2 Sheets--Sheet 1.

E. QUADLING & W. MAY.

Machines for Manufacturing Metal-Tubing.

No. 146,358. Patented Jan. 13, 1874.

FIG: 1.

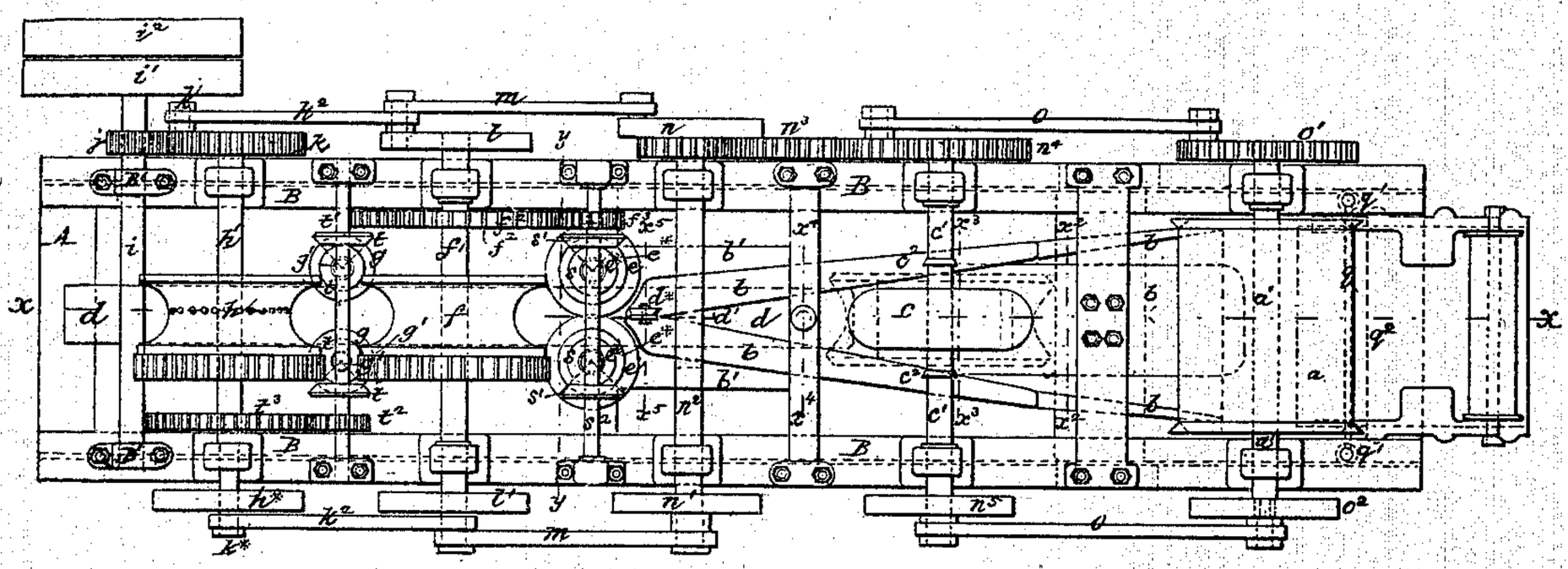
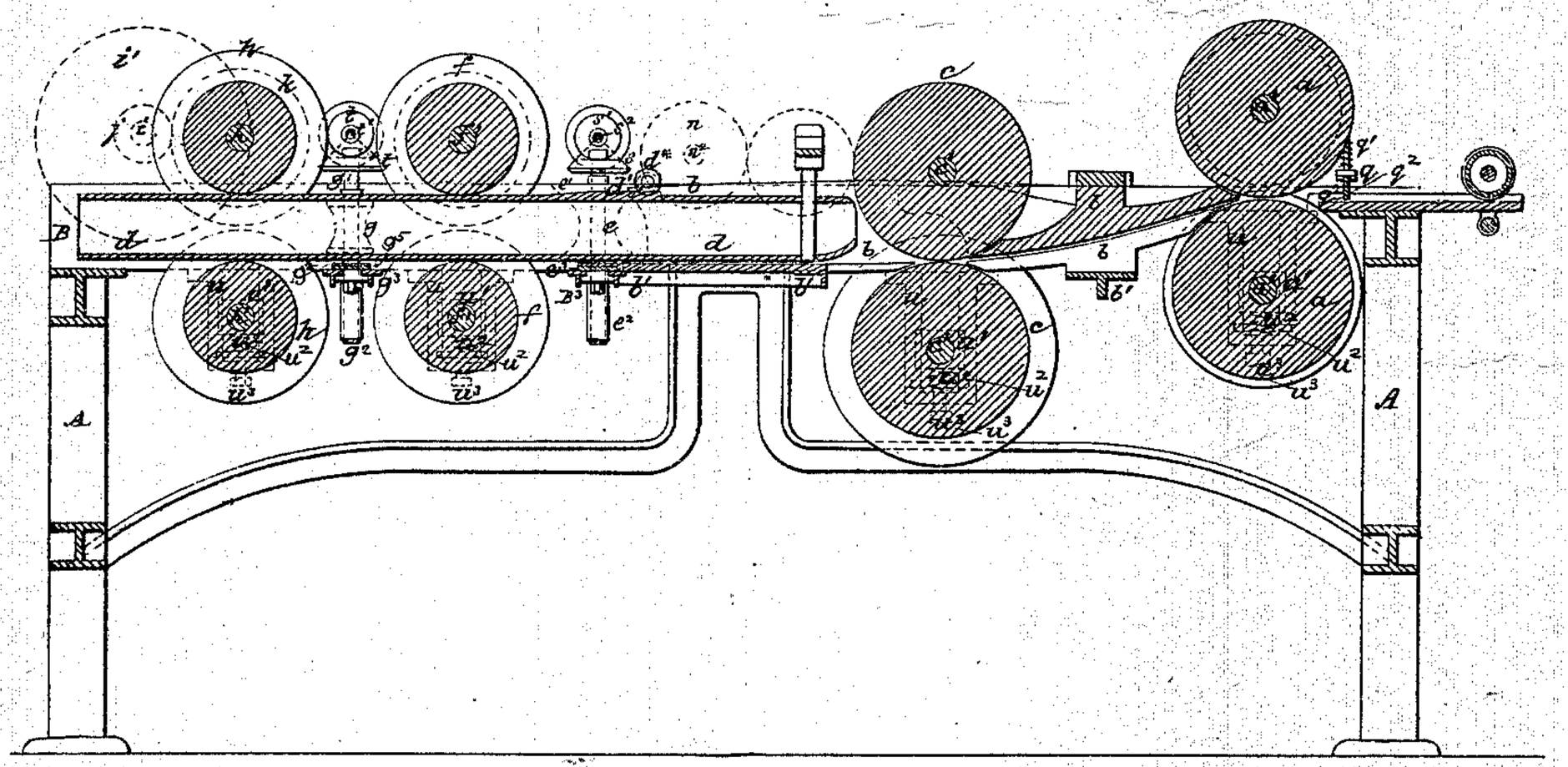


