AUTOMATIC BOILER FEEDER.

The apparatus we here illustrate takes its name from its inventor, M. Edouard Fromentin, of Paris. It may be designated a water bottle feeder, and is made automatic by coupling two "bottles," as they are technically named, on to one and the same axis, and on which they turn. The bottles are alternately placed in communication with the boiler, through the pipes connected up to the former at both the top and bottom of the latter, and thus a slight additional pressure only is required to allow the water to pass freely into the boiler; this is obtained by placing the apparatus slightly above the water level, and thus utilizing the force due to gravity for that purpose.

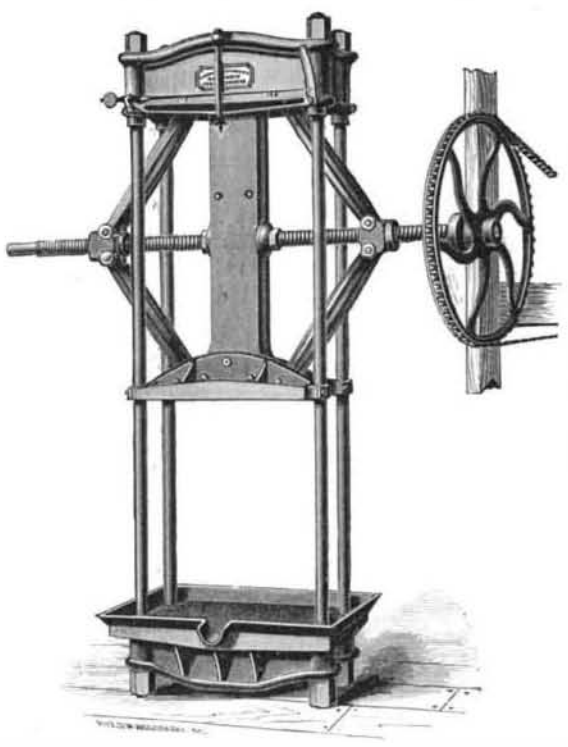
Referring to the annexed illustrations it will be seen that the Fromentin self-acting feeder consists mainly of the two pear-shaped bottles, circular in cross section, and each capable of holding about 12 gallons of water, these two bottles being connected to the central disk by means of two sets of pipes. The pipes marked 2, 2^1, connected to the top of the bottles, are those through which steam finds its way alternately into the two bottles each time the apparatus moves or makes a stroke, this taking place whenever the water level in the boiler is lower than it should be, or than the bottom end of the plunge, or steam supply pipe inside the boiler. This steam supply pipe finds an inlet to the apparatus at the top flange 11, Fig. 2; the outlet for the non-condensed steam is at 14, this steam by means of a pipe being led back into the water supply tank and thus assisting in heating the cold supply water before it goes into the bottles. The water supply inlet to the apparatus is at 13, and the outlet or delivery to boiler at 12, the water passing into the boiler through an ordinary check or back pressure valve mounted close up to the boiler in the usual manner; the arrows shown at each of these passages in Fig. 2 indicate the direction taken by both steam and water.

The two disks on which the apparatus turns are represented in Figs. 3 and 4, that shown by Fig. 3 being stationary and bolted down to the foundation plate, while that represented by Fig. 4 is movable, the latter being that disk to which the two bottles are connected by means of the pipes before mentioned. In the fixed disk Fig. 3, and which receives at the back all the flanges and connections, including both the water and steam supply as well as the delivery to the boiler, there are, as is seen, two distinct sets of ports, the top set being for steam and those at the bottom for water; the movement given to the apparatus is just sufficient to open and close these ports.

The two cylinders, 18, 18, Fig. 1, contain water, and the descent of the pistons in them is met with just sufficient resistance to allow the loaded bottles to come down noiselessly and without knock; the stroke is about 10 in., and is adjusted by means of the pistons in these cataract cylinders. The apparatus moves or makes one stroke on the average about every three or four minutes, but its action being purely automatic and its function to maintain a constant level, the number of strokes in a given time must necessarily depend upon the rate of evaporation.

