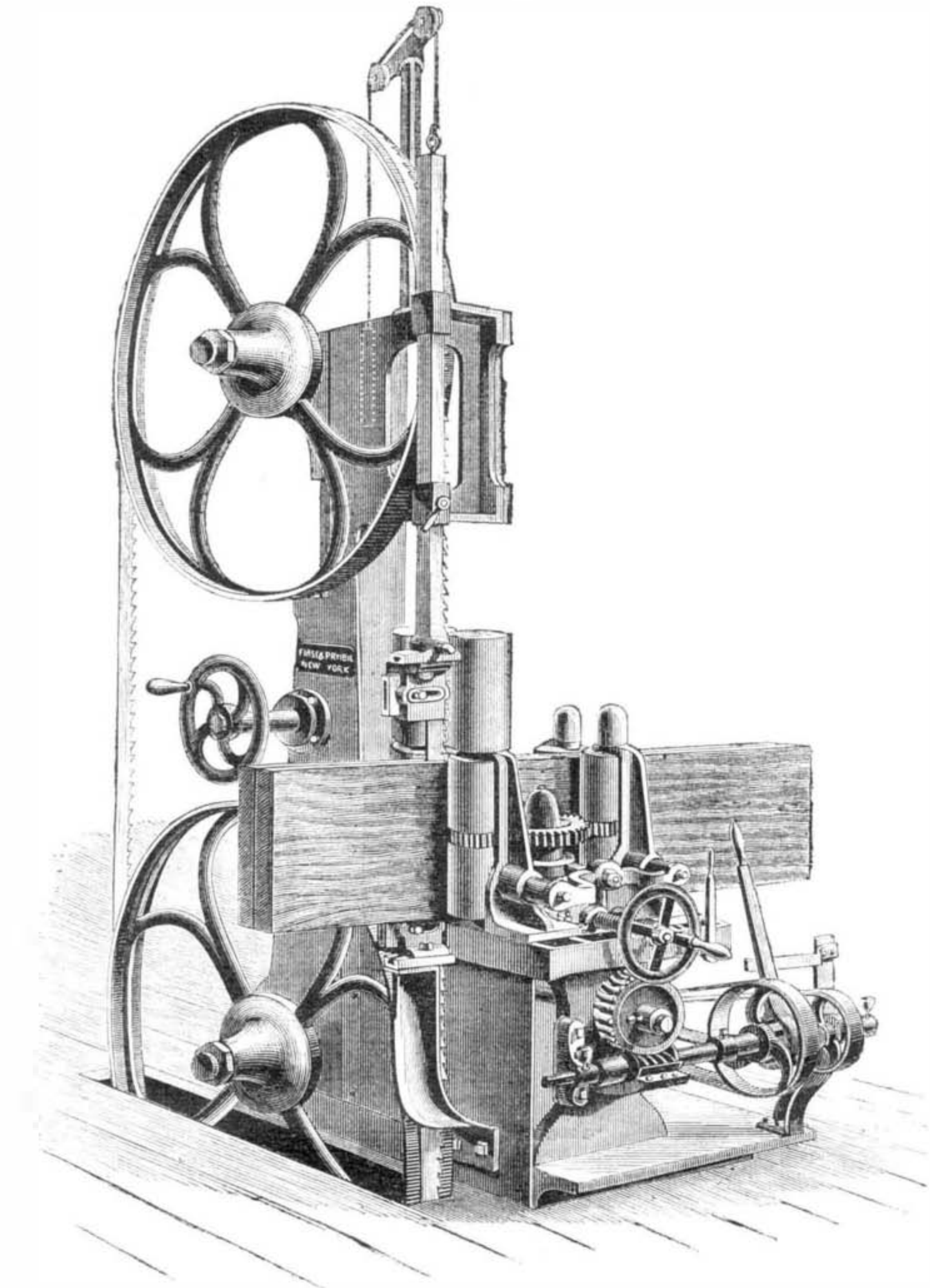
RE-SAWING BAND SAW

The annexed illustration represents a new and improved band saw, designed exclusively for re-sawing. After several years spent in experiments and trials, to construct a machine for the above purpose, Messrs. First & Pryibil, of 461 to 467 West 40th street, New York city, a well known firm manufacturing band saws and other woodworking machinery, have succeeded in getting a machine giving full satisfaction, and they have at present several of them in operation.

