6 Sheets—Sheet 1.

J. B. ROOT.

MACHINE FOR MAKING SPIRAL-JOINTED METALLIC TUBING.

No. 183,329. Patented Oct. 17, 1876.

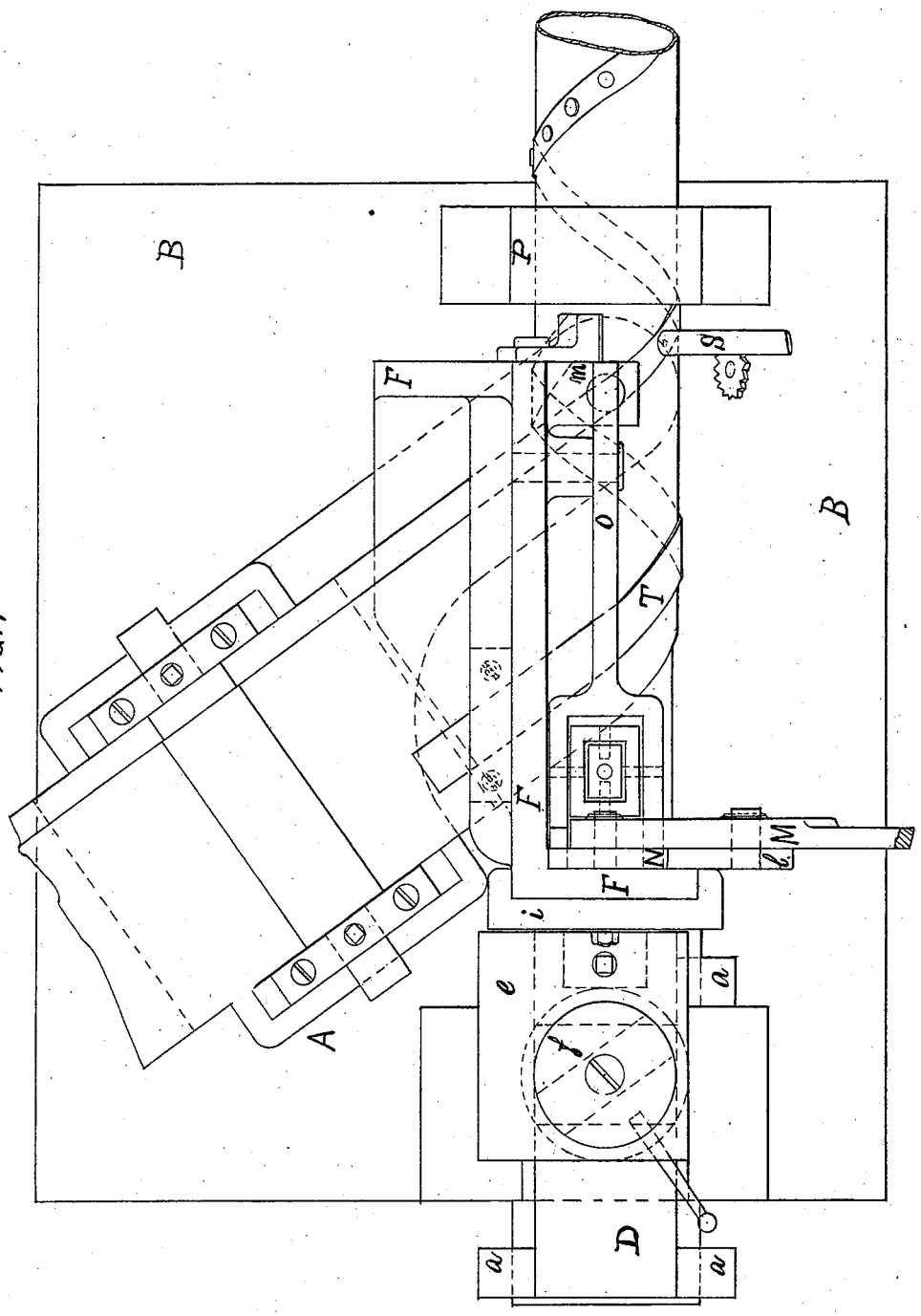

FIG. 1

WITNESSES.

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6 Sheets—Sheet 2.

