(No Model.) 4 Sheets—Sheet 1.

J. B. ROOT.

MACHINE FOR MAKING SPIRALLY JOINTED METAL PIPE.

No. 346,615. Patented Aug. 3, 1886.

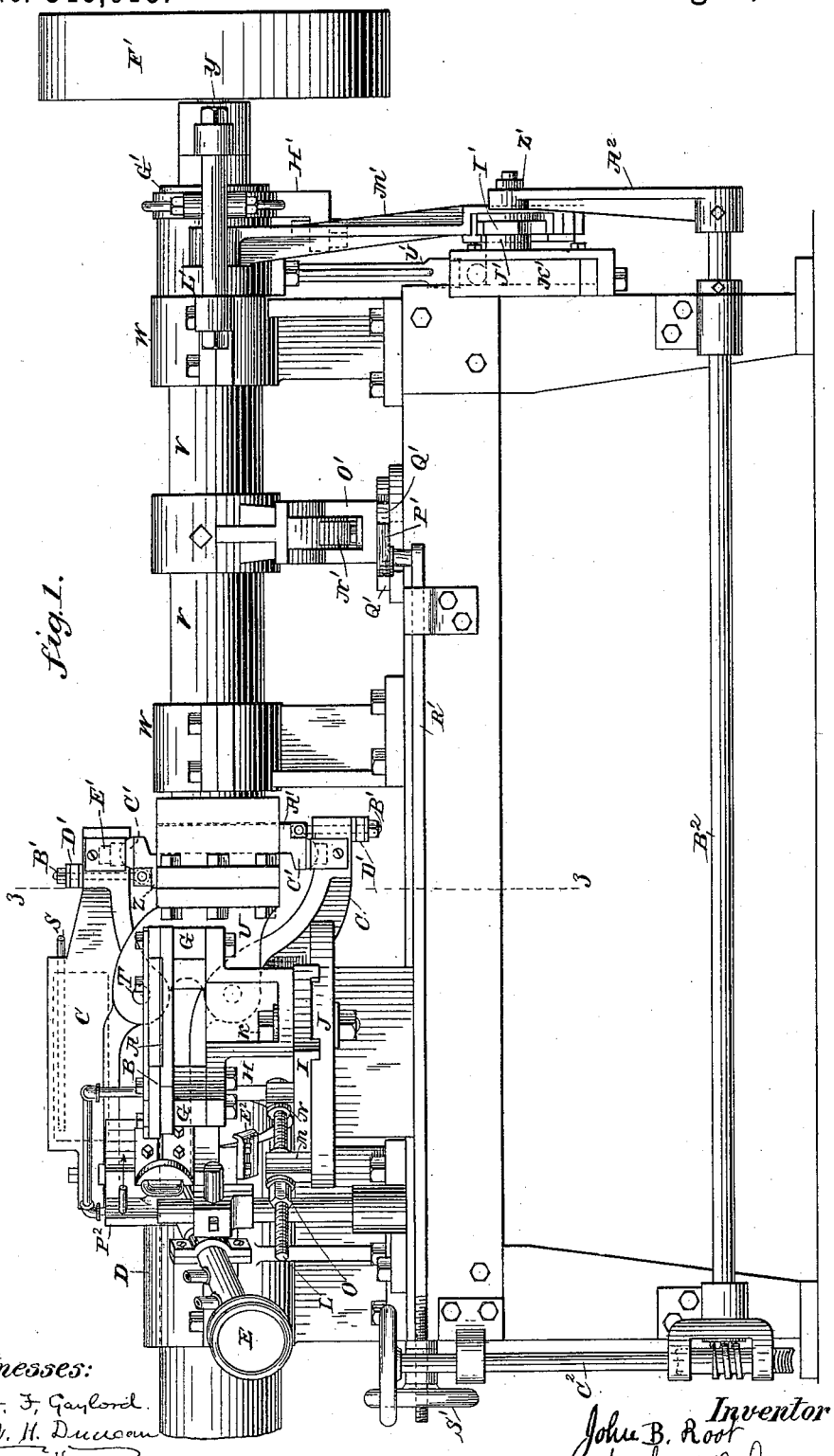

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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MACHINE FOR MAKING SPIRALLY JOINTED METAL PIPE.

