

(No Model.)

2 Sheets—Sheet 1.

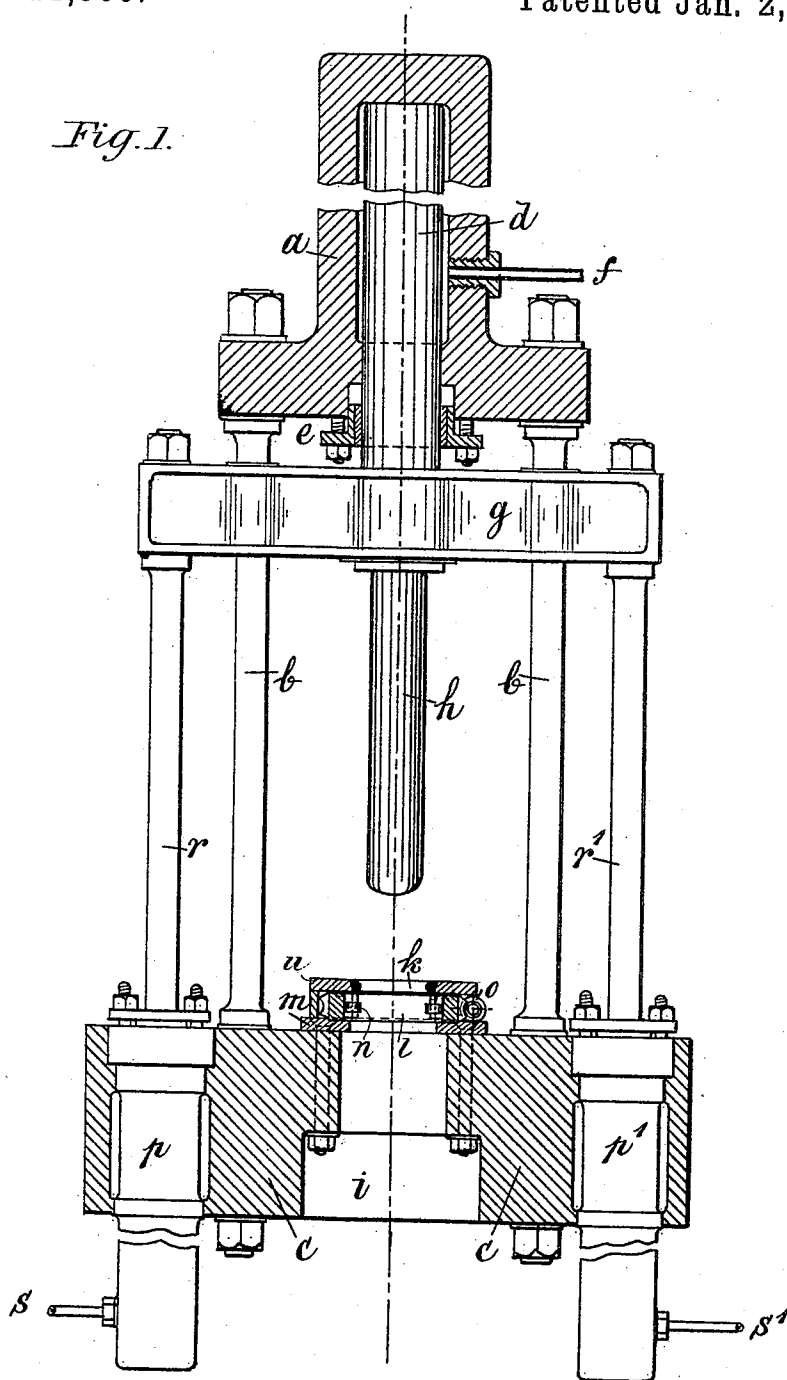
H. LANE.

APPARATUS FOR DRAWING METAL TUBES.

No. 511,900.

Patented Jan. 2, 1894.

Fig. 1.



Witnesses.

Ernest Parker.

J. Woodgate

Inventor.

Harold Lane

(No Model.)

2 Sheets—Sheet 2.

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Fig. 6.



Fig. 7.

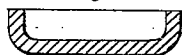


Fig. 8.

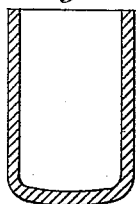


Fig. 9.

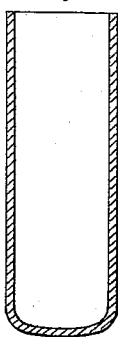


Fig. 10.

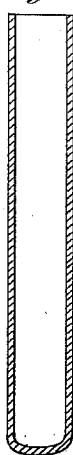


Fig. 11.

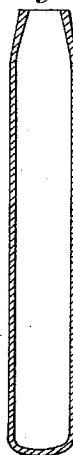


Fig. 12.

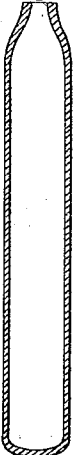


Fig. 13.

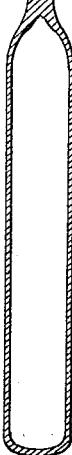


Fig. 14.