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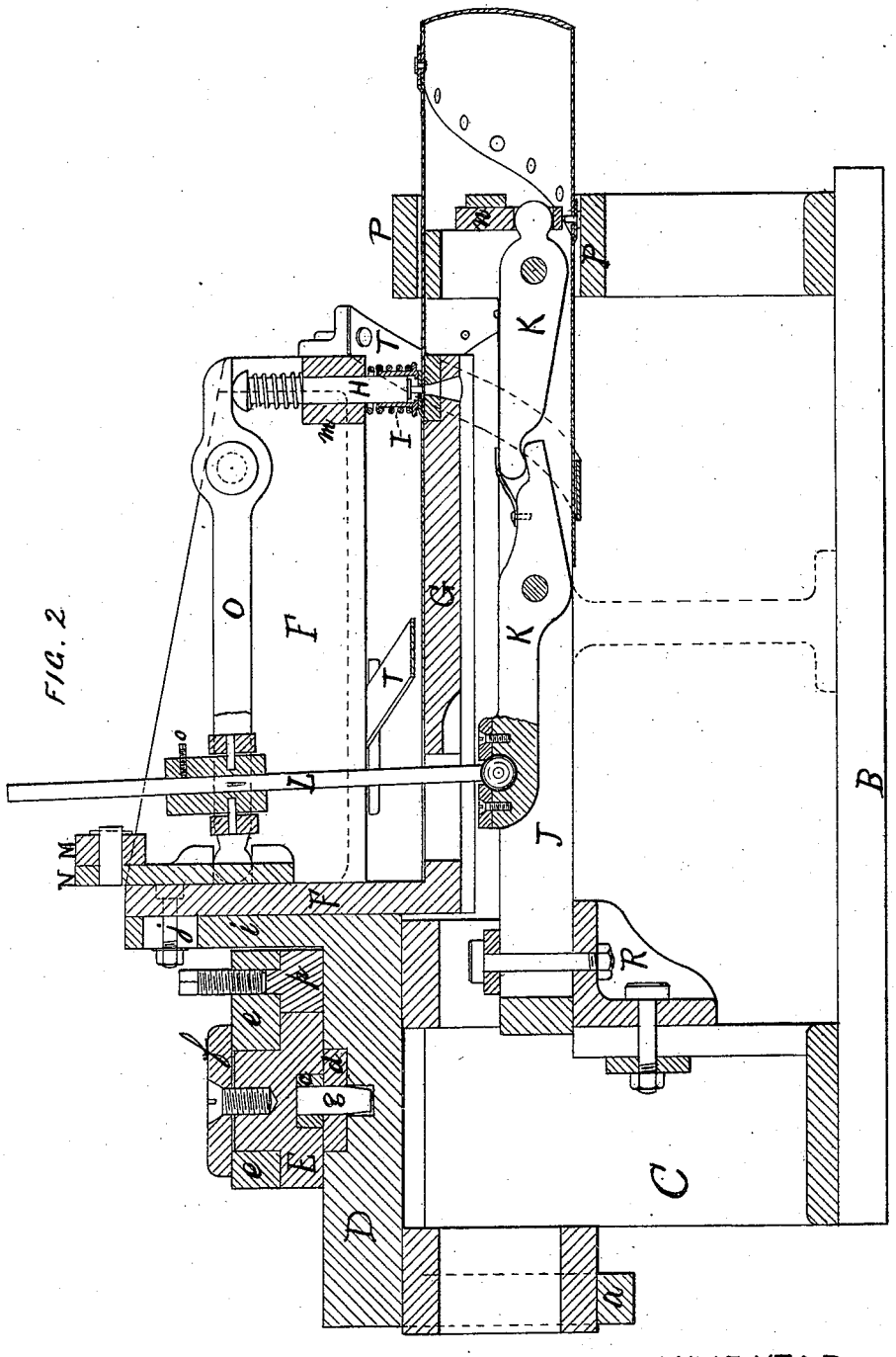
FIG. 2



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J. B. ROOT.

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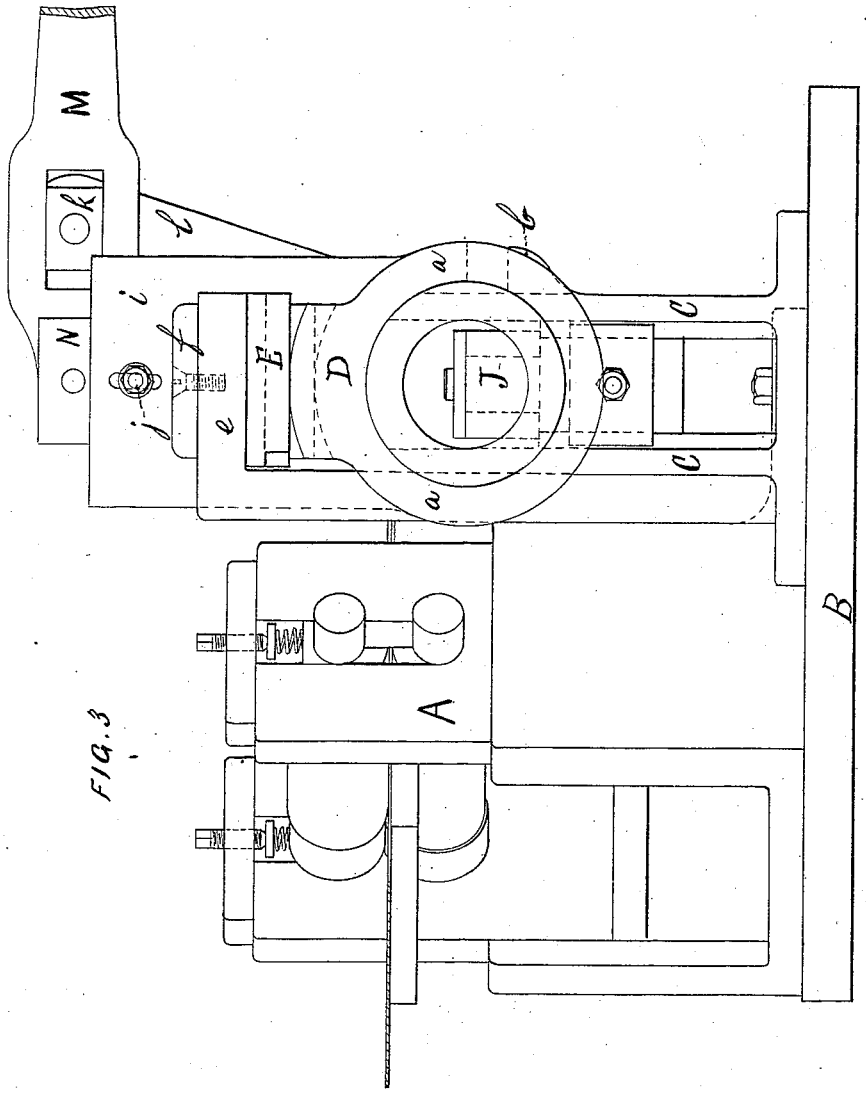

