(No Model.) 3 Sheets—Sheet 1.

J. REESE.

MACHINE FOR ROLLING METAL RODS.

No. 338,360. Patented Mar. 23, 1886.

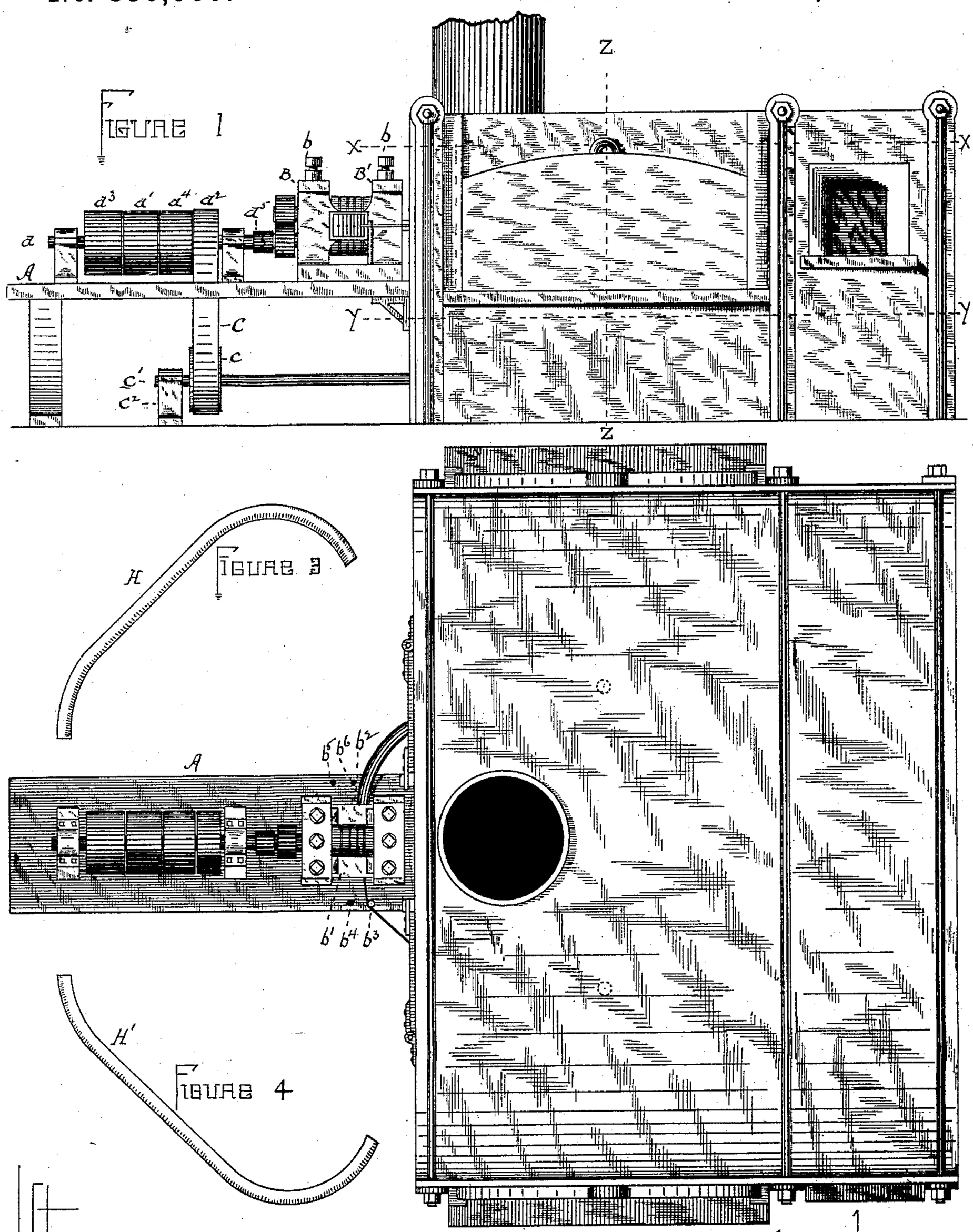

FIGURE 1

FIGURE 4

FIGURE 2

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Jacob Reese.

(No Model.) 3 Sheets—Sheet 2.