FIG: 2.



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2 Sheets--Sheet 2.

E. QUADLING & W. MAY.

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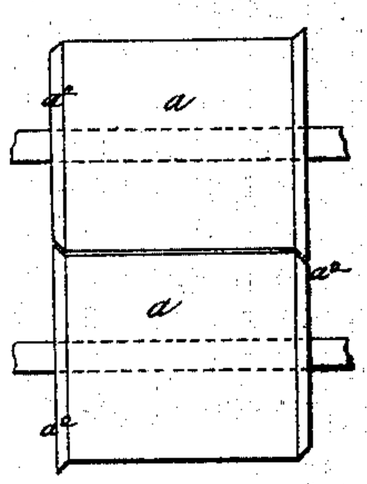
FIG: 3.



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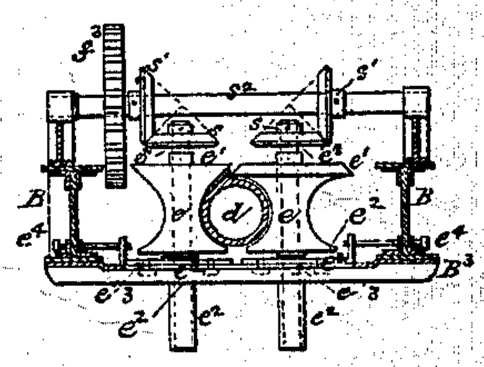


FIG: 4.

