

(No Model.)

3 Sheets—Sheet 1.

C. DE LOS RICE.
APPARATUS FOR DRAWING TUBES.

No. 565,726.

Patented Aug. 11, 1896.

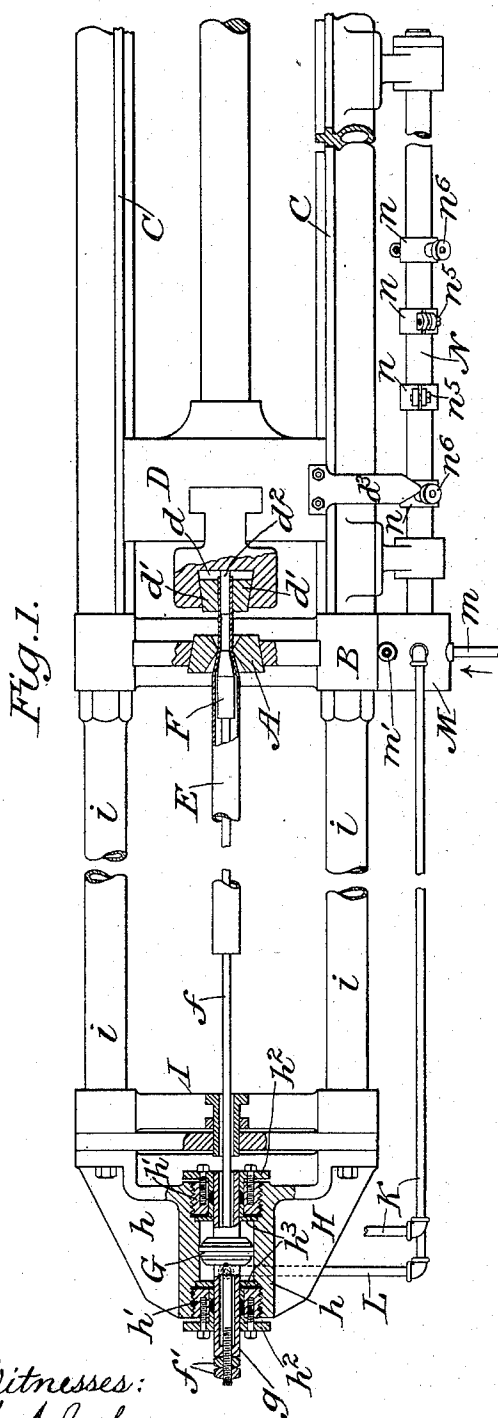


Fig. 1.

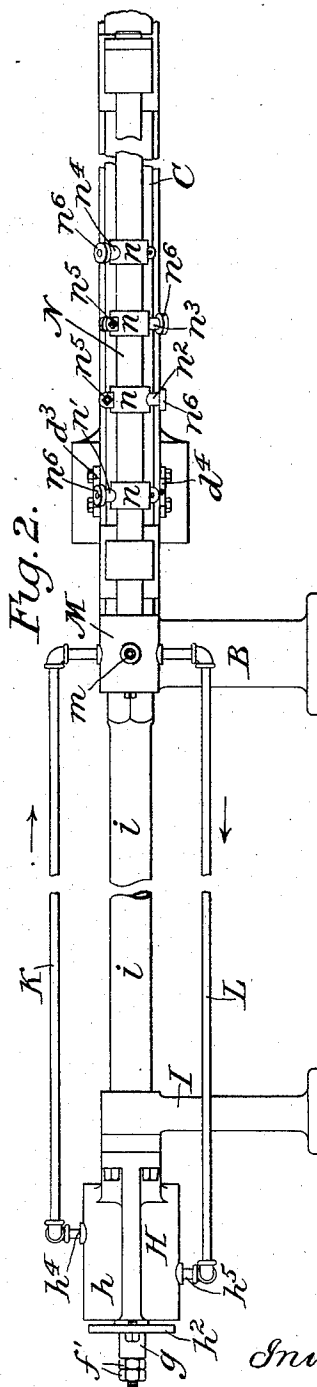


Fig. 2.

