No. 652,802. Patented July 3, 1900.

J. M. MURPHY.

ROLLING MILL APPLIANCE.

(Application filed Feb. 12, 1900.)

(No Model.) 3 Sheets—Sheet 1.

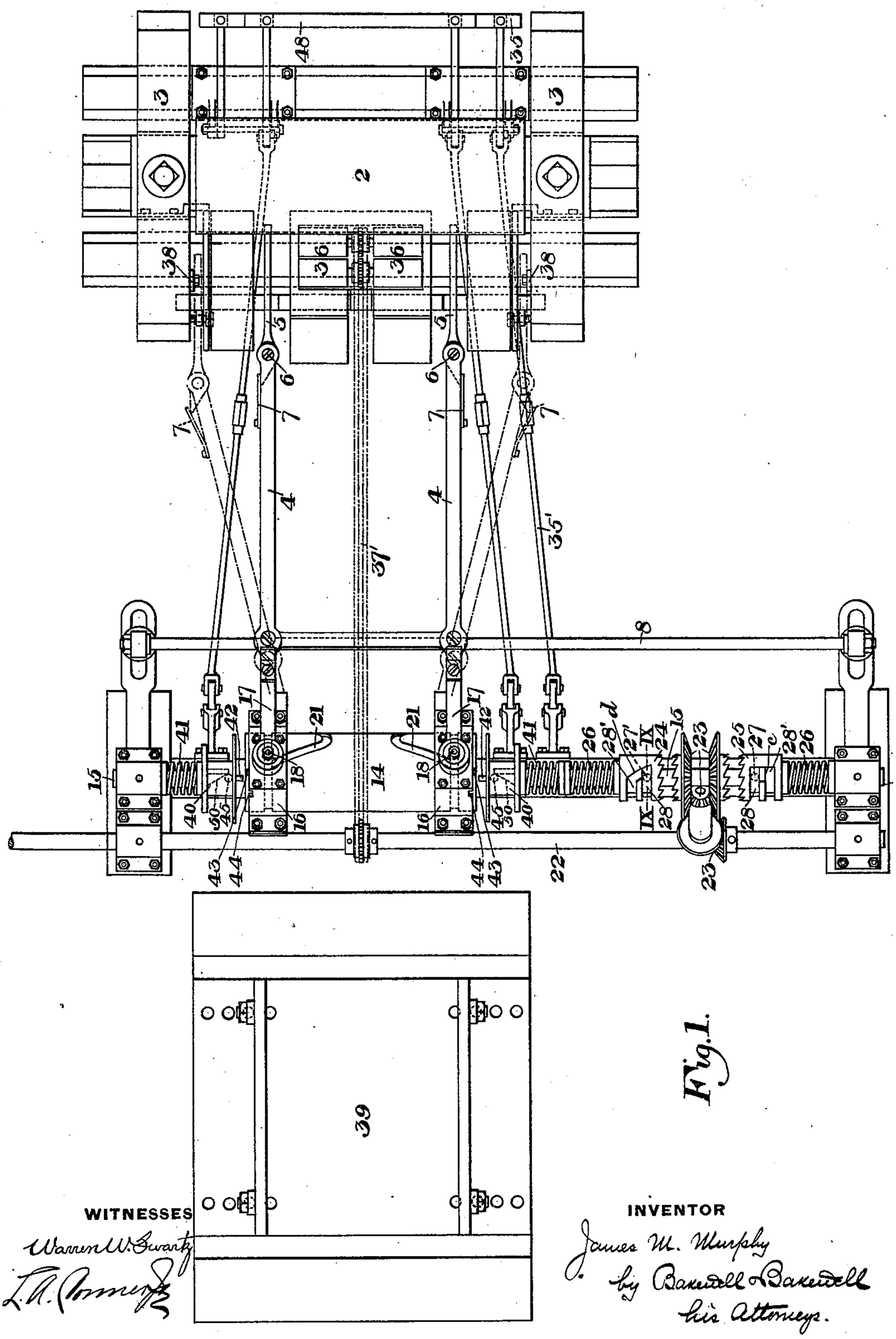

Fig. 1.

WITNESSES

Warren W. Swartz

L. A. Bonney

INVENTOR

James M. Murphy

by Bakewell & Bakewell

his Attorneys.

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(No Model.) 3 Sheets—Sheet 2.

