The Composition of Glass.

Glass is a salt, every salt being the result of a combination of an acid with an alkaline base—that is, an alkali or alkaloid of organic nature. In the case of glass the acid is silica or silicic acid, and the base a mixture of an alkaline with an earthy base, such as lime, or with the oxide of one of the heavy metals, such as lead. Silica exists in nature in such minerals as flint, agate, rock crystal, or quartz. Its character as an acid was first clearly established by Berzelius. This does not appear until it is at a red heat, when it acts very powerfully, and, expelling other acids, combines with bases to form solid compounds or salts called silicates. Glass may be made by substituting boracic acid for silica. It is remarkable that while the silicates formed by nature crystallize, those made by art do not. Potash and soda are the most important ingredients, next to silica itself, in glass. They act as a flux, rendering the glass easy to melt. Lead renders glass brilliant, clear, and fusible, but in excess softens it. Lime increases the density, hardness, and luster of glass. Carbon in the form of charcoal aids the fusion. Glauber's salt with lime is sometimes used instead of soda, and muriate of soda, or common salt, is extensively used as a flux for coarse ware. A small admixture of the black oxide of manganese is essential in making flint glass, its property being to clear and purify the mass from the discoloration caused by particles of carbon and iron. For this reason it is called the "glassmaker's soap," as it appears to wash away all impurities. In excess, manganese causes reddish color. This may be removed by agitating the glass. Coarse green glass is, however, made white by an excess of manganese. The purple-pink windows sometimes seen in dwelling houses are made so with manganese. As a general principle, the glass is less fusible and offers greater resistance to the action of water and acids the larger its proportion of silica and alumina, while the contrary results from an excess of potash, soda, baryta, lime, magnesia, or oxide of lead. Luster and the refractive power of glass are produced in the highest degree by lead glass, next by baryta, next by potash, and least by soda glass.

A very important invention was made by M. De la Bastie, which has been fully tested and verified by scientific men in London and New York. It consists of plunging hot glass, manufactured in any form, into hot oil, or a heated oleaginous compound. When cool it becomes almost as tough as metal, so that a cup or mirror made of it may be thrown violently many feet or dropped on a stone floor without receiving any injury. When very violently broken it separates into granulated fragments, without sharp edges, so that the danger of being cut by it is much diminished. The process does not affect the transparency or beauty of the glass in any way.

The base of all glass is sand, and the quality of this is of great importance. Formerly calcined and powdered flints were used, but now sand procured from mines in various places is used. To fit it for use it is dried or burned, sifted, and washed. Much fine sand is taken from New Jersey to France.

In preparing the frit, saltpeter, binoxide of manganese, and arsenic are sometimes used to purify the melted metal. Red lead (minium, Pb_3O_4) has the same effect in the compound glasses, which renders it superior to litharge. Lime, soda, and potash are used in all their forms. Coal, wood, or peat is the common fuel, great care being taken to exclude the smoke or carbonaceous deposits, and to use only the best qualities. In some furnaces powdered resin is employed to great advantage.

In the manufacture of French window glass a mixture is used of 100 parts quartz sand with from 30 to 40 parts of dry carbonate of sodium (or as much sulphate with charcoal, and 30 to 40 parts of chalk. German window glass consists of a double silicate of chalk and potassa: 100 parts of quartz sand, 50 parts of pearl-ash, from 25 to 30 parts of chalk, and 2 parts of niter. In many mixtures common salt is an ingredient. According to A. F. Gehlen it is prepared with 100 parts quartz sand, 50 parts of dry Glauber's salt, 17·5 to 20 parts of lime, and 4 parts of charcoal. Peligot's formula is: Silica, 69·06; lime, 13·04; soda, 15·2; alumina, 1·18. An analysis of ancient window glass from Pompeii gave: Silica, 69·43; lime, 7·24; soda, 17·31; alumina, 3·55; oxide of iron, 1·15; oxide of manganese, 0·39, with traces of copper. No fixed proportion of materials can, however, be agreed upon, and the manufacturer has to determine the amount of real alkali in every fresh supply of ash.