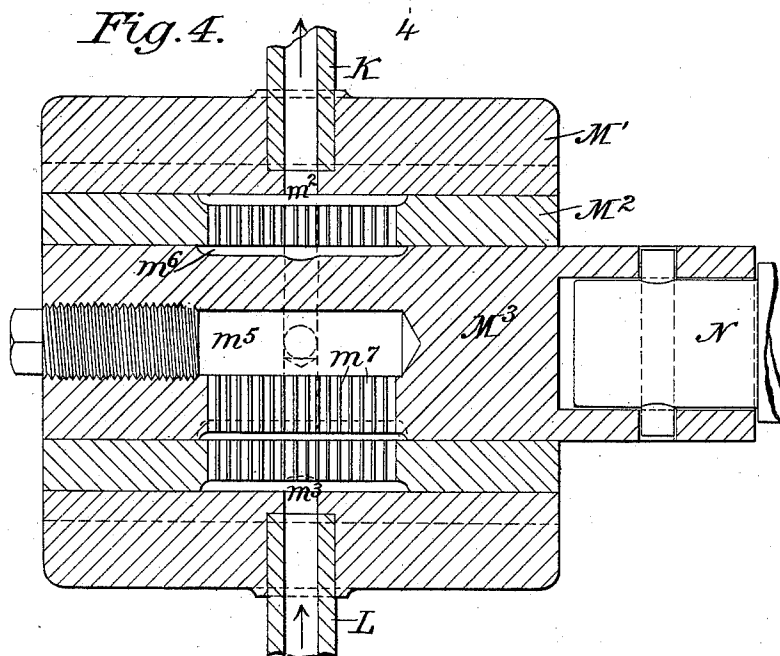
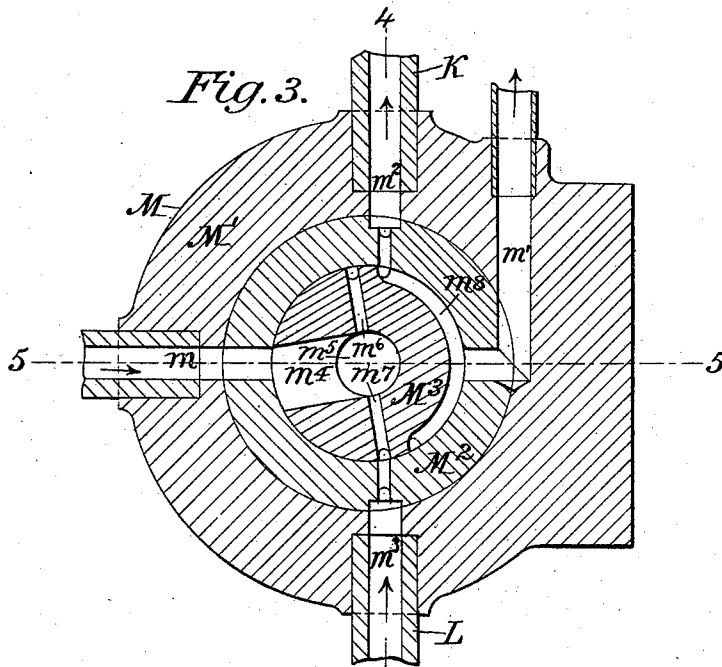
Witnesses:
A. N. Jesbera.
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 Inventor:
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By Redeling & Kiddle
Atty's.

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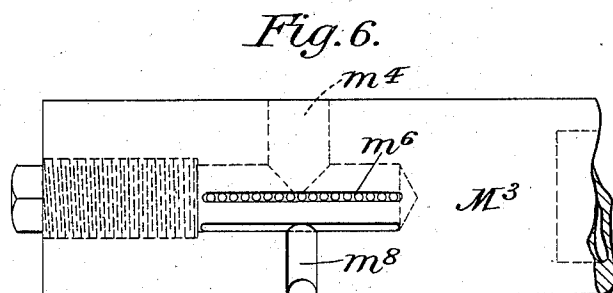
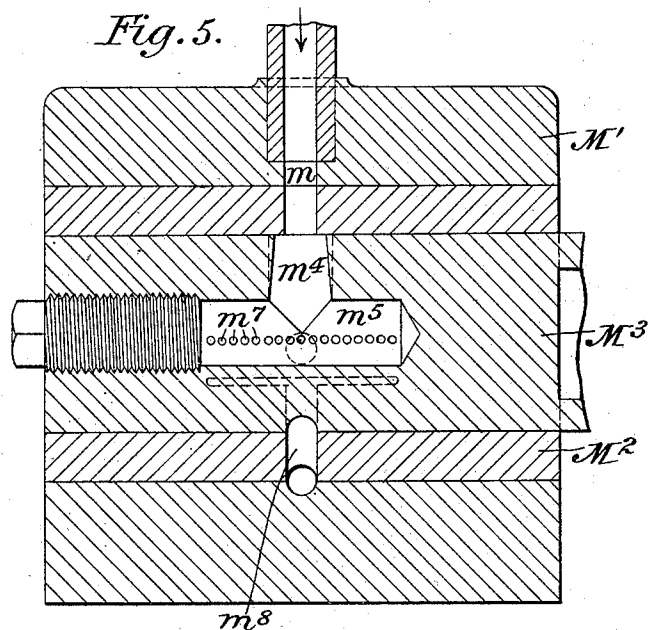
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3 Sheets—Sheet 3.

