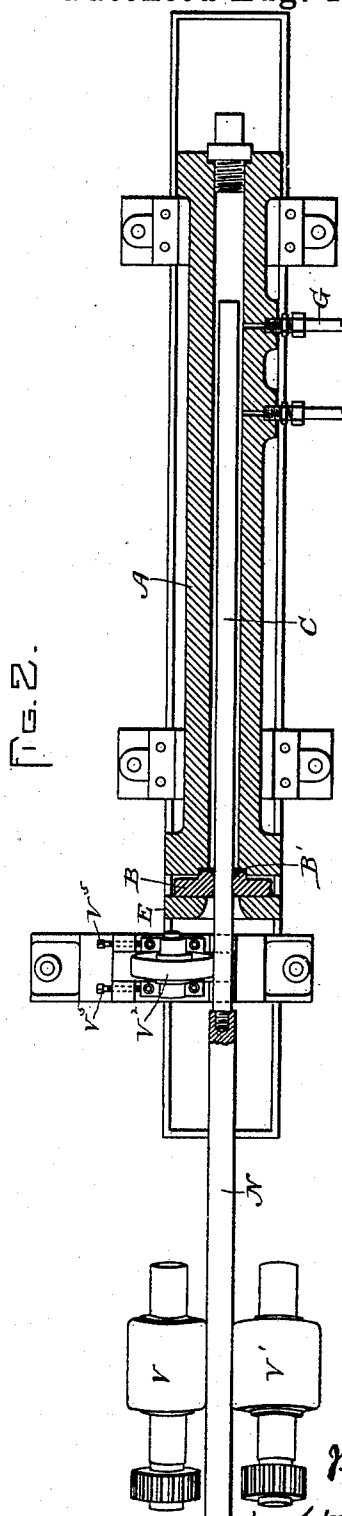
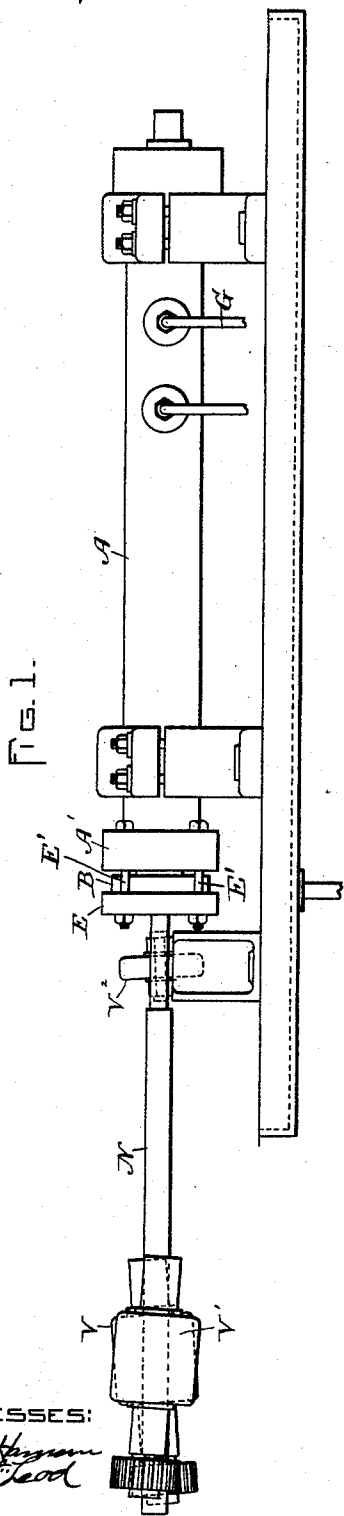


(No Model.)

J. ROBERTSON.
METHOD OF FORMING METAL ARTICLES.

No. 524,508.

Patented Aug. 14, 1894.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JAMES ROBERTSON, OF MANCHESTER, ENGLAND.

METHOD OF FORMING METAL ARTICLES.

SPECIFICATION forming part of Letters Patent No. 524,508, dated August 14, 1894.

Original application filed September 30, 1893, Serial No. 486,869. Divided and this application filed February 19, 1894. Serial No. 500,728. (No model.) Patented in England October 14, 1893, No. 19,356.

To all whom it may concern:

Be it known that I, JAMES ROBERTSON, of Manchester, England, have invented certain new and useful Improvements in the Manufacture of Metal Tubes, Tubular and Hollow Articles, Rods, Bars, Wires, and Plates, (for which I have obtained British Letters Patent No. 19,356, dated October 14, 1893,) of which the following is a specification.

