WIRE APPARATUS FOR LABORATORY USE.

BY GEO. M. HOPKINS.

Before the year 1351 everything known as wire was hammered out by hand, but at that date or thereabout the art of wire drawing was invented. Since then the art has been developed and expanded, so that at the present time wire drawing is a leading industry, and we have wire of every size and shape made from all of the ductile metals, and used in an infinite number of ways.

It is not my purpose to enter into an extended treatise on wire, but simply bring to the notice of the reader several new as well as some well known forms of laboratory appliances made of wire; and while I am conscious that this subject is by no means exhausted, I believe that the few examples of wire apparatus for the laboratory given in the engraving will not only be found useful, but will prove suggestive of other things equally as good. I have found wire invaluable for these and kindred purposes, and have often made pieces of apparatus in the time that would be required to order or send for them, thus saving a great deal of time, to say nothing of expense, which is no inconsiderable item in matters of this sort.

It is perhaps unnecessary to describe fully in detail each article represented in the engraving, as an explanation of the manipulations required in forming a single piece will apply to many of the others.

For most of the apparatus shown, some unoxidable wire should be selected, such as brass or tinned iron, and the tools for forming these articles of wire consist of a pair of cutting pliers, a pair of flat and a pair of round nosed pliers, a few cylindrical mandrels of wood or metal, made in different sizes, and a small bench vise. Any or all of the articles may be made in different sizes and of different sizes of wire for different purposes.

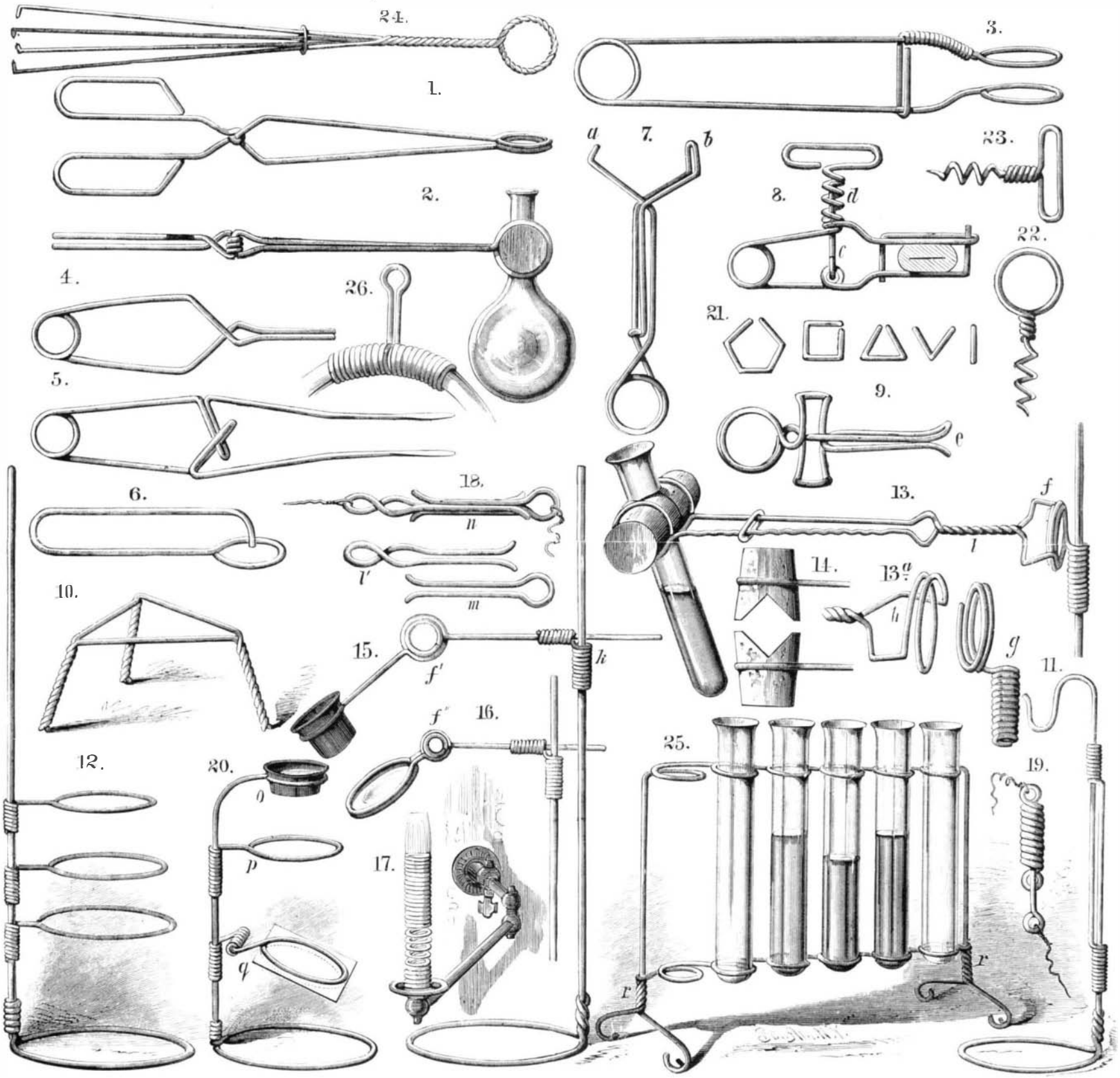
Fig. 1 shows a pair of hinged tongs, which are useful for handling coals about the furnace, for holding a coal or piece of pumice stone for blow-pipe work, and for holding large test tubes and flasks, when provided with two notched corks, as shown in Figs. 2 and 14. These tongs are made by first winding the wire of one half around the wire of the other half to form the joint, then bending each part at right angles, forming on one end of each half a handle, and upon the other end a ring. By changing the form of the ring end the tongs are adapted to handling crucibles and cupels and other things in a muffle.