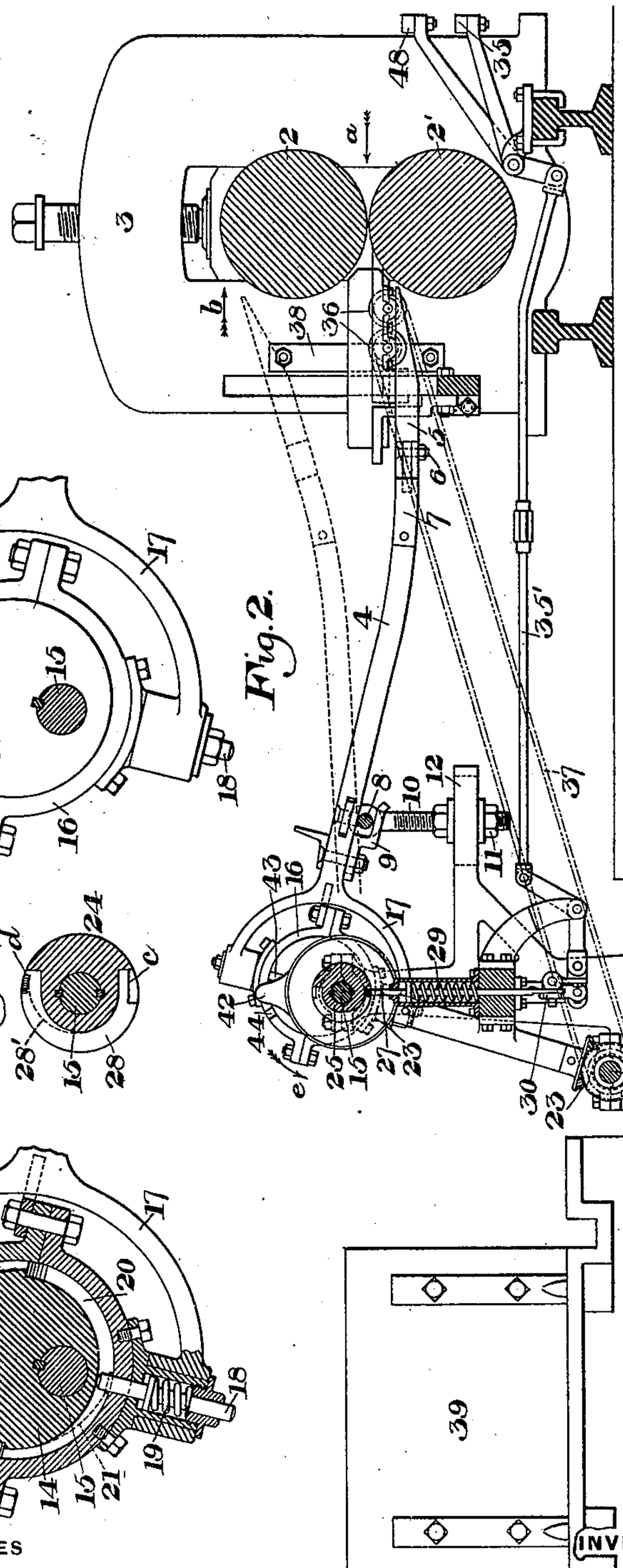

Fig. 2.

Fig. 5.

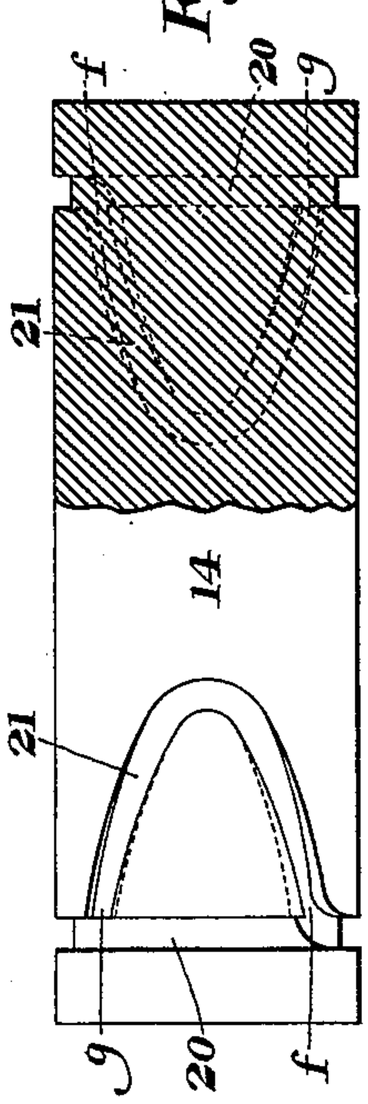

Fig. 7.