FIG. 3

WITNESSES.
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J. B. ROOT.

MACHINE FOR MAKING SPIRAL-JOINTED METALLIC TUBING.

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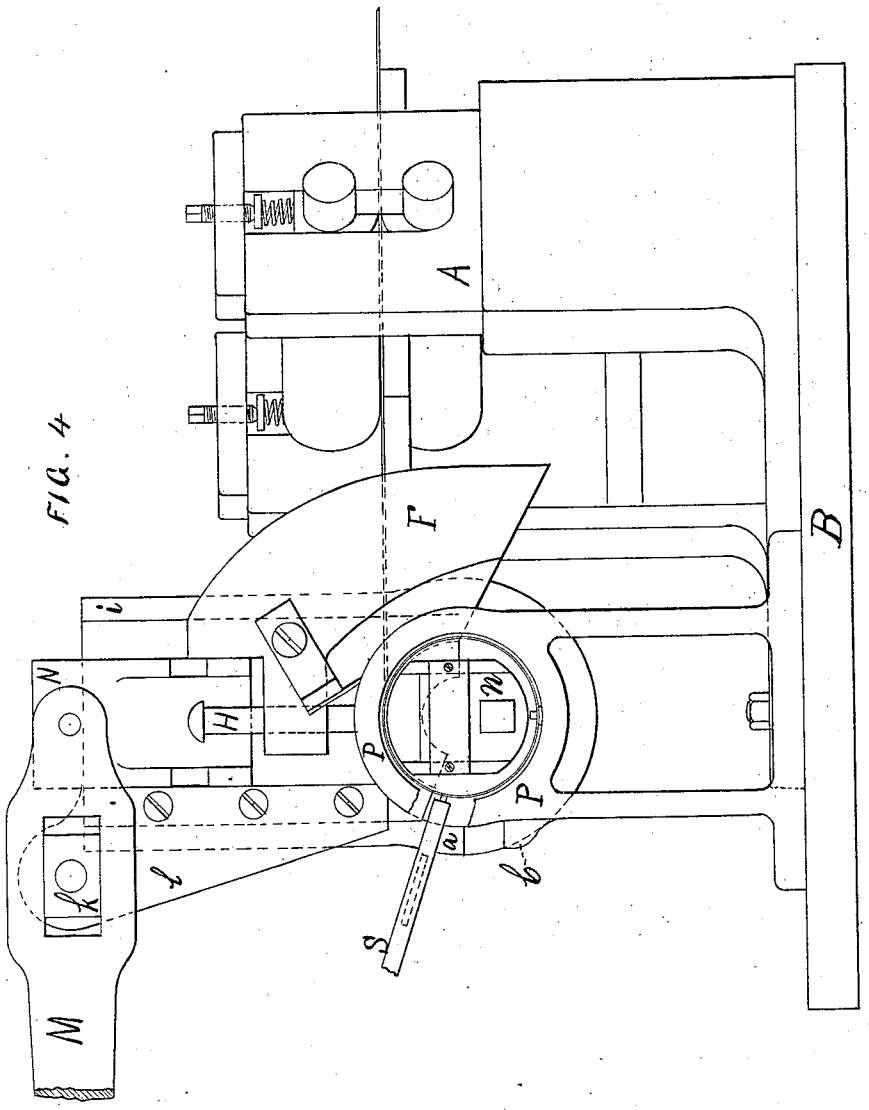
FIG. 4



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6 Sheets—Sheet 5.