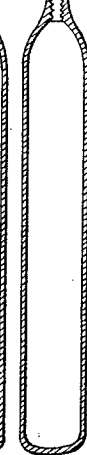


Fig. 3.

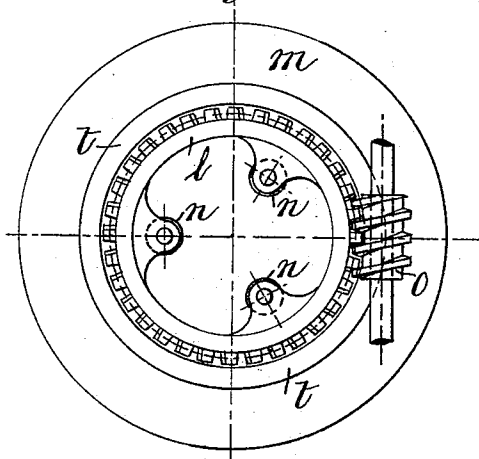


Fig. 2.

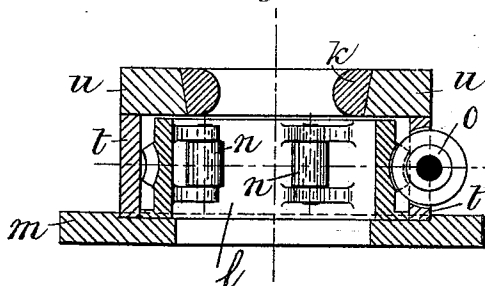


Fig. 5.

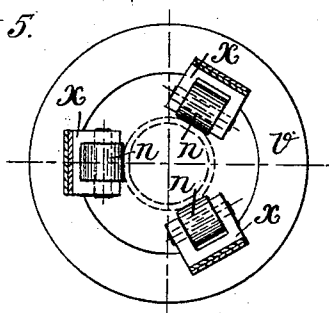
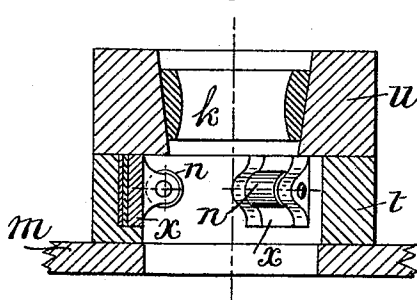


Fig. 4.



Witnesses.

Ernest Barker.

J. J. Woodgate

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UNITED STATES PATENT OFFICE.

HOWARD LANE, OF BIRMINGHAM, ENGLAND.

APPARATUS FOR DRAWING METAL TUBES.

SPECIFICATION forming part of Letters Patent No. 511,900, dated January 2, 1894.

Application filed April 3, 1893. Serial No. 468,871. (No model.) Patented in England September 14, 1891, No. 15,534.

To all whom it may concern:

Be it known that I, HOWARD LANE, engineer, a subject of the Queen of Great Britain, residing at Birmingham, in the county of Warwick, England, have invented a new and useful Improvement in Machinery or Apparatus for Making Metal Bottles or Tubes, (which has been in part patented in Great Britain under No. 15,534, dated September 14, 1891,) of which the following is a specification.

My invention relates to improvements in machinery or apparatus for making metal bottles or tubes from plates or blocks of suitable iron or steel, by forcing them through dies by means of mandrels or rams actuated by hydraulic or other power; and the objects of my improvements are, first, to provide means for loosening the metal upon the mandrel or ram so that it can readily be removed from the latter; second, to provide dies through which the metal vessels are drawn or shaped.

My invention may be carried into effect by means of the apparatus illustrated in the accompanying drawings, in which—

Figure 1 represents a longitudinal vertical section of the apparatus or press by which I form the vessels or bottles. Figs. 6 to 14 represent the material in successive stages of progress during the manufacture, Fig. 6 showing a plate or block of steel or other metal, and Fig. 14 showing a section of the finished vessel. Figs. 2 and 3 are detailed views, on a larger scale, of some of the parts shown in Fig. 1. Figs. 4 and 5 show the die and a modified arrangement of the loosening rollers.

The same letters of reference represent similar parts in the several figures.

The vessels or bottles when made may owing to their great strength and homogeneity be used for containing gases under pressure, or fluid substances such as metallic mercury. They are made in the form of strong tubes of iron or steel, cylindrical in shape and closed at their lower end while the upper end is provided with an aperture, which can be closed by a suitable screw or valve, and through which the contents of the vessel can be introduced and withdrawn.

The vessel or bottle is made from a disk of iron or steel, such as Fig. 6, by stamping it up in the ordinary way until it has assumed

about the shape shown in Fig. 8 after which and while in a cold or hot state it is passed through dies by means of plungers, and assumes the shapes such as shown in Figs. 9 and 10. By pressing or hammering, its upper open end is then brought together as shown in Figs. 11 and 12, until it is completely closed as shown in Fig. 13, and it is then drilled and screwed as shown in Fig. 14, to receive a screw stopper or valve.

