 765 grains of gunpowder. The difference between the size and number of the fragments in the two instances is very striking. In the case of the fulminate of mercury the explosive effect is exerted almost instantaneously in all directions, and the shell is therefore shattered into a very large number of fragments, the force of the explosion being almost entirely spent upon the bursting of the shell ; while in the case of gunpowder, the explosion being comparatively gradual in its nature, the force developed is only partly spent upon the fracture of the shell, and is still in course of development when this result is produced ; hence, not only are the resulting fragments much fewer and larger, but a considerable projectile force is exerted upon them after their production, and they are consequently scattered to a much greater distance than those produced by the employment of fulminate of mercury.

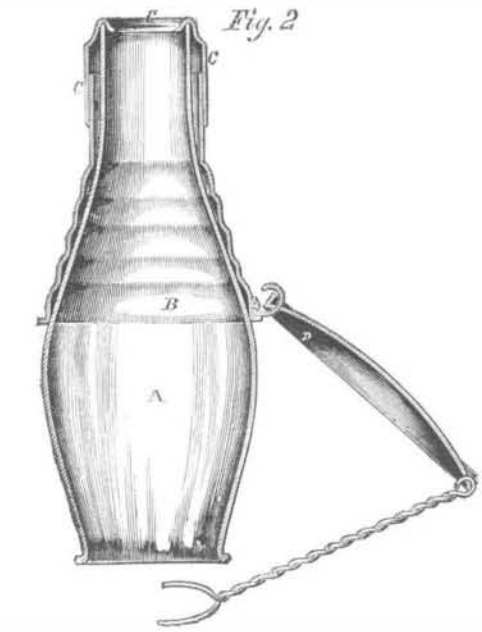
COLBURN'S PROTECTOR AND REFLECTOR FOR GLASS-LAMP CHIMNEYS.

The principal cause of the breaking of glass-lamp chimneys, which occurs so frequently, is the unequal expansion and contraction of the glass. When the

Fig. 1

lamp is first lighted, the upper portion of the chimney, being narrow, is in close proximity to the flame, and it is also exposed to a current of hot air ; it, consequently, becomes heated more quickly than the bulb below, and as the heated portion expands while that which is cool does not expand in the same de-

Fig. 2



gree, a fracture necessarily ensues. If glass was a good conductor of heat instead of being one of the poorest known, the heat would be rapidly conducted to all parts of the thin chimney, and the breaking would not occur.

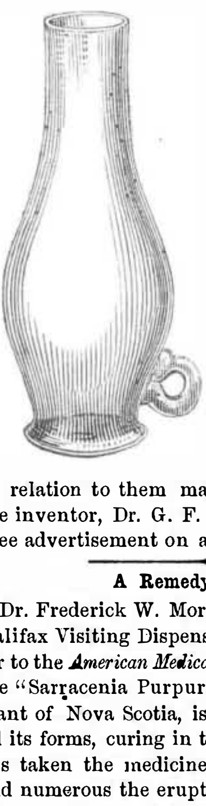
The accompanying engraving illustrates a device for conducting the heat rapidly over the whole surface of the chimney, and thus preventing it from being broken. The upper portion of the chimney is surrounded by a thin cap of tin, or other metal which is a good conductor of heat, and as the upper portion of this cap is heated, it leads the heat downward ; spreading it over the glass so rapidly as to prevent the unequal expansion by which fractures are produced.

Fig. 1 is a perspective view of the device, and Fig. 2 is a vertical section. A represents the chimney, and B the cap. The cap is made in two parts, the upper portion, C, fitting upon the lower portion, forming a telescopic joint, so that the length of the cap may be varied to suit chimneys of different hights. The tube, C, has its walls bent inward at the upper end, hooking over the upper edge of the chimney to hold it in place, as clearly shown in Fig. 2.

The inventor says that he has tried this cap thoroughly, putting the chimneys ice-cold upon lamps and raising the blaze to the highest point at once, and that it proves to be a perfect protection even to the cheap unannealed chimneys in common use.

The cap, D, affords a convenient hold for the reflector, D, which is the secured feature in this invention. This reflector has its lower surface concave and plated with firmly-polished silver or other metal of high reflecting powers. It is attached to the lower edge of the cap by a hinge, and is braced to the proper angle to reflect the light downward by a forked wire the lower end of which rests upon the flange at the lower end of the chimney. While this reflector effectually shades the eyes, and throws the light upon the book or work below, it does not cut off the light from the room, as does an ordinary paper shade.

A third improvement in lamp chimney, designed by the same inventor, is represented in this little cut. It is simply the forming of a glass handle upon the chimney near its lower end, for removing the chimney when the lamp is burning. The location of this handle prevents it from becoming heated, and the inventor says that it insures the annealing of the chimney by the manufacturer, as chimneys cannot be made with this handle without being annealed.



Patents for both these inventions have been applied for, and further information in relation to them may be obtained by addressing the inventor, Dr. G. F. J. Colburn, at Newark, N. J. [See advertisement on another page.]

A Remedy for Smallpox.

Dr. Frederick W. Morris, resident physician of the Halifax Visiting Dispensary, N. S., has written a letter to the *American Medical Times*, in which he states that the "Sarracenia Purpurea," or Indian cup, a native plant of Nova Scotia, is the remedy for smallpox in all its forms, curing in twelve hours after the patient has taken the medicine. That "however alarming and numerous the eruptions, or confluent and frightful they may be, the peculiar action of the medicine is such that very seldom is a scar left to tell the story of the disease." If either vaccine or variolous matter is washed with the infusion of the sarracenia, they are deprived of their contagious properties. So mild is the medicine to the taste that it may be largely mixed with tea and coffee and given to connoisseurs in these beverages to drink without their being aware of the admixture. The medicine has been successfully tried in the hospitals of Nova Scotia, and its use will be continued.

Power of Imagination.—In illustration of the power of imgination, the case of the old lady who watched the vane, to see when her rheumatism was going to begin, is not equal to that of the storekeeper, who painted the lower part of his stove red, and saved seventy-five per cent in the consumption of wood thereby during the winter. The illusion was so complete, that one man tried to make him pay for a pair of boots that he had burnt on the stove.

Upward of three thousand applications have been received from young women wishing to be engaged as waiters to the London Exhibition.