J. J. SPEED, Jr. & J. A. BAILEY.

MACHINE FOR MAKING PIPES OR TUBING.

No. 15,348.

PATENTED JULY 15, 1856.

Fig. 2.

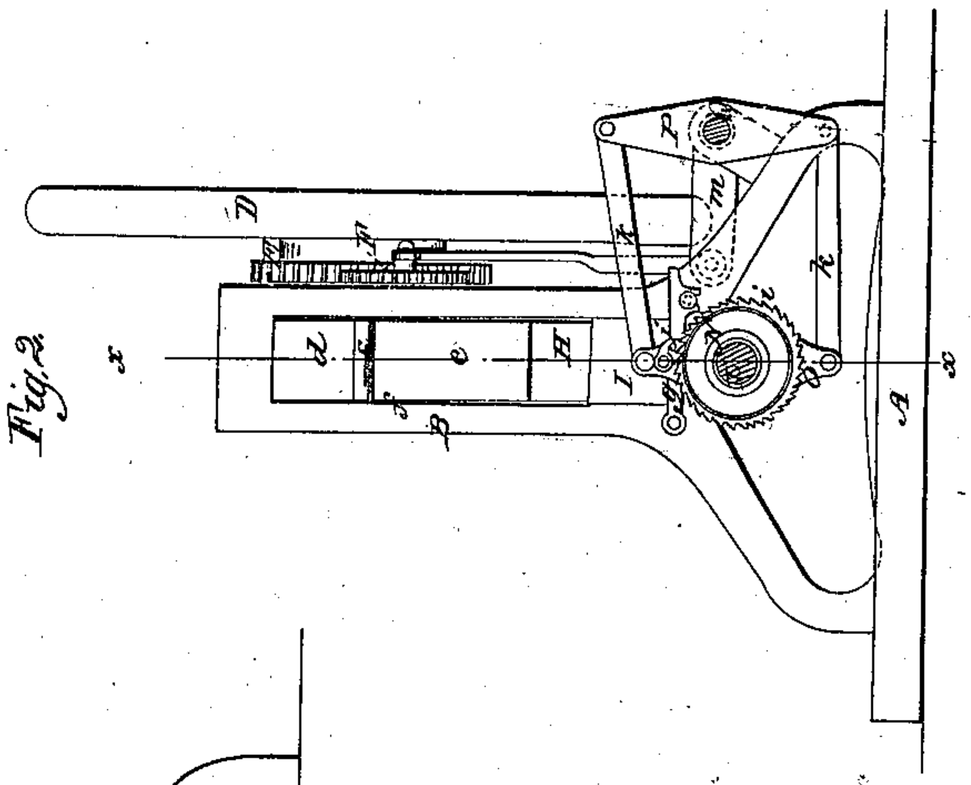


Fig. 3.