The capacity of the machine, shown in the engraving, the manufacturers state, is from 12,000 to 16,000 feet of lumber per day. The hight of the machine is 10 feet; the wheels are 5 feet in diameter; the weight is between 4,000 and 5,000 lbs. The saw kerf made is from $\frac{1}{16}$ to $\frac{3}{32}$ inch thick, and its sawing space is 30 inches, taking in timber 18 inches thick.

As lumber has become costly, it will be seen that it is of great advantage to use a thin blade; the saving of power is also considerable. On hard lumber, the saving amounts to more than the saw-ing costs. The general construction will be readily understood from the engraving.

Further particulars may be obtained by addressing the manufacturers as above. On page 141 will be found an advertisement of this machine, and a copy of the manufacturers' correspondence with the Managers of the American Institute.



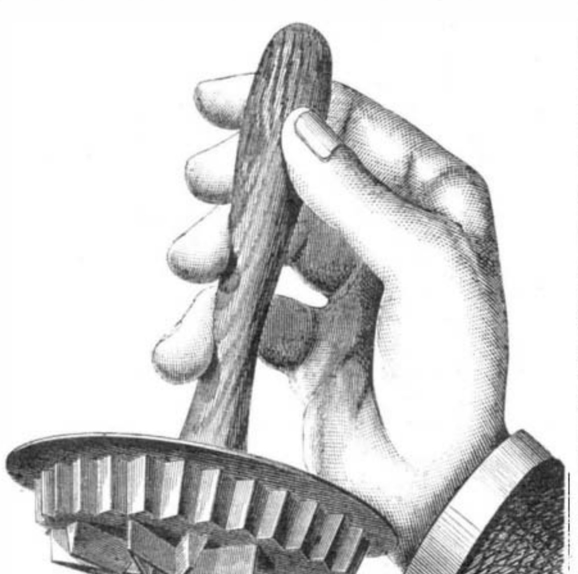
RE-SAWING BAND SAW.

On the Motive Power of Diatoms.

Professor Leidy, in some remarks on the moving power of diatoms, desmids, and other algæ, stated that, while the cause of motion remains unknown, some of the uses are obvious. The power is considerable, and enables these minute organisms, when mingled with mud, readily to extricate themselves and rise to the surface, where they may receive the influence of light and air. In examining the surface mud of a shallow rain water pool, in a recent excavation in brick clay, he found little else but an abundance of minute diatoms. He was not sufficiently familiar with the diatoms to name the species, but it resembled *navicula radiosa*. The little diatoms were very active, gliding hither and thither, and knocking the quartz and grains about. Noticing the latter, he made some comparative measurements, and found that the naviculæ would move grains of sand as much as twenty-five times their own superficial area, and probably fifty times their own bulk and weight, or perhaps more.

A NEW PIE MARKER.

The form of this device is plainly shown in the annexed engraving. The stamping portion may be made of any desired shape and of any suitable material. Its object is to give an ornamental appearance to pies, cake, or butter, and it will be found a handy little device for the purposes.



It was patented December 23, 1873, through the Scientific American Patent Agency, to Mr. Thomas S. Macomber, of Hamilton, N. Y., who may be addressed for further particulars.

Look well to the little things, and the larger ones will take care of themselves

Electrical Resistance of Various Metals.