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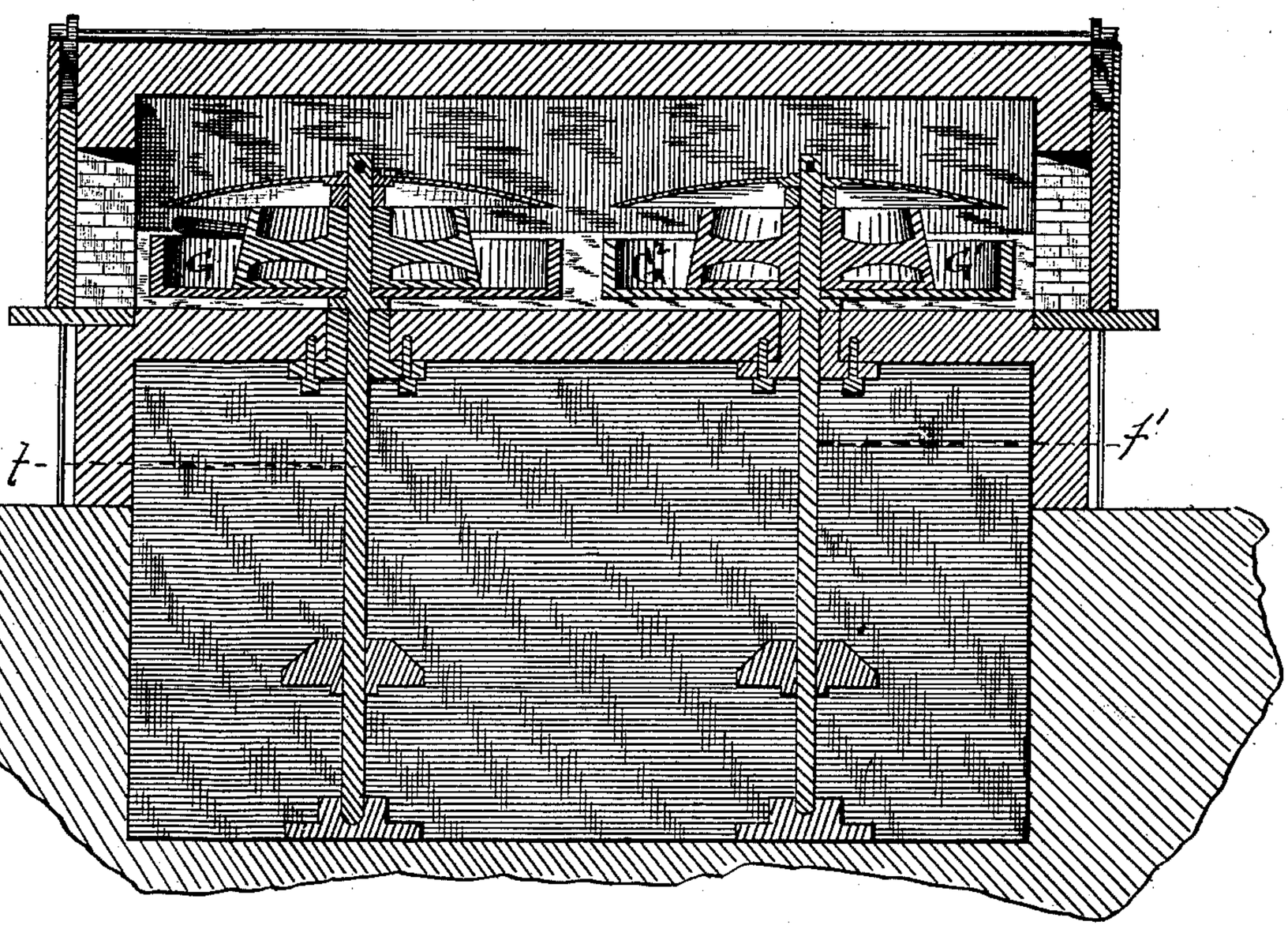
FIGURE 5



Witnesses

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(No Model.)

3 Sheets—Sheet 3.

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MACHINE FOR ROLLING METAL RODS.