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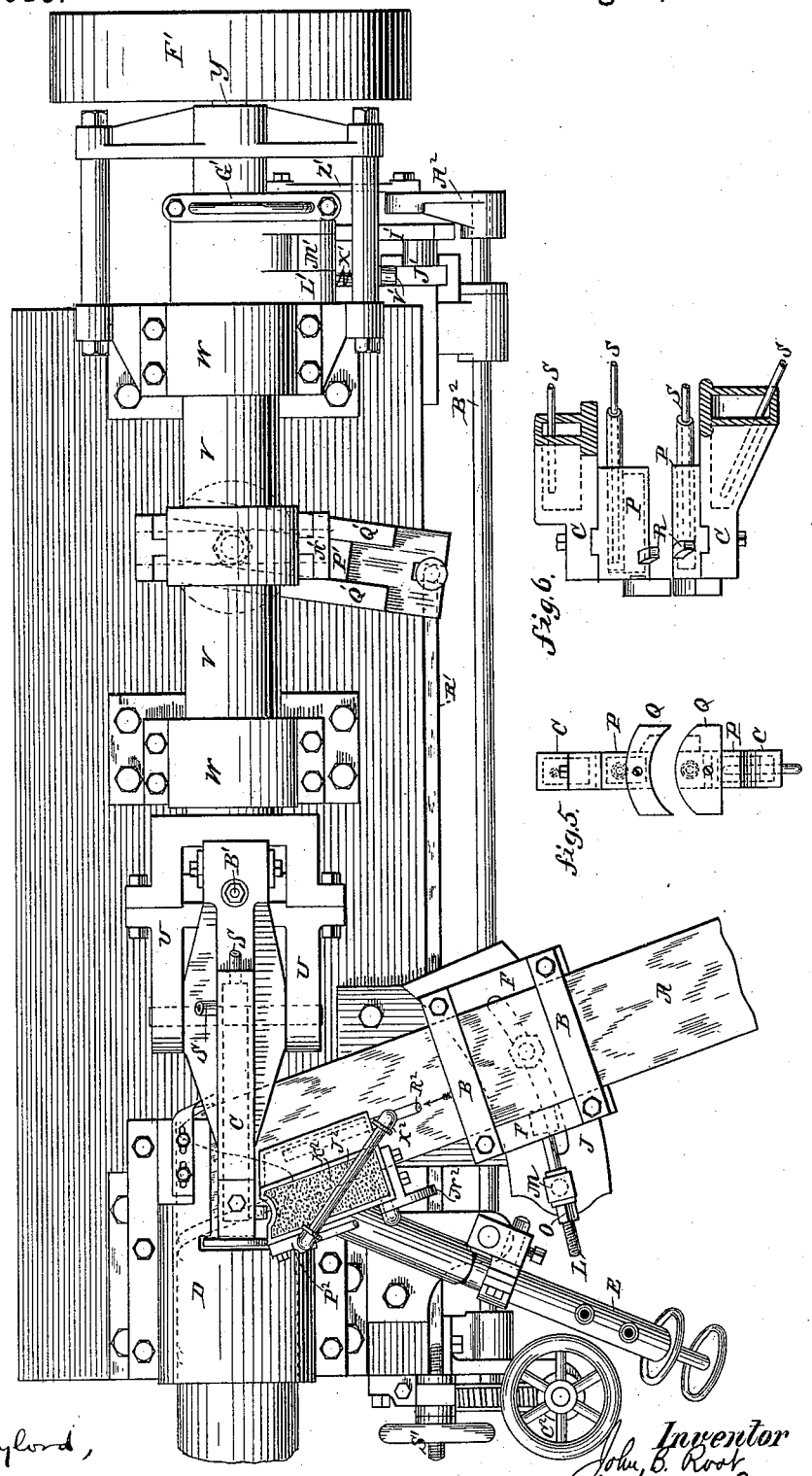

fig. 2.

fig. 6.

fig. 5.

