## EXPERIMENTS IN MAGNETISM.

BY GEO. M. HOPKINS.

When a piece of soft iron is placed in direct contact with the poles of a permanent magnet, the magnetic force is nearly all concentrated upon the soft iron, so that there is very little free magnetism in the vicinity of the poles of the magnet. This may be readily shown

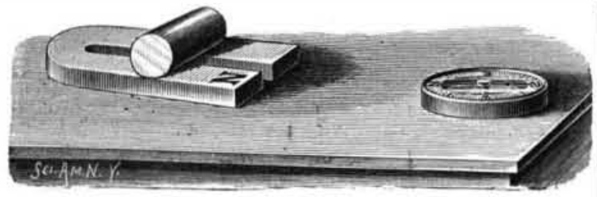


Fig. 1.—EFFECT OF THE ARMATURE.

by arranging a U-magnet parallel with the magnetic meridian, placing in front of and near the poles of the magnet a compass so adjusted with reference to the poles as to cause the needle to rest at right angles to the magnetic meridian, then applying to the poles of the magnet a massive armature. It will be found that the needle, under these conditions, immediately tends to assume its normal position, showing that the power of the magnet over the needle has been, to a great extent, neutralized. By rolling a cylindrical armature along the arms of the U-magnet, as shown in Fig. 1, it is found that as the armature recedes from the poles of the magnet the influence of the magnet upon the compass needle is increased, while the movement of the armature in the opposite direction diminishes the power of the magnet over the needle.

In Fig. 2 is illustrated an example of temporary magnetization by induction, and of the effect of a permanent magnet on the iron so magnetized, showing that the iron bar inductively magnetized acts like a permanently magnetized needle. The soft iron bar is freely suspended, and receives its magnetism from the fixed magnet. The end of the suspended bar adjacent to the

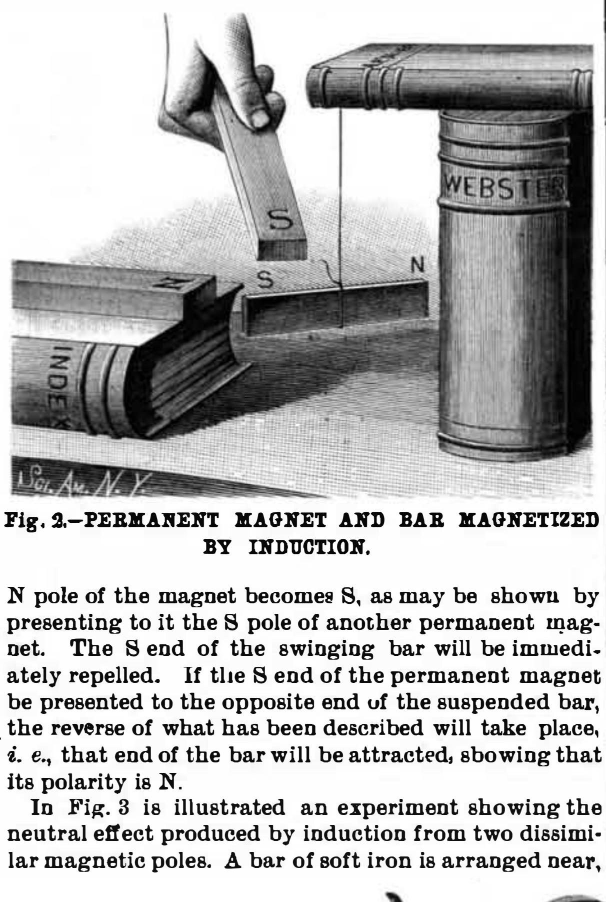



Fig. 2.—PERMANENT MAGNET AND BAR MAGNETIZED BY INDUCTION.

N pole of the magnet becomes S, as may be shown by presenting to it the S pole of another permanent magnet. The S end of the swinging bar will be immediately repelled. If the S end of the permanent magnet be presented to the opposite end of the suspended bar, the reverse of what has been described will take place, *i. e.*, that end of the bar will be attracted, showing that its polarity is N.

In Fig. 3 is illustrated an experiment showing the neutral effect produced by induction from two dissimilar magnetic poles. A bar of soft iron is arranged near, but not in contact with, the pole (say the N pole) of a magnet, so that it becomes magnetized by induction to such an extent as to support a nail. The N pole of the magnet produces S polarity in the end of the soft iron bar adjacent to it and N polarity in the opposite end. The S end of another permanent magnet presented to the same end of the iron bar will produce exactly the opposite effect in the bar, and will, therefore, neutralize the magnetism induced in the bar by the first magnet and cause the nail to drop.