The manufacture of window glass, though conducted here for more that seventy years, was for many years conducted under difficulties from the alleged superiority of the English crown glass. After a time such improvements in the manufacture of cylinder or sheet glass were made in England that it was regarded as equal in quality and brilliancy to the crown glass, and could of course be made of larger sizes; but the Pittsburg manufacturers have far surpassed in size and in uniform thickness the English. The largest size of sheet glass ordinarily made in England is 50x30, or possibly 35 inches. At Pittsburg sheets 70x40 inches, and of uniform thickness of seven to the inch, are not uncommon. These are the "double strength," and are very remarkable for their uniformity. In the dexterous handling of these immense cylinders, and so managing them as to make them of uniform thickness and freedom from blemishes (a very difficult matter), the American manufacturers have been remarkably successful. They are also free from the liability to rust or devitrification, caused by the excess of alkali in the glass, which has been so serious an objection to much of the German and some of the English window glass.—*Glassware Reporter.*

NEW PEGGING AWL

No one having seen a shoemaker tugging to remove his awl from his work will fail to see the utility of the invention shown in the engraving. It is a simple and effective device for withdrawing the pegging awl from the shoe sole after it has been driven in to make a hole for the peg, and it also serves the purpose of a wrench for securing and releasing the awl. The sleeve which usually screws on the awl-holding chuck is provided with an arm to which is pivoted a right-angled lever, the longer arm of which extends upward along the side of the awl handle, while the shorter arm is forked

LOGAN'S PEGGING AWL.

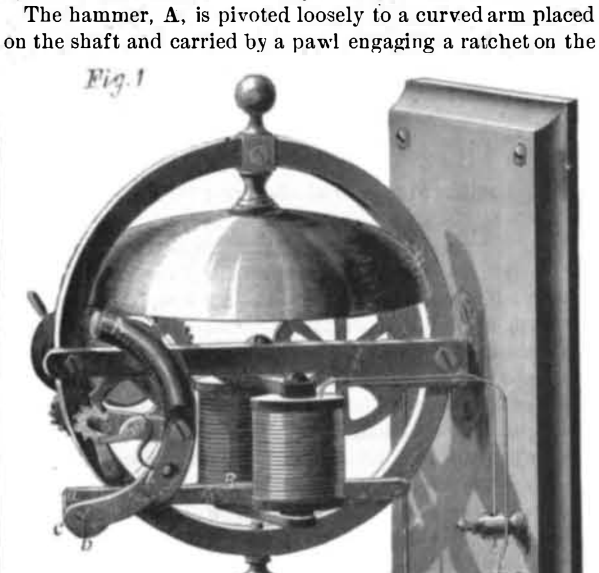
and extended beyond the awl. After driving in the awl, pressure on the longer arm of the lever by the hand grasping the handle forces the shorter arm of the lever against the work and withdraws the awl with very little exertion.

This invention was lately patented by Mr. Thomas H. Logan, of Lowell, Msss

NOVEL STRIKING MECHANISM FOR ELECTRIC BELLS.

The device shown in the engraving provides for a long stroke of the bell hammer, with the movement of the hammer always in one direction. The hammer is made in the form of a segment of a ring, and is carried by a shaft driven by a weight or spring. The hammer is released and stopped by an escapement controlled by an electro-magnet.

The hammer, A, is pivoted loosely to a curved arm placed on the shaft and carried by a pawl engaging a ratchet on the



BOWERS' STRIKING MECHANISM FOR ELECTRIC BELLS.

shaft. The outer end of the hammer is free to swing in and out through a limited distance, but is held normally at the inner limit of its movement by a spring which also holds the pawl into engagement with the ratchet.

On the end of the curved arm there is an escapement pin, *c* (see Fig. 2), and on the armature lever, B, are two lugs, *a b*, placed one for contact with the end of pin, *c*, when the armature is down, and the other for contact with it when the armature is raised in contact with the magnet. The contact of the lugs, *a b*, by pin, *c*, arrests the hammer and prevents its being revolved by the weight.

The curved hammer is below the edge of the bell, at one side, in such position that the hammer strikes at about the end of its upward movement. As the shaft carries the hammer the centrifugal force acting on the long arm overcomes the resistance of the spring acting against the short arm, and throws the end of long arm outward, so as to come in contact with the bell; this checks it and allows the spring on short arm to force the end of long arm inward, when it passes the bell and moves on until arrested by the pin, *c*, and lug, *a*. When the armature is raised by closure of the magnet circuit the lug, *a*, is raised above pin, *c*, and the lower lug, *b*, brought behind the pin. When the armature is released by breaking the circuit the lug, *b*, is carried down, and the pin, *c*, being released, the hammer revolves, and the blow is struck at completion of the revolution.