J. B. ROOT.

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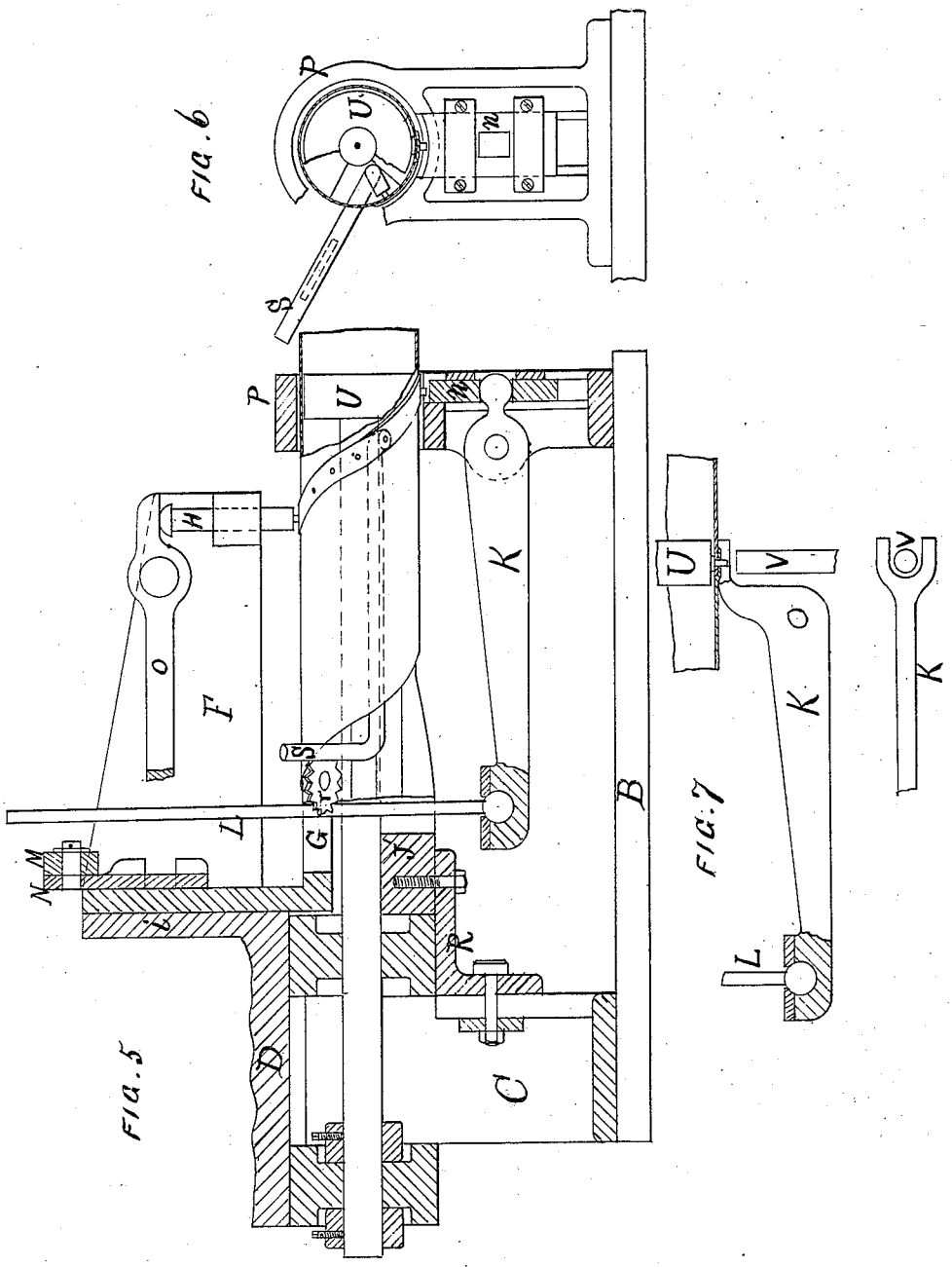

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6 Sheets—Sheet 6.

J. B. ROOT.

MACHINE FOR MAKING SPIRAL-JOINTED METALLIC TUBING.