In the drawings *a* is a strong hydraulic or steam cylinder, carried by a sufficient number of columns *b, b*, the lower ends of which are fixed to the foundation or bed *c*. A ram *d* works in the cylinder *a*, from which it passes out through a stuffing box or its equivalent at *e*, and *f* is a pipe through which water or steam under sufficient pressure can enter cylinder *a*, or be allowed to escape from same. The lower end of the ram *d* is connected to a cross-head *g* to which is also attached a plunger or ram *h* of suitable size and shape which may be varied as required. In the lower bed or frame *c* is a central opening *i* above which is adjusted and fitted a tempered steel die *k* (shown on a larger scale at Fig. 2) supported by ring *t* and having a central opening of suitable size. Below this die is fitted a strong ring *l* turning freely in a recess in the plate or frame *m* fixed to the bed *c*, and carrying on its inner circumference three strong friction rollers *n n n*. The ring *l* is also provided with teeth round its outer circumference, gearing with a worm screw *o* carried in bearings on the frame *m*, and made to revolve when desired by any convenient power, so that the ring *l* is caused to revolve in its bearings.

p p' are cylinders supported in the bed *c* and having rams *r r'* working in them, the upper ends of which are attached to the cross head *g* which is shown guided upon the columns *b b*; and *s s'*, are supply pipes by which water or steam under pressure can be admitted into or withdrawn from the cylinders *p p'*, when desired, in order to raise the rams *r r'*, cross head *g*, plunger *h*, and ram *d*.

The action of the apparatus is as follows:—The partially formed vessel, as shown in Fig. 8 is placed centrally upon the die *k*. The plunger *h* is forced down, by admitting water under pressure through the pipe *f* into the cyl-

inder α , pipes $s s'$ being of course open. As the vessel is forced down through the die k , the sides are reduced in thickness and the tube elongated and after being forced through a succession of dies of gradually reduced diameter the vessel or tube assumes a shape as illustrated in Fig. 10.

In operations of the kind described, great difficulty has always been experienced in removing the hollow vessel from the ram h , and in order so to loosen it upon the plunger that the latter can be readily withdrawn from it at the conclusion of the operation, the rotating ring l is used below the fixed die k . The rollers n, n, n , carried by this ring, press forcibly and in a form of a spiral upon the exterior of the metallic tube or vessel after it has passed through the fixed die k , thereby loosening the tube or vessel sufficiently upon the mandrel or plunger h .

Different shaped dies and plungers are used in succession, until the metallic vessel has assumed the desired shape and the open end is then preferably heated and gradually compressed and welded, as shown in Figs. 11, 12, and 13, and an opening is then drilled through it and screwed, as shown in Fig. 14.

Fig. 4 shows a vertical section, and Fig. 5 a plan, of a modified arrangement of the rollers, the axes of which are in this case horizontal instead of vertical. t is a strong ring or support, preferably of steel, having recesses on its inner circumference into which fit brackets x carrying the rollers n, n, n , which are adjustable by packing of variable thickness at the back of the brackets, so that the rollers may be made to press with sufficient force against the exterior of the vessel or tube upon the mandrel after it has passed through the die k . This pressure is sufficient to release the vessel from the mandrel or ram, from which it can be then readily withdrawn but the disadvantage of this arrangement is that the rollers form flattened surfaces upon the tube.

Figs. 2 and 4 show the method which I prefer to use for making the die. u is a very strong ring or support preferably of mild steel, and having a somewhat conical hole through it into which fits the die k , of cast steel hardened throughout. By this arrange-

ment, the die is comparatively thin and can readily be hardened, while when it is forced down in its conical seat, the ring u receives the bursting strain.

When necessary the die k can readily be removed and another substituted for it.

The apparatus may be arranged horizontally, or in other convenient position, and instead of the mandrel or plunger h being fixed directly below the ram d , it may be arranged laterally with respect to the latter.

I do not here claim the particular arrangement of hardened inner die and softer carrying die.

What I claim, and desire to secure by Letters Patent, is—

1. In apparatus for the manufacture of metal tubes or bottles and in combination a mandrel, a die, and rollers for loosening the molded article on said mandrel arranged adjacent the die to operate on the article after it has passed through the same and brought the shape around the mandrel, substantially as set forth.

2. In apparatus for the manufacture of metal tubes or bottles the combination with a mandrel of a hardened inner die a softer ring carrying said die and rollers adapted to revolve on the molded article to loosen it from said mandrel substantially as set forth.

3. In apparatus for the manufacture of metal tubes or bottles the combination with a mandrel and die of rollers adapted to have independent bearing motion upon the molded article to loosen it from said mandrel substantially as set forth.

4. In apparatus for the manufacture of metal tubes or bottles the combination with the mandrel and die of a crosshead carrying said mandrel a ram or plunger for operating the crosshead in one direction and separate rams or plungers for operating it in the other substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HOWARD LANE.

Witnesses:

ERNEST HARKER,
J. J. WOODGATE.