A similar effect is produced when the iron bar is in actual contact with the N pole of a magnet and the S pole of another magnet is brought into contact with the opposite end of the bar, as shown in Fig. 4. The nail will adhere to the bar when either magnet alone is in contact with the bar; but when dissimilar poles are brought into contact with opposite ends of the bar, its middle portion becomes neutral, and is no longer able to support the nail.

When like magnetic poles are presented to the ends of the iron bar, as in Fig. 5, a strong consequent pole is

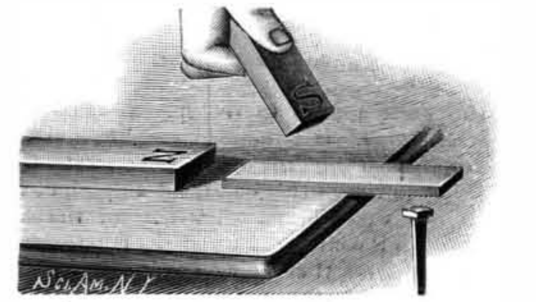


Fig. 3.—NEUTRALIZING EFFECT OF AN OPPOSING POLE.

developed in the center of the bar, which is of the same name as that of the ends of the magnets touching the bar.

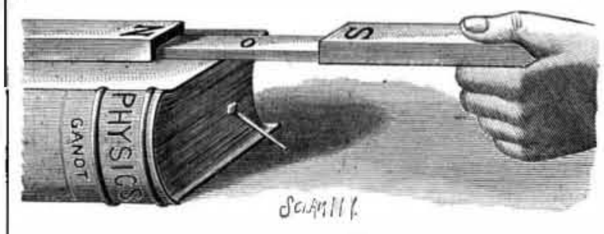



Fig. 4.—NEUTRAL POINT BETWEEN UNLIKE POLES.

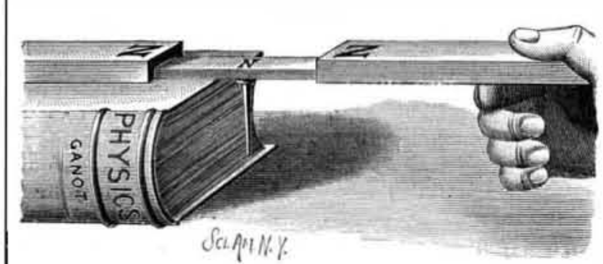



Fig. 5.—CONSEQUENT POLE.

### Luminous Cascade for the Exposition.

At the Academy of Sciences M. Troost described an apparatus, newly imagined by M. Beckman, for illuminating large size jets of falling water. Colladon's method, hitherto employed, consists in the use of a hollow cylinder containing water under pressure. Several holes allow the water to flow down in the shape of parabolic jets, and little windows on the opposite side of the cylinder enable the operator to throw a pencil of electric light into the axis of each one of the jets. The effect, probably known to most readers, says the *Chemist and Druggist*, is exceedingly fine, as the light follows the course of the water, and each jet sparkles like liquid fire. Unfortunately the plan will not work with high pressures, when the jets are, for instance, thrown much farther than one meter from the cylinder. In the new system devised by M. Beckman the jets will be, owing to an ingenious form of faucets, hollow instead of solid, and the electric light will be projected into the central space. It has been found that streams of water may thus be illuminated throughout, even when thrown 4½ or 5 meters from the cylinder or fountain, and a brilliant night display is expected in the exposition gardens.