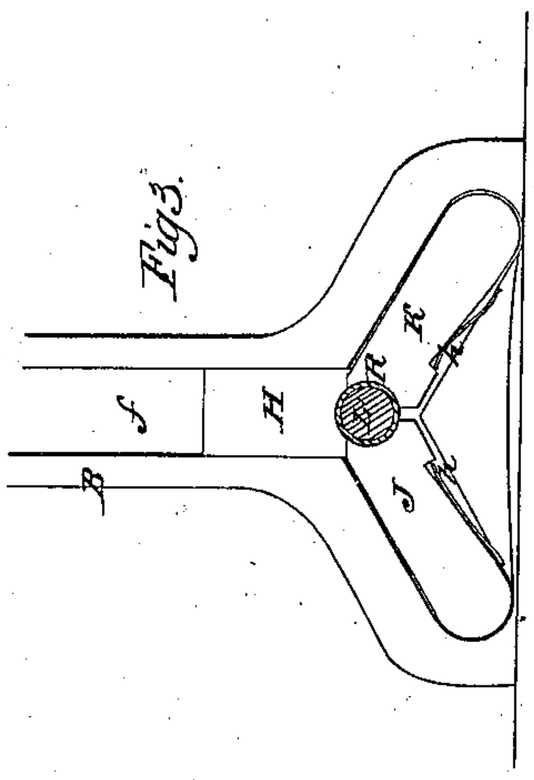
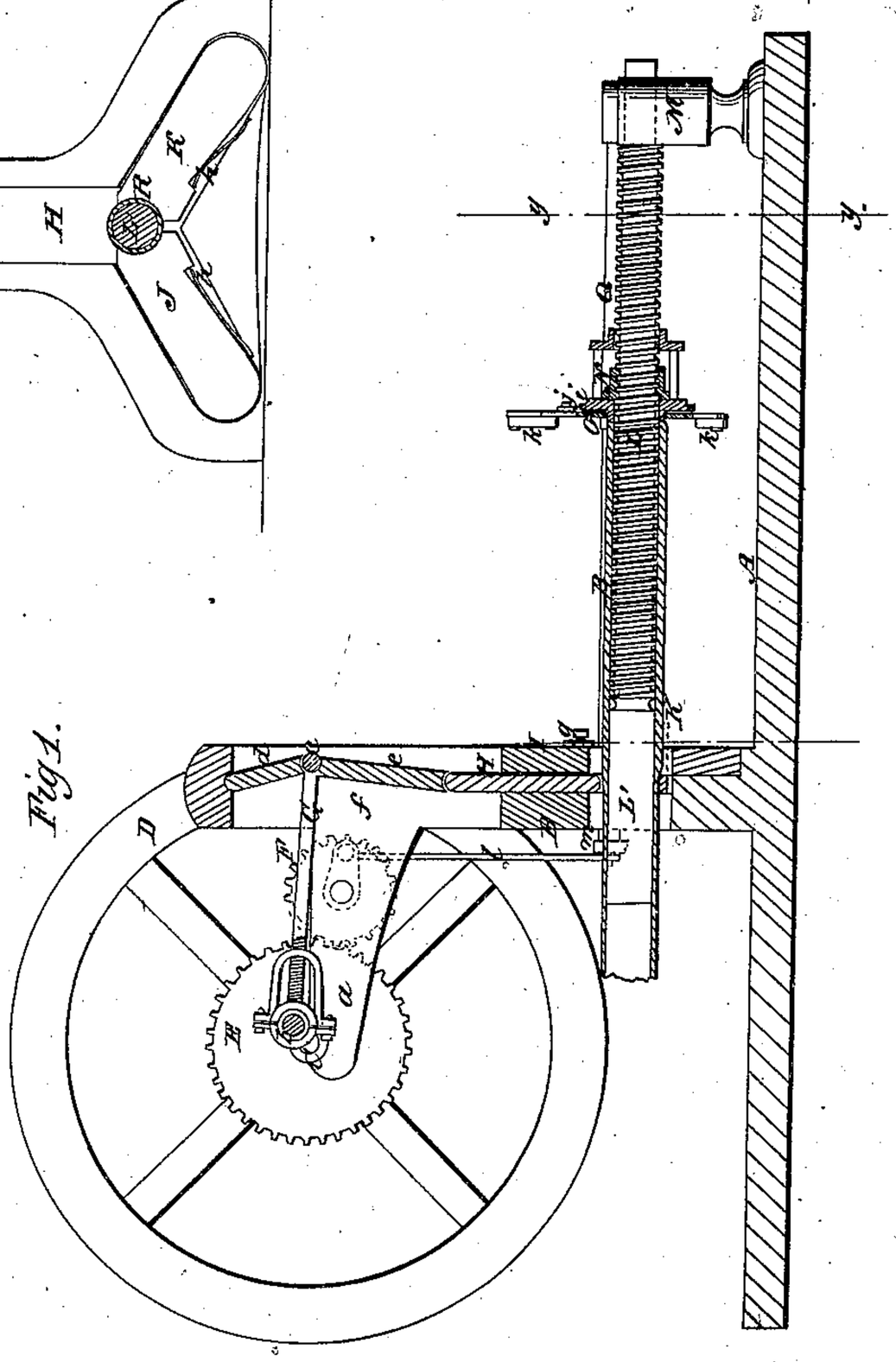


Fig. 4.