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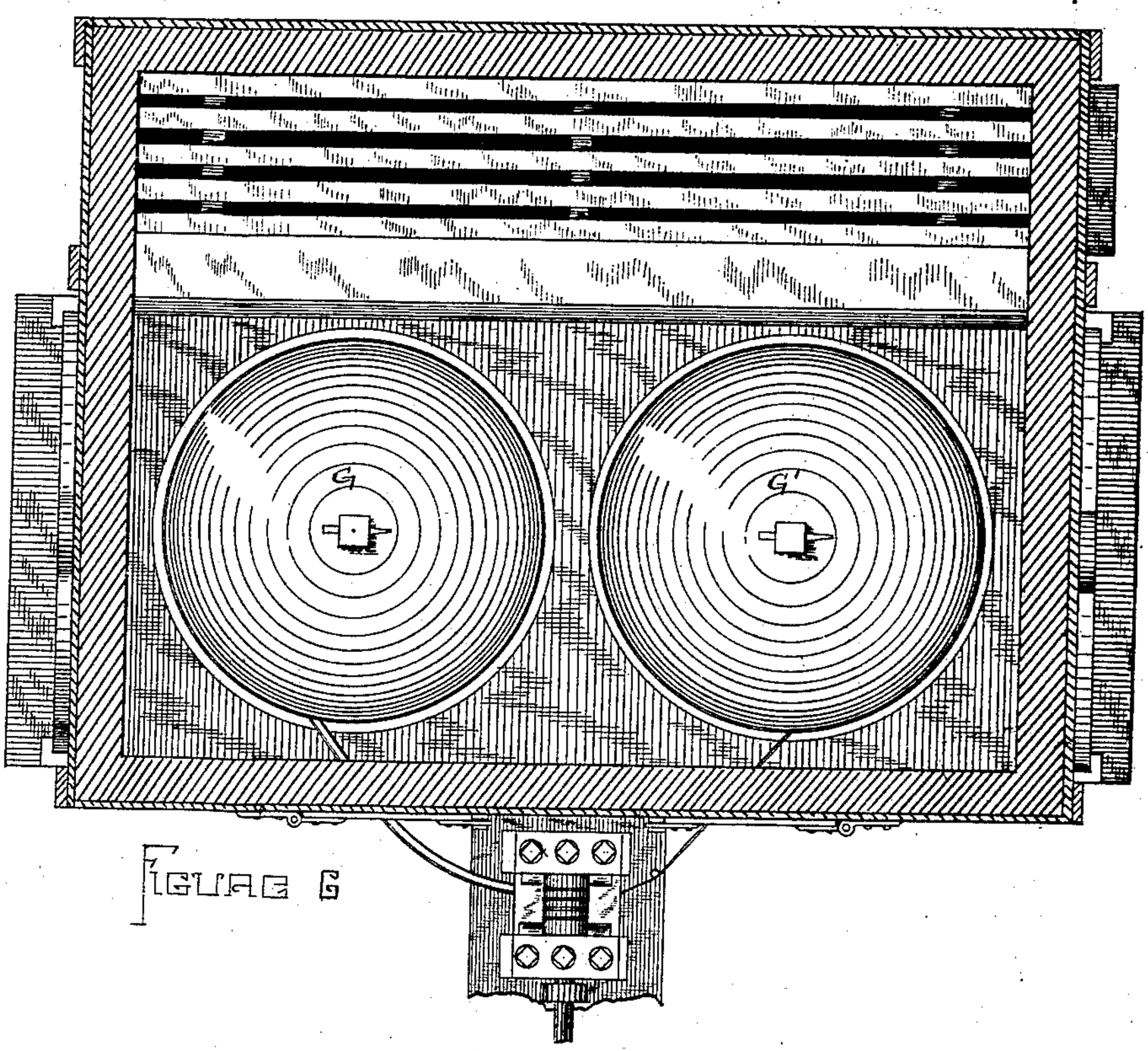