### REMARKABLE LOCOMOTIVE EXPLOSION IN NORWAY.

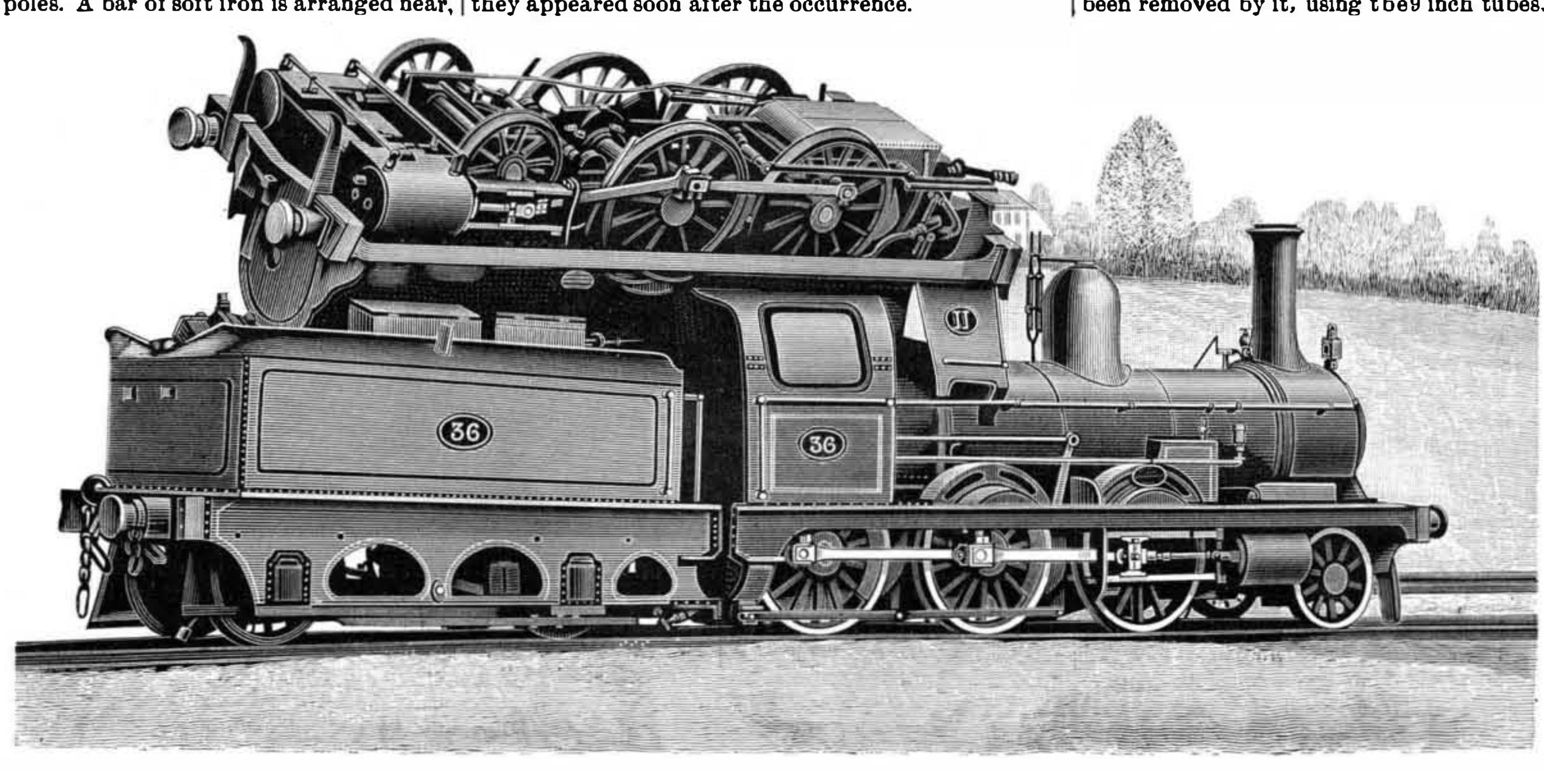
We give an engraving of a remarkable explosion of a locomotive, which took place at Strommen, December 22, 1888. By the force of the explosion the locomotive was thrown upward and capsized, and came down bottom up, alighting upon an adjacent locomotive that was standing on the track. Our illustration was prepared from a photograph of the two locomotives as they appeared soon after the occurrence.

### New Antidote for Morphine.

Professor Bokai, of Klausenberg, believes that the best antidote for morphine is picrotoxin. The two substances act in an opposite manner on the respiratory center, morphine paralyzing its action, while small doses of picrotoxin increase it. As in poisoning by morphine death occurs from paralysis of the respiratory center, and as picrotoxin hinders this paralysis, it follows that picrotoxin is likely to be of real use in morphine poisoning. In morphine poisoning, diminution of the blood pressure plays an important part, but picrotoxin enjoys the property of stimulating the vasoconstrictor center of the medulla and thus counteracts the effect of the morphine. Once again, the action of these two substances on the cerebral hemispheres is also of an opposite character. As atropine, the only known antidote of morphine, cannot be administered in large doses, it is certainly desirable that other means of combating morphine poisoning should be sought for. Professor Bokai thinks that picrotoxin may be useful as a substitute for preparations of nux vomica, and he also believes that it will be found of value in preventing chloroform asphyxia.—*Lancet.*