UNITED STATES PATENT OFFICE.

JOHN J. SPEED, JR., AND JOHN A. BAILEY, OF DETROIT, MICHIGAN.

IMPROVEMENT IN MAKING SEAMLESS METAL TUBES.

Specification forming part of Letters Patent No. **15,348**, dated July 15, 1856.

To all whom it may concern:

Be it known that we, JOHN J. SPEED, Jr., and JOHN A. BAILEY, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in the Manufacture of Seamless Metal Pipes or Tubing; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a longitudinal vertical section of our improvement, *x x*, Fig. 2, showing the plane of section. Fig. 2 is a transverse vertical section of the same, *y y*, Fig. 1, showing the plane of section. Fig. 3 is a detached front view of the vibrating dies.

Similar letters of reference indicate corresponding parts in the several figures.

Our improvement has no reference to what is termed "lap-welded tubing," but relates exclusively to the manufacture of that description of metal tubing in which there is no seam or lap, but the tube is elongated or thinned out lengthwise, as it were, from a close, thick, and comparatively short tubular casting of metal having no seam or split in it.

To enable those skilled in the art to fully understand and construct our invention, we will proceed to describe it.

A represents a bed-plate, to which an upright bar or plate B is attached or secured in any proper manner.

C represents a shaft, the bearings of which are placed in horizontal arms *a*, attached to the bar or plate B. On one end of the shaft C a fly-wheel D is placed, and on the center of the shaft between the arms *a* there is placed a crank *b*. There is also a spur-wheel E on the shaft C, and the wheel E gears into a pinion F, the axis of which is secured to one of the arms *a*.

To the crank *b* one end of a pitman G is attached. The opposite end of the pitman has a cylindrical cross-arm *c* connected to it, which arm is fitted between two plates *d e*, which are placed in a slot *f* in the bar or plate B. The upper end of the upper plate *d* is rounded or made of semi-cylindrical form and fits or bears in a corresponding shaped recess or cavity in the upper part of the bar or plate B. The lower end of the lower plate *e* is concave and fits over the rounded or semi-cylindrical top of a die H, which is placed in the bar or plate B, and is secured therein by a plate I, which is secured in a recess in the bar or plate B by a cross-bar *g*, as shown in Figs. 1 and 2. Within the bar or plate B there are also placed two dies J K. These dies are placed in oblique or inclined positions, as clearly shown in Fig. 1, and each die J K has a spring *h* attached to its under side. The face edges of the three dies are made concave, the three faces forming a circular aperture through which the tubular casting is fed.

L represents a screw-rod one end of which has its bearing in an upright M on the bed-plate A. The other end is made perfectly smooth, and forms the mandrel L′, on which the tubular casting is drawn out by the dies, as will be presently explained.

On the screw-rod L a nut N is placed, said nut having a ratchet *i* at one end, and a circular plate O is placed on the screw-rod, said plate having a pawl *j* attached to it, which pawl catches into the ratchet *i*. To the upper and lower ends of the plate O there are pivoted arms *k k*, which are connected to the upper and lower ends of a cross-bar P, which is fitted loosely on a rock-shaft Q, said shaft receiving its motion by means of a connecting-rod *l*, the upper end of which is attached to the pinion F and the lower end to an arm *m* on the shaft Q.

The dies J K are secured in the bar or plate B by the plate I.