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(No Model.) 4 Sheets—Sheet 3.

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MACHINE FOR MAKING SPIRALLY JOINTED METAL PIPE.

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Fig. 4.

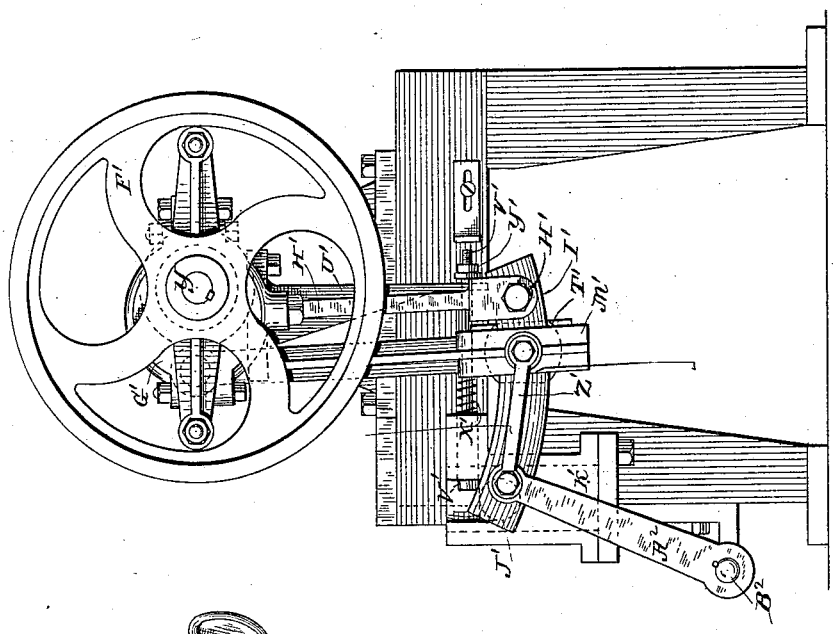

Fig. 3.

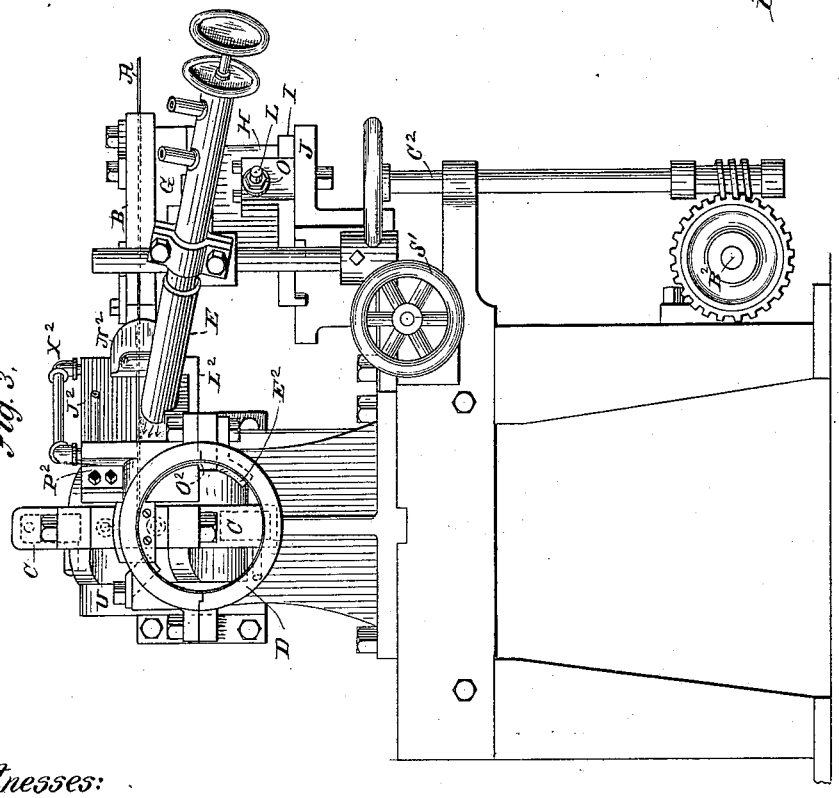

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fig. 7.