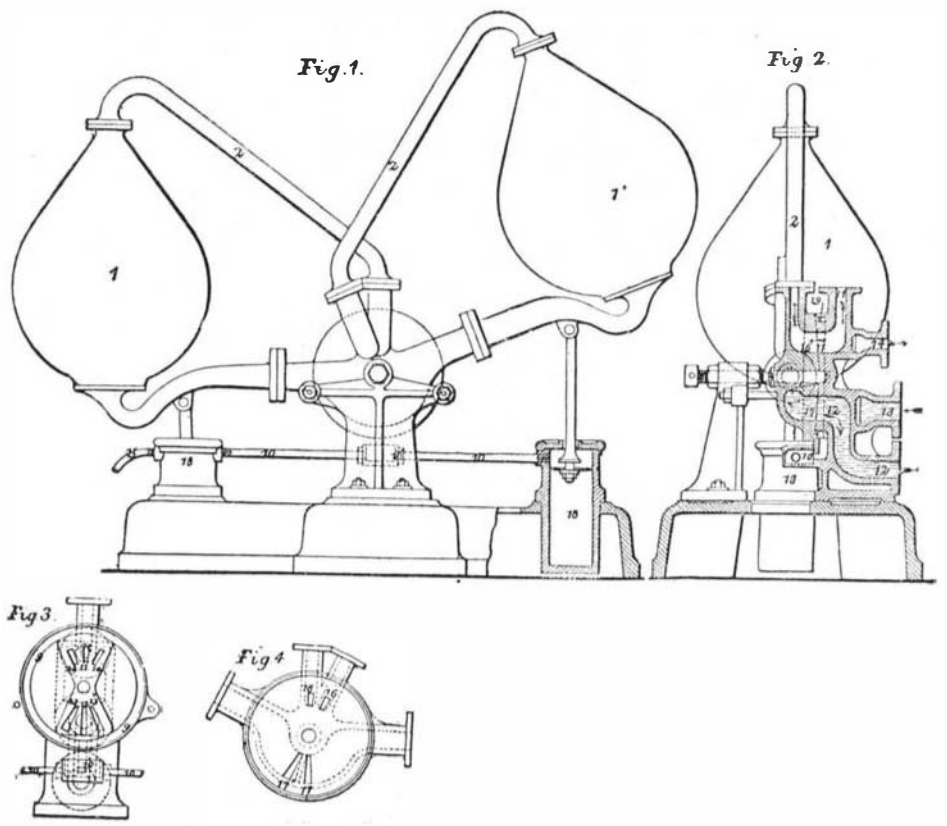
The general action of the apparatus may be summed up thus: for instance, in the above illustration we will suppose the feeder has just moved or made a stroke in consequence of the now lower bottle 1, Fig. 1, having while uppermost been filled (and thus become the heavier of the two) with water from a small supply tank or from the town water service pipes, while at the same time the opposite bottle 1^1, Fig. 1, while lowest, has been emptying a portion of its contents into the boiler; this state of things has, however, been now reversed, and, as seen in Fig. 1, the bottle 1 is open to the boiler, and the water level in the latter being slightly lowered by evaporation, steam passes at once into the now full bottle up the pipe 2, and presses on the surface of the water with a force due to the boiler pressure, the water gradually passing out of the bottle by way of the pipe attached to the bottom of the same into the boiler through the delivery pipe and check valve, the flow of the water from the apparatus boilerwards being simply due to gravity or to the elevation of the apparatus above the level of the water line in the boiler—an elevation which need not in any case exceed three feet.

It may also be remarked that when the water level in the boiler is at its maximum, or say when the lower end of the plunge steam pipe is sealed, steam is then of course no longer able to pass up the pipe into the bottles, this state of affairs continuing until by evaporation the water level has again become lowered sufficiently to unseal this pipe. It is while the water is at the maximum level that certain returns of water from the boiler take place back into that bottle then in communication with the boiler through either one or other of the two steam pipes, 2, 2^1, attached to the bottles, the steam which had previously found its way into the bottle having condensed and left the latter partially empty, but the vacuous space being soon filled up again by these rapid returns of water from the boiler. This reversal of current through the pipes and the intermixture inside the bottle of the water of a higher temperature direct from the boiler with that already remaining in the bottle is found by experience to be productive of the most beneficial results, as it not only keeps all the ports, pipes, bottles, etc., clean and free from all scale or deposit of any kind, but also lends material aid by way of preventing incrustation in the boiler,



PRESS FOR THE MANUFACTURE OF OILS.

the solids contained in the water being precipitated in the bottles under the action of a higher temperature before admission to the boiler, and thus scaling or incrustation inside the boilers fitted with this apparatus being, it is claimed, greatly diminished.—*Engineering.*



THE FROMENTIN AUTOMATIC BOILER FEEDER.

How Agates are Formed.