M. Benoit has measured with great precision the electrical resistance of various metals at temperatures from 0° to 860°. He employed both the method of the differential galvanometer and of the Wheatstone's bridge, and for each metal has measured several specimens. The mean of these is given in the following table, the second column giving the resistance of a wire, 39·37 inches long and having a cross section of 0·03 inches, in ohms, and column three the same quantity in Siemens units. Column four gives the resistance compared with silver:

Metal.	Ohms.	Siemens.	
Silver, A.	0154	·0161	100
Copper, A.	·0171	·0179	90
Silver, A.(1)	·0193	.0201	80
Gold, A.	·0217	·0227	71
Aluminum, A.	·0309	·0324	49·7
Magnesium, H.	·0423	·0443	36·4
Zinc, A., at 350°	·0565	·0591	27·5
Zinc, H.	·0594	·0621	25·9
Cadmium, H.	·0685	·0716	22·5
Brass, A.(2)	·0691	·0723	22·3
Steel, A.	·1099	·1149	14
Tin	·1161	·1214	13·3
Aluminum bronze, A. (3)	·1189	·1243	13
Iron, A.	·1216	·1272	12·7
Palladium, A.	·1384	·1447	11·1
Platinum, A.	·1575	·1647	9·77
Thallium	·1831	·1914	8·41
Lead	·1985	·2075	77·60
German silver, A.(4)	·2654	·2775	5·80
Mercury	·9564	1·0000	1·61

A, annealed; H, hardened; (1) silver ·75; (2) copper 64·2, zinc 33·1, lead 0·4, tin 0·4; (3) copper 90, aluminum 10; (4) copper 50, nickel 25, zinc 25.

These results, which are all taken at ·0, agree closely with those obtained by other observers. M. Benoit has extended his observations to a range of temperature much greater than those previously employed for this purpose. He wound the wire around a clay pipe inclosed in a muffle, and immersed the whole in a bath of water, mercury, sulphur, or cadmium, which was kept at the boiling point by a Perret [illegible]. Constant temperatures of 100°, 360°, 440°, and 860° were t[illegible], obtained. Various temperatures below 360° were also obtained by a mercury bath. The measures were also corrected for expansion. Plates annexed to his memoir, presented to the Faculty of Sciences of Paris, show the results graphically. They show that the resistance increases regularly for all metals like tin, lead, and zinc up to their points of fusion. This increase, however, differs for different metals. We notice that tin, thallium, cadmium, zinc, lead, are found together in the upper part of the plate; at 200° to 230°, their resistance has doubled. Below them are iron and steel; for the last, the resistance doubles at 180°, quadruples at 430°, and at 860° is about nine times that at 0°. Palladium and platinum, on the other hand, increase much less, and only double their resistance at 400° to 450°. Gold, copper, and silver form an intermediate group. In general, the conductibility decreases more rapidly in a metal the lower its point of fusion. Iron and steel are exceptions to this rule. In alloys the variation is always less than in their constituents, and this is especially the case with German silver.

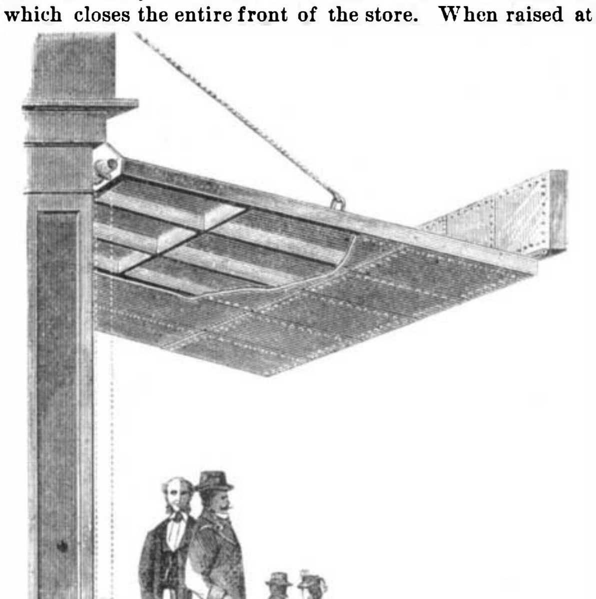
A Curious Artificial Fish.