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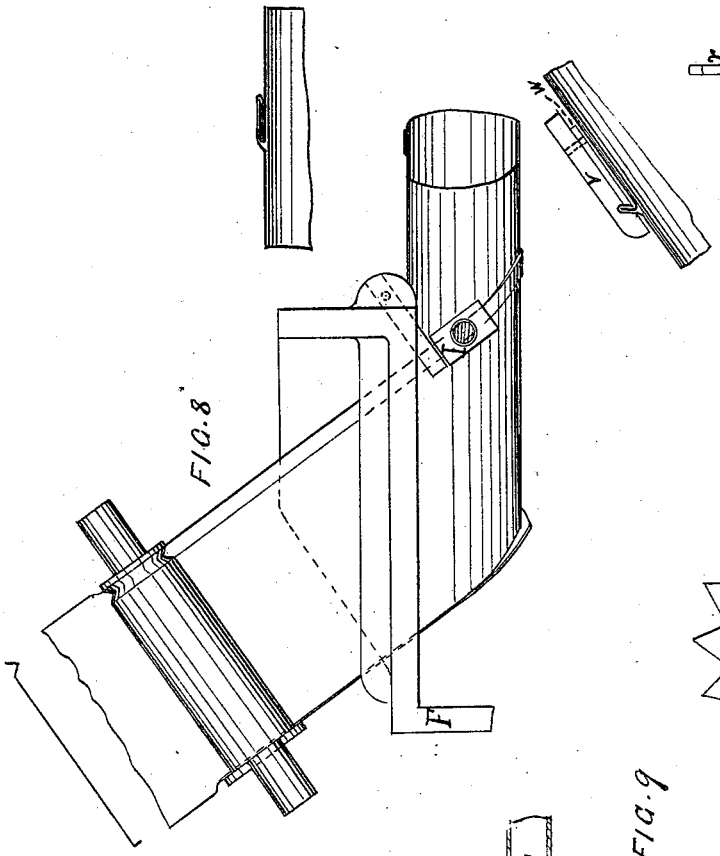

FIG. 8

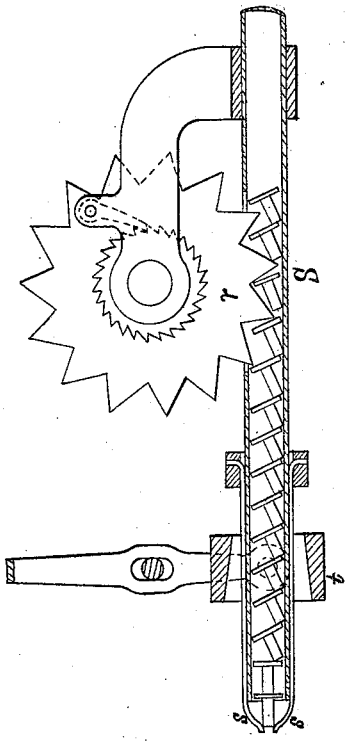

FIG. 9

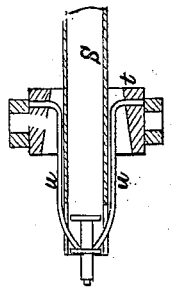

FIG. 10

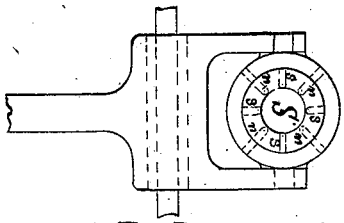

FIG. 11

WITNESSES.

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UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF NEW YORK, N. Y.

IMPROVEMENT IN MACHINES FOR MAKING SPIRAL JOINTED METALLIC TUBING.

Specification forming part of Letters Patent No. **183,329**, dated October 17, 1876; application filed May 15, 1876.

To all whom it may concern:

Be it known that I, JOHN B. ROOT, of city and county of New York, in State of New York, have invented new and useful Improvements in Machines for the Manufacture of Spirally-Formed Pipe or Tubing, of which the following is a specification:

The essential parts of the improved mechanism which constitutes the present invention, besides the bed-plate, fixed standards or supports, and adjustable roll-frame, are the following: First, a saddle mounted upon the fixed supports, and constructed and arranged so as to receive simultaneously a circular and a longitudinal reciprocating movement; second, a clamping and feeding mechanism, which is so connected with the saddle as to partake of its spiral reciprocations, and thus draw the work into and advance it through the machine with an intermittent motion; third, a stationary holding mechanism which seizes the work and holds it in position while the feeding devices are performing their alternate backward reciprocations; fourth, forming devices for shaping the blank into tubular form as it is advanced through the machine.

In addition to the above, which are capable of producing a spirally-formed pipe with a lock-joint, riveting devices may be added, by means of which a spirally-formed lap-joint may be riveted.

The above improvements, with the details of their construction, are fully shown and illustrated in the accompanying drawings, in which—

Figure 1 is a plan view. Fig. 2 is a vertical longitudinal section. Fig. 3 is an end elevation, looking toward the saddle end. Fig. 4 is an end elevation, looking toward the delivery end. Fig. 5 is a vertical longitudinal view, partly in section and partly in elevation, of certain modifications of the construction shown in Figs. 1 to 4. Fig. 6 is an end elevation of such modifications. Fig. 7 shows a further modification. Fig. 8 is a partial plan of the machine when used for making pipe with a locked joint, being specially designed to show the shoe and tucker. Fig. 9 is a sectional view of a rivet-feeding tube, with the toothed feed-wheel. Fig. 10 is a sectional view of the rivet-tube, with a slip-ring for aiding the discharge of the rivets. Fig. 11 is a view in plan and section of the tube, slip-ring, and ring-lever.