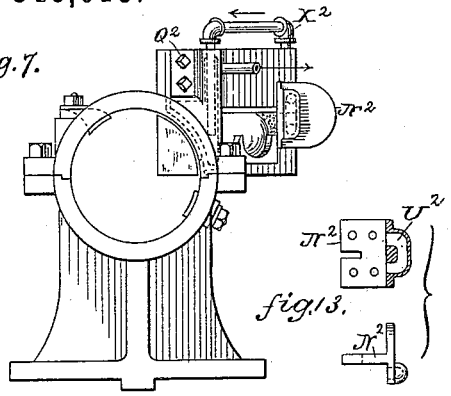


fig. 13.

fig. 8.

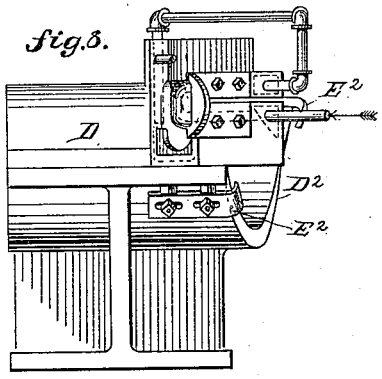


fig. 9.

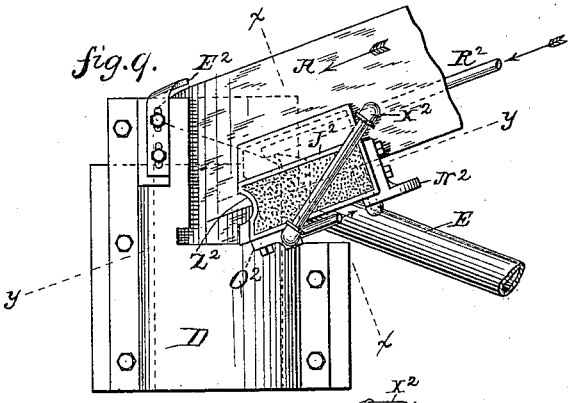


fig. 12.

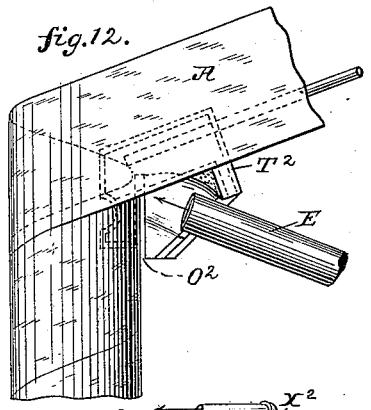


fig. 10.

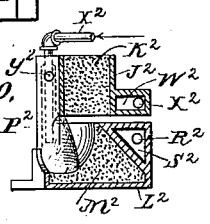


fig. 11.

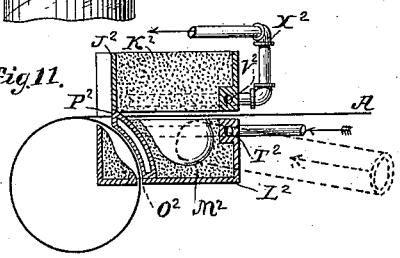


fig. 14.

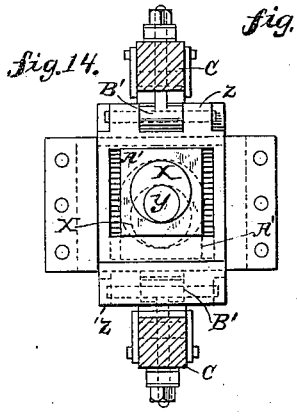


fig. 15.