Fig. 3 shows a pair of spring tongs, the construction of which will be fully understood without explanation. It may be said, however, that the circular spring at the handle end is formed by wrapping the wire around any round object held in the vise; the rings at the opposite end are formed in the same way. The best way to form good curves in the wires is to bend them around some suitable mandrel or form.

Fig. 4 shows a spring clamp for holding work to be soldered or cemented. It may also be used as a pinch cock.

Fig. 5 represents a pair of tweezers, which should be made of good spring wire flattened at the ends. Fig. 6 is a clamp for mounting microscope slides, and for holding small objects to be cemented or soldered. Fig. 7 is a pinch cock for rubber tubing; its normal position is closed, as in the engraving, but the end, *a*, is capable of engaging the loop, *b*, so as to hold the pinch cock open. Fig. 8 shows a clamp or pinch cock having a wire, *c*, hooked into an eye in one side, and extending through an eye formed in the other side. This wire is bent at right angles at its outer end to engage a spiral, *d*, placed on it and acting as a screw. The open spiral is readily formed by wrapping two wires parallel to each other on the same mandrel and then unscrewing one from the other. The handle will of course be formed by aid of pliers. Fig. 9 shows still another form of pinch cock. It is provided with two thumb pieces, which are pressed when it is desired to open the jaws. Fig. 10 is a tripod stand, formed by twisting three wires together. This stand is used for supporting various articles, such as a sand bath or evaporating dish, over a gas flame. It is also useful in supporting a charcoal in blow-pipe work.

Fig. 11 shows a stand adjustable as to height for supporting the beak of a retort, or for holding glass conducting or condensing tubes in an inclined position. The retort or filter stand, represented in Fig. 12, is shown clearly enough to require no explanation. Should the friction of the spiral on the standard ever become so slight as to permit the rings to slip down, the spirals may be bent laterally, so as to spring tightly against the standard. Fig. 13 shows



WIRE APPARATUS FOR LABORATORY USE.

1, 2, and 3. Tongs.—4. Spring Clamps.—5. Spring Pliers.—6. Spring Clamp.—7, 8, and 9. Pinch Cocks.—10. Stand.—11. Adjustable Support for Tubes.—12. Retort or Filter Stand.—13, 14. Test Tube Holder.—15. Holder for Magnifier.—16. Holder for Condenser.—17. Heating Burner.—18, 19. Electrical Connectors.—20. Microscope Stand.—21. Aluminum Grain Weights.—22, 23. Corkscrews.—24. Cork Puller.—25. Test Tube Stand.—26. Rubber Tube Support.

an adjustable test tube holder, adapted to the standard shown in Fig. 12, and capable of being turned on a peculiar joint, so as to place the tube in any desired angle. The holder consists of a pair of spring tongs, having eyes for receiving the notched cork, as shown in Fig. 14. One arm of the tongs is corrugated to retain the clamping ring in any position along the length of the tongs. The construction of the joint by which the tongs are supported from the slide on the standard is clearly shown in Fig. 13 *a*. It consists of two spirals, *g*, *h*, the spiral, *h*, being made larger than the spiral, *g*, and screwed over it, as shown in Fig. 13. This holder is very light, strong, and convenient.