This invention is a division of my application of Letters Patent of the United States filed September 30, 1893, Serial No. 486,869. Said application describes certain improvements in the manufacture of metal rods, bars, tubes, tubular articles, plates, and wires, by a drawing operation, a new method being involved, namely, compressing and forming a metal article by confining a blank, or partially formed mass of metal at the entrance to a drawing die and forcing a liquid against said metal under sufficient pressure to push it through the die and thus impart to the cross-section of the metal the form of the die, the liquid pressure acting to force the metal forward without involving any injury to the completed article or to any part thereof, by the force used in driving the metal through the die.

The present invention has for its object to facilitate the passage of the metal through the drawing die in the process of forming it, and to provide certain subordinate improvements in the apparatus.

The invention consists in the method substantially as hereinafter described and claimed.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of an apparatus embodying my invention. Fig. 2 represents a partial plan view and partial horizontal section of the same.

The same letters of reference indicate the same parts in both figures.

In the drawings, A represents a container or receptacle, of strong construction, adapted to sustain the high pressure of a liquid introduced into it, as hereinafter described. The container is of elongated form, and its interior cavity or chamber is formed to correspond

to the general shape of the blank or mass of metal to be drawn.

The container has at one end a discharge opening, through which the metal passes. At said opening is located a drawing die B which is or may be a plate of suitable metal, such as hardened steel, having an orifice, the walls of which are shaped to give the desired form to a mass of metal forced through the die, as usual in the operation of drawing dies. The die constitutes, in effect, the outlet of the container, it being secured to the container in such manner that when liquid pressure is maintained within the container, the only outlet will be through the die.

In the simplest form of apparatus embodying my invention, the die is or may be secured to the container by means of a head or plate E, which is secured by bolts E' to a flange A' formed on one end of the container. The plate E is thus removably attached, so that the die may be at any time removed and another one substituted for it, the die being placed loosely between the flange A' and plate E.

A water-tight joint may be maintained between the die and the container, by means of a packing-ring or washer B' (Fig. 2) of leather or other suitable material.

G represents a pipe, communicating with the interior of the retainer, and adapted to conduct a liquid into the same. Said pipe is preferably connected with a hydraulic accumulator loaded to give a sufficiently high degree of pressure to the liquid to cause the latter to push a blank or mass of metal inserted in the container through the die B. There may be two of these pipes, as indicated in the drawings.

C represents a blank in the form of a solid rod, which is placed in the container A, the cross section of said rod being larger than that of the opening in the die.

A liquid introduced under high pressure into the container acts to force the blank C through the die and thus reduce and elongate the same, forming a completed rod of a cross-section equal to that of the opening in the die.

In carrying out my invention, I reduce the frictional resistance of the die to the passage

of the rod or blank being drawn through it, by rotating the same during its passage through the die, so that the pressure required is not so great as it would be if the blank were not rotating. To this end, I affix to the forward end of the blank C a rod N, which may be secured to the blank by means of a screw-threaded socket in the rear end of the rod, and a screw thread formed on the forward end of the blank, and provide a pair of rolls V V' mounted on shafts which are arranged obliquely and at different inclinations, said rolls being in contact with the rod N and arranged so that their rotation causes the rotation of the rod and the blank affixed thereto, the result being a helical motion of the rod and blank.

V² represents a straightening roll, the axis of which is obliquely arranged, said roll being arranged to bear upon the finished article as it emerges from the die, for the purpose of straightening the said article. The straightening roll V² may be adjusted by means of screws V⁵ V⁵ bearing against a slide which supports the axis of the said roll.

I do not limit myself to the employment of the rod N, as the rolls V V' may be arranged close to the container A, so that they will bear directly upon the article issuing from the container; but such an arrangement is not so desirable, because the rollers will have a tendency to mark the surface of the finished article.

Any other method of rotating the article being drawn and thereby relieving its frictional resistance may be employed without departing from the spirit of my invention, the

essential features of which are the forcing of a metal article through a drawing die by the pushing action of a liquid under pressure, and the application of external devices for rotating the article and thus assisting the drawing action. Tubes may be drawn in this way through long mandrels, and when this is done two setting rolls should be used, close to the die B, to impinge upon and grasp the tube firmly and thus expand it over its mandrel sufficiently to loosen it and make the tube easily removable from the mandrel.

I claim—

1. The method of compressing and forming a metal article, which consists in pushing a blank or mass of metal through a drawing-die, by the direct action of a liquid surrounding the metal in the container and under continuously supplied pressure, and at the same time rotating the metal and thereby facilitating its passage through the die.

2. The method of forming a metal article, which consists in pushing a blank or mass of metal through a drawing-die by the direct action of a liquid surrounding the metal in the container and under continuously supplied pressure, and at the same time rotating the metal and subjecting it to the action of straightening devices.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 27th day of December, A. D. 1893.

JAMES ROBERTSON.

Witnesses:

ARTHUR C. HALL,
JOHN W. THOMAS.