Fig. 9.

Fig. 6.

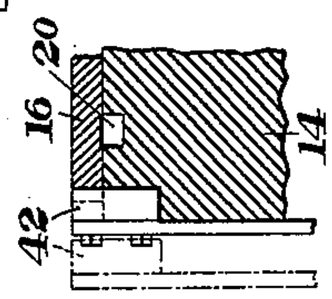

Fig. 8.

WITNESSES

Warren W. Swartz

L. A. Sommers

INVENTOR

James M. Murphy

by Bakewell & Bakewell

his Attorneys.

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J. M. MURPHY.

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(Application filed Feb. 12, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 3.

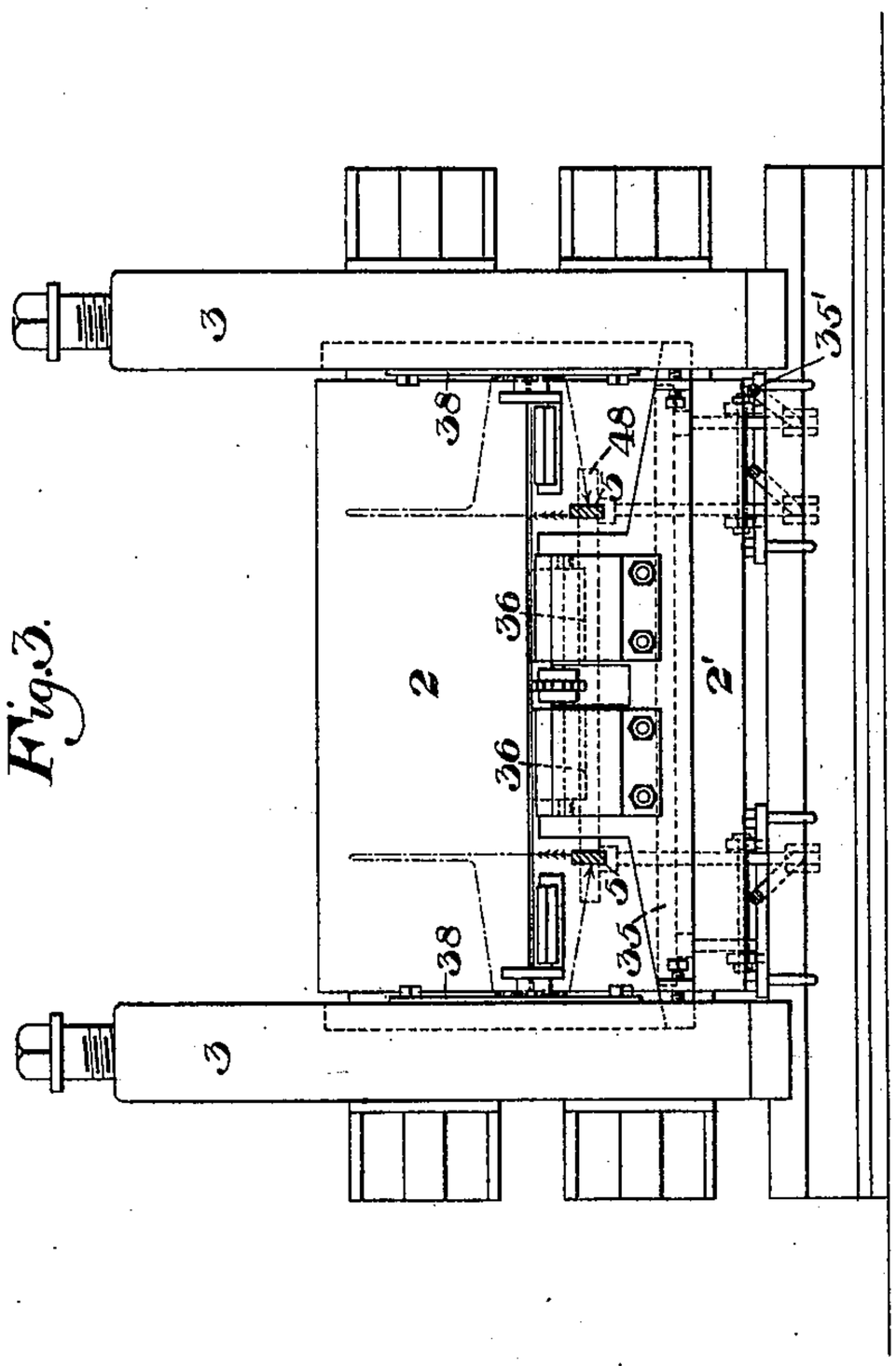
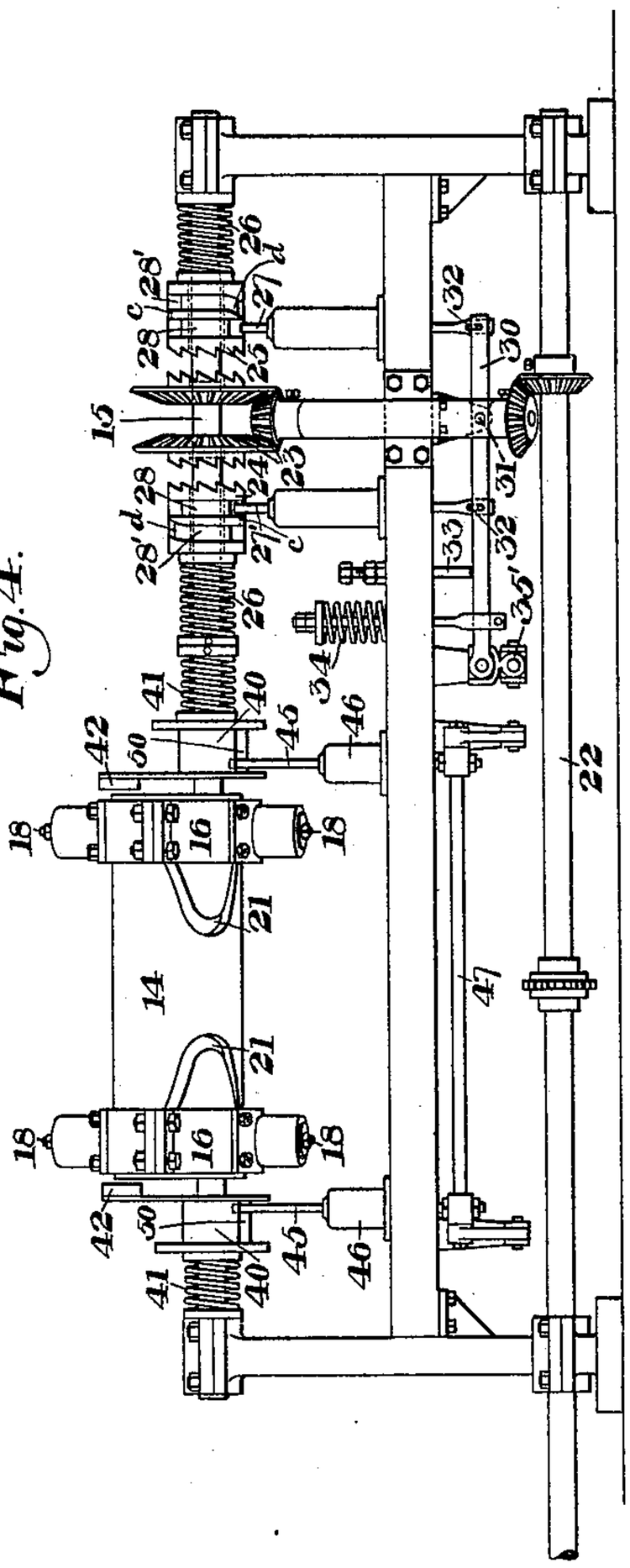


Fig. 4.



WITNESSES

Warren W. Swartz

L. A. Connett

INVENTOR

James M. Murphy

by Bakewell & Bakewell

his Attorneys.

UNITED STATES PATENT OFFICE.

JAMES M. MURPHY, OF PITTSBURG, PENNSYLVANIA.

ROLLING-MILL APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 652,802, dated July 3, 1900.