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APPARATUS FOR DRAWING TUBES.

No. 565,726.

Patented Aug. 11, 1896.



Witnesses:
A. St. Jesera
H. Gibson

Inventor:
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UNITED STATES PATENT OFFICE.

CHARLES DE LOS RICE, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE POPE MANUFACTURING COMPANY, OF SAME PLACE AND PORTLAND, MAINE.

APPARATUS FOR DRAWING TUBES.

SPECIFICATION forming part of Letters Patent No. 565,726, dated August 11, 1896.

Application filed May 4, 1895. Serial No. 548,102. (No model.)

To all whom it may concern:

Be it known that I, CHARLES DE LOS RICE, a citizen of the United States, and a resident of the city and county of Hartford, State of Connecticut, have invented certain new and useful Improvements in Apparatus for Drawing Tubes, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to the manufacture of tubes from other roughly-formed tubes or hollow ingots, and it has for its object particularly to provide for the variation at will of the thickness of the walls of the tube as the latter is being formed.

The invention consists in improved apparatus for effecting the desired result, and I have herein shown and described a certain form of mechanism which is well adapted for the practice of the invention; but it will be understood that, except as may be pointed out in some of the claims, the invention is not to be limited to the particular form of mechanism shown and described herein, such form being merely a preferred form and serving to illustrate the principle of the invention.

In the accompanying drawings, in which, as stated, a preferred form of apparatus has been illustrated, Figure 1 is a partial plan view of such apparatus, parts being broken off to save space and parts being also shown in horizontal section, in order to enable the construction thereof to be shown more clearly. Fig. 2 is a side elevation of the same, the supply-pipe for the motive fluid being represented in section. Fig. 3 is a transverse section of the controlling-valve hereinafter referred to, the scale being considerably larger than that of Figs. 1 and 2. Fig. 4 is a longitudinal central section thereof on a vertical plane, indicated by the line 4 4 of Fig. 3. Fig. 5 is a longitudinal central section thereof upon a horizontal plane, indicated by the line 5 5 of Fig. 3. Fig. 6 is a view in elevation of the inner valve-plug removed from its seat.

In the form of apparatus shown in Figs. 1 and 2 of the drawings the die or other device for drawing tubes is represented at A as carried by a suitable support B, which forms a part of the usual draw-bench, the ways of

which are indicated at C C. A draw-head D may be arranged to travel on said ways and to be operated by any suitable means, which it is not necessary to illustrate or describe herein. The draw-head is adapted to engage the tube to be drawn, and is represented as having formed in its face a recess d , which enlarges inwardly and receives the gripping blocks or jaws d' d' , which are adapted to grip the end of the tube indicated at E. A solid plug d^2 may be inserted in the end of the tube before it is introduced into the grip, in order to guard against the collapsing of the same.

The parts thus far referred to may be of any usual or suitable construction, the present invention not being directly concerned therewith.

A triblet or mandrel is adapted to be inserted within the tube E to be drawn and to form with the die or other drawing device A a substantially annular opening through which the tube may be drawn, having its walls reduced in the operation. The relation of the mandrel and die or drawing device is such that said annular space, or, in other words, the distance between the outer wall or surface of the triblet and the inner surface of the die, may be varied during the operation of drawing the tube, whereby the thickness of the walls of the tube may be varied at will, and means are provided for causing and controlling such variation. It will be observed that many different arrangements might be provided for producing the desired variation of the annular space between the triblet and die or drawing device and thereby effecting the ultimate object—viz., the variation of the thickness of the tube being drawn. This object is attained conveniently, with certainty in operation and without objectionable complication, by the devices shown in Figs. 1 and 2 of the drawings, in which the triblet F is tapering toward its extremity or otherwise has its diameter progressively reduced, whereby longitudinal displacement of either the die or the triblet with respect to the other produces variation of the annular space or distance between the two, it being understood that the triblet approaches or enters within or is encircled by the die or

drawing device. It being desirable that the die should be held firmly in place, the triblet is preferably made the movable member of the pair and therefore may be attached to a rod f , by which movement is transmitted from some actuating part.

