

C. G. SMITH.

Machine for Making Metal Tubes.

No. 57,783.

Patented Sept. 4, 1866.

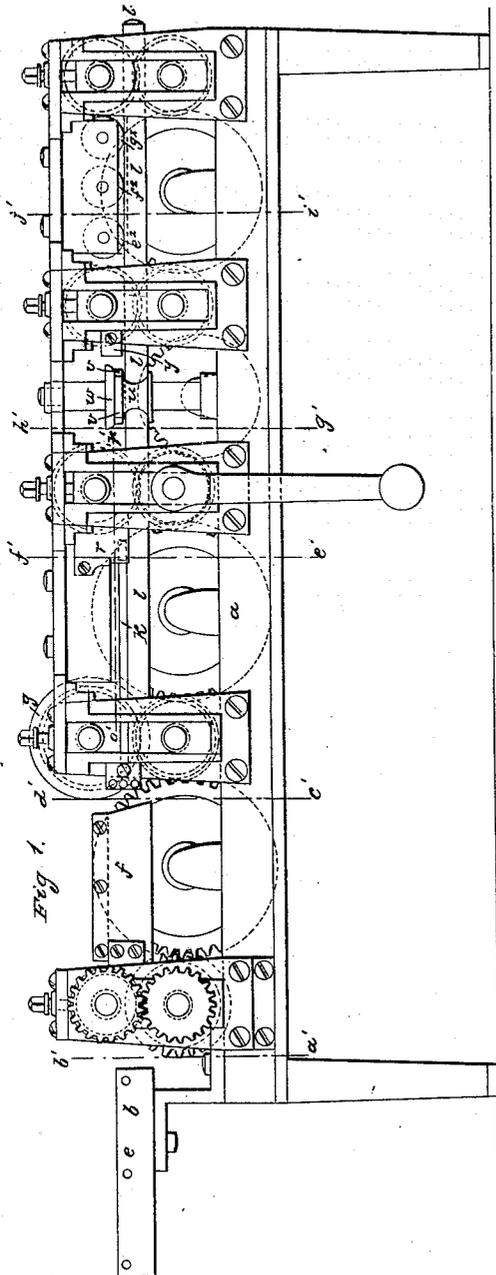


Fig. 1.

Witnesses:
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No. W. Frothington.

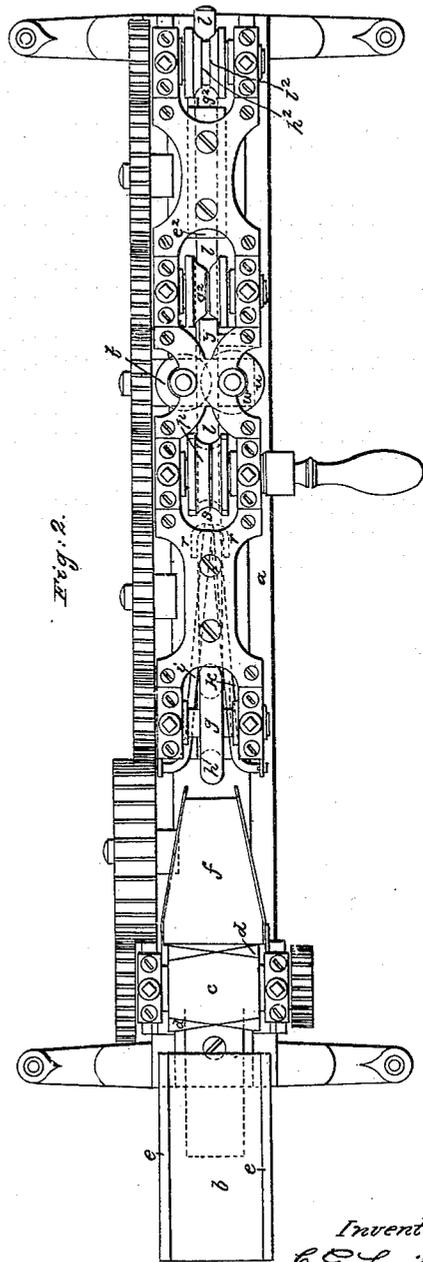


Fig. 2.