Referring to the drawings in detail, A is the roll-frame, over which the blank passes on its way to the main machine; B, is the bed-plate; C, the main standard or upright; D, the saddle; E, adjusting-block for determining the longitudinal throw of the saddle; F, frame of the clamping and feeding mechanism; G, clamping-bar; H and I, clamping rod and shoe; J, lever-bar of the holding or riveting mechanism; K, compound lever of the same; L, connecting-rod between the clamping or feeding devices and the holding devices; M, main lever for operating the feeding and the holding devices; N, slide intermediate between the main lever M and the lever O of the feeding devices; P, ring through which the pipe passes, and which forms a part of the holding or riveting mechanism; R, adjustable bracket for regulating the position of the lever-bar J; S, rivet-feeding pipe; T, guide band or strap.

The roll-frame is to be set at an angle with the main axis of the machine, and is to be adjustably attached to the bed-plate so that its angle with such axis may be changed, at pleasure, according to the width of blank that is being worked or the size of pipe that is being made. The rolls, moreover, should be vertically-adjustable in the uprights or standards of the roll-frame, to accommodate the height of feed to the different sizes of pipe, and each pair of rolls should be mounted with springs to compensate for any inequality in the work passing between them. The rolls may also be shaped to give the requisite form to the edges of the blank, according as it is desired to produce a lap-joint or a lock-joint in the finished pipe.

These various features in the construction of the roll-frame form no part of the present invention, having already been made the subject of another application. They are referred to here simply to show their relation to the improvements to be hereinafter described.

The frame A, instead of being provided with rolls for shaping the edges of the blank, may carry properly shaped dies for this purpose; or, if desired, the edges of the blank

may be shaped before the blank is placed upon the frame A, in which case the frame A may be regarded as simply a guide-frame for giving the proper support and direction to the blank as it enters the machine, and will not necessarily carry either rolls or dies.

The saddle D is mounted upon circular bearings upon the main upright or supporting standard of the machine, being held to its bearings by rings *a a*, which permit of its moving around the main axis of the machine in the arc of a circle, the extent of this arc or motion being limited by the stop *b*.

The longitudinal movement of the saddle is effected by means of the block E, and by the intermediate blocks *c* and *d*. The block E is secured to the overhanging bracket *e* of the main supporting-standard, being clamped thereto by means of the plate *f* and a set-screw, and it is constructed with a groove in its under face, such groove, when the machine is in action, being diagonal to its axis. The block *c*, which runs in the groove of the block E, is swiveled upon the back of the block *d*, and the block *d*, in turn, is mounted in a transverse channel in the back of the saddle. The face of this channel is curved, but the under face of the block *d* is plain; consequently the block is tangential to the face of the channel. It is connected with the saddle by means of the rock-pin *g* playing in a socket or bearing of the proper size and shape, to allow freedom of motion; or, in lieu of such pin, the block *d* may be fitted to the face of the channel in the saddle-back by means of gear-teeth.

The result of the foregoing construction and arrangement of parts is that whenever the saddle is rocked around its axis it is also caused to move longitudinally on its bearings. The extent of this longitudinal movement will depend upon the obliquity of the groove in the under face of the adjusting-block E to the axis around which the saddle rocks, and the angle between these parts can be changed at pleasure by means of the clamping device *f*, according to the requirements of the work.

Rising from the inner end of the saddle is an upright plate, *i*, on which is mounted, by suitable adjustable connections, the frame F of the clamping and feeding mechanism. This frame, as shown in the drawings, is gibbed to the plate *i* of the saddle, and can be set at any desired elevation, according to the size of the pipe being made, by means of the set-screw *j* working in an upright slot in the plate *i*.

The clamping and feeding devices consist, in general, of the clamping-bar G and the clamping or pressure rod H, and their accessories, the bar G acting on the interior of the pipe, and the pressure-rod H on the exterior at a corresponding point. As shown in the drawings, these accessories consist of the main lever M, the slide N, the lever O, and the shoe I.

The lever M is slotted to embrace a bearing-block, *k*, which rocks on a pivot connecting it to the bracket *l*, which is fastened to the frame F. The inner end of the lever M is pivoted to the slide N, which moves up and down in suitable ways in the frame F, and this slide operates the long arm of the lever O, which is pivoted to the frame F. The short arm or toe of the lever O acts upon the head of the pressure-rod H to depress it whenever the outer end of the main lever M is depressed. When the pressure is taken off from the rod H it is returned to its normal position by a coiled spring acting against the upper face of the bracket *m*.

When the machine is used for making a riveted pipe the lower end of the pressure-rod H is to be armed with a punch, which will punch a rivet-hole in the overlapping edges of the pipe-blank with each descent of the punch-holder. In such case, too, it will be found advisable to use a shoe, I, which can be held down upon the seam by a spiral spring acting against the under face of the bracket *m* when the punch is withdrawn, and thus prevent the upper lap of the metal from drawing up with the punch.