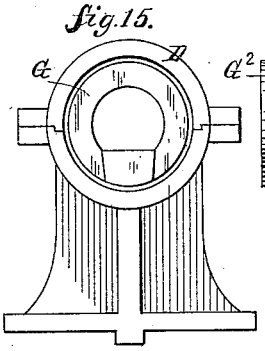
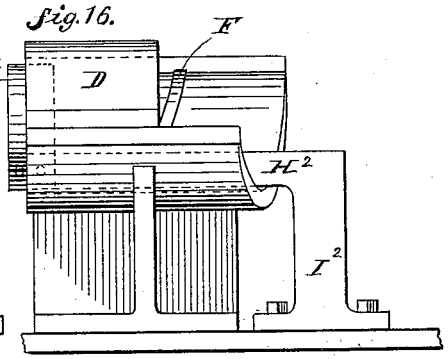


fig. 16.



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UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF PORT CHESTER, NEW YORK.

MACHINE FOR MAKING SPIRALLY-JOINTED METAL PIPES.

SPECIFICATION forming part of Letters Patent No. 346,615, dated August 3, 1886.

Application filed July 18, 1884. Renewed November 9, 1885. Again renewed July 2, 1886. Serial No. 206,971. (No model.)

To all whom it may concern:

Be it known that I, JOHN B. ROOT, of Port Chester, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Spiral-Pipe Machines; and I hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same.

These improvements relate to machines in which a continuous blank is spirally wound, with its edges overlapping, by the action of spirally-reciprocating pinching and feeding mechanism, the overlapping edges being heated just before they come in contact, to prepare them to be welded together by the operation of the pinching and feeding mechanism when it seizes the blank and carries it forward along its spiral course.

The invention consists, essentially, of improved mechanism for spirally shaping the blank and pinching or welding the seams together, and also of improved heating devices for bringing the edges that are to be united to a welding-heat.

In the drawings, Figure 1 is an elevation of a machine embodying my improvements. Fig. 2 is a plan view of the same. Fig. 3 is a front end elevation of the same. Fig. 4 is a rear end elevation of the same. Figs. 5 and 6 are detail end and side views of the pinchers. Figs. 7, 8, and 9 are respectively end, side, and top views of the former, with the heating appliances attached thereto. Figs. 10 and 11 are respectively sections on the planes *x x* and *y y* of Fig. 9. Fig. 12 is a detail view, showing the relative positions of the blank, the lower half of the furnace, and the blow-pipe. Fig. 13 is a detail view of the clamp connecting the halves of the furnace. Fig. 14 is a detail view of the eccentric-connections on the inner ends of the pinchers, the same being on the plane *z z* of Fig. 1; and Figs. 15 and 16 are end and side views of the former, showing the shearing-ring, which, for clearness of illustration, has been omitted from the other views.

The blank A, in the form of a sheet or strip of metal of the requisite thickness and width, is fed into the machine upon a guide-table, B, which delivers it to a pair of jaws or lever-pinchers, C C. These pinchers have a closing and opening motion to pinch the blank and release it, and also a compound motion consisting of a rotary movement around, and a rectilinear movement parallel to their axial support, which is to cause them to move along the spiral course of the blank. These pinchers seize hold of the blank and draw it forward in a spiral direction, at the same time shaping it cylindrically and forcing it through a former, D, which further shapes it and maintains its form and guides it around, so that its opposite edges overlap, both of which edges are brought to a welding-heat by a jet from a blow-pipe, E, just before they come in contact, so that as the pinchers seize the two edges they are brought together with sufficient force to insure a complete weld, thus feeding forward the blank and finishing a portion of the tube at every successive opening and closing of the pinchers. These several parts and their operating mechanisms are mounted upon a common bed or frame. The guide-table consists of a flat plate of iron having two raised guide-edges, F F, secured to it at the proper distance apart to permit the blank to pass between them, and it is mounted upon the leveling-blocks G G, regulating the thickness of which adjusts the table to any desired height, as required by different sizes of pipe. This table and its blocks are secured by bolts to the swivel-block H, carried on the slide-plate I, traversing the slotted quadrant-bed J, and secured thereto by the swivel-bolt K, the quadrant-bed being secured to the main frame in such position that the center of the quadrant-curve lies in a vertical line passing through the axis of the pinchers and former. By this arrangement of these parts the guide-table can be adjusted to accurately direct blanks of various widths, and for various sizes of pipes, to the same pinchers, it being understood that for different sizes of pipe formers of corresponding sizes are used. For convenience in making such adjustment a tangent screw, L, is used, which is fastened to the quadrant-bed and to the sliding plate by swivel-studs M and N in such manner that by turning the nut O of the screw the slide-plate may be moved to the requisite position.