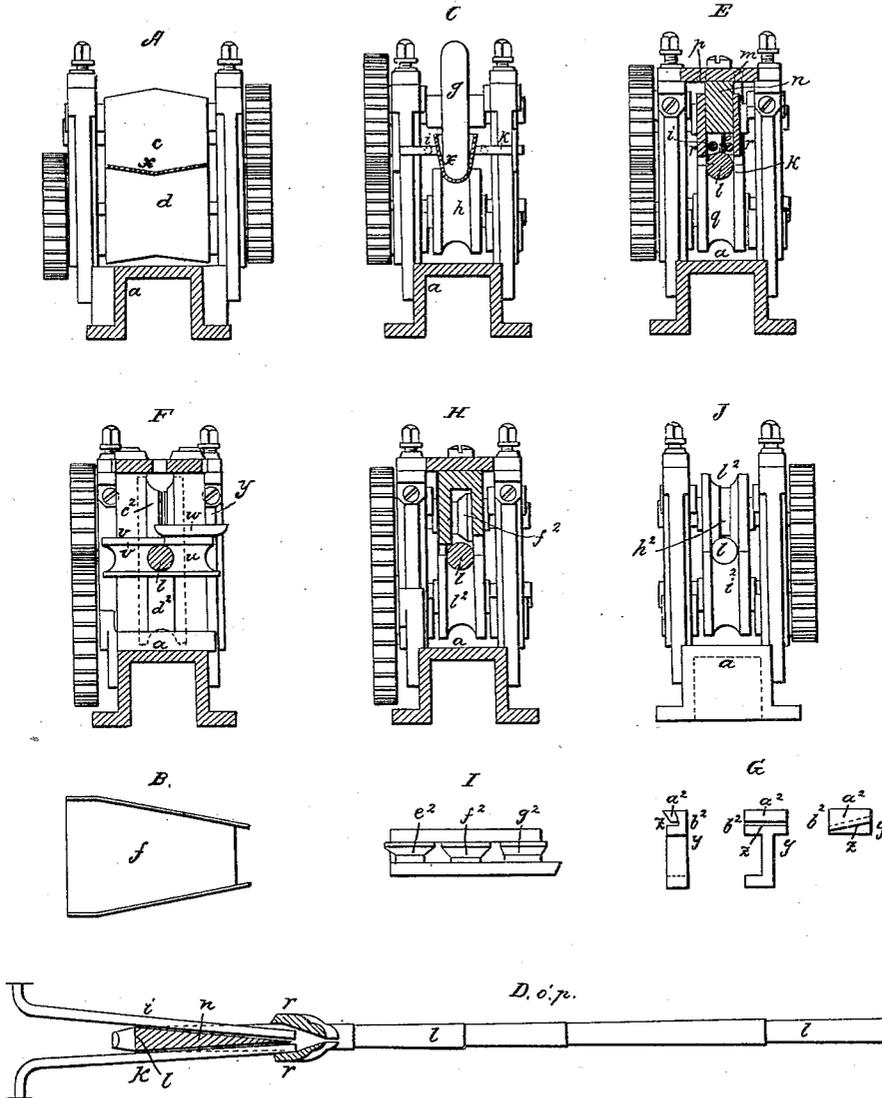
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UNITED STATES PATENT OFFICE.

CHARLES G. SMITH, OF CHELSEA, MASSACHUSETTS.

IMPROVED MACHINE FOR MAKING METAL TUBES.

Specification forming part of Letters Patent No. 57,783, dated September 4, 1866.

To all whom it may concern:

Be it known that I, CHARLES G. SMITH, of Chelsea, in the county of Suffolk and State of Massachusetts, have invented an Improved Machine for Making Tubes from Sheet Metal; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

The invention relates to an arrangement or organization of mechanism for forming, from sheet metal, tubes or pipes with a lap-joint, the object being to so construct and arrange the parts of the machine that the successive operations upon the plate or strip of metal to shape it into cylindrical form, and to make and finish the joint, are performed automatically, the material in the form of a plate or long flat strip being fed into the machine at one end by the mechanism, and being delivered from the opposite end by the action of the mechanism in the form of a finished tube.