This shoe may also be used with advantage when the machine is used for making locked pipe. In such case instead of bringing the end of the pressure-rod H to bear directly upon the interlocked edges of the metal for setting them down permanently, the shoe-piece may be interposed; and for this purpose it will be found advisable to curve it to conform it to the curve of the pipe and to form a groove in its under face of substantially the shape of the finished seam, this groove being turned to conform to the direction in which the seam is traveling, and the face of the shoe being of sufficient extent to pinch down all parts of the seam.

Whether the pressure-rod is armed with a punch or otherwise, it will be seen that the pipe is griped by the conjoint action of such pressure-rod and of the internal clamping-bar G, and when thus clamped between the two it will be drawn forward spirally by the rocking of the saddle and the connected frame of the feeding mechanism. In order to hold the pipe while the feeding mechanism, after one advance, is returning to its first position, another clamping mechanism is employed, the principal parts of which are the lever-bar J, the compound lever K, and the curved support or ring P, against which the toe of the lever K acts. This holding mechanism is operated by means of the rod L, which connects it with the lever O of the feeding devices, by which means the lever K is made to engage with and clamp the pipe upon the ring P at the moment when, by the lifting of the lever M, the feeding-clamps are disengaged from the pipe preparatory to their return movement. The lever K, as shown in Fig. 2, is a compound lever, and is pivoted in a slot in the lever-bar. The connecting-rod is attached to the lever K with a ball-and-socket joint, and its connection with the lever O is made with a universal

joint. Instead of having the toe of the lever K act directly upon the interior of the pipe, it may be provided with a pressure-slide, *n*, moving in ways in the end of the lever-bar J. The curved support P, against which the lever K acts, is made in the form of a ring, this form adding much to the strength of the parts. This form facilitates the holding of the work while the rivet is being set down by the riveting lever or slide, the work being clamped between the lever-bar and the upper part of the ring; and the upper part of the ring also takes the strain which arises from the reaction of the riveting-tools.

When a riveted pipe is being made the rivets are inserted in place in the seam after the work has passed the punch and before it reaches the holding devices above described. The further advance of the work carries the rivets successively under the end of the lever K, or the pressure-slide operated thereby, and thus each rivet is firmly headed down or set. The primary function of the clamping-bar G is to act against the pressure-rod H, and thus firmly gripe the metal for feeding it forward; but, preferably, the upper face of this bar should be curved in a transverse direction, to adapt it to act as a former in shaping the pipe, the metal passing in between this bar and the guide band or strap T. The guide-band T winds spirally around the bars G and J in the direction of the progress of the metal, and is connected at both ends with the frame of the feeding mechanism, so as to partake of all the movements of the same. Instead of being a mere strip or narrow band, as shown, this device may be widened out so as to form a concave shield, though, for the purpose of ready adjustment to work of different sizes, the narrow band is preferred.

As already indicated, a machine constructed as above described may be adjusted for working blanks of different widths, and making pipe of different diameters. For the latter purpose it will become necessary to change the vertical position of the frame of the feeding mechanism upon the saddle-plate, which is effected by means of the slot and set-screw *j*, as hereinbefore described. The lever-bar J is also made vertically adjustable for the same purpose, this adjustment being effected by means of the sliding bracket R, which supports the bar J, and can be clamped upon the main upright of the machine at any required height. Whenever any change is made in the diameter of the pipe, a corresponding adjustment must be given to the guide-band T. The height of the flanging-rolls of the roll-frame must also be changed, a new supporting-ring, P, must be provided, and the operative length of the connecting-rod L must be changed, which last-named adjustment is effected by means of the set-screw *o*. A friction-block, *p*, is gibbed to the under side of the overhanging bracket *e*, and is provided with a set-screw, as shown, for maintaining its bearing upon the back of the saddle. The object of this piece is to hold the saddle stationary while the feeding-clamps are parting and the stationary retaining-clamps are coming into play. One means of inserting rivets in the seam of the pipe after the holes have been punched is shown in Figs. 9, 10, and 11, in which S is the feeding-tube; *r*, a toothed feed-wheel, and *s s s s* fixed guide-springs. This tube is supported in a bracket so located that each halt in the advance of the pipe brings a punched hole of the seam directly beneath the delivery end of the tube. The toothed wheel plays through a slot in the side of the tube, and is to be so connected with the feed-frame, or other reciprocating parts of the machine, that it will move forward one step with each movement of such frame or other part. If preferred, in order to insure the more perfect delivery of the rivets, a slip-ring, *t*, may be used carrying springs *u u u u*. This ring is mounted on a lever, and, as it moves up, the springs *u u* snap in behind the head of the rivet, and on its return movement they act as pushers to crowd the rivet out between the fixed springs *s s*.