A step toward the solution of the enigma as to the formation of agates, the *Academy* says, has apparently been made by Messrs. J. I. Anson and E. A. Parkhurst. By introducing through a pipette some strong acid into a solution of an alkaline silicate, which contains also a certain amount of alkaline carbonate, a stream of bubbles of carbonic acid is disengaged, and around the ascending stream of gas a tube of gelatinous silica is soon formed. The continued addition of the acid causes a growth of silica, which forms a series of concentric tubes suggestive of the stalactitic forms often seen in agates. If a cavity containing a solution of an alkaline silicate exist in a rock which is permeated by an acid solution silica will be deposited in successive zones around the internal walls of the cavity, and thus the origin of banded agates, of the endogenous type of growth, may be explained. Some of the artificial specimens illustrate also the stalactitic or endogenous type of growth.

To remove rust from saws, chisels, etc., first scour with emery moistened with sulphuric acid diluted with six volumes of water, rinse, dry, and finish with oil and emery flour.

PRESS FOR THE MANUFACTURE OF OILS.

The press shown in the engraving is designed for use in the manufacture of oils where the material to be pressed is inclosed in canvas and pressed between wrought iron plates. It is very extensively used in the manufacture of oleomargarine, being among the first, if not the very first, used in this country for that purpose. They are also largely used for the second or "hard" pressing of paraffine wax, the first, or "slack" pressing being made in presses of same principle, but having wood frames and of larger capacity. The presses are worked by a chain-belt passing over a chain wheel on the end of the horizontal screw, and from thence to a "power attachment," to which motion is communicated by belting from the line shaft. Upon the head is fastened a system of levers called an "indicator," and which, by the spring of the casting shows the amount of pressure being transmitted to the material being pressed. The power of the press shown is 250 tons. These presses have a very solid and substantial look, and the reputation of the company warrants the belief that the material and workmanship are of the best. This company build presses for various uses where the hydraulic was once the only press used, and from the peculiar progressive movement of the platen and increase of power as the material under pressure becomes dense, together with the fact that it never yields to the pressure, it is in very many cases being substituted for it. At their New York office experiments are made free of charge with such materials as require heavy pressure.

Further information may be obtained by addressing the Boomer & Boschert Press Co., Syracuse, N. Y., or 62 Vesey street, New York city.

How to Make the Phosphorus Metals.

For the preparation of phosphorus compounds of metals, for example, phosphor-copper, Dr. H. Swarz gives in the *Industrie-blätter* the following directions:

A mixture of bone ash, silica, and carbon is placed in a crucible and upon it a layer of granulated copper, which is in turn covered with the above mixture. The lid of the crucible is luted on. To make it melt more easily, some (carbonate of) soda and glass may be added, or a mixture of pulverized milk glass with charcoal and powdered coke is used for lining and covering it. Take, for example, fourteen parts of silica, eighteen parts of bone ash, and four parts of powdered carbon. This is mixed with four parts of soda and four of powdered glass, stirred up with a little gum water, and used to line the crucible. When this is dry the copper is put in and covered with the same mass and the whole melted at a bright red heat. The copper obtained flows well, and has a reddish-gray color. It contains from 0·50 to 0·51 per cent. of phosphorus.

The simplest method for introducing phosphorus into bronze, says the *Metal-worker*, is to stick a bar of the phosphorus into a tube of pinchbeck, one end of which is hammered together and closed tightly. After the phosphorus is put in, the other end is closed too. When the metal, which contains thirty-two parts of copper to five of zinc and one of tin, is melted, the tube charged with phosphorus is pushed down in it to the bottom of the crucible by means of a bent tongs.

The stick of phosphorus must always be kept under water until it is about to go into the pinchbeck tube, when it must be carefully dried, as the presence of any moisture would be sure to cause the metal to spurt or fly about.

Self-closing Stand Glass.

The glass tubes attached to boilers to show the height of the water break occasionally and permit the hot water and steam to escape. L. Heppner attaches two cocks to cut off the steam, and prevents their closing by a rod of fusible metal placed near the tube, a spring or weight tending to close them both as soon as released. The escape of steam will melt the rod and permit of their closing. The inventor, a Saxon, uses Lipowitz metal, the bar being as long as the glass, and about three millimeters (one-eighth of an inch) wide and thick.

A NEW TEST FOR NITROUS ACID.—Dr. Jorissen uses a solution of fuchsine in glacial acetic acid, in the proportion 0·1 gramme to the liter, as a test for nitrites. Max Vogel used an alcohol solution. At first it turns purple, then blue, afterward dark green, and finally yellow. Nitrates have no effect on this reagent. Free mineral acids also color it yellow finally, but the red color is restored by adding water, which is not the case when it has been acted upon by nitrites. If this test works well in the hands of persons of small experience, and is sufficiently delicate to detect nitrites in well water, it will be a welcome improvement.

To bleach sheepskin parchment white, expose the pieces to strong sunlight under glass in a moist atmosphere.