

coal in 12 hours, after lighting the fires, against 24 to 36 hours in the old furnace.

The new or "open tank" glass furnace is built of fire-brick, and is of the subjoined modest proportions. The "tank," holding 6,000 pounds of glass, is 7 by 5 by 2 feet. Across one end of this space, and separated from it by a fire wall, is the furnace or fire box. This is simply a fireplace, 30 inches square, furnished with grate bars, and not differing in appearance from the ordinary furnace under a steam boiler. To this fire box is led air from a rotary blower. This finds its way to the grate bars and through flues in the surrounding wall. In the latter instance this air becomes intensely hot before escaping through suitable openings and mingling with the products of the burning coal. So mingled, air, smoke, and gases blend in a flame of intense heat, and following the draught pour over the fire wall and down upon the tank, converting the "batch" into molten glass in the time stated. It should be added that the old style furnace, with its great mass of brickwork, requires two weeks of continuous firing to make ready for melting, and that skilled labor, "teasing," is necessary to properly preserve the pots from undue heat or cold.

The new furnace is the invention of Mr. Thomas Atterbury, of Pittsburg, and an inspection of the operation of the gas furnace warrants the supposition that the days of the old style and time honored furnace are numbered.

TREES IN CITIES.

An interesting paper has been recently read by Dr. Phené at Edinburgh on the benefits to be derived from planting trees in cities. Among the beneficial results to be attained are, he stated, the relief to the optic nerve through the eye resting on objects of a green color. Just that which is effected by the use of green or blue glasses in strengthening and sustaining the power of sight, is attained, or, at any rate, much aided, by the presence of green in nature; and in streets the only method to procure this result is by planting trees. It was pointed out by the author that wherever opportunity exists nature provides green and blue (the latter being the same color minus the presence of yellow), and that as the absence of color produces snow blindness, and in tropical calms, where the ocean presents only a white reflected light from a uniform glassy surface, reduced optical power soon follows a long continuance of the absence of blue color, which becomes immediately apparent on motion of the waves.

So in the streets, to the occupants of houses having a northern aspect, the glare of the reflected light is injurious; but the effect would be much modified by the coolness to the eye produced by the green of trees. In ancient surgery, persons having weak or declining sight were advised to look at the emerald. In the old style of building, the streets being narrow, were both cooler, from the sun not being able to penetrate them with direct rays, and less subject to noxious exhalations from the scouring and purifying effects of the searching air to which the narrow streets were subject, so that while there was no space for trees there was also less necessity. Wide streets, on the contrary, are hotter, and require the shade of trees to cool them; and, as in the case of London, which had so far done without trees in its streets, it was pointed out that not only are modern streets compulsorily wide, but that the enormous increase in metropolitan buildings render every sanitary question one of importance; and the chemical properties of trees as shown by experiment give them an important standing, irrespective of ornament or the pleasure they produce. Some of Dr. Phené's experiments on this subject have extended over a period of thirty years, and he it was who first tried the planting of trees in the streets of London. Since the reading of a former paper by him at Manchester, wherein the importance of the subject was pointed out, a number of streets in wealthy localities have been planted, and even Trafalgar Square, in the heart of the metropolis.

SINGULAR DISCOVERY IN CONNECTION WITH PHOSPHORESCENCE.

The property possessed by certain metallic sulphides and other phosphorescent bodies of absorbing light when exposed to its influence, and giving out the same when brought into a darkened room, has long been known to scientists, but it is only quite lately that efforts have been made to utilize such properties. Of these, the most striking consisted in spreading a sulphide of this nature upon a flat tablet and exposing it to strong light for a few seconds under an ordinary photographic negative. Upon removing the tablet thus impressed into a dark room, the picture on it will be found to be glowing in quite a mysterious and wonderful manner, and it will continue for some minutes to radiate the light which it absorbed.

It has occurred to an ingenious physicist, A. L. Henderson, to mix one of the most sensitive of these phosphorescent metallic sulphides with the bromide of silver, now so generally employed in the preparation of photographic dry plates, and, after emulsifying this mixture with gelatine, spreading it upon the surface of glass plates, and treating the same as ordinary ones except in so far as regards the exposure, which must be momentary. He appears to have reasoned in this way: With even the briefest exposure capable of being given, a certain modicum of change will be produced on the sensitive bromide of silver, although manifestly such as will be incapable of yielding a properly developed image. But the light also falls upon the atoms of the phosphorescent powder incorpo-

rated in the films: and as these in turn radiate such light, it follows that they will complete the imperfect exposure set up in the bromide by the direct action of the light.