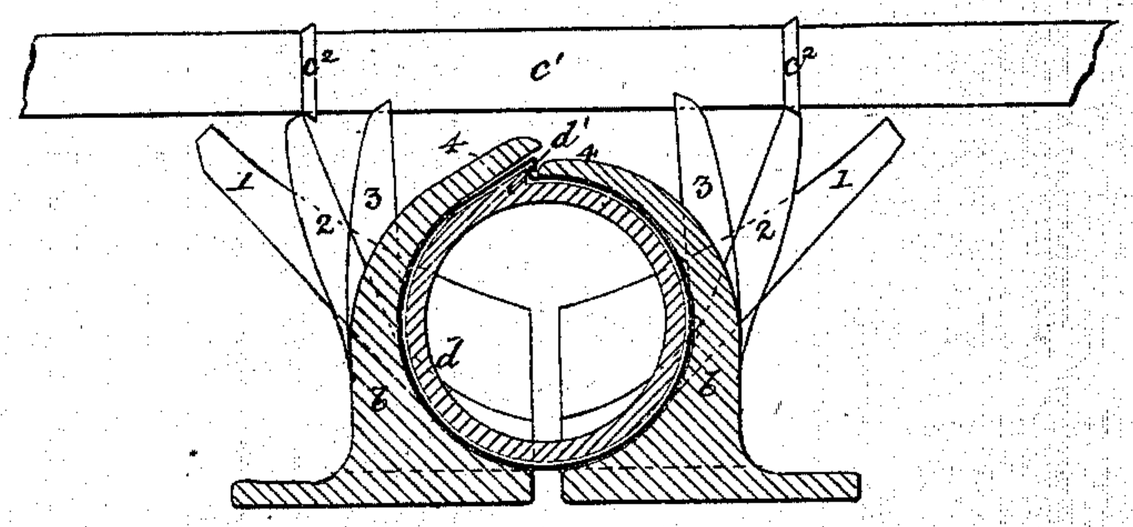
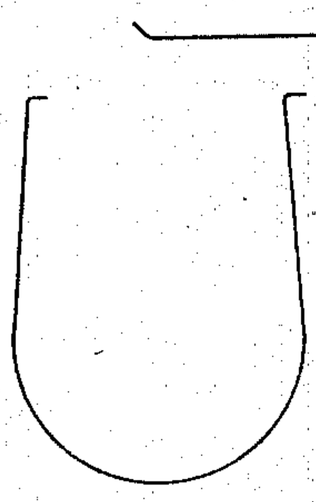


FIG: 6.

FIG: 7.



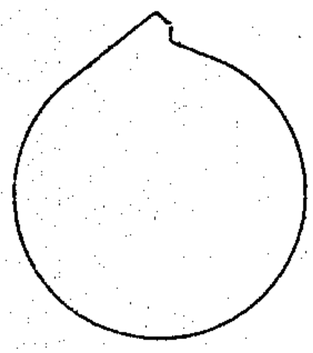


FIG: 8.

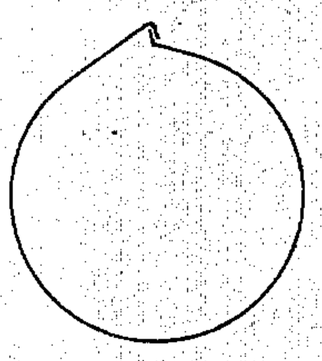
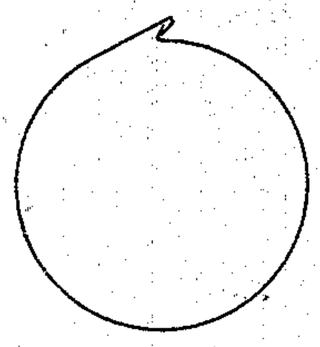


FIG: 9.

FIG: 10.



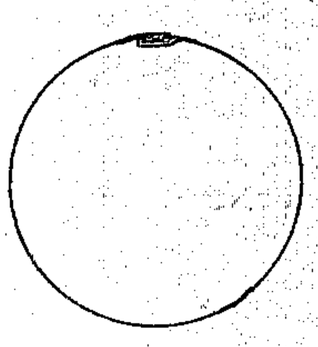


FIG: 11.

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UNITED STATES PATENT OFFICE.

EDWIN QUADLING AND WILLIAM MAY, OF LONDON, ENGLAND.

IMPROVEMENT IN MACHINES FOR MANUFACTURING METAL TUBING.

Specification forming part of Letters Patent No. **146,358**, dated January 13, 1874; application filed October 8, 1873.