### Dredging Sand and Silt.

In *Les Annales des Ponts et Chaussees*, M. Boulle describes a form of dredger in which the removal of sand or silt is effected by an injection of compressed air instead of by suction. The machine consists of a tube passing through the water to the bottom to be dredged, and a compressed air injector placed at the bottom and at right angles to another pipe. The injector surrounds the main tube, and is fitted with a number of small mouthpieces producing a flow of a mixture of water, silt, and air up the main tube. In a trial at Saumur, on the Loire, the main tube was 4 inches in diameter, and sand was dredged from a depth of 15 feet, lifted 5½ feet above the water level, and finally transported to a distance of 50 feet. The compressor was of 15 horse power, which drew in 3·53 cubic feet of air per second, and by it raised 130 cubic yards of sand-burdened water per hour, the sand constituting from three-tenths to four-tenths of the whole volume. At Havre a 9 inch tube was used, and the depth was from 26 feet to 30 feet. Using a compressor of the same power as at Saumur, 390 to 520 cubic yards of silt and water were lifted per hour, the silt forming one-quarter of the whole. The dredger is most efficient in soft silt, sand, or gravel, but stones weighing 22 pounds have been removed by it, using the 9 inch tubes.




REMARKABLE LOCOMOTIVE EXPLOSION IN NORWAY.

### Climatic Influence of Forests.

It is a popular induction that extensive forests or plantations promote the depression of moisture in the atmosphere, and that the removal of such growths, whether by felling or conflagration, makes a region dry and unfruitful, while their judicious cultivation and tendence keeps up or even creates the fertilizing rain supply. Of late years this view has been disputed, and at the present moment there is a controversy being carried on, mainly between German and American climatologists, as to whether it has any foundation in fact—whether it is not, like some other popular inductions, due to a misreading of natural phenomena or to a transposition of effect and cause. Gunther and Ebermayer, supported by English observers like Blandford, whose East Indian experience supplies many of the most significant data to the upholders of the popular view, are quite convinced that that view will ultimately be the scientifically accepted one. They point to the well known tree in the Canary Islands, which, standing alone, absorbs from the sea breeze the moisture with which it bedews the ground beneath; they cite the so-called rain trees of the tropics, which condense the watery vapor in such volume that they give it out in a kind of modified shower bath, which converts the soil around them into a swamp; and they adduce the authority of Fautrat, who has made comparative statistics of the condensing power of the different trees in European forests, and who shows that the best condensers are the firs, whose needles contain more than 50 per cent, while the foliage crowns of the leaved timber detain at most 42 per cent, of the water that descends on them.

These highly significant facts, however, do not constitute scientific proof, the materials for which are only of late years beginning to be compiled under the requisite conditions of period and locality. So far as they have gone, the researches of Brandis and Studnika may legitimately be claimed as tending to a provisional confirmation of the popular induction; and if they are ever to be set aside, or even modified, it must be by better observation and argument than those employed by their more strenuous transatlantic opponents. Even the ablest of these, Mr. Henry Gannett, does not deny a certain meteorological influence of forestcultureon soil productiveness. He admits that land under tillage retains its moisture better than land not so treated, and that woods equalize temperatures and air currents and act as water reservoirs. But some of his divergences from the popular view are surely inadequately reasoned out; for example, that the great superficial area made up by leaves favors evaporation and sends back to the air a large proportion of the rain which, unintercepted, would go straight to the soil, which is thus impoverished of its due supply of moisture. To this objection Ebermayer can rejoin that evaporation in the forest is two and a half times less than outside it; nay, Clavé makes it as much as five times less. If we take into account the protective covering of the soil caused by the leaves that have been shed upon it, then, compared with the evaporation from the free or woodless ground, we get a diminution of more than 80 per cent! The practical question, however, lies not so much in the increase or diminution of the rainfall as in its distribution.