This reasoning has been found correct, and the result at present stands that plates have been prepared having such exceeding sensitiveness as to be well impressed by what Mr. Henderson designates "the flash of a match."

Phosphorescent sulphides may easily be prepared by heating the carbonate of lime, of barytes, of strontia, or other carbonate found most suitable, in a covered crucible with half its weight of sulphur. After an hour's exposure to heat the preparation is complete and phosphori are obtained which, upon being briefly exposed to light and then withdrawn into a dark room, will be seen to glow brightly, the color of the light emitted depending upon the nature of the carbonate originally selected.

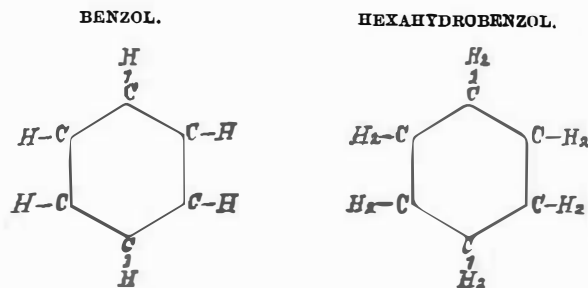
This application of a well recognized fact in phosphorescence is so novel, and calculated to be of so much use, that we have no doubt its progress toward development will be rapid.

A DESCRIPTION OF CAUCASIAN PETROLEUM.

It has been known for years, if not for centuries, that combustible gases escaped from the earth at Baku, in the Caucasus, yet no one seems to have suspected that Baku was destined to become as famous for its oil springs as our own Pennsylvania. Recently, however, the production of Caucasian petroleum has been such as to interfere with the sale of American petroleum in Russia. Two of the foremost chemists of St. Petersburg, Messrs. Beilstein and Kurbatow, have subjected this oil to a critical examination, which is given in full in the *Berichte* of the German Chemical Society.

The peculiarity of this petroleum from Baku consists of its high specific gravity as compared with American petroleum of the same boiling point. For a long time this fact caused the consumers to be mistrustful of their own oil. Wilm and Biel, however, proved that the Russian oil gave ten per cent more light than the American, and Biel also found that the illuminating oil even of this high gravity was drawn up the wick to the flame more easily than the American oil. Since that time the public prejudice has disappeared, and the importation of American oil into Russia has as good as ceased entirely. The high gravity of Caucasian oils is taken advantage of by the manufacturers of lubricating oil, and at present a lubricator with a gravity of 0.940 is made without adding any solid substance, which has already found extensive use in Europe.

The oils examined by Beilstein and Kurbatow was the first distillate obtained by a careful distillation of crude oil. Although they submitted it to fractional distillation nine times with the aid of Glinsky's dephlegmator, they did not succeed in obtaining any products with constant boiling points. That which boiled below 176° Fah. had a specific gravity of 0.717, while American petroleum of like boiling point had a specific gravity of only 0.669. The portion distilling over between 200° and 212° had a density of 0.748, the American of 0.699. At first they were inclined to attribute this to the admixture of hydrocarbons of the aromatic series like benzol, C_6H_6 ; toluol, C_7H_8 , etc. On shaking it with fuming sulphuric acid they were unable to detect a trace of any aromatic hydrocarbon. An ultimate analysis of that boiling about 185° corresponded nearly with the formula C_7H_{14} , while the American oil of 205° to 212° is nearly C_7H_{16} , showing that the Caucasian petroleum is poorer in hydrogen than the American. Yet it does not consist of homologues of ethylen (C_2H_4), because bromine did not act upon it until heated, when hydrobromic acid was copiously evolved, showing that substitution had not taken place. A farther study of these products convinced these investigators that they were dealing with the hydrogen addition products of aromatic hydrocarbons, such as hexahydrobenzol C_6H_{12} , hexahydrotoluol C_7H_{14} . The graphic formula of the former is given below:



A very unusual circumstance for a petroleum was the action of nitric acid (sp. gr. 1.38). When boiled until red fumes ceased the acid liquid contained acetic and succinic acids; the oily portion contained a liquid boiling at 410° to 420° Fah., and having the formula, $C_6H_{11}NO_2$. This may be either a nitrous ether, or a true nitro-compound, a very surprising fact in petroleum.

The different petroleum wells of the Caucasus yield oil of varying composition, according to their situations. Those examined came from the wells of Messrs. Von Benkendoff. Others will soon be examined by the same persons.