To all whom it may concern:

Be it known that we, EDWIN QUADLING and WILLIAM MAY, both of London, England, have invented certain new and useful Improvements in Machines for Manufacturing Metal Tubes; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings making a part of the specification, in which—

Figure 1 is a plan of our improved machine. Fig. 2 is a longitudinal vertical section of the same on the line *x x*, Fig. 1. Fig. 3 is an elevation of the first pair of rolls of the said machine. Fig. 4 represents a number of transverse sections, drawn to an enlarged scale, of a portion of the said machine, on the several lines x^2 x^3 x^4 x^5, Fig. 1. Fig. 5 is a transverse section on the line *y y*, Fig. 1. Figs. 6, 7, 8, 9, 10, and 11 are transverse sections, illustrating the progressive formation of a tube in our machine.

The same letters in all the figures indicate the same parts.

A A are standards of cast-iron, or other suitable material, upon which is secured a bed or frame, B, of suitable strength and shape to support the operative parts of the machine. These parts consist chiefly of the first pair of bending-rolls *a*, the stationary molding-guides *b*, the second pair of bending-rolls *c*, the mandrel *d*, the vertical laying-roll *d**, and the third, fourth, fifth, and sixth pairs of rolls *e f g h*.

We will now proceed to describe the peculiar construction and purpose of each of these parts, and the contrivances for operating the same.

i is the driving-shaft, provided with fast and loose pulley i^1 i^2. The said shaft is supported in suitable bearings B^1, formed on or attached to the frame B. *j* is a pinion, fixed on the said shaft, and gearing with the spur-wheel *k* on the shaft *k'*. This wheel carries a crank-pin, k^1. A similar crank-pin, *k**, is fixed on the disk *h**, from which connecting-rods k^2 extend to a crank-pin in the disk *l*, fixed on the shaft f^1 of the upper roll *f*. This shaft has a similar crank-disk, *l'*, on its other end, and from the pins of these disks connecting-rods *m* extend to a crank-pin on the disk and pinion *n*, and disk n^1, carried on the shaft n^2. An intermediate spur-wheel, n^3, gears with the spur-wheel n^4 on the shaft c^1 of the upper rolls of the second pair *c*, and on this shaft a disk, n^5, and spur-wheel n^4, by which the rods *o o* are connected to the spur-wheel o^1 and the disk o^2, carried on the shaft a^1 of the upper roll of the first pair *a*.

By using these connecting-rods, we are enabled to dispense with a long train of wheel-gearing, and thereby reduce the weight and friction of the machine and its cost of construction.

Instead of these connecting-rods, we may use endless screws, or worm and worm-wheels, or may gear them in the usual way.

In these machines, as heretofore constructed, the effect of the first pair of rolls is to bend both edges or laps of the metal strip in one direction. This manner of commencing to form the lap is disadvantageous, as, when the joint is finished, one lap has to lie within the other, and consequently one of the laps so bent must, subsequently to its first bending in one direction, be bent in the reverse direction. Therefore, in our machine, we commence the formation of the joint by bending the two edges or laps in opposite directions, so that when the two laps are subsequently brought together, one will lie properly within the other. For this purpose we construct the first pair of rolls as shown in Fig. 3—that is to say, the ends a^2 of the said rolls are beveled in opposite directions, and the metal strip thereby receives the shape represented in Fig. 6. For conducting the metal strip to the bending rolls *a*, we use the guide-plate *q*, which is supported by the bolts q^1, attached to the frame B. These bolts are provided with spiral springs, which tend to press the said plate down upon the metal strip, passing under it upon the table q^2, and thereby prevent the buckling of said plate. Instead of this spring-plate, we may use any elastic agent. The stationary molding-guides

b are supported on the brackets b', secured to the bed B. Their edges are formed as shown in Fig. 4, and in its passage between these guides from the line x^2 to the line x^5 the metal strip passes through the various shapes represented by the lines 1, 2, 3, and 4 in Fig. 4, being left by the said guides in the sectional form shown in Fig. 9.

On the shaft c^1 of the upper roll c are, or may be, formed small beveled collars c^2, which, by their action upon the laps, bring them from the shape indicated in Fig. 6 to that represented in Fig. 7. The mandrel d, as clearly shown in Fig. 2, is made hollow or tubular. The said mandrel has a feather, d', which forms a guide and support for the laps of the metal strip during its passage through the guides b and vertical laying-roll d^*. The vertical friction or drawing rolls e, as clearly shown in Fig. 5, are arranged in combination with the feather. The feather and the upper edges e^1 of these rolls are so shaped that the form of the laps is changed from that shown in Fig. 9 to that shown in Fig. 10, the said laps being partially pressed down upon the perimeter of the tube.