FIGURE 6

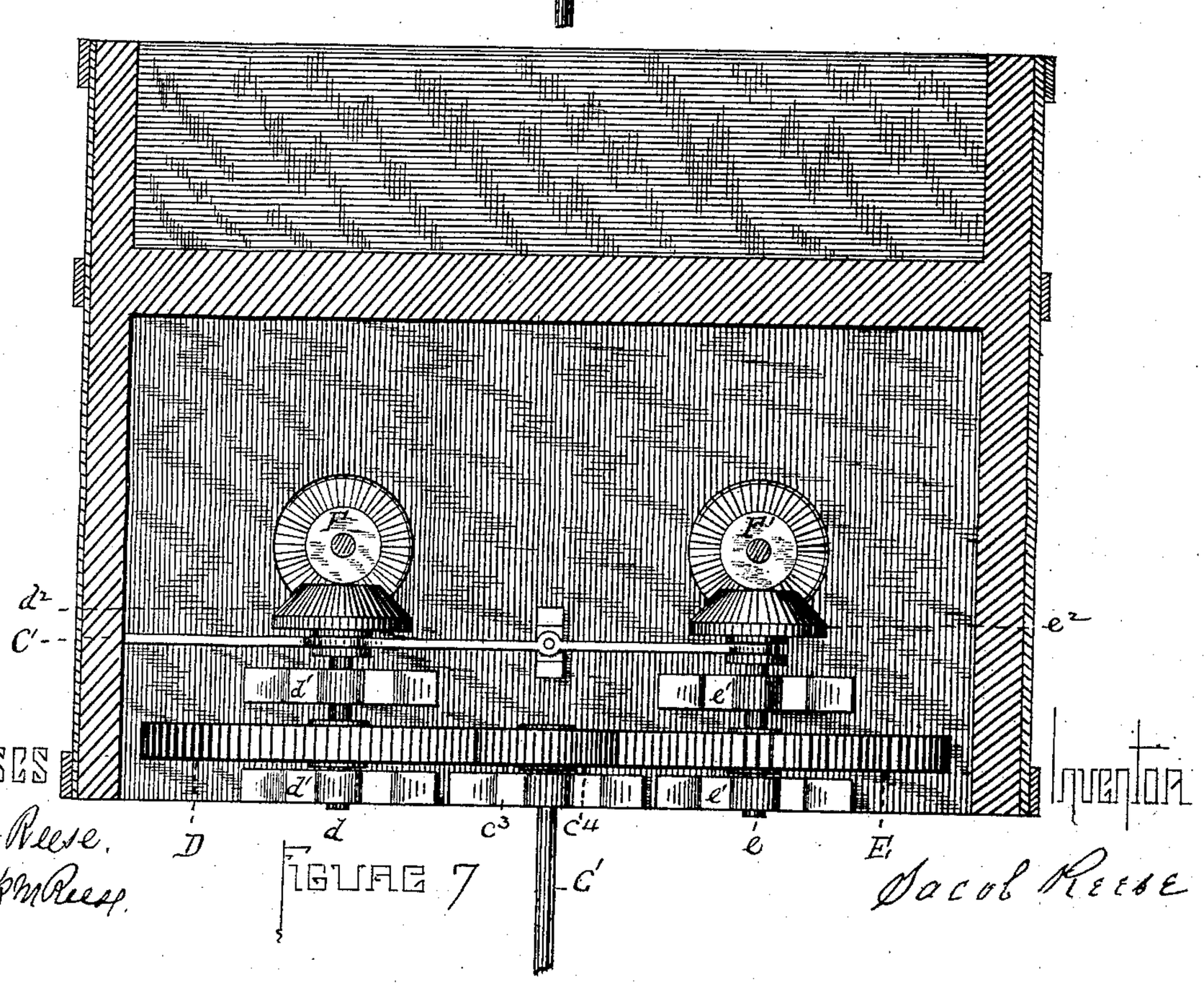

FIGURE 7

WITNESSES

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UNITED STATES PATENT OFFICE.

JACOB REESE, OF PITTSBURG, PENNSYLVANIA.

MACHINE FOR ROLLING METAL RODS.

SPECIFICATION forming part of Letters Patent No. 338,360, dated March 23, 1886.

Application filed March 17, 1884. Serial No. 124,448. (No model.)

To all whom it may concern:

Be it known that I, JACOB REESE, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Plants for Rolling Metals; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 on Sheet 1 indicates a side elevation of an improved plant for heating and rolling metals. Fig. 2 indicates a plan view of the same. Figs. 3 and 4 indicate detached plan views of the guide-pipes for transferring the metal from the rolls to the furnace-reels. Fig. 5 on Sheet 2 indicates a vertical transverse sectional view through the furnace and furnace-reels, taken through at the lines *z z* shown in Fig. 1. Fig. 6 on Sheet 3 indicates a longitudinal transverse sectioral view of the same, taken through at the horizontal dotted lines *x x*, shown in Fig. 1. Fig. 7 on Sheet 3 indicates a longitudinal transverse sectional view of the furnace, showing the mechanism for actuating the furnace-reels, and taken through at the lower dotted horizontal lines, *y y*, shown in Fig. 1.

Like letters of reference indicate like parts wherever they occur.

My invention relates to a plant for rolling metals.