October 8, 1880.

B. B.

Chemical Research by Means of Photography.

By the use of the electrical spark and a photographic apparatus the presence of very minute quantities of certain substances in certain liquids may be readily detected. The

liquid to be examined is placed in a vessel, the sides of which are composed of quartz, which is one of the few purely transparent substances. If one part, by weight, of the coloring matter known as anthracene is mixed with fifty million times its weight of alcohol the presence of the color may be detected by a gelatine plate photograph taken as above, which will show the characteristic bands of the absorbed rays pertaining to anthracene.

ELECTRO-METALLURGY.

SILVER DEPOSITS.

For electro-silver plating the double salt of silver and potassium cyanide is almost universally employed. The baths are used either hot or cold. The latter method is generally adopted for articles which require great solidity. The hot process is used for small articles, and is preferable for steel, iron, zinc, lead, and tin, which have been previously electro-coppered. The hot baths are generally kept in enameled cast iron kettles, and the articles are either suspended or moved constantly about in them. A somewhat energetic current is needed, especially when the articles are moved about in order to operate rapidly. A gray or black deposit indicates too strong a current, and when the surface becomes covered with bubbles of gas the same thing is indicated. The anodes are plates of silver or heavy silver foil. The wooden tanks for the cold baths are similar to those used in plating with copper and nickel, but should be very thoroughly coated on the inside with gutta-percha.

THE BATH.

Water (soft).....	1	gallon.
Cyanide of potassium (pure).....	8	ounces.
Nitrate of silver.....	5/4	"

Dissolve the nitrate of silver in a sufficient quantity of pure water (soft), and add to it gradually, with constant stirring, hydrocyanic (prussic) acid until all the silver has been precipitated as cyanide, which may be known by the formation of no cloud in a portion of the clear liquid when a drop of the acid is added to it—avoid adding an excess of the acid. Throw the precipitate upon a fine cotton cloth filter, and as the liquid runs through wash the precipitate on the cloth several times with pure water. Dissolve the cyanide of potassium in the water, and stir in the cyanide of silver carefully removed from the cloth. If it does not dissolve in the liquid entirely, add more cyanide of potassium until it does, stirring continually. Let the impurities settle, and the bath is ready for use. Many electroplaters use a preliminary or silver "whitening" bath, which is the same composition, but contains less silver, more cyanide, and is worked with a somewhat stronger current.

The cleaned article in some cases is first dipped for a few moments in a solution of nitrate of mercury, one ounce in one gallon of water, and then in the whitening bath for a few minutes, and after brushing is transferred to the silver bath proper.

The vessels containing the cold bath are sufficiently high to allow about four inches of liquid above the immersed objects, whose distance from the bottom and sides should be nearly the same to give a regular deposit of metal at both ends of the object.

The upper ledge of the trough carries two brass rods all around, which do not touch one another, one above the other, so that other metallic rods placed transversely will rest upon the higher or lower series of rods only. The upper rods are connected with the zinc, the lower with the carbon or copper end of the battery, or with the corresponding poles of the dynamo-electric machine. The transverse rods resting upon the lower set support the silver anodes; those resting on the upper set, the work. The work suspended from an upper transverse is placed so as to face two anodes suspended from two lower transverse rods.

As the lower layers of the bath are apt to become denser (richer) than the upper, it is often necessary to reverse the articles during the operation to obtain a perfectly uniform thickness of deposit. For the same purpose small articles should be kept in motion as much as possible.

The deposit is finer and denser if obtained with a weak battery and long exposure than if a strong current is employed. A sufficient quantity of silver may be deposited in three or four hours, but it will be of much finer quality and more easily burnished if the work is left in the bath for twelve or fifteen hours with a few cells of battery.

When the articles, especially coppered iron, etc., have acquired a coherent film of silver, they are sometimes removed from the bath and thoroughly scratch-brushed, cleansed in alcohol, or preferably in a hot silvering bath, thence again passed through the mercurial solution and finished in the cold plating bath.

The first scratch-brushing, which is not always necessary, obviates the tendency of certain alloys to assume a crystalline appearance and corrects the imperfections of the cleansing in process.

Should the anodes become black during the passage of the current the solution contains too little cyanide. In this the deposit is adherent, but too slow; and the bath loses more silver than it can gain from the anodes.

If the anodes remain white during the passage of the current the bath contains an excess of cyanide, and the deposit does not properly adhere; correct by adding cyanide of silver until it dissolves with difficulty.