Fig. 15 represents a holder for a magnifier, which has a joint, *f*', similar to the one just described. The slide, *k*, is formed of a spiral bent at right angles and offset to admit of the two straight wires passing each other. This holder may be used to advantage by engravers and draughtsmen. Fig. 16 shows a holder for a microscope condenser, the differ

ence between this and Fig. 15 being that the ring is made double to receive an unmounted lens.

Fig. 17 shows a Bunsen burner, formed of a common burner, having a surrounding tube made of wire wound in a spiral, and drawn apart near the top of the burner to admit the air, which mingles with the gas before it is consumed at the upper end of the spiral.

Fig. 18 represents a connector for electrical wires, which explains itself. The part with a double loop may be attached to a fixed object by means of a screw. Another electrical connector, shown in Fig. 19, one part of which consists of a spiral having an eye formed at each end for receiving the screws which fasten it to its support; the other part is simply a straight wire having an eye at one end. The connection is made by inserting the straight end in the spiral. To increase the friction of the two parts, either of them may be curved more or less.

A microscope stand is shown in Fig. 20. The magnifier is supported in the ring *o*. The ring, *p*, supports the slide, and the double ring, *q*, receives a piece of looking-glass or polished metal, which serves as a reflector.

Fig. 21 shows a set of aluminum grain weights in common use. The straight wire is a one grain weight, the one with a single bend is a two grain weight, the one having two bends and forming a triangle is a three grain weight, and so on. Figs. 22 and 23 are articles now literally turned out by the million. It is a great convenience to have one of these inexpensive little corkscrews in every cork that is drawn occasionally, thus saving the trouble of frequently inserting and removing the cork screw. The cork puller shown in Fig. 24 is old and well known, but none the less useful for removing corks that have been pushed into the bottle, and for holding a cloth or sponge for cleaning tubes, flasks, etc.

Fig. 25 shows a stand for test tubes. The wire is formed into series of loops and twisted together at *r* to form legs. A very useful support for flexible tubes is shown in Fig. 26. It consists of a wire formed into a loop and having its ends bent in opposite directions to form spirals. A rubber tube supported by this device cannot bend so short as to injure it. Most of the articles described above may be made to the best advantage from tinned wire, as it possesses sufficient stiffness to spring well and at the same time is not so stiff as to prevent it from being bent into almost any desired form. Besides this the tin coating protects the wire from corrosion and gives it a good appearance.

THE STEAM BOILER SMITH.

Among the large number of notable machines inspected at the works of the Barrow Shipbuilding Company during the recent visit of the Institution of Mechanical Engineers, few created greater interest than the flanging hammer made by Messrs. Campbells & Hunter, Leeds (England), and illustrated herewith.

Flanging is a favorite method of dealing with certain joints in boilers of all kinds in these days, and the inclination is to a still further adoption of this effective operation; and although the flanging of flues has been done by machines specially constructed for that particular purpose, the bulk of flanging operations has been performed by hand, and no machine of a comprehensive character has been introduced before this.

In Fig. 1 we illustrate the operation of flue flanging. Here a flanging block, with separate anvil, is mounted upon a swiveling slide, upon which it can be moved as required. This block has a projecting angular face in front, upon which is carried an adjustable roller or rollers for taking the end thrust of the flues, plates, etc. On each side of the roller carriage are two wrought iron arms, and two others on each side of the anvil block, each arm having a small runner at the outside end; these arms keep the flue square, and the runners assist it when being turned round. For turning the flue round when flanging, two chain barrels with ratchet motion and sufficient chain are provided; these barrels are fixed in frames upon the foundation plate, one on either side of the flue; the chain is given a lap around the flue and is wound on to the empty barrel as it unwinds from the full one, or the flue can be revolved easily by hand. Flues up to four feet in diameter can be done at one heat, and so accurately finished that the leveling block is not required, and although they may have been out of truth before, when flanged they are perfectly circular. The flues of the steamship City of Rome were all done by the machine at the above named works.