This invention was recently patented by Mr. George E. Bowers, of Fitchburg, Mass.

Proposed Telegraph Stations in the Ocean.

A Frenchman, M. Menuisier, has just proffered a novel and bold plan for enabling vessels crossing the Atlantic to communicate with the mainland. Lay, he says, a telegraph cable between Saint Nazaire, Bordeaux, and New York, with branch in mid ocean to Panama. Every sixty leagues, the average daily distance covered by a ship, connect to the principal cable a vertical cable ending in a buoy at the surface. To the right and left of the principal cable lay two branch cables, ten to twenty leagues each, ending in a vertical cable with buoys. These branches would form two crosses with the main cable. The chances of ships sighting buoys would thus be frequent. Each buoy has a number, and its position in mid-ocean is known from special tables. When a ship passing near a buoy wishes to telegraph it connects its apparatus wire, one with the wire of the buoy, the other with the buoy itself, which serves as an earthwire. Thus the ship might communicate with a central post which should be established on an island or rock, or a ship moored according to M. Menuisier's system. A vessel in distress near one buoy might, through the central station, get help from a ship passing near the next buoy. The difficult matter would be the buoy. How would it resist storms that have broken cables? M. Menuisier has not yet described it in detail, but says it is pronounced quite successful by competent navigators. It is luminous by night, sonorous in fog, and easily accessible in any weather.

American Manufactures in Australia.

While the United States, by means of exorbitant duties, preclude our manufacturers from competing on a fair footing with American-made goods in the States, our cousins are not slow in pushing their goods wherever there is an opening. The following articles are imported into New South Wales from America by a Sydney firm:

Axes, squaring axes, hunters' hatchets, lath and shingling hatchets, mattocks, picks, shovels and spades, sugar cane knives, Boynton's saws, Disston's saws, trowels, wrenches, scythes, hay rakes, hay forks, scythe, ax, pick, hoe, hammer, spade and shovel, and broom handles, digging forks, millet brooms, cattle bells, turpentine, resin, wood-working machinery, angle boring machines, iron planes, American tacks, tinned and blued; Hungarian nails, finishing nails, bolts and nuts for carriage work, spirit levels, mouse traps, clothes wringers, gate latches and hinges, sewing machines, kerosene lamps, Fairbanks' scales, grindstone fixings, tinsmiths' tools and machines, novelty braces, oil stones, farriers' hammers and adz-eye hammers, clothes pegs, clocks, plated goods, carriage woodwork and ironwork; leather, japanned and enameled; enameled duck and drill; locks, drawback, rim, mortise and pad; lock furniture, lift and force pumps, lanterns, hat and coat hooks, tinned wire-work, lemon squeezers, egg whisks, axle grease, buggy axles, firmer chisels, miter boxes, rolling pins, wood and glass, glass reflectors, sash fasteners, shelf brackets, bronzed barrel bolts, sash lifts, draw pulls, carpenters' mallets, door springs, pruning shears, carriage jacks, metallic hair and horse brushes.

Our informant adds that the above list might be greatly extended. The cause of this profitable import business carried on by the Americans with our Australian colonies is not far to seek. They generally excel our manufacturers of such articles by giving them a finish and adaptability to local requirements which we have yet to learn. It is not the first time that this has been pointed out.—*Iron.*

SOME little time ago Miss Frances Power Cobbe, who has so identified herself with the cause of anti-vivisection, called on a distinguished man of science in London to endeavor by persuasive speech and viva voce argument to gain him over to her cause. Three points were observable in Miss Cobbe's outward presentment, namely, she had an ostrich feather in her bonnet, a bird of paradise on or near her muff, and she carried an ivory handled umbrella. Consequently the distinguished man of science replied as follows: "Madam, charity begins at home. When you have given up wearing ostrich feathers, which are plucked from the living bird, causing the most exquisite pain; and birds of paradise, which, in order to enhance their beauty and luster, are skinned alive; when you have abjured the use of ivory, because you know that the tusks are cut out of the dying elephant's jaw—then, and then only, come and upbraid me with the cruelty of my operations. The difference between us is, madam, that I inflict pain in the pursuit of knowledge and for the ultimate benefit of my fellow creatures; you cause cruelty to be inflicted merely for your personal adornment."