When in good working order the anodes present a gray appearance while the current is passing, becoming white when circuit is broken.

The specific gravity of the bath may vary from 5° to 15° Baumé's hydrometer and still furnish good results.

Electro-silvering baths do not generally work so well when freshly prepared. If properly used and cared for they improve by age. At first the deposit is often granulated, bluish or yellowish.

It is customary to mix portions of an old bath with a freshly prepared one. Some platers introduce small quantities of ammonia instead to age the liquid.

Bisulphide of carbon in small quantities imparts a bright luster to plated articles. An ounce of the bisulphide is put into a pint bottle filled with a strong solution of the cyanide of potassium and silver, briskly shaken, and a few drops of this liquid poured into the bath occasionally until the work appears sufficiently bright. An excess of bisulphide must, however, be avoided, as it will spoil the bath.

What has been said about the arrangement of battery in articles of nickel and brass plating will also apply here. (See p. 153, vol. xliii., and 4, current volume.)

Electric Light Experiment.

The recent experiment of lighting the Hoosac (Mass.) Tunnel with electricity was with an apparatus placed on a platform car which was pushed slowly along by a locomotive. The generator of 4,000 candle-power was operated by an engine of 20 horse power, and each of the burners was of 2,000 candle-power. In the parts of the tunnel free from smoke the light was thrown strong enough to do track work over 500 feet away, and driving spikes and shoveling 1,000 feet off. Between the central shaft and the east portal, where the smoke was so dense that an ordinary locomotive light would not be visible 10 feet away, the electric light could be seen for over 100 feet. In some parts of the tunnel one could read by the electric light 250 feet from the car. The State authorities are soon to witness an experiment, and it is probable that the improvement will be adopted. If the electric lights are adopted power can be supplied from a turbine water wheel now lying idle in a shop at the east end. It is thought that twelve lanterns will light the tunnel, except when the smoke is unusually dense.

IMPROVED LOCK FOR MUSEUM CASES.

The difficulty of properly fastening the doors of museum, cabinet, and library cases in institutions where such cases are employed in large numbers, is only too well appreciated by those having such matters directly in charge. The usual method of bolting one of a pair of doors and locking the other, or of locking both doors simultaneously where cases are numerous, entails a great deal of labor, beside incumbering the person doing it with a weight of keys that is really burdensome.

We give herewith engravings of an improved system of locking mechanism for museum doors, by means of which an almost unlimited number of doors and drawers may be securely fastened by a single operation. This invention has been practically tested in the Museum of the University of Michigan, where its application to the newly-built cases effected a saving of \$800, beside furnishing a complete fastening, which not only holds the doors securely, but draws them into place should they be left slightly ajar before locking. The inventor has shown us letters from several of the professors in the Michigan University endorsing the lock in the highest terms.

The bolt consists of a steel rod extending along the top and another at the bottom of the series of doors, and carrying beveled hooks capable of engaging sockets or eyes attached to the doors. The rods are supported at suitable intervals by guides attached to the casing of the doors. In like manner a rod extends over a series of drawers and carries hooks which engage sockets attached to the sides of the drawers. The upper and lower continuous bolts are each connected to a bell-crank lever, and the two levers are connected by a vertical rod, so that the bolts will move simultaneously in the same direction. The vertical rod is connected with a lever whose pintle extends through an opening in the front of the case, and is capable of being turned by a key adapted to it. The opening in the front of the case is closed by a small door, which is locked by means of a fine lock and key of approved make.

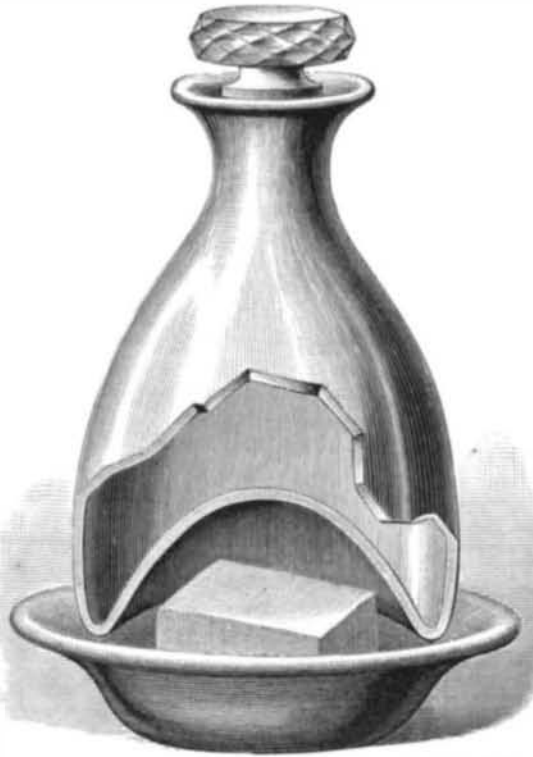
The bolt which locks the drawers is connected with the lower door bolt by a lever, so that when the key is turned, the bolts at the top and bottom of the doors and at the top of the drawers are all moved at once, permitting of opening any of the doors or drawers in the case. The bolt may be applied to cases containing any number of doors,

