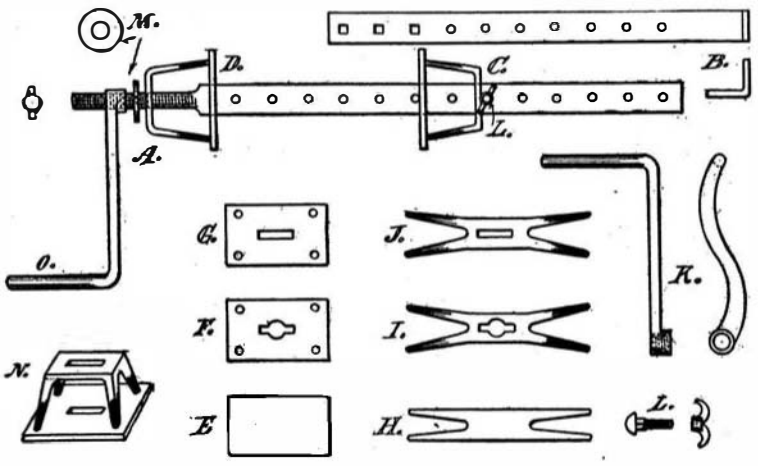
TOOLS FOR THE WORKSHOP.—I.

BY I. G. BAYLEY.

It is not the intention of the writer to describe in these articles all the tools necessary for a complete outfit. Such information can be obtained by studying a good tool catalogue.



DETAILS OF THE CARPENTER'S CLAMP.

It is advisable not to take the better class of tools when called upon to do a job at a distance; for though it is commendable to make a good job of any work which may come to hand, many cases are on record where good tools have been spoiled in doing the job, which could have been done just as well with others. An excellent saw is on the market, which has the reputation of cutting through iron, nails, or hard wood, without doing itself much damage. Such a tool, with others of a kindred nature, should be put in the carpenter's shoulder chest, when called upon to do general repair work.

A CARPENTER'S CLAMP.

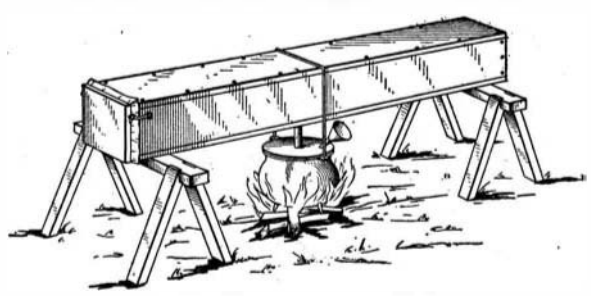
For holding work together while being glued or nailed, a clamp of some description is indispensable. The one herewith illustrated has the advantage of being easily made by a blacksmith or the mechanic himself.

In the illustration, *A*, with the extension *B*, shows the clamp complete. The extension *B* is used on large work, such as door frames. It is about 20 inches in length, after the end has been turned up, as shown, 1½ inches. The first three holes are made square to bite the thumb screw *L*, by which it is connected to the body *A*. The clamp is made of 1 1/2 x 5/16-inch wrought iron. *A* is 30 inches long, including the threaded end, which is ¾ inch diameter by 6 inches long. The holes are made to suit the thumb screw *L*, ⅜ inch diameter. The stops *D* and *C* are identical, except that *D* has the slots rounded out to pass over the threaded end of the clamp, as shown in detail at *I* and *F*. Two plates are cut out as shown at *E*, 5 x 3 x ¼ inch, and four holes bored in the corners, ¼ inch diameter. A slot is cut in the center, large enough to slip easily over the body of the clamp. As already stated, in one case this slot must be rounded out in the center to pass over the threaded end of the clamp. Two pieces *H*, 3 x ¼ x 9 inches, are cut out as shown, the legs being 3 inches long, and tapered down to ¼ inch diameter. The legs are spread to suit the holes in the plates *F* and *G*, into which they are riveted, after being bent into shape as indicated in the sketch marked *N*.