A Spaniard named Fernandez, says a contemporary, has constructed at San Francisco a submarine propeller, eleven feet long, four feet deep, and four feet wide, and resembling a monitor in its general shape. A forward hatchway opens into a cistern which will hold forty gallons of water, introduced and expelled by means of a force pump inside the boat and under control of the operator. The water passes in both instances through a hole perforated amidships under the keel. When the operator desires to sink his vessel he fills the cistern with water, and when he wishes ascend he empties it. By means of complex machinery, he is enabled to steer his vessel in any direction, and with remarkable rapidity. The hexagonal manhead or trunk, which looks like the turret on a monitor, is three feet long and from one to two feet wide. It is closed over with a hatch cover, held down inside by two iron claws, which are secured by iron rods. A slight pressure on these rods in a given direction instantly loosens the claws and the hatch cover springs open. In this way the inventor purposes escaping from his boat, should anything go wrong with the machinery. The manhead has five small apertures for light, four of the six sides and the top having windows of French plate glass. On either end of the manhead, extending upward several feet, are two wrought iron rods, intended to facilitate the escape of the operator in danger, who uses them to force himself from his place. To the aft rod is connected a contrivance which makes the upper section airtight, and the operator, can, by it, expel the foul air.

IMPROVED AWNING.

The device herewith illustrated serves, when raised in suitable position, as an awning for the exterior of a store; and when lowered, may be used as a single large shutter. The construction and arrangement, as will be seen from the following description, are necessarily suited to both purposes.

To a large inner section, which is hinged directly to the building, a smaller outer section is similarly attached. Both sections are composed of a framework, the pieces of which are set at right angles, so as to form square or rectangular air chambers. The frame is covered with sheet iron, tin, or similar suitable material. When both sections are let down, as indicated by the dotted lines, the device forms a shutter which closes the entire front of the store. When raised at



an inclination to serve as an awning, the outer section is allowed to swing from its hinges for the purposes of a sign.

The invention is simple and convenient, and, doubtless, will be found an economical substitute for the appliances which it is designed to replace. Patented December 1, 1874, to Martin Stonehocker, of Streator, La Salle county, Ill., to whom letters for further information may be addressed.

Manufacture of Extract of Indigo.

To make what is generally called sour extract of indigo, mix 5 lbs. of best Bengal indigo in 30 lbs. of strong oil of vitriol. Let it stand five days; then put it in a tub and add 40 gallons of boiling water to it; then filter while hot through strong felt cloth. The filters are usually made this way: A frame like a table top, 8 yards long, 2 yards wide. This frame is divided into four filters. Pieces of wood across are put on the top and made to fit the holes (the shape of bowls, with small holes perforated in them); then the felt cloth is put on the top, and the liquid is put on the filter and filtered through. The sediment at the top is used to color pottery molds; that which runs through is put in a tub, and 40 lbs. of common salt added. Digest for six hours; then put on the filters again for four or five days. That which drains through runs away into the sewers; that on the top of the filters is the extract. For these proportions the extract should weigh 80 lbs. This is sour extract of indigo of commerce.

FREE EXTRACT.—To make free extract of indigo, put 100 lbs. of the sour extract in a tub, 12 gallons of water as well. Neutralise the acid in the extract with strong soda ash liquor until it is free from any sour taste; then put on the filters for six days. It should weigh 100 lbs. when it comes off. That is free extract of indigo of commerce.—*Chemical News.*

PUBLIC BUILDINGS IN BRUSSELS.