Any suitable means, controlled in any desired manner, may be employed for effecting the movement of the triblet at the proper time, but that the machine may be as nearly as possible automatic and thereby facilitate the production of tubes closely resembling one another it is desirable that the movement of the draw-head should control the movement of the triblet. This result is readily accomplished by connecting the triblet to a piston and by causing the draw-head in its movements to actuate the valve which controls the admission of steam or compressed air or other motive fluid to the cylinder in which such piston is adapted to move. Accordingly the rod f is connected to a piston G, mounted in a cylinder H, as represented in Figs. 1 and 2 of the drawings. The cylinder is conveniently formed integral with a bridge h , which is carried by a suitable support I, the latter being braced by tie-beams i , secured to the support B. The cylinder has annular throat-pieces h' to receive packing and facing rings h^2 h^3 , and the piston G has a trunk-stem g , which is extended through the ends of the cylinder. The rod f may be screw-threaded at its end to engage the trunk-stem g to permit adjustment of the triblet with respect to the piston, and may receive lock-nuts f' f' .

The motive fluid is admitted to the cylinder H at opposite sides of the piston G through ports indicated at h^4 h^5 , to and from which the motive fluid is conducted by pipes K and L, leading from the valve M. The latter is so situated as to be conveniently actuated by the movement of the draw-head D. It may comprise, as clearly shown in Figs. 3, 4, 5, and 6 of the drawings, a shell M' and bushing M^2 , having ports m and m' for connection, respectively, with the supply and exhaust pipes, and ports m^2 and m^3 for connection, respectively, with the pipes K and L, leading to a cylindrical valve-plug M^3 . The ports m^2 m^3 , through the bushing M^2 , are preferably formed as slits or as series of small holes, so that the cut-off may be quick. The valve-plug M^3 is arranged to oscillate within the bushing M^2 , and has a wide port m^4 , connected with a central chamber m^5 , and adapted to communicate also with the inlet-port m . It has also lateral ports m^6 and m^7 , adapted to be brought into connection, respectively, with the ports m^2 and m^3 to an exterior channel m^8 , forming an exhaust-way and being always in connection with the exhaust-port m' and adapted to bring either port m^2 or m^3 into connection therewith.

The valve-plug M^3 is intended to be oscillated by the movement of the draw-head. For this purpose an oscillating shaft N is

mounted parallel with the line of movement of the draw-head in suitable bearings which may be secured to one of the ways C and is connected to the valve-plug M^3 . The shaft has fixed thereon a series of split hubs n n , carrying each an arm n' n^2 n^3 n^4 . The arms have different angular dispositions about the shaft N and the position of each may be adjusted by unscrewing the clamping-bolt n^5 and loosening the hub upon the shaft. Each arm may carry a roller n^6 , if desired. The draw-head D has fixed thereon two actuating-dogs d^3 and d^4 , one or the other of which, during the movement of the draw-head, will strike the arms n' n^2 n^3 n^4 and rock the shaft to a limited extent in one direction or the other, thereby bringing the valve-ports into such relative position as to cause the movement of the piston G and triblet F in the required direction.

In the operation of the mechanism described above and in the practice of the method therewith the end of the tube to be drawn is introduced between the jaws of the die or drawing device A and is connected to the draw-head, which is then in its proximate position with respect to the die or drawing device. At this time the valve-plug M^3 is in such position as to establish communication from the inlet-pipe to the pipe K, and the piston G therefore stands at the rear end of the cylinder H, and the triblet F is in its most remote position with respect to the die or drawing device A. If movement is then imparted to the draw-head D away from the die or drawing device A, the dog d^3 , which is carried thereby, will, when the draw-head has reached the position indicated in Figs. 1 and 2, strike the roller of the arm n' and will therefore rock the shaft N and with it the valve-plug M^3 , bringing the latter into the position represented in Figs. 3 and 4, thereby cutting off communication from the inlet-pipe to the pipe K, establishing communication between the pipe K and the exhaust-port m' and establishing communication between the inlet and the pipe L. As a result of this movement the steam or other fluid is admitted through the pipe L to the rear end of the cylinder H and the piston G, and with it the triblet F, moved forward, such movement of the triblet being simultaneous with the movement of the draw-head. The effect of such movement of the triblet F is to cause it to project farther within the die or drawing device A and therefore to reduce the distance between its surface and the inner surface of the die, whereby the thickness of the walls of the tube being drawn is reduced. It may be assumed that the movement of the triblet continues while the draw-head moves far enough to bring the dogs d^3 and d^4 from the position just described to a position approaching or in line with the hub supporting the arm n^2 . When the draw-head reaches this latter position, the dog d^4 strikes the arm n^2 and rocks the shaft N in a direction opposite to that in which it has just been