The object of my invention is to produce wire rods or wire of much smaller cross-sectional area than has heretofore been produced by rod-rolling mills.

In the ordinary practice of rod-mills it has been impracticable heretofore to roll rods of less size than No. 5 gage on account of the difficulty of handling the rod and retaining sufficient heat in it for rolling. In my present invention I propose to overcome these difficulties by heating the rod when coiled around a reel in the furnace, then inserting one end of the heated wire into the rolls, and transferring the metal as rolled by a suitable guiding-trough into another reel within the furnace. The rolls and reels are then reversed. The rod is again entered, subjected to a reverse pass, and guided back again by a suitable guiding-trough into the first reel, and the operation is thus continued from one reel to the other until the metal has been subjected to the required number of passes to bring it to the gage desired.

I shall now describe more fully the apparatus which I use in the practice of my invention, so that others skilled in the art may make and use the same.

In the drawings, A indicates the frame-work which supports the rolling and roll-driving mechanism. *a* indicates the main driving-shaft, which is suitably journaled in a set of pillow-blocks upon the upper part of the frame-work, and is provided with a set of tight pulleys, a' and a^2, and a set of loose pulleys, a^3 and a^4, mounted thereon. The object of this arrangement is to allow reverse rotative movements to be imparted to the driving-shaft *a* by alternately shifting straight and crossed belts (not shown) from the loose pulleys a^3 and a^4 onto the tight pulley a', as will be readily understood by the skilled mechanic, such arrangement being commonly employed for similar purposes.

a^5 indicates a coupling-clutch, which connects the end of the main driving-shaft to the spindle of the lower or driving roll.

B and B′ indicate a set of open-top roll-standards, in which a set of drawing-rolls are suitably journaled, and are provided with suitable cap-pieces, which are retained in position by bolts, in the usual manner.

b and *b* indicate the roll-tightening screws for regulating the pressure or draft of the rolls upon the metal during the rolling operation. These rolls are geared together by gear-wheels mounted upon one end of their spindles, and are provided with a series of grooves of graduated size and of proper form to effect a gradual reduction of the metal when subjected to a succession of passes to bring it to the shape and gage desired.

b' and b^2 indicate a pair of guide-boxes, which are securely attached to the standards immediately in front and rear of the rolls, and they are each provided with a series of guides adapted to deliver the rods to and receive them from the series of reducing-grooves upon the surface of the rolls. b^3 and b^4 are a set of guiding-pins located immediately in front of the guides for delivering the metal, respectively, into the first and the third grooves; and b^5 and b^6 indicate a similar set of guiding-pins,

located at the rear of the rolls immediately in line with the guides for delivering the metal into the second and fourth grooves during the reverse rolling operations, the idea of this arrangement being to guide the metal when drawn from the furnace into a straight line with its proper receiving-guide before its entrance therein.

C indicates a driving-belt, which communicates motion from the pulley a^2 to a driving-pulley, c, mounted on a supplemental driving-shaft, c', which is suitably journaled in a pillow-block, c^2, and a pillow-block, c^3, located beneath the front of the furnace. (See Figs. 1 and 7.) This supplemental driving-shaft c' is provided at its rear end with a gear-wheel, c^4, which meshes into and communicates motion to a set of gear-wheels, D and E, mounted on a set of horizontal shafts, and which are journaled beneath the furnace in suitable journal-boxes, d' d' and e' e'. These shafts d and e are provided at their rear ends with adjustable beveled friction-wheels d^2 and e^2, which work upon splines, and are provided with grooved hubs, which are engaged by the annular collars of the shifting-lever C′, which latter has its fulcrum upon a vertical support located midway between these friction-wheels, in order that the latter may be alternately thrown backward and forward in unison upon their respective shafts, to bring them alternately into and out of contact with the driving friction-wheels F and F′, mounted on the vertical shafts f and f', which actuate the reeling and coiling apparatus located within the forward part of the furnace.

f and f' (see Figs. 5 and 7) indicate a set of vertical reel-driving shafts, which are journaled in suitable bearings in the forward part of the bottom of the furnace, and are provided with suitable bearings at their lower ends beneath the furnace.

G and G′ indicate the reeling and coiling drums, which are located within the forward part of the furnace. These reels or drums are composed of ordinary-formed reels attached to and mounted in the center of a set of rotative cast-iron coiling-tubs, G^2, which are keyed, respectively, into the upper portion of the reel-driving shafts f and f', and are provided with dished caps, which are secured and held in position by small pins passed through apertures in the upper part of the reel-driving shafts, as is indicated in Figs. 5 and 6.