and in fact to any number of cases if desired, so that one motion locks or unlocks the entire series. When the doors are closed and bolted the key is removed, and the small door which covers the pintle of the unlocking lever is locked by a single key, rendering all secure by the use of a single key weighing but the fraction of an ounce, and capable of being carried without the slightest inconvenience. These bolts are very cheaply made, and yet strong and durable, and capable of accomplishing all that is required of them.

This useful invention was recently patented by Mr. Andrew Climie, of Ann Arbor, Mich.

BUTTER COOLER AND WATER HOLDER.

The engraving shows a novel device for holding water and cooling butter. It consists of a water bottle, having a deeply-recessed bottom, and a butter plate of sufficient size



COMBINED BUTTER COOLER AND WATER HOLDER.

to receive the base of the bottle. The cavity in the bottle is sufficiently large to inclose the butter without touching it, and the bottle, when in use, is filled with water and ice in small pieces.

This invention was recently patented by Mr. P. Dorlon, of Brooklyn, N. Y.

Mr. Oliver Byrne.

We record with regret the death of Mr. Oliver Byrne, C.E., who died at Grecian street, Maidstone, England, on December 9, 1880, aged 70 years. For some time past he had been in failing health, and lived a retired and secluded life. About two months ago, when in London, he caught a violent cold, which terminated in inflammation of the lungs, involving the smaller bronchial tubes, from which he gradu-

ally sank. Mr. Byrne was the author of several engineering works, and notably editor of, and a large contributor to, "Spons' Dictionary of Engineering." He was the inventor of the dual system of arithmetic, for which he claimed many peculiar advantages.

MISCELLANEOUS INVENTIONS.

A reel for measuring bagging, patented by Mr. Charles J. Le Roy, of Palestine, Texas, may be used for handling, measuring, and cutting bagging, matting, carpet, etc. It consists of a spool or roller from which the stock is taken, a reel upon which it is wound from the roller, a cutting board or table, and a measuring wheel, by which the operations named are simply, accurately, and easily performed.

In a button hole attachment for sewing machines, patented by Mr. John K. Harris, of Springfield, Ohio, an automatically acting and adjustable feeding device gives the cloth an intermittent lateral movement combined with a forward movement by improved devices, whereby an extra pressure of the presser piece upon the cloth is obtained, the locks of the stitches are caused to terminate in a straight line either above or below the surface of the material or at the edge, according to the regulation of the tension, and all upward or downward motion of the goods around the needle is prevented.

A feather renovator, patented by Messrs. Jefferson Hatch and Leonard Fortune, of Felt's Mills, is intended for cleansing feathers before using them for beds, both when new and after they have been used. The feathers are placed in a rotating cylinder, in which the feathers are subjected to the action of a strong blast which issues from openings in the hollow shaft of the cylinder, through which air is blown by a fan blower, the air finding outlet through a perforated or reticulated door in the side of the cylinder, through which the feathers are put in and taken out.

Mr. William A. Jennings, of Dyersburg, Tenn., has patented a clevis that may be adjusted to draw-beams of different dimensions. Two bars are hinged to the ends of a link. A screw bolt is pivoted to the free extremity of one of the bars, and its threaded end passes through an eye in the free end of the other bar, where it may be secured by a nut. The pivoted bolt is passed through a hole in the beam to which it is desired to attach the clevis.

A skirt ironing board, patented by Mary H. Baldwin, of Hamlin, Texas, has hinged detachable leaves, with devices for holding the leaves open, the board being hinged to a frame, the lower part of which forms a box for receiving that part of the article which hangs down, to protect the same from dust and dirt and to keep it moist.