The invention consists in the general arrangement of mechanism for effecting the construction of the tube, and in the details of mechanism by which the successive operations are performed.

The drawings represent a mechanism embodying my invention, Figures 1 and 2 showing, respectively, a plan and a side elevation of the machine, various details, as will be hereinafter referred to, being shown in the other views.

A sectional view of a finished tube as formed by this machine is shown at O, and the shape given to the metal at each progressive stage in its formation into the tube will be understood from the lines in red in the sectional elevations.

a denotes a bed or frame, which supports the various sets of rolls and other mechanism. At one end of this bed is a table or mouth-piece, *b*, over which the metal plate or blank is entered between and to the action of two horizontal rotating rolls, *c d*. This table has guide-walls *e* at its opposite sides, and the strip of metal cut to a width corresponding to the width of the table between the walls is guided by them to the action of the rolls *c d*. The

lower roll, *d*, is made slightly dishing or concave on its acting-surface, and the upper roll has a corresponding convexity, as seen at A, which is a section taken at *a' b'*, just in rear of and looking toward these rolls. The rolls, matching together, seize the end of the plate presented to them, and as they feed it between them they bend it slightly down in the center and up at the sides, as seen at *x* in said section A, the two sides so bent up being of equal width. As the sheet passes beyond these rolls it enters a throat-piece, *f*, which has sides inclined toward each other, as seen at B, which is a reversed plan of it. The opposite edges of the plate, bent as seen at *x*, strike these inclines as the sheet is fed along, and the bend in the plate is increased by contact with the sides of the throat-piece until the sheet reaches the front end of said throat, when its form is that of an angular gutter, and is such that it is seized at the center by a pair of narrow rolls, *g h*. (Seen in detail at C, which is a view taken at *c' d'*, just in rear of these rolls.) The lower roll is a grooved one, and the upper roll convex and corresponding to the groove of the lower one, and as the plate reaches them its sides have been so inclined by the action of the throat *f* that they enter between a pair of long rods, *i k*, which at the rear end are at a distance apart equal to the width of the front end of the throat, but at the front end are nearly in contact, as seen by dotted lines in Fig. 1, and at D. The rolls *g h* seize the plate, and, feeding it along, impart to its center a semicircular form in section, as seen at *x* in section C. As the sheet passes beyond the action of the rolls *g h* it is fed under and along a long horizontal stationary beak iron or triblet, *l*, a plan of which is shown at D. This triblet is fastened at its rear end beneath and to a plate, *m*, (a piece, *n*, projecting up to the plate *m*, as seen at D,) and from this point it extends horizontally through to the front end of the machine. This piece *n* and the triblet at their rear ends are of about the width of the tube to be formed; but from this point (which is just in front of the rolls *h i*) to the front end of the projection *n* the part of this projection nearest the triblet narrows down into a web, *o*, as seen at E, which is a section at *e' f'*, just in rear of the

next pair of forming-rollers $p q$, this web not being in a vertical plane with the axis of the triblet, (the triblet being arranged centrally in the machine,) but terminating on one side thereof, as seen at o in section E. The point of this web is just in rear of the rolls $p q$, and the incline rods $i k$ follow along its opposite sides, as seen in Fig. 1, and at D and E, and terminate at about the same point. These rods are hung at their rear ends in the housings of the rolls $g h$, and at their front ends are kept from spreading by projections r .

The triblet is circular in section, and as the plate passes from the action of the rolls $g h$ the parts bent up from the center pass between the rods $i k$, these rods crowding the plate inward and over upon the surface of the triblet, as seen at E, (the plate being denoted in red.) Now, as the action of the angle in the rolls $c d$ and the action of the rolls $g h$ were upon the center of the plate, it will be obvious that the opposite sides or edges turned up therefrom must be of equal width, as seen at C; but as the web o on the triblet extends out from the center of the triblet toward one side thereof, and the rods $i k$ crowd the metal down to the surface of the triblet and up to this web, it will be also obvious that by this action one edge of the plate will be left projecting up beyond the other, as seen at E. In this condition the plate reaches the grooved rolls $p q$. The lower one of these rolls has a semicircular groove corresponding with the exterior diameter of the tube, and the roll holds the passing metal up to the surface of the triblet, which in section at this point corresponds to the inner diameter of the tube. The groove in the upper roll is similar; but from this groove, in the line of the terminating-point of the web o , is a deep slit, s , into which the two edges of the plate enter from the web. The upper roll forces the metal closely down to the upper surface of the triblet and brings the two edge-pieces into contact, and with one edge projecting up beyond the other. From these rolls the metal, in cylindrical form and with the opposite edges of the plate projecting up, passes to the action of two horizontally-rotating rolls, $t u$. (See section F, taken at $g' h'$, just in rear of these rolls.)