moved and changes the relations of the valve-ports so that both ports m^2 and m^3 are closed and the movement of the piston and triblet ceases in consequence. The movement of the draw-head continuing, the dog d^4 next strikes the arm m^3 , which shifts the valve-plug M^3 sufficiently to establish communication between the inlet-pipe and the pipe K and establish communication between the pipe L and the exhaust-pipe. The steam or other fluid is thus admitted to the forward end of the cylinder H and causes the withdrawal of the triblet F, effecting a corresponding increase in the thickness of the walls of the tube being drawn. This movement last described continues until the dog d^3 is brought into contact with the arm n^4 , thereby shifting the valve-plug M^3 sufficiently to shut off the communication between the inlet-port and the pipes K and L and stopping the rearward movement of the triblet and preventing further increase in the thickness of the walls of the tube being drawn. When the movement of the draw-head D has been brought to an end, the tube which has been drawn is removed and the parts are restored to their initial positions in readiness for another operation. During the restoration of the parts to such initial positions the supply of steam or other fluid may be entirely cut off and movement of the triblet be thereby prevented.

It is obvious that the number of the arms on the shaft N may be increased and that their arrangement may be varied to produce any desired result. It will also be understood that the form and arrangement and construction of the mechanism may be varied from that shown without departing from the spirit of my invention.

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

1. The combination with a die and a draw-head for drawing a tube through said die, of a triblet supported within said die and forming therewith an annular space for the reduction of the walls of the tube, means for varying said space, and devices operated by the draw-head for controlling such variation and causing it to be simultaneous with the drawing of the tube, whereby the thickness of the walls of the tube may be varied.

2. The combination with a die and a draw-head for drawing a tube through said die, of a triblet having its operating-surface of varying diameter supported within said die and forming therewith a space for the reduction of the tube, means for effecting relative longitudinal displacement of said die and triblet during the movement of the tube, and devices operated by the draw-head for controlling such displacement and causing it to be simultaneous with the drawing of the tube, whereby the thickness of the walls of the tube may be varied.

3. The combination with a die and a draw-head for drawing a tube through said die, of a triblet supported within said die and form-

ing therewith an annular space for the reduction of the tube, the outer surface of said triblet and the inner surface of said die being so related that longitudinal displacement of one of said parts with respect to the other causes a variation of the annular space between them, a piston adapted by its movement to effect such relative displacement, a cylinder within which said piston is fitted, and means actuated by the movement of the draw-head for controlling the supply of motive fluid to said cylinder, whereby the thickness of the walls of the tube is varied during the drawing of the tube.

4. The combination with a die and a draw-head for drawing a tube through said die, of a tapering triblet supported within the said die and forming therewith an annular space for the reduction of the tube, a piston connected to said triblet, a cylinder within which said piston is fitted, and means actuated by the movement of the draw-head for controlling the supply of motive fluid to said cylinder.

5. The combination with a die and a draw-head for drawing a tube through said die, of a tapering triblet supported within said die and forming therewith an annular space for the reduction of the tube, a piston connected to said triblet, a cylinder within which said piston is fitted, a valve controlling the flow of motive fluid for said cylinder, and devices actuated by the movement of the draw-head for shifting said valve.

6. The combination with a die and a draw-head for drawing a tube through said die, of a tapering triblet supported within said die and forming therewith an annular space for the reduction of the walls of the tube, a piston connected to said triblet, a cylinder within which said piston is fitted, a valve controlling the flow of the motive fluid for said cylinder, a rod connected to said valve to operate the same, and having a projection and a striker carried by said draw-head and adapted in its movement to strike said projection and shift said valve.

7. The combination with a die and a draw-head for drawing a tube through said die, of a tapering triblet supported within said die and forming therewith an annular space for the reduction of the tube, a piston connected to said triblet, a cylinder within which said piston is fitted, inlet and outlet ducts for said cylinder, a valve controlling the direction of the flow of the motive fluid through said ducts, an oscillating shaft connected to said valve and having a series of projections, and a striker carried by said draw-head and adapted to strike said projections during the movement of the draw-head and effect the shifting of the valve.

This specification signed and witnessed this 26th day of April, A. D. 1895.

CHARLES DE LOS RICE.

In presence of—

WM. J. BONNER,
LUCIAN HORTON.