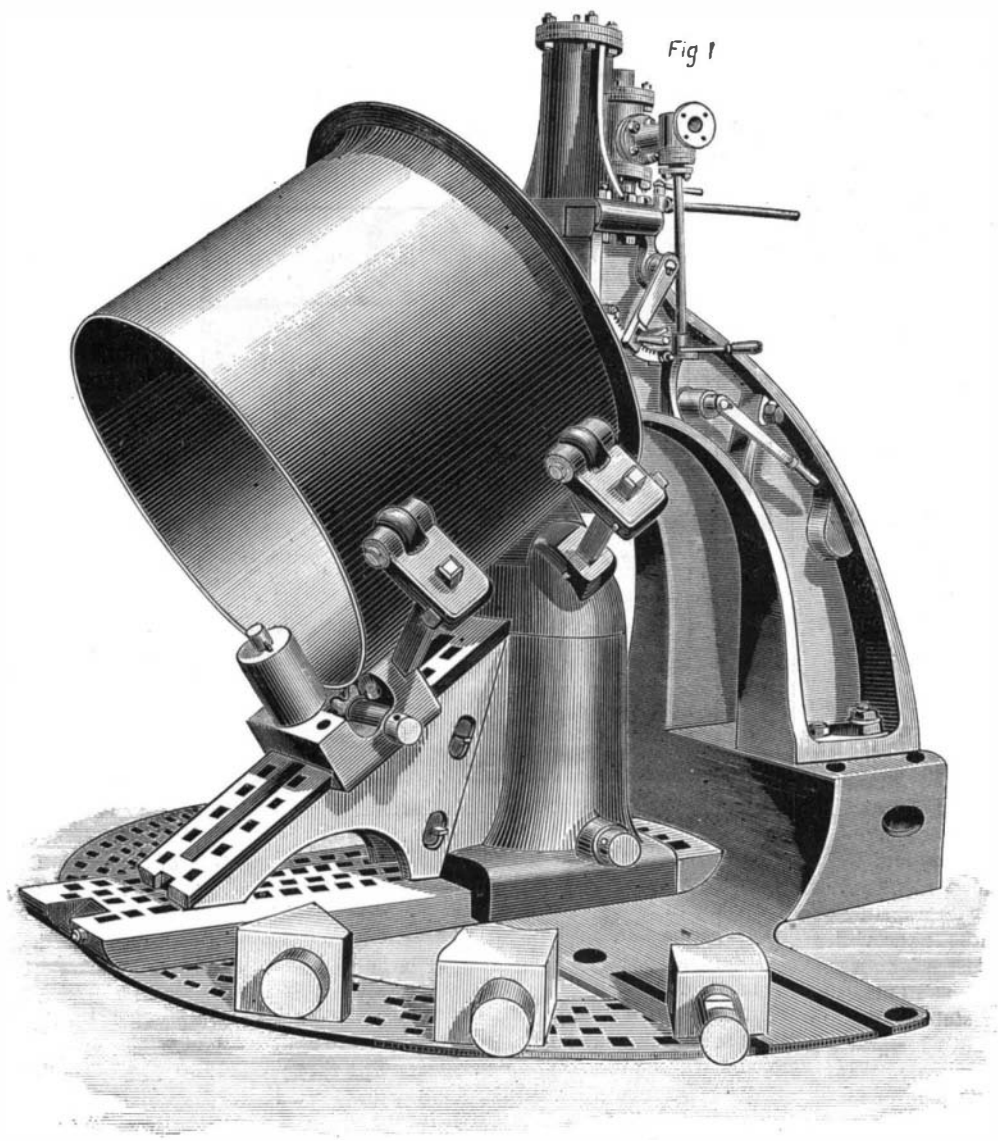


Fig. 1.—FLANGING HAMMER.