The Belgian capital contains, without doubt, more fine public buildings than any other city of its size: and its bright appearance, and the general aspect of brilliance and gaiety of its inhabitants, have gained for it the name of "the miniature Paris." A new boulevard, which traverses the city, is now completed; and the principal building situated on it, the new Exchange, was opened last year with a grand ball, at which the King and Queen and other celebrities were present, in all some 3,500 persons, so that, although the floor of the great hall occupies some 4,000 superficial yards, the dancers were much cramped for room. M. Léon Suys is the architect of the building, which was begun in 1868. It is 300 feet long by 150 wide; it is rectangular shaped, and its principal façades open on the Boulevard Central and the Rue du Midi. The style is mixed, the architect has united the types of various ages, iron is found in complete harmony with stone, and the result is a splendid hall of commerce, a saloon which can at any time be converted into a theater, one of the most capacious concert rooms on the Continent, and a trophy of almost dramatic elegance. The sculptural ornamentation is very rich. The frontispiece of the great peristyle represents the city of Brussels, surrounded by groups of allegorical figures—Industry, Agriculture, Peace, Navigation, Painting, Free Trade, etc. Many other groups to sculpture decorate the outside of the building, which is surrounded by a large dome, culminating in a gilt spire. The immense cupola, says *Harpers' Weekly*, from which we extract the engraving, is supported by twelve Corinthian column in reddish gray stucco, while the galleries rest on columns imitating dark red porphyry. The floor is a masterpiece of mosaic work, executed by Italians. The sun burners, by which this magnificent structure is lighted, are composed of 1,400 jets of gas.

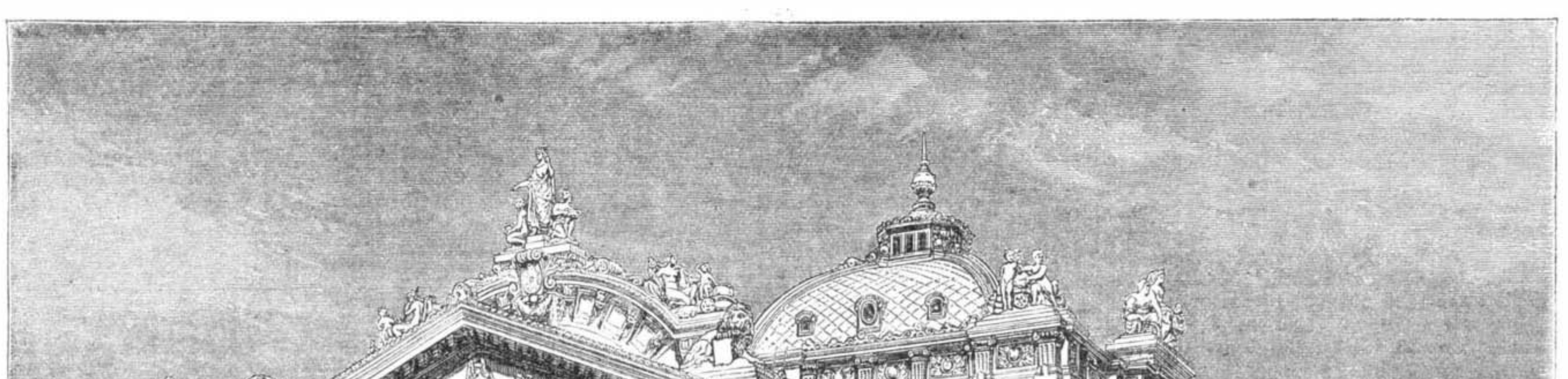
Solders and Soldering.