The pinchers C C consist of two strong jaws

carrying pinching-blocks P P, secured to their outer ends. These pinching-blocks have their adjacent faces curved to correspond with the shape of the pipe to be made, so as to form the blank when they are closed upon it. These pinchers are provided with supplemental shaping-heads Q Q, which take hold upon the shaped portion of the blank and extend the grasp of the pinchers, and the pinchers are also provided with the lugs R R, which are arranged in the path of the overlapping edges of the blank and bring such edges in loose contact with each other as a preliminary step to the heavy welding-pressure given by the pinchers. These pinchers and their blocks are likewise cored out, as shown in Fig. 6, and water is caused to circulate through their cores by means of pipes S S, to keep the parts properly cooled. The pinchers are mounted upon trunnions T T in the head U, which is secured to the hollow shaft V, supported by but free to rotate and slide in the pillow-blocks W W, secured to the bed of the machine. The pinchers extend back past the the trunnions, forming levers of which these trunnions are the fulcra, and these inner ends of the pinching-levers are actuated to close and open the pinching ends, as seen in Fig. 14, by the oppositely-arranged eccentrics or cams X X on the main or driving shaft Y, and the interposed sliding blocks Z Z and A′ A′ and the rocker-bolts B′ B′, which hold the circular bearers C′ C′, Fig. 1, of the slides Z′ Z′ against the inner edges of the pinchers. Cushions of rubber, D′ D′, under the nuts of the bolts B′ B′, keep the parts in proper contact and take up any excess of motion that would otherwise cause backlash or looseness of the parts. So, too, in this end of the upper pincher there is a block of rubber, E′, (shown in dotted lines,) placed between the upper bearer, C′, and the pincher, and this causes the upper jaw to take the metal a little before the lower jaw, thus crowding the pipe down in the former and slightly upsetting the hot metal, and thereby counteracting the natural tendency of the pipe to become larger in diameter. As the lower jaw rises, the upper one will yield to the extent that it was carried below its pinching position by the elastic block, and the deflected metal will be brought back to its proper position and the upset part forced into the weld of the two edges.

The eccentric-shaft Y extends back through the hollow shaft V, and is driven by means of a belt applied to pulley F′. This shaft also carries the eccentric G′, which, through the rod H′, vibrates the right-hand end of the quadrant-arm I′, the other end being jointed to a slide-block, J′, moving vertically in the bracket K′, which is bolted to the main frame, and this motion of the quadrant-arm is transmitted to the pincher-shaft, to give the pinchers their reciprocating circular movement through the medium of the rocking arm L′, fast upon this shaft, and the bar M′, connecting said rocking arm to said quadrant-arm. The simultaneous rectilineal movement of the pincher-shaft is effected through the segment-gear N′, fixed to the pincher-shaft, the tangent rack O′, moved by said gear and centrally pivoted to the slide-block P′, which block moves in the guide Q′, pivoted to the bed-plate directly under the axis of the pincher-shaft, and is adjusted to any desired angle with the pincher shaft from the front of the machine by the rod R′ and hand-wheel S′, which adjusting devices also serve to hold the swinging guide fixed at any position to which it is adjusted. (These parts may be found more fully described and claimed in United States Patents No. 183,329 and No. 271,740, issued to me on improvements in similar machines.) It will now be plain that as the pincher-shaft rotates it must also move longitudinally to an extent depending upon the angle of its fixed guide, and that the result of these two motions will be along a spiral, which is the direction it is desired to have the pinchers take. Adjusting the length of these motions relatively will give to the pinchers a spiral reciprocation of any desired limit or pitch.