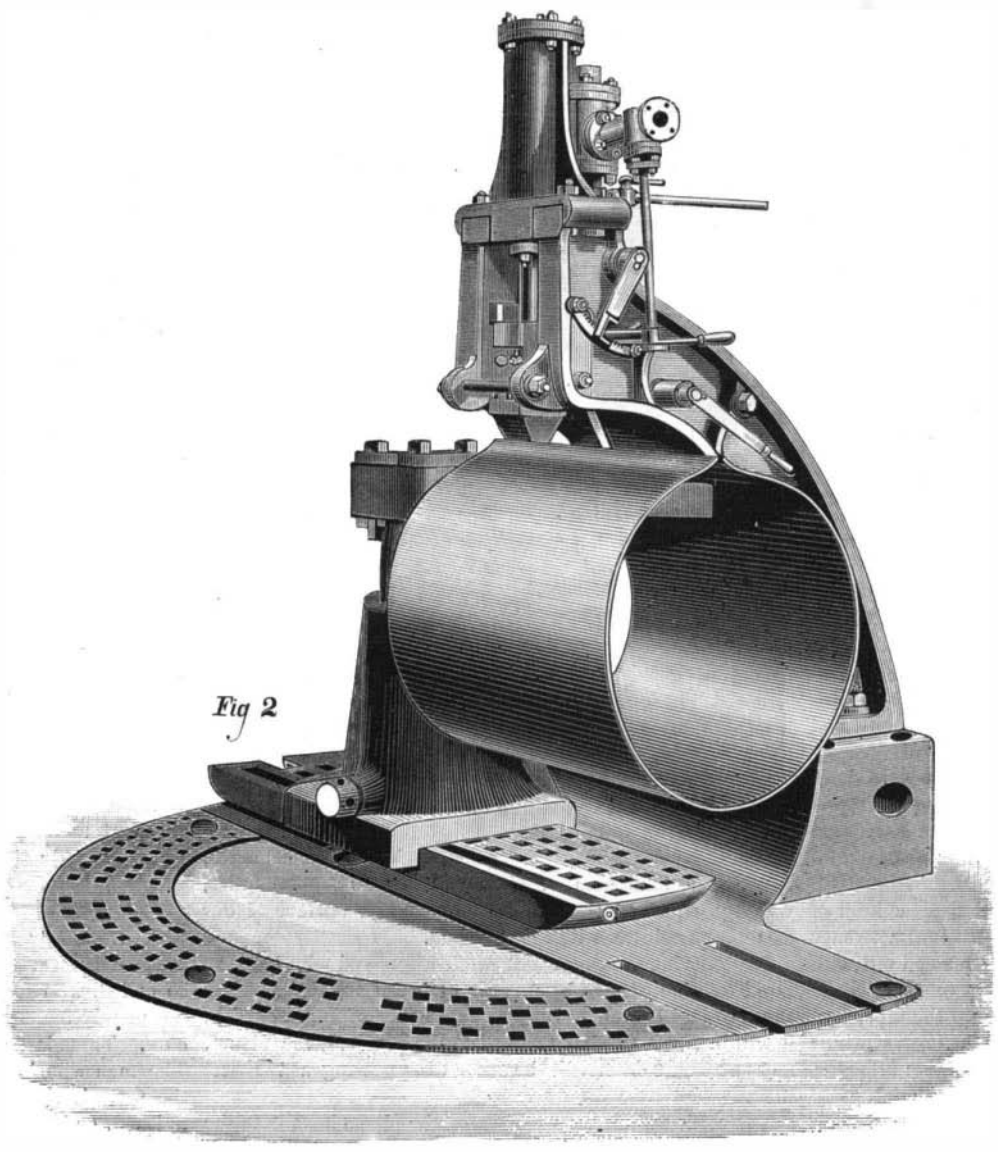


Fig. 2.—WELDING HAMMER.

The anvil block is arranged to admit a variety of anvils for flanging end plates up to fifteen feet in diameter, tube plates, dished crown plates, etc., and for setting back the bottoms of vertical fire boxes, and the guide block will admit heads to suit.

In Fig. 2 we illustrate the machine as used for welding purposes. In doing this work a welding block is mounted on the long slide; this block carries a welding bar, upon which saddles may be fitted for different diameters. The block and bar carrying the flue are traversed along the bottom slide, and as much length as can be heated may be welded at once. The usefulness of the hammer has been further developed by the Leeds Forge Company in the manufacture of their well known Fox's corrugated flues, the diameters of which at the ends are reduced upon it prior to flanging.

By the foregoing operations it will be seen that the machine covers a great range of work of a kindred character where the easily-regulated blow of the hammer is necessary for the varying conditions of hot iron.—*The Engineer.*

Manual Labor vs. Machinery.

A fear seems to have taken possession of many minds lest by the inventive genius of man machinery might be produced capable of accomplishing so much as to remove the necessity for manual labor, and, as a consequence, lest they themselves should be unable to gain a livelihood. So widely have these views been imbibed, even by men of apparent intelligence of a comparatively high order, that they have advocated in strong terms, upon the rostrum and elsewhere, the desirability of not only banishing new machinery, but inventors also. This opposition has made the path of those who possessed sufficient enterprise to lead them to devise new methods, and new apparatus to effect the same, not only unpleasant, but generally unprofitable; whereas if mankind had been more fully endowed with wisdom and brotherly love a very different state of affairs would have existed.

The cry that "the rich are growing richer and the poor are growing poorer," as the result of the introduction of new machinery is not true. In fact, the use of machinery is constantly improving the condition of all classes; and the advance that has been made by the masses toward a higher civilization the last half century is simply wonderful, and is due to the development of the inventive genius of man. That there is not an equitable distribution of the products of the farm, the mine, and the manufactory cannot be denied. But where does the fault lie? Not with the machinery either of old or new design.

Let the reader look back with the aid of proper books of reference to the condition of things fifty years ago. At that time it was beginning to dawn upon the minds of the most progressive that steam railways were a possibility; but everything for the next ten years was in the crudest possible condition, no more like the comfortable railways of to-day than a two-wheel springless ox cart is like a modern pleasure carriage. Then travel was slow and tedious for all classes, rich