The crank *O*, detailed at *K*, is made from a ⅝-inch diameter bar, about 15 inches in length; the part forming the handle being 4½ inches long. A boss one inch long is formed at one end, and threaded to suit the end of the clamp *A*. A washer *M*, to take up the wear, and a thumb screw *L*, complete the list.

A STEAM BOX.

It is sometimes necessary to bend or twist wood into various shapes, to suit certain work. Long or short strips, and even planks, can be made very pliable by steaming them from half an hour to an hour in a cheaply-constructed box, like the one illustrated. The size of the box will naturally depend upon the



THE STEAM BOX IN USE.

class of work to be operated upon. Boxes all the way to 35 feet in length by 3 feet square have been made, for bending planks in boat building. For ordinary work, however, a box 10 to 12 inches square by 8 to 12 feet in length will be ample.

The box is made of inch boards, nailed together with tenpenny nails, about 6 or 8 inches apart, with one end closed permanently, and the other either furnished with a hinged lid and two side catches, or left open entirely. When the latter scheme is resorted to, either an old piece of carpet, burlap, or hay can be used to close up the end. Even when the hinged lid is used, it is well to use a piece of burlap as indicated. An ample-sized pot is furnished with a wooden lid, which is made to fit the opening tightly. A hole is cut in the lid of the kettle, and the bottom of the steam box, with a compass saw, large enough to take a piece of pipe, 1½ to 2 inches in diameter.

The pipe must fit very tightly. It must be of sufficient length to prevent the box from coming too near the fire; say 4 feet from the ground.

The kettle is suspended from the middle of the box by means of a strong wire or chain over a fire. The wooden lid is furnished with an opening for a funnel to supply the kettle with water. The opening is closed with a tight-fitting cork when the funnel is not used. The box is generally placed outside the shop, within convenient reach, upon a couple of trestles or horses.

(To be continued.)

MILK TESTING WITHOUT APPARATUS.

BY PROF. GUSTAVE MICHAUD, COSTA RICA STATE COLLEGE.

The following process for the detection of added water or of skimmed milk in ordinary milk is more accurate than the simple use of the lactodensimeter without the creamometer check. The whole test can be made in five minutes. The result does not show

SIMPLE METHOD OF TESTING MILK.

whether the adulteration consisted in the addition of water or in the subtraction of cream, but as a rule this matters little to the consumer. What he wants to know is whether or not he had what he paid for.

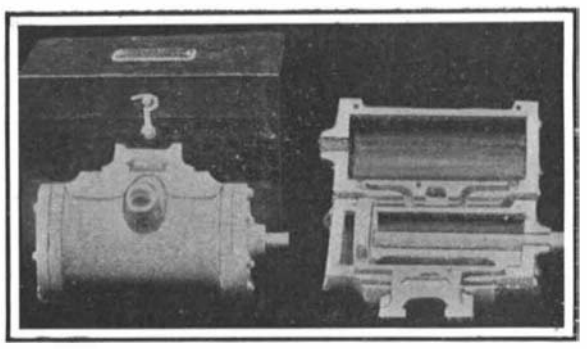
The suspected milk is stirred with a spoon, in order to disseminate into the whole liquid the cream which may have come to the surface. Then one volume of milk is poured into fifty volumes of water. (One fluid ounce to two and a half pints.) A candle is lighted in a dark room. The experimenter takes an ordinary drinking glass with a tolerably flat and even bottom, and holds it right above the candle, at a distance of about one foot from it, so as to be able to see the flame of the candle through the bottom of the glass. He then pours slowly the diluted milk into the glass. (See the accompanying figure.)

The flame becomes less and less bright as the level of the liquid rises into the glass. The flame is soon reduced to a dull white spot. A little more liquid, slowly added so as to avoid pouring an excess, and the flame becomes absolutely invisible. All that remains to be done is to measure the height of the liquid in the glass, this being most conveniently ascertained by dipping into it a strip of pasteboard and then measuring the wet part. It should measure not over one inch if the milk is pure. With good quality milk, diluted and tested as stated, the depth will be about ⅞ of an inch before the flame is lost to view. A mixture of one volume of milk and a half a volume of water should show a depth of 1½ inches. A depth of 2 inches indicates either partially skimmed milk or a mixture of one volume of good milk with one of water, and so on.