These machines, as heretofore constructed, when designed to make tubes of a certain size, can make them of that size only. It is, however, very desirable that the said machine should be capable of adjustment, so that any one machine constructed to make tubes of a certain size can be adjusted so as to make tubes of various sizes; and we accomplish this object by making the parts of the machine adjustable, as herein described.

The shaft e^* of the rolls e is supported in adjustable steps e^2 upon the brackets B^3, india-rubber e^3 being interposed between the said steps and brackets to form an elastic support for the said rolls. The steps e^2 are provided with screws e^4, whereby they are adjusted laterally to set the rolls nearer together or farther apart; and the said rolls are adjusted vertically by moving them upon their shafts e^*, whereon they are secured by set-screws, as shown. s s are bevel-gear wheels, whereby the rolls e are driven from the shaft s^2, which is geared with the shaft f^1 by the spur-wheels f^2 f^3. The bevel-wheels s^1 are secured on their shaft s^2 by set-screws or otherwise, and are adjustable thereon, so that they may follow the rolls e in their adjustment.

The rolls f and h complete the formation of the lap or seam of the tube. As shown in the drawings, these rolls have a plain or smooth periphery, and are designed for forming an inside seam; but, if desired, they may be grooved or channeled to form an outside seam on the tube.

The shafts q^1 of the friction or drawing rolls g are supported in adjustable steps q^2, which are carried in a bracket, q^3, extending across the bed B, and these shafts are adjustable laterally by means of screws, and vertically on the shafts, as described, with regard to the rolls e, a cushion of india-rubber being also interposed between their steps and the bracket which carries them, to give an elastic support to the said rolls. t t are bevel-wheels for driving these rolls, and which are adjustable on their shaft t^1, the said shaft being geared, by the wheels t^2 t^3, with the shaft h'. Bearing or guide blocks u are attached to the under side of the bed B for supporting the bearings u^1 of the bottom rolls a c f h. Springs u^2, of steel, india-rubber, or other elastic medium, are placed under the bearings u^1, set-screws u^3 being so arranged, in combination with these springs, as to regulate their pressure, and thereby adapt the rolls to the different sizes of the tubes being manufactured.

The rolls a are sometimes made telescopic and adjustable on their shafts by means of screws. The other rolls may be made in two halves, with removable rings between them, their size being varied by changing the rings.

By making the various parts of the machine adjustable, as described, we are enabled to vary the size of tubes made in the machine, within certain limits, without changing the mandrel d; but by using different-sized mandrels, rolls, and guides, we can make tubes of any size not exceeding the capacity of the machine.

We do not confine ourselves to the peculiar position of the apparatus on the frame, as described. It may be advantageous to place the gearing on one or both sides of the bench or frame, as circumstances require.

Our invention relates to machines constructed with a series of shaping and bending rolls and stationary guides, a mandrel, and other contrivances, whereby a strip of metal introduced into one end of the machine is bent, and has its edges lapped, folded, and secured together automatically, and is delivered in the form of a complete tube at the other end of the machine.

Our present invention consists in the novel construction and arrangement of the rolls and other parts of the mechanism for performing the above operations.

We are aware that machines for the same purpose have been heretofore constructed, but operating in a manner widely differing from this, as hereinbefore described.

Having thus described our invention, what we claim, and desire to secure, is—

1. The first pair of rolls, a, with their ends a^2 beveled or inclined in the peculiar manner set forth, for the purpose specified.

2. In combination with the rolls a, the spring pressure-plate q, or elastic roll arranged over the feed-table, as herein set forth, and for the purpose specified.

3. The stationary molding-guides *b*, constructed as described, and arranged in combination with the small rotating beveled collars c^2, as herein set forth, and for the purpose specified.

4. The vertical friction-roll *d**, as described, and arranged in combination with the stationary molding-guides *b*, as herein set forth, and for the purpose specified.

5. The mandrel *d*, when constructed with the rib or feather *d'*, in the manner described, and for the purpose set forth.

6. The third pair of rolls, *e*, on vertical shafts, operating in combination with the mandrel *d* and the rib or feather *d'* on the same, as herein specified, and for the purpose set forth.

Signed August 12, 1873.

EDWIN QUADLING.
WILLIAM MAY.

Witnesses:
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GEO. W. DRISCOL.