The connecting-bar M′ is attached to the quadrant-arm by a rocking gib, T′, which permits the lower end of this bar to be moved along the quadrant in order to alter the extent of its movement and correspondingly the length of the spiral throw of the pinchers; but it is requisite that the pinchers shall always begin their forward motion from the same position, whatever the length of this throw may be, and hence it is necessary to always stop the pinchers at the same point when they return from carrying the block forward, and this is accomplished by the lower end of the tripping-arm U′, which is fast to the pincher-shaft, withdrawing the latch-bolt *v*′, which normally holds the slide-block J′ from moving, and by thus permitting this block to move upward preventing any further downward movement of the other end of the quadrant being transmitted to the connecting-bar M′, and causing such further movement of the quadrant to be taken about the rocking gib T′ as a center. When the right-hand end of the quadrant again rises, its slide-block is at once returned to its first position, and then the forward movement of the pinchers begins, the tripping-arm having meanwhile released the latch-bolt, which, under the stress of its spring X′, has returned to its former position in engagement with the quadrant slide-block. The stop Y′ on the latch-bolt, against which the tripping-arm strikes, is made adjustable along the bolt so as to change, if desired, the point from which the pinchers begin to move forward. In this case it consists of two common screw-nuts. Z′ is a link joining the lower end of the connecting-bar M′ to the arm A^2 upon the shaft B^2, which shaft extends to the front end of the machine, where at C^2 it is op-

erated by a worm and hand wheel to regulate the throw of the pinchers by moving the connecting-bar M′ along the quadrant I′.

The former D, Figs. 7 to 9, consists of a fixed iron ring or annulus having an internal size corresponding to the pipe being made, and it is secured to the bed of the machine in a position such that its central line coincides with that of the pincher-shaft. The upper part of the inner end of this former is cut away to make room for the pinchers and heating devices, to be yet described, and the lower part of its inner end is carried back under the pinchers, and its end edge, D^2, is curved to the same spiral shape that it is desired the edge of the blank to take, guides E^2, to direct the edge of the blank, being arranged along such curve, and a slot, F^2, Fig. 16, cut in the inner face of the former along the course the finished seam should take, making room for the seam.

At the outer end of this former is a shearing-head, G^2, borne on the end of an arm, H^2, passing through the former and fixed to a support, I^2. This head is of substantially the same size as the inside of the tubing or pipe to be made and projects out from the former. It is used, in connection with hand-chisels or shearing-disks or similar devices, to cut the pipe in sections of suitable length.

The heating devices consist of a blow-pipe, E, arranged and adapted to apply a heating-jet to the lapping edges of the blank between the wound and straight portions thereof at and just before the point when they come together when being wound up, and also of a furnace composed of fire-brick or some other refractory material, which is constructed and arranged to confine the heating-jet to substantially the only portions of the blank, the seam, or lapping portions that it is necessary to bring to a welding temperature.

The special construction of the blow-pipe forms the subject-matter of an application filed by me in the United States Patent Office on June 11, 1884, and is not therefore herein described or claimed. The furnace, Figs. 9 to 11, for use in connection with this blow-pipe, is made in two parts, J^2 being the metallic shell and K^2 the contained refractory material of the upper half, and L^2 the shell and M^2 the contained refractory material of the lower half. These halves are fastened together and held slightly separated by the hollow clamp N^2, which is bolted to the shells of both, the whole furnace being secured to and supported by the pipe-former D. The blank A passes between these halves, and after making a turn, Figs. 11 and 12, comes up through the slot O^2 in the lower half. The brick in the lower half is shown as hollowed out or recessed to receive the end of the blow-pipe, and this recess or cavity is so made that practically only those portions of the lapping edges of the blank just in advance of and at the point where such edges meet will be exposed to the action of the heating-jet. This cavity where the heating is done is further closed and the heating-jet directed upon the edge of the underlapping blank by the casting P^2, which is fastened to the upper half of the furnace at Q^2, and is covered on its side next the jet by some refractory material like that with which the other parts are filled.