The rolls are grooved to fit around the surface of the tube and to hold it closely to the surface of the triblet, and each has also a cylindrical face, v , one of which is of a depth equal to the width of the narrow lip turned up from the metal, and the other the same depth plus the thickness of the metal. Surmounting the roll v is a conical or quarter-round head, w . As the metal passes between these rolls the lips are held closely together by the faces v , and the head w turns the projecting edge down over the top of the narrow edge, and at or nearly at a right angle thereto, as seen at F. Passing from these rolls, the edges run through a stationary guide or guide-block, y , (detailed views of which are seen at G,) which has a per-

pendicular wall, z , against which the outer side of the wide lip passes, and an inclined roof, a^2 , inclining down from the rolls $t u$, the lip turned over the edge pieces being, in its movement through this guide, gradually turned down from its horizontal position toward the two edges in contact, bringing the three into vertical position together by this incline, and a vertical slit, b^2 , into which the incline leads and terminates. From this guide the tube passes forward between a pair of groove-rolls, $c^2 d^2$, both of which fit to the surface of the tube to hold it against the surface of the triblet, while the upper one has a vertical slit just wide enough for the lip (made up of the two edges turned up from the metal and the edge turned down from one and against the other) to pass through, the edges being firmly compressed together by the movement through this slit. From these rolls the tube passes under a series of frusto-conical rolls, $e^2 f^2 g^2$, the first of which bends the lip down slightly from its vertical position, this inclination being increased by the second roll, f^2 , as will be readily understood from the section H, taken on line $i' j'$, and still further by the third, g^2 . A plan of these rolls is seen at I. From these rolls the tube passes between the finishing-rolls $h^2 i^2$, (seen in rear elevation at J,) the lower one of which has a semicircular groove, and the upper one a corresponding groove, with the exception of a recess in the center, in which is a cylindrical surface, l^2 . The circular parts of the grooves press the tube closely to and around the cylindrical surface of the triblet, while the cylindrical face l^2 flattens down the flap and compresses it against the cylindrical surface of the tube, the compressed flap fitting into the recess in the groove. The tube is thus fed from the machine in a finished condition, the cylindrical form of the tube being effected by the general cylindrical form of the triblet, and being maintained in such form until the seam is completed.

To obviate friction in the movement of the metal along the triblet, said triblet may be shaped to conform in diameter to the interior of the tube in the plane of action of each set of rolls, and to taper from each set to the adjacent ones, as seen at D, so that the metal will only bear against such surface where the rolls act upon it.

The pairs of rolls $c d$, $g h$, $p q$, $c^2 d^2$, $h^2 i^2$ are geared together by a train of gearing, as seen at Figs. 1 and 2, they all moving at the same surface velocity, and effecting the regular progression of the material through the machine.

It will be obvious that some of the rolls may be dispensed with, the others being made to perform a greater share of the work; but the arrangement shown is considered the preferable one, as the gradual bending of the metal by the successive operations insures a more perfect result than if the bending were more abruptly performed by fewer rolls.

The lap-joint of the tube may be made from

two lips of equal width laid together vertically, and then doubled and laid down against the cylindrical surface of the metal; but such a joint is considered inferior to the one shown.

I claim—

In combination with a stationary triblet or mandrel, mechanism for feeding the plate, mechanism for bending part of the plate into a tubular form over the surface of the triblet

or mandrel, and mechanism for forming the opposite edges of the plate into a lap-joint, the whole operating together to form the plate into a tube, substantially as described.

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Witnesses:

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