Van Bebber, in his work on the "Influence of Forest Growth on Climate," shows that wood culture increases the rainfall, but that it acts more favorably on the weather by promoting an equable distribution of the moisture and by obviating extremes of temperature. "This effect," says one of Gannett's German critics, "is left completely out of account in the American's investigations, and it is therefore quite possible that reafforesting, without notably increasing the annual volume of rainfall, may yet have considerably enhanced the fertilizing effect of the prairie showers. The old experience that the destruction of woods accentuates climatic extremes, and more especially enhances the danger of floods, has not thus far been contradicted. Nay, it receives calamitous confirmation in the disasters which, in the south Tyrol, for example, recur so frequently, and which it is vainly sought to prevent by artificial works." For the medical climatologist, as well as for the agriculturist, the further prosecution of the researches on the relation between forest growth and rainfall now so vigorously carried on in Germany is as practically important as it is theoretically interesting.—*The Lancet, London.*

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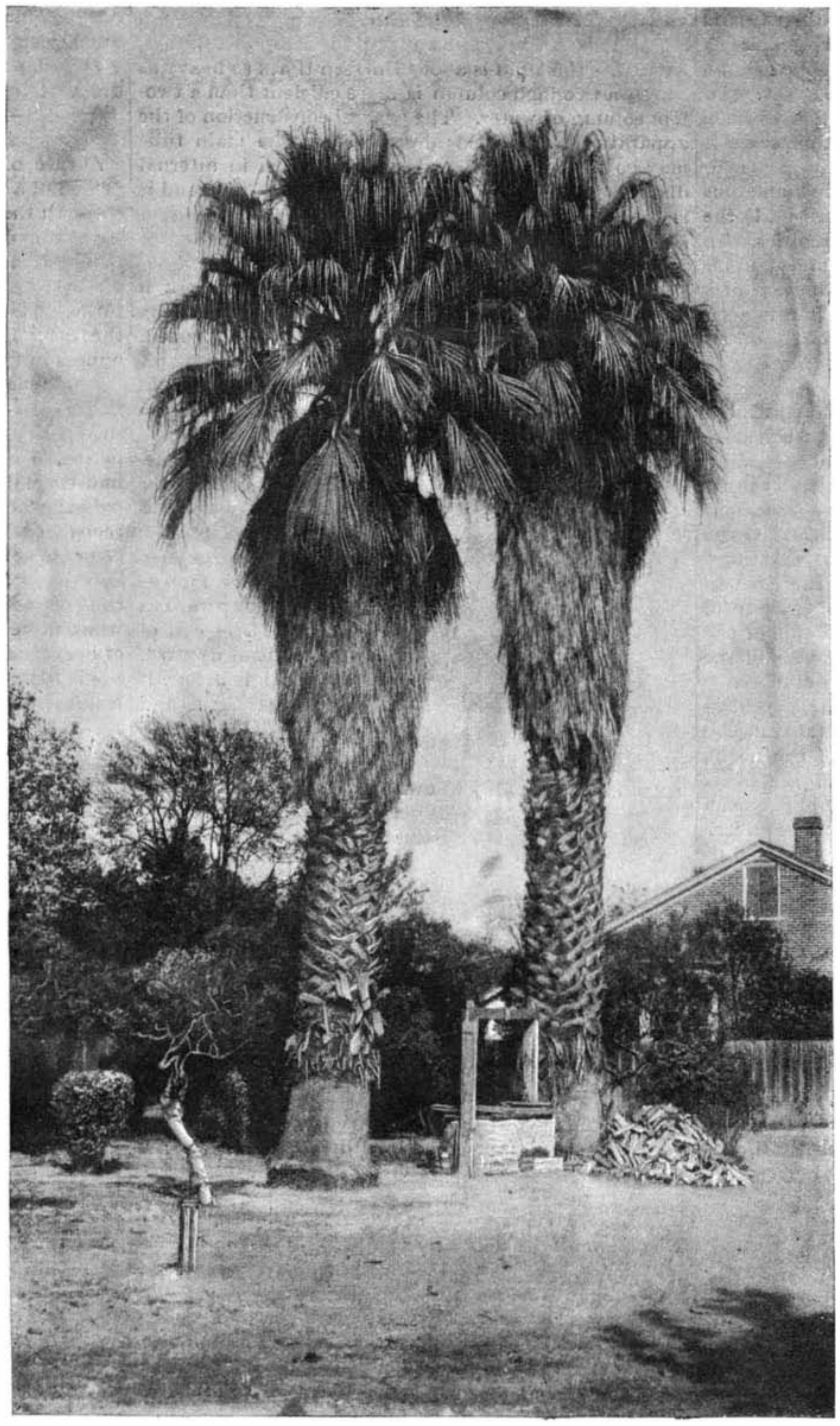
### THE TWIN PALMS AND ANCIENT WELL OF LOS ANGELES.

The accompanying engraving is from a photograph taken by our correspondent, Mr. A. W. P. Kinney, of Los Angeles, and shows the "Twin Palms" on San Pedro Street, Los Angeles, Cal. Mr. Kinney says:

These trees are of the fan palm species, and are gigantic in size, being probably the largest in the United States.