The main lever M may be worked by hand, which in many small machines for special work will be found desirable, or it may be attached, by means of a connecting-rod, to a crank, and thus worked by any desired power.

The above-described machine will be found specially adapted for use in making welded pipe where the pipe passes directly from the forming-machine into and through the furnace to the welding mechanism. The intermittent action of the machine gives the requisite pause for the full effect of the hammer or rolls, or other devices employed to effect the welding of the seam. In Figs. 5 and 6 there is shown a modification of the machine, as above described, the chief modification consisting in placing the lever K of the holding and riveting mechanism below instead of within the pipe, (a simple lever of the first order being substituted for the compound lever shown in Fig. 2,) and in using a mandrel, U, within the pipe to receive the pressure of the lever K, or its connected slide *n*. The stem of this mandrel revolves upon the curved upper face of the bar J′. The connecting-rod L is offset where it passes the stem of this mandrel. In making use of this modified construction, (shown in Figs. 5 and 6,) for riveted pipe, the rivets preferably are inserted from the inside of the pipe. This necessitates the use of a rivet-tube curved in parts, as shown in Fig. 5, to enable it properly to enter the pipe and properly to discharge the rivets into the holes of the seam.

The form of mechanism shown in Figs. 5 and 6 has this advantage—that first described—viz., that the stem of the winding-mandrel U can be made hollow for the passage of water through it to the bulb of a welding-mandrel whenever it is desired to use the machine in connection with a furnace and welding mechanism.

Where a riveted pipe is to be made by inserting the rivets from the inside, instead of using a slide, *n*, upon the lever K to set the rivets, this lever may be forked and bent, as shown in two views in Fig. 7, and thus pressed against the seam of the pipe, the forks of the lever permitting the rivet-shank to pass between them, while a hammer, V, strikes one or more blows sufficient to head the rivet down.

When any of the hereinbefore-described mechanism is used for forming pipe with a lock-joint, the interlocking of the edges of the blank, previously shaped therefor by properly-constructed rolls of the roll-frame, or otherwise, will be assisted by means of shoe and tucker, as shown in plan and elevation in Fig. 8, in which *v* is the shoe, and *w* the tucker. These parts are to be attached to the feed-frame F at a point just in front of the clamping rod or shoe. As the two edges of the metal interlock, they pass into a groove in the shoe-piece *v*, and the tucker *w*, held against the partially-formed seam by any suitable means, presses all the parts thereof well together preparatory to the pinching action of the pressure-rod H and the internal pressure-bar G, by which means the seam is turned down and closed.

What is claimed as new is—

1. The spirally-reciprocating saddle, constructed and arranged to operate substantially as and for the purpose set forth.

2. In combination with the spirally-reciprocating saddle, an adjustable clamping and feeding mechanism, constructed and arranged to operate substantially as described, so as to be carried by, and reciprocate with, the saddle, and at the same time be adjustable relatively thereto for pipe of different sizes.

3. In combination with the spirally-reciprocating saddle and an adjustable clamping and feeding mechanism, partaking of the various movements of the saddle, the adjustable lever-bar, which supports the lever of the holding or riveting mechanism.

4. The combination of the spirally-reciprocating saddle, a grooved adjusting-block, E, and the intermediate guide-blocks *c* and *d*, or their equivalents, as a means of regulating the longitudinal movement of the various parts, substantially as described.

5. The spirally-reciprocating clamping bar or former, constructed to operate substantially as set forth.

6. The combination of the spirally-reciprocating bar or former G and the guide band or strap, arranged and operating substantially as set forth.

7. The combination of the spirally-reciprocating bar G and a clamping device, constructed and arranged to move in unison therewith, substantially as and for the purpose set forth.

8. The combination of the spirally-reciprocating bar G and a punch, constructed and arranged to move in unison therewith, substantially as and for the purpose set forth.

9. In combination with a spirally-reciprocating feeding-frame, F, the pressure-rod H and pressure-shoe I, constructed and arranged to operate substantially as described.

10. The combination of the guide-frame and a spirally-reciprocating clamping and feeding mechanism, constructed to operate substantially as set forth, so as to advance the work with an intermittent motion.

11. The combination, in a machine for making pipe, of a spirally-reciprocating clamping and feeding mechanism, by means of which the work is advanced intermittingly, and a stationary holding or riveting mechanism, acting alternately with the feeding mechanism, substantially as and for the purpose described.

12. The combination of the connecting-rod L with the lever O of the clamping and feeding mechanism, and the lever K of the holding or riveting mechanism, the former regulating the relative movements of the latter, substantially as and for the purpose set forth.

13. In combination with the lever O of the feeding mechanism, the connecting-rod L and the lever K of the holding mechanism, the main lever M, arranged to operate in combination, substantially as described.

14. In combination with the holding and riveting lever, the ring P, arranged and operating substantially as described.

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