Application filed February 12, 1900. Serial No. 4,932. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. MURPHY, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rolling-Mill Appliances, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of my improved apparatus. Fig. 2 is a side elevation thereof, partly in section. Fig. 3 is a rear elevation of the rolls. Fig. 4 is a rear elevation of the power-transmitting mechanism. Figs. 5, 6, 7, and 8 are detail views thereof; and Fig. 9 is an enlarged cross-section on the line IX IX of Fig. 1.

My invention relates to the rolling of sheet metal, and is designed to afford apparatus whereby the sheets or plates may be easily and rapidly manipulated during the operation of rolling and properly stacked when the said operation is completed; and it consists in the apparatus hereinafter described.

In the drawings, in which like reference-symbols indicate like parts, 2 2′ are the upper and lower rolls, respectively, mounted in suitable housings 3. The metal sheets to be rolled are passed between the rolls in the direction of the arrow *a* and are alternately passed back over the upper roll in the direction of the arrow *b*. It is the purpose of my improvement to provide means for receiving the sheet metal as it is delivered from the rolls, of raising it so that it may be passed back over the upper roll, and, finally, when the metal has been completely rolled transferring the same to a compartment or box in which the finished sheets are piled.

4 4 represent the transferring-arms of my improved device, which may be of similar construction. Each of the arms has at its end next to the rolls a section 5, connected to it by a pivot-pin 6 and adapted to turn thereon, as indicated by dotted line, a spring 7 being provided to hold the parts of the arm in line when the arm is in its receiving position. Each arm rests upon a cross-bar 8, on which it can tilt or move, as on a fulcrum, and for holding it thereon it is provided with a hook portion 9, which fits under the bar, but permits longitudinal motion on the latter. The bar is supported by screw-standards 10, having nuts 11, which permit its vertical adjustment, and its horizontal adjustment is provided for by forming longitudinal slots in the brackets 12, through which the bolts pass. For the purpose of manipulating the arms I employ a cylindrical eccentric 14, mounted on the shaft 15 and having straps 16, which are connected pivotally with the arms by yokes 17. The strap of each arm has one or more pins 18, (I show two of them in the drawings,) provided with springs 19 and fitting in grooves 20 in the eccentric. These grooves extend around the eccentric and have also opposite U-shaped branches 21, which cause the lateral motion of the arms, as I shall presently explain. The shaft 15 is driven from a driving-shaft 22 by interposed gearing 23 and clutches 24 and 25, and by operation of these clutches the shaft may be driven in either direction. As a convenient means for operating these clutches I prefer to employ springs 26 26, which normally tend to force the parts of the clutches together, and I hold the movable clutch-sections back against the pressure of these springs by locking-rods 27 27′, of which the rod 27 is the shorter. These locking-rods fit at the ends in grooves 28, which are made in the periphery of the clutch-sections and are held in engagement with said grooves by springs 29. These grooves are formed with two branches 28 28′, and the operation is as follows, referring to the clutch 24: When the parts are in the position shown in Fig. 4, the rod 27′ is in the groove 28 and holds the parts of the clutch separate from each other. As the clutch-section continues to rotate the end of the rod is brought opposite a cross-groove (shown at *c*) in the clutch 24, and then if the rod 27′ be pulled down by the mechanism described below the spring 26 will force the clutch-section into engagement with its companion section and will bring the end of the rod 27′ into the groove 28′. Then as the clutch continues to rotate the end of the rod 27′, moving along the groove 28′, which is inclined or spiral at *d* for this purpose, gradually forces back the clutch-section against the tension of the spring until by said spiral portion the end of the rod is moved into the groove 28. The groove 28′ is made shallower toward its end,

and the moving of the clutch-section by bringing the end of the rod 27′ into the deeper groove 28 will cause it to hold the clutch from being moved longitudinally, and the parts of the clutch being then separated the motion of the shaft 15 is stopped.