H and H′ (see Figs. 3 and 4) indicate a set of curved guiding-pipes which are inserted in front of the delivering-grooves and into the reels when it is desired to conduct the metal back again into the reels during the rolling operation.

The operation of the mechanism is as follows: Power is applied (either by straight or crossed belt) to the tight pulley a', communicating a rotary motion to the main driving-shaft, which in its turn transmits the rotative movement to the rolls and to the tight pulley a^2, and motion is communicated from the latter to the supplemental driving-shaft c' through the medium of the belt c. This rotative movement of the shaft c' imparts a rotative movement to its gear-wheel and to the gear upon the shafts d and e. Assuming that the adjusting-lever is in its normal position, as shown in Fig. 7, the friction-wheels d^2 and e^2 will be both held back far enough upon their splines to keep both out of contact with the friction-wheels upon the vertical shafts which actuate the reeling and coiling mechanism, and consequently the latter will remain idle. The mechanism now being in condition for operating, the cap is taken off one of the reels, say G′, and the furnace being properly heated, a coil of No. 5 wire rod is placed within the reel. The cap is then replaced and keyed down. When the coil is heated to a suitable temperature, one end of one of the guiding-tubes is placed behind the delivery side of the groove it is purposed to roll the metal through, and the other end of the tube is inserted down into the space between the opposite coiling-tub and reel, so that the metal may be conveyed from the rolls and coiled up within the opposite reel, which is then caused to rotate by throwing the adjusting-lever in position to bring the friction-wheel d^2 into contact with its driving-gear. The end of the heated rod is then drawn out of the drum G′, and passed to the side of the first guide-pin, and inserted properly in the first guide to enter it into the first groove of the rolls, as is shown in Fig. 2. It is drawn in by the action of the rolls, and the metal uncoils rapidly from the delivering-reel, passes through the groove, through the guiding-tube, and into the opposite or receiving reel. This action of the rolls will reduce the cross-sectional area of the metal about thirty-five per cent. (35%) and impart an oval form to it. As soon as the metal has been coiled up in the receiving-reel the guiding-spout is removed, and the other guiding-spout is placed in position upon the opposite side of the rolls to transfer the metal back from the second groove again into the first reel. The adjusting-lever is then made to force the gear-wheel d^2 out of contact with the gear-wheel of the vertical spindle on which the reel G is mounted, and to force the gear e^2 into contact with the gear which actuates the vertical spindle of the reel G′, so that the latter may have a rotative movement imparted to it, while the former reel remains free to be rotated by the tension upon the rod as the latter is drawn through the rolls during the reverse rolling operation. The main driving-belts are then shifted to impart a reverse rotative movement to the main driving-pulley. The end of the rod is then taken from the reel G, drawn to the side of the guiding-pin, and inserted with its larger axis up through the guide-box and into the second groove. The action of the reverse pass rapidly withdraws the metal from the reel G, forces it from an oval to a round form, causes a decrease of about thirty-five per cent. of its cross-sectional area and forces it through the

guiding-pipe back again into the rotating reel G. As soon as the reverse rolling operation has been finished one guiding-pipe is removed, and the other guiding-pipe is placed in position at the rear of the rolls to take the metal from the third groove and deposit it in the opposite reel. The shifting-lever is then moved to cause the empty reel to rotate, the rolling mechanism is reversed, and the metal is entered within the third groove and coiled up within the receiving-reel. This rolling operation again forces the rod into an oval and greatly reduces its cross-sectional area. The mechanism is then again adjusted and reversed, and the metal is subjected, with its long axis up, to the action of the fourth pass. It is desirable, in order to get a perfect round, that the reduction of the cross-sectional area of the metal should not exceed fifteen per cent. in this pass. As soon as the rolling operation has been completed the mechanism is stopped, the cap is removed, and the coiled wire or rod is removed. Another rod is then inserted and rolled to the size desired in the manner before described.