Continuing our remarks on this subject (see page 112), we have now to speak of hard solders and of the methods employed to solder other metals than tin, lead, and zinc. Probably the most important of these methods is that known as brazing, that is, the process employed for uniting pieces of iron, steel, copper, etc., by means of a solder consisting of brass, or an alloy of copper and zinc in different proportions. This solder is technically termed strong or hard solder. In workshop parlance, this is denominated spelter, a name which in commerce is used to designate the bars or ingots of cast zinc, as received by the metal merchant. Although this use of one name to indicate two very different things is at times confusing to the tyro, there is little fear that he will be misunderstood in the workshop or by tradesmen if he asks for his hard solder under the name of spelter. It is of far more importance, however, to remember that, for some kind of work, commercial spelter is not so well suited as other brasses; for it ordinarily consists of equal weights of zinc and copper, and in certain cases it is advisable to use a harder solder than is obtained by these proportions. The admixture of copper and zinc produces a series of alloys differing considerably in their qualities; and when tin is introduced, the increase or decrease of the zinc and tin produces a compound metal, the properties of which are widely different according to the relative quantities of the ingredients used in its production. Spelter when home made is best prepared by melting the copper and zinc in separate crucibles, the copper being in a crucible large enough to hold the zinc as well. When both metals are thoroughly melted, the zinc is poured into the copper crucible, the two being stirred well, so as to ensure thorough admixture, when the alloy is poured out on to a bundle of birch twigs or pieces of coarse basket work, supported over a tub of water, the object being to obtain the solder in form of fine grains with an irregular crystallization. If, when taken from the water, the spelter is not sufficiently uniform in size of grain, it is sifted through a sieve, and the large particles are crushed in a cast iron mortar or any suitable appliance, and again passed through the sieve, for fineness and uniformity of size are essential to the accomplishment of some examples of brazing in a thoroughly satisfactory manner. The manufacturers of the hard solder, however, usually cast it into ingots, delaying the cooling in order to develop as much as possible the crystalization, which is found to facilitate the subsequent crushing and sifting of the spelter. The flux used in nearly all the operations performed with hard solder is borax—the biborate of soda—which not only prevents the surfaces of the metals from becoming oxidized, but also exercises the remarkable property of dissolving any oxide already there. In some cases the flux can be dispensed with, but the pieces to be joined must be filed perfectly bright and clean, and care taken to melt the solder as quickly as possible when heat is once applied. The handiest way is, however, to dissolve the borax in water and add the solder, forming a paste which can be easily spread on the surfaces of shapes to which the drier powder would not readily adhere. For many jobs, however, it will be sufficient to merely crush the borax, which contains in its uncalcined state a considerable quantity of water; and for others it will be best to use merely a solution of borax.

The ordinary proportions of the constituents of hard solder are usually stated to be:

	Copper.	Zinc.	Tin.
Hardest........................	3	1	—
Hard (spelter)..................	1	1	—
Soft............................	4	3	1

and softer still is no longer a brass, but an alloy of tin and antimony (2 to 1). By the rough and ready processes of the manufactories, however, these proportions are probably never very accurately observed; and a variation of a few parts per cent is, perhaps, of little moment, when copper and zinc alone enter into the alloy. Thus, for solder for iron, the zinc may be present in the proportion of from 33 to 50 per cent, though the harder solder (that with least zinc) is to be preferred. For soldering brass and copper, the ordinary spelter will answer for common work; but where, as in the case of, say, microscope tubes, it is desirable that the solder should be as nearly as possible of the same color as the brass, the proportions of zinc must be increased or decreased, according to the paleness or yellowness of the metal to be soldered. In a similar manner, it is often advantageous or advisable to study the hardness of the solder, and to keep the zinc as low as possible to secure fusibility, without running the risk of damaging the article to be soldered. Thus for brazing tubes of pure copper, the zinc may be as little as 25 per cent, or even less; or a solder composed of copper 7, zinc 3, and tin 2, may be employed. For uniting brass tubes, that are to be afterward bent and hammered over the soldered portions, an alloy of brass 77·5, zinc 22·5, will be found to yield better results than other hard solders; but if the tubes are thin, and have to be soldered to flanges or pieces of stouter substance, it will be advisable to add a little tin—from 2 to 5 parts—in place of a similar quantity of zinc. Where, however, a large amount of work has to be done with the same kind of brass, the very best solder that can be had is to take the scraps of the metal itself, and add zinc in the proportion



THE NEW BOURSE AT BRUSSELS, BELGIUM.