The reader has already understood that the process is based upon the close relation between the opacity of milk and the number of fatty corpuscles contained in it. Both skimming and the adding of water work in the same direction, namely, to decrease the opacity of milk. The same cannot be said of the density. Skimming increases it, adding water decreases it; and the common test, which consists in the mere introduction of the lactodensimeter in milk, is worthless, as a skimmed milk may have a normal density if care has been taken to pour into it a certain amount of water. Density should be taken before and after skimming, and the percentage of cream should be determined with the creamometer. Thus applied, the density test requires a lactodensimeter, a thermometer, and a creamometer, and the test requires twenty-four hours, while the result is not much more accurate than the opacity test just described.

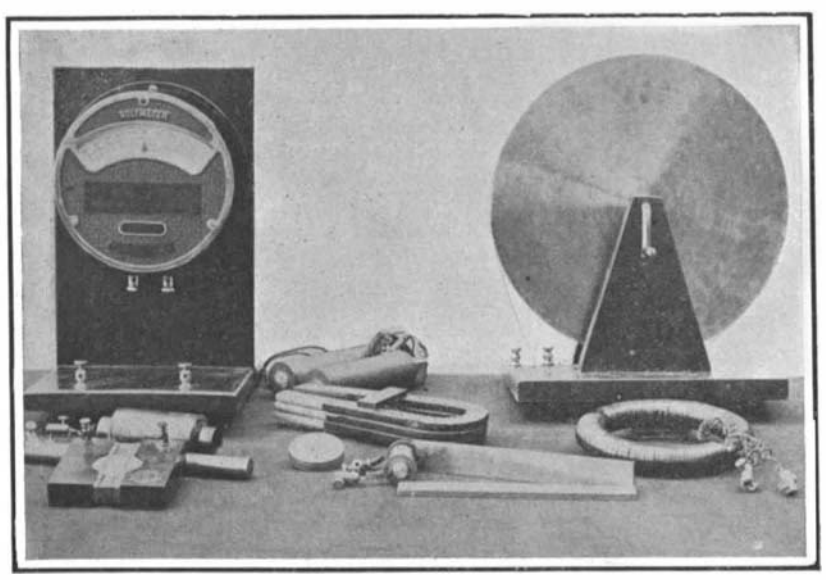
SOME INTERESTING MODELS.

An exact reproduction of the apparatus used by Oersted and Faraday in their pioneer electrical work has just been prepared by Mr. Joseph G. Branch. The models show all the fundamental principles of electricity. Faraday's disk is well known in schools and colleges, but this is probably the first time in which a complete set of exact reproductions of the original apparatus used by Faraday has been made. Mr. Branch has studied copies of the original notes of Faraday and has endeavored to make perfect copies of the apparatus. Faraday's ring is not only the exact size of the original ring, but is made of the same kind of iron and the winding is similar. With this ring all the principles of the transformer can be clearly



MODEL OF A "D" SLIDE VALVE.

shown, and it is so sensitive that it can be used with the ordinary pocket compass. As shown in the illustration the set is furnished with a compass galvanometer, and also with a millivoltmeter which reads to 50 millivolts on each side of the scale. There are seven models in the set illustrating relations between magnetism and electricity; how magnetism is converted into electricity; how electricity can be produced from magnetism; how one current induces a secondary current; how electricity can be produced by the expenditure of mechanical energy; and how mechanical energy can be produced from an electric current. In addition to these models Mr. Branch has prepared two engine-valve models, one of which is shown herewith. These models illustrate all the leading principles of the D slide valve and the piston valve. They are dissectible, so every detail may be examined.



EXACT REPRODUCTIONS OF FARADAY'S AND OERSTED'S ELECTRICAL AND MAGNETIC APPARATUS.