Wire rods may be rolled from No. 5 to No. 11 in four passes or to No. 13 in six passes by this method. When No. 5 is rolled to No. 9 in four passes and the rolls are four inches in diameter and run seven hundred revolutions per minute, the rod will only require two minutes' time for passing through all the grooves, as the aggregate lengths of the bar will only be fourteen hundred feet for the four passes. Now, allowing one minute for reversing each pass, I am enabled to roll a coil of No. 5 wire rod weighing sixty-three pounds down to No. 11 gage every six minutes, or at the rate of ten pounds per minute, and allowing fifty minutes in the hour and eight hours per day for working gives a product of four thousand pounds per day to each machine.

In making six passes from No. 5 to No. 13, the aggregate length of the metal will be two thousand eight hundred feet; hence six minutes will be required for reversing and four minutes for rolling, or ten minutes to roll a sixty-three-pound bundle of No. 5 to No. 13, or at the rate of six pounds per minute, three hundred pounds per hour of fifty working minutes, and twenty-four hundred pounds per day of eight hours.

It will be observed by reference to Figs. 3 and 4 that one end of the guiding-pipes is curved somewhat sharply. This curved end is also preferably bent downward slightly to cause the rod to be delivered down well within the coiling-drums. The object of this sharp curve at one end of the pipes is to cause the rod to coil up as it is delivered into the drum, and thereby obviate the necessity of attaching the rod to the latter to accomplish that purpose.

In the use of my invention I propose to use, when desired, a reel-heating furnace provided with a large heating-chamber adapted to receive and heat a number of bundles of wire rods previous to their insertion within the reel, as it may prove desirable for rapid working.

Some of the advantages of the invention are:

First. Any given portion of the metal is only exposed to oxidation during the almost inappreciable instant of time required for its passage from the furnace through the rolls and guiding-trough into the opposite reel; hence oxidation of the metal is reduced to a minimum during the rolling operation.

Second. As the metal is almost entirely within the furnace during the entire rolling operation, but little heat is lost; hence a very rapid reduction may be had, and a lower temperature may be employed. Consequently the required heat may be readily imparted by a carburizing-flame, so that no appreciable loss of metal occurs in heating.

Third. As the wire is automatically returned and reeled within the furnace the rolls may be driven at a very high rate of speed and a large output thereby secured.

Fourth. As the practice is almost automatic, cheaper and less labor is required.

Fifth. As compared with wire-drawing apparatus, the invention dispenses with the pickling, scaling, washing, and annealing operations, is more rapid, cheaper, and the product is softer and tougher.

In the use of the invention I preferably heat the metal by a carburizing-flame.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, in a plant for reducing metals, of a set of reducing-rolls with rotatable drums, tubs, and caps or covers for the drums, substantially as set forth.

2. The combination, in a plant for reducing metal, of a set of reducing-rolls with rotatable drums, rotatable tubs surrounding the lower ends of the drums, and caps or covers for the drums, substantially as set forth.

3. The combination, with a heating-chamber, of rotatable drums or reels located therein, and rotatable tubs surrounding the lower ends of the drums, substantially as set forth.

4. The combination, with a set of reducing-rolls, of rotatable drums or reels, and tubs surrounding the lower ends of said reels, and caps or covers for said drums and tubs, substantially as set forth.

5. The combination of the rolls, the front and rear roll-guides, and the front and rear guiding-pins for guiding the metal in line with the entry sides of the roll-guides, substantially as set forth.

6. The combination of the rolls, the front and rear roll-guides, the front and rear guiding-pins, a delivering guiding trough or tube, and a drum or reel, substantially as set forth.

7. The combination of the rolls, the roll-actuating mechanism, the front and rear roll-guides, and the guiding-trough with the receiving and delivering drums or reels, substantially as set forth.

8. The combination of the main driving-shaft with the supplemental driving-shaft, gears E D C^4, the movable gears e^2 d^2, and the lever pivoted midway between said gears e^2 d^2, substantially as set forth.

9. The combination of the main driving-shaft with the supplemental driving-shaft, gears E D C^4, and the movable gears d^2 e^2, substantially as set forth.

10. The combination of the main driving-shaft, the supplemental driving-shaft, and its pinion with the auxiliary driving-shafts, pinions D E, adjustable gears d^2 e^2, and adjusting-lever C, substantially as set forth.

11. The combination, with a shaft, of a tub fitted thereon to revolve therewith, a reel on the shaft and secured to the tub, and a dished cap or cover for the tub and reels, substantially as set forth.

12. The combination, with a furnace and revoluble reels or drums therein, of a set of reducing-rolls and a guiding trough or tube having a bent end, substantially as set forth.

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Witnesses:
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WALTER REESE.