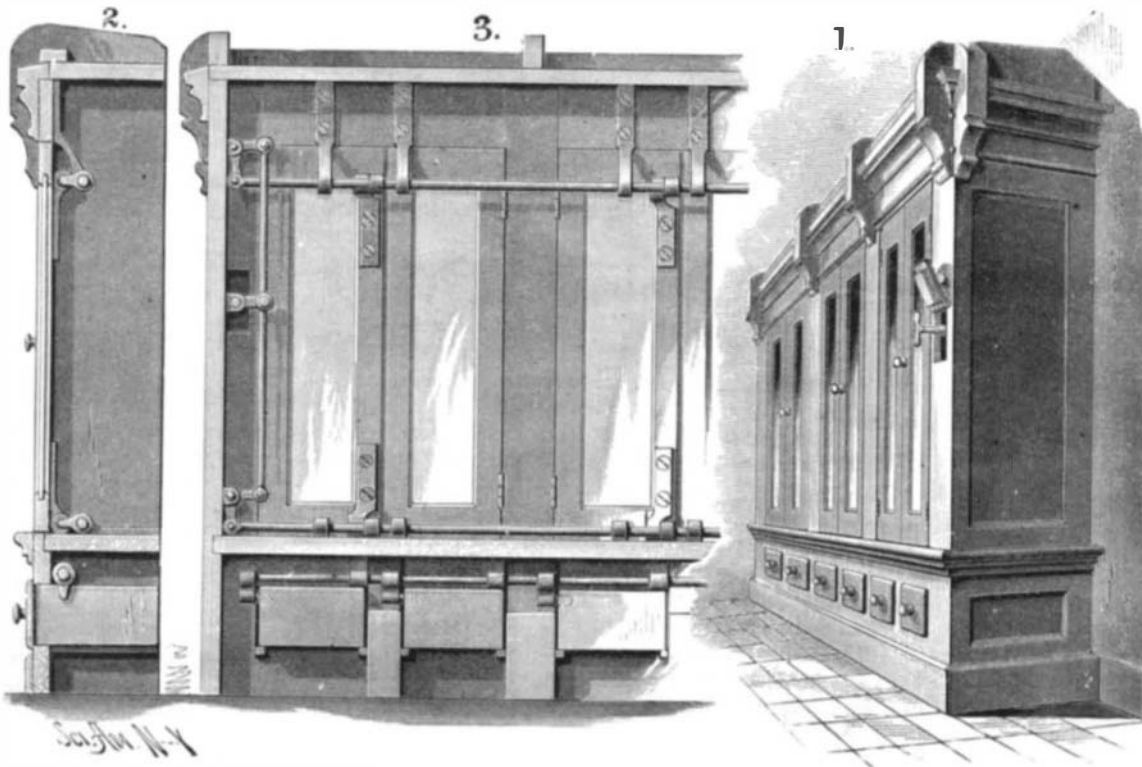
A jack screw, patented by Mr. William H. Williams, of Key West, Florida, appears a very effective device for raising heavy weights. A peculiarly constructed detachable pawl, combined with a bifurcated lever for actuating the screw, is the main feature of the invention. The construction of the pawl permits the screw to be worked in either direction according as the pawl is adjusted; its detachability affords means for preventing any tampering with the screw by unauthorized persons.

Mr. Karl Kreuzer, of New York city, has patented a game bat of that class having oval-shaped heads fitted with netting. He bends a piece of wood to the shape required, the strip having wire rods embedded into it at opposite sides throughout its length for strengthening the bat, and gore pieces fitted into the crotch in a peculiar manner to resist strain and prevent disconnection at that point.

Mr. Robert Watkinson, of Salford, England, has invented an improved coupling for hose and other pipes. The joints are formed by interlocking devices, assisted by an elastic packing, which not only maintains the locking of the parts after they are joined, but acts to tighten the joint through the action of interior pressure upon the packing.

An improved pile for the manufacture of composite metal plates, patented by Mr. Dolphus Torrey, of New York city, protects the metal forming the pile from the action of oxidizing flames and gases while in the heating furnace and immediately subsequent thereto. The pieces of metal forming the pile are so shaped that no bands, ties, bolts, or rivets are required to keep them in position. The pile is made of two plates and intermediate band and steel scrap, which fills the space inclosed by the plates and band.

Mr. Otis D. Thompson, of Elkhart, Ind., has patented an improvement in wind wheels, which consists in a novel construction, arrangement, and operation of the wheel and vane relatively to each other, whereby provision is made for throwing



CLIMIE'S MUSEUM CASE LOCK.