It is supposed they were planted by some of the mission fathers who founded the old Spanish missions on the Pacific coast. They may be classed among the wonders of sunny California.



THE TWIN PALMS AND ANCIENT WELL OF LOS ANGELES.

They are about ninety-five feet in height and seven feet in diameter. Their age is variously estimated, but it is safe to say that they are over one hundred years old.

During this period they have witnessed the growth of Los Angeles from a Spanish pueblo of adobe huts to the metropolis of Southern California.

Near these palms there still may be seen a well of great antiquity, whose waters have refreshed, perhaps, many of the ancient Aztecs, the children of the sun.

The well and palms together form an interesting study for the historically inclined tourist and scientist, as well as the botanist and antiquarian.

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MR. COE F. YOUNG, for many years vice-president and general manager of the Delaware and Hudson Canal Company, died at Thomasville, Ga., March 22, at the age of 65. He was appointed superintendent of the canal department of the company in 1865, and five years later became general manager of the railroad and canal systems, which position he held until three years ago.

### The Japanese as Colporteurs.

One embarrassment attending the colporteur work in Japan is due to the fact that any kind of trade has always been considered as degrading here. Persons engaged in trade are looked upon as beneath ordinary laborers, and next in rank to coolies or beggars. As the result of this, the business of the country is mostly in the hands of unscrupulous persons, with no reputation to gain or lose, and is conducted in a very loose and unsatisfactory way. There are but few merchants who appear to have a high sense of honor and a fixed price for their goods. The price demanded is usually adjusted to the supposed ability of the purchaser or the present need of money on the part of the seller. No foreign firms will trust the Japanese in business transactions, and every large establishment in Yokohama employs the Chinese to handle the money and watch for fraud.

Bible selling is also a kind of trade, and men who peddle Scriptures are generally classed with hucksters of all sorts. Those who engage in this business are usually without other means of support, and have no experience in our work or much idea of what we expect of them. They naturally adopt the usual methods of trade; and there is no end of trouble in teaching them to keep their accounts properly and deal honorably with all. It is a new departure in business to adhere strictly to the price marked in a book, and we have detected some of them putting in a new price on top of ours. It does not follow from a man's joining a church in Japan that he understands the art of selling Bibles after the methods in vogue at home. It is a matter of fact that Bibles are being sold in Tokio and Osaka constantly at less than our retail prices. One firm even advertises them at about *twenty per cent* less than the catalogue rate. Where they can procure them and by what means is more than I can tell. Of course, they refuse to let us know the process.—*H. Loomis, in the Bible Society Record.*

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### To Make Sheet Wax.

Dr. H. E. Beach, Clarksville, Tenn., says: Take of pure, clean wax anywhere from one to five pounds, put in a tin bucket or any deep vessel, with clear water sufficient to fill it within two and a half inches of the top. Set on the stove till thoroughly melted, then set aside until partially cooled; skim all the air bubbles off. Then fill a smooth, straight bottle with ice water, a bucket of which you should have by you. Soap the bottle and dip it deliberately in the solution two or more times, according to the thickness you desire your wax. After the last dip, as soon as the wax hardens to whiteness, cut a line through it and remove it from the bottle as quickly as possible. Spread to cool and straighten out smooth while warm. Continue this process until all the wax is made into sheets.

Any office boy or girl can do the work, and make enough sheet wax in an hour—equal to any you can buy—to last a whole year. Paraffine, or paraffine and wax, may be made in the same way, and colored and perfumed to suit one's fancy. The water in the bottle should always be kept cold in order to get the best results.—*Archives of Dentistry.*

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### Steel Pipe.

Public attention in this country having been called to the experiment of steel pipe manufacture in Glasgow, Scotland, the *Ohio Valley Manufacturer* says: "While our English cousins have finally 'caught on' to what is destined to be a great and important industry in the line of pipe manufacture in the world, it may not be entirely inappropriate to inform them that what to them is a new discovery is an accomplished fact on this side of the ocean. The manufacture of steel pipe has passed its experimental stage here, and is now both a successful and an acknowledged article of commerce. Its manufacture in this city was begun in August, 1887, and since that date some 15,000 tons have been manufactured and shipped into nearly every State and Territory in this country, and large quantities have been sent to Mexico. The Riverside Iron Works, of Wheeling, were the first, and up to the present time are, we believe, the only, manufacturers of steel pipe in America."