R^2 is a pipe that conveys water to the inner end of the core S^2 of the lower part of the furnace. From this inner end the water circulates through the end core, T^2, then through the hollow U^2 of clamp N^2, then into the end core, V^2, of the upper half of the furnace, down to the inner end of its core W^2, out through pipe X^2, and to the bottom of the casting P^2, then up to the top of this piece and out through the pipe Y^2, and this is for the purpose of keeping these various parts properly cooled.

The pinchers take hold of the blank close to the inner end of the furnace, and accordingly the inner end of the furnace is slightly recessed at Z^2 to give room for the play of the pinching-lugs R R on the sides of the pinchers.

The blank which is used, so long as the machine is running on one size of blank, is preferably made continuous. As the sheets of metal from which the blanks are cut are of the usual marketable straight and flat lengths, it becomes necessary to have the various short strips that compose the continuous blank united at their ends to one another. I have invented and have in use a cross-welding machine that I use for this purpose in connection with the machine herein described, the continuous blanks as made up from the short pieces being run right to the herein-described welding-machine or being wound on drums in lengths sufficient to complete the making of a given quantity of a certain size of pipe, and the blank being taken as the pipe is made from said drums. This cross-welding machine forms the subject-matter of another application filed at the same time as this, and is not, therefore, herein described.

It will be manifest that the various parts of this machine are susceptible of changes without departing from the essence of the real invention. I do not confine myself, therefore, to the exact constructions shown; but

What I do claim as new is—

1. In a spiral-pipe machine, the combination of blank forming and welding mechanism, a heating-jet, and a furnace arranged to confine the action of the jet to the parts of the blank to be welded together.

2. In a spiral-pipe machine, the combination of blank forming and welding mechanism, a heating-jet, and a furnace for confining the action of the jet to the parts of the blank to be welded together, composed of two parts arranged one above and one below the blank, and recessed, substantially as and for the purpose described.

3. In a spiral-pipe machine, the combination of blank forming and welding mechanism, a heating-jet, and a furnace for confining the

action of the jet to the parts of the blank to be welded together, which is provided with water-passages, for the purposes of keeping the parts properly cooled.

4. In a spiral-pipe machine, spirally-reciprocating blank advancing and welding mechanism, a fixed former, and a heating-jet.

5. In combination, the spirally-reciprocating lever-pinchers, the heating-jet, and the furnace for confining the action of the jet to the edges of the blank at and near their point of junction.

6. In combination, the spirally-reciprocating pincher-shaft carrying blank pinching and feeding mechanism, a rotating driving-shaft, and connections between the shafts whereby the pincher-shaft receives its circular motion from the driving-shaft.

7. In combination, the lever-pinchers borne upon the end of the pincher-shaft, the main shaft arranged within the pincher-shaft and having connections with and for operating said pinchers.

8. In combination, the pincher-shaft, the main shaft contained therein, the quadrant-arm vibrated from the main shaft, and connections between said arm and the pincher-shaft, whereby a circular reciprocating motion is given to the pincher-shaft from the rotating main shaft.

9. In combination, the spirally-reciprocating pincher-shaft carrying blank pinching and feeding mechanism, the fixed guide by which the pincher-shaft is made to move rectilinearly, the rotating main shaft having connections with the pincher-shaft through which the pincher-shaft receives its circular motion.

10. In combination, the spirally-reciprocating pincher-shaft carrying blank pinching and feeding mechanism, the rotating main shaft contained within said pincher-shaft and operating to open and close said pinching mechanism, and connections between said shafts whereby the former derives its circular reciprocating motion from the latter.

11. In combination, the pincher-shaft, the main shaft contained therein, the quadrant-arm vibrated from the main shaft and connected with and reciprocating the pincher-shaft, and a tripping mechanism operated by the pincher-shaft to release the pincher-shaft from operative connection with the main shaft.

12. In combination, the two spirally-reciprocating pinching-levers, one of which is arranged to take the metal before the other, as and for the purpose set forth.

13. In a spiral-pipe machine, a circular former, D, having guides E^2 arranged upon its inner end for directing the blanks, as and for the purpose described.

14. In a spiral-pipe machine, the combination of circular former D and a shearing-head, G^2, for the purpose described.

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