The short thick tubular casting or ingot R, out of which the tube is made, is placed on the mandrel L′, one end of it being connected to the circular plate O, and motion being given the shaft C a vibrating movement radially to the mandrel is communicated to the dies H J K, the two plates *d e* forming a toggle, and the upper die H, when radiating inward, forcing down the two lower and lateral dies J K till the latter arrive at a solid bearing or seat, and when the circle formed by the combined curvatures of the inner faces of the three dies is complete and close or unbroken the two lower dies J K, by their relative position to the upper die H, effectually restraining the compressed ingot or partially-formed tube from giving out laterally one way or the other under the action of the upper die, and thus effecting an equal reduction

or uniform thinning of the tubing (so important in metal pipes) all round at every point on its surface, as the three dies, when closed, encircle the tubing throughout its circumference, and, as we have proved in practice, two semispherical dies, an upper and a lower one, by unavoidably giving out laterally as the machine wears, will not produce the same perfect or uniform tubing while three dies otherwise operating touching the circle of the tube at but three points and sliding lengthwise over it, while the tube (necessarily supported on a mandrel the length of the tube) continuously rotates; or the tube is continuously fed lengthwise and the dies rotated, (as in the machine patented to J. Pratt on the 6th June, 1854,) will not effect the same perfect result, as the compressive operation or action of the dies or die-rollers in Pratt's machine under either method of operation is a spiral one, elongating any flaw there may be in the surface of the metal forming the tube, and this is a defect incidental to all "drawing" arrangements, while Pratt cannot employ other than dies touching merely at their points, as to operate a circle of dies such as ours in his manner would twist and rend the metal, and dies touching merely at their points cause the metal to "pucker up" between the dies; but our arrangement, it will be observed, is a radial compressive action when the tube is at rest and taking in every point in the circle or circumference of the tube, the screw-feed of the ingot R being, like the compressive action of the dies, intermittent and made automatically alternate with said action of the dies by means of the nut N, plate O, pawl *j*, ratchet-arms *k k*, cross-bar R, and rock-shaft Q, operating together, as will be well understood by reference to equivalent feeds, to effect this action; but it is important that this automatic intermittent feed should be nicely timed, both as regards period and extent, with or to the action of the dies, so that not only the entire circumference of the tube may be acted on by the three dies, but every point throughout the length of the tube be compressed in a radial direction, and without which a perfect tube cannot be formed.

The spreading out of the tube by compression on every point of its circumference over a short mandrel-surface L′ is preferable to the employment of a long varied mandrel-surface, both as regards forming a perfect exterior and interior to the tube, as a short mandrel-surface may be made and kept truer than a long one and varied spring of the mandrel is avoided, and thus our arrangement and operation of the three dies on the ingot on the mandrel, in connection with the specified automatic intermittent feed, makes a seamless pipe or tubing of the most perfect exterior and interior rotundity and of the smoothest finish; also makes it more compact and firm than under any previous arrangement for the manufacture of tubes of this sort, the metal in them being made denser, and the dies hammering radially on the tube over the entire circumference and at every point throughout the length any hole or blemish in the metal will be closed up instead of being drawn out, as by Pratt's and other methods.

We are convinced from experiment that a different arrangement and operation of the dies on the ingot solidly all round the interior mandrel of the entire configuration of the bore will not effect the same perfect exterior and interior to the tube, both of which are equally important, the two lower side dies J K not only effectually preventing unequal lateral disturbance by the downward thrust of the upper one, but the three dies, taking in the whole circle, doing away with the formation of longitudinal seams or ridges at the junction of the dies, as occurs with an arrangement of two encircling dies only, and which have a tendency to produce an oval formation of the tube.

We do not claim in itself as new an automatic intermittent feed of the work, nor do we claim as new the manufacture of seamless metal tubing on a mandrel by action of a triple-die pressure irrespective of the construction, arrangement, and operation of the dies, nor yet, of itself, a compressive action of two dies on the article to be formed under a stationary condition of the latter and a diagonal arrangement of the hammering-dies to it, as such has been used in thimble-making machines; but

We do claim as an improvement in the manufacture of seamless metal pipes or tubing and desire to secure by Letters Patent—

The three encircling and radially-hammering or pressure dies H J K when arranged relatively to each other and operating together on the tubular ingot while stationary, as specified, and, in combination with the intermittent feed to the ingot or partially-formed tube on or over the mandrel, alternate with the compressive action of the dies, as shown and described.

JOHN J. SPEED, JR.
JOHN A. BAILEY.

Witnesses:
WM. TUSCH,
JAMES F. BUCKLEY.