Both clutches 24 and 25 may be of the same construction, and their rods 27 and 27′ are connected to a lever 30 at opposite sides of its fulcrum 31, the connections between the rods and the levers being slotted at 32 in order to permit the springs 29 to move the rods, as above explained. The lever 30 is limited in its motion by a stop 33 and is provided with a lifting-spring 34 and an actuating foot-lever 35, connected with it by suitable connections 35′. As shown in Fig. 4, the lever 30 is held by the spring 34 so that its rod 27 is in its lowest position with its end in the groove 28, into which it has been moved by the inclined surface *d* and so that when the clutch is turned so as to bring the end of the rod opposite the cross-groove *c* the clutch-section shall be moved automatically by the spring into engagement with its companion clutch and shall reverse the rotation of the shaft. Fig. 4 also shows the rod 27′ in its highest position, fitting in the groove 28 and opposite to the cross-groove *c*, so that when it is pulled down by operation of the lever 30 and foot-lever 35 the clutch-section will be forced by its spring into connection with its companion clutch-section and gear-wheel. Such operation of the last-named clutch-section will cause the shaft to rotate, as shown in the drawings, in a direction counter-clockwise, which it will continue to do for, say, five-eighths of its revolution, at the end of which time the rod 27′ has engaged the inclined portion *d* of the groove and has retracted the clutch 24, while the other rod 27 has come opposite to the cross-groove *c* and permits the spring to bring the sections of the clutch into connection with each other and to revolve the shaft in the opposite direction as soon as the operator raises his foot from the lever 35 and permits the spring 34 to operate the lever 30 reversely. It will thus be seen that in the arrangement illustrated in the drawings, which shows my mechanism in its preferred form, the depression of the lever 35 will cause the shaft to rotate in one direction for five-eighths of a revolution and then to stop until the operator raises his foot, whereupon the shaft will turn in the reverse direction for five-eighths of a revolution. I will now describe how these back-and-forth rotations of the shaft operate the arms 4.

As the shaft rotates in the direction of the arrow *e* the eccentric 14 will actuate the strap 16, so that in the first part of its motion it will draw back the arms 4 somewhat from the position shown by full lines in Fig. 2 and will cause them to clear the upper roll, and the further motion of the eccentric will tip these arms on the fulcrum-bar, raising them to the position shown by dotted lines in Fig. 2 and bring them to the level of the top of the upper roll, at which time the action of the eccentric during the last one-eighth of the revolution will move the arms forward slightly toward the roll. Then on the reverse motion of the eccentric the arms are moved downward; but by reason of the arrangement of the grooves 20 and 21 at a portion of their travel they are moved outward, as shown by dotted lines in Fig. 3, so as to clear the sheet already deposited below them, and will then move back to their original position. This forward motion of the arms at the end of their throw is important for various reasons. It causes the approach of the metal to the rollers and enables the roller to utilize the forward motion as a means for effecting the separation of the piled sheets by the operation known in the art as "knocking off" or "opening" the sheets. These motions are shown by the dotted lines in Fig. 3 and are effected as follows: At the end *f* of the branch groove 21 the groove 20 is made abruptly deeper than its remaining portion, so that as the pin 18 travels along the groove during the rise of the arm 4 it will slip down into the deeper portion and will then continue on in the groove 20; but on the reverse motion of the eccentric when the pin is brought opposite to the portion *f* it will engage therewith and will be switched thereby into the branch groove 21, which by its lateral direction will cause the strap 16 to slide on the eccentric back and forth, and thus to impart to the arms 4 the back-and-forth lateral motion indicated by dotted lines in Fig. 3. I show in Fig. 6 two of the pins 18 set diametrically opposite to each other. I also provide the eccentric at each end thereof with two of the lateral branch grooves 21, which are set opposite to each other. To prevent the pin from entering the groove 21 at the point *g* when the eccentric is moving in the direction of the arrow *e*, I make the end of the groove 21 at that point somewhat shallower than the groove 20.

In the operation of my machine the roller standing at the right side of the rolls in Fig. 2 passes the sheet through them in the direction of the arrow *a*, and the sheet is received upon rollers 36, which are set opposite to the rolls and may be driven by a chain 37. These rolls carry the metal during the first part of its reduction, when it is still small, and deliver it upon the arms 4, which are in the position shown by full lines in Fig. 2. Thereupon the operator depresses the foot-lever 35, and, as above explained, causes the arms to rise to the level of the upper rolls, carrying the sheet with them. In this position the metal is seized by tongs and is drawn back over the top roll; but before taking the metal from the arms the roller introduces a second sheet between the rolls. He then reverses the motion of the parts by taking his foot from the lever 35, and thereupon the arms descend, and as they approach their lowest position they are swung outward, as above explained, so as

to clear the sheet which is coming through the rolls, and are then moved inwardly under said sheet. The pivoted sections 5 of the arms 4 strike against the wearing-plates 38 at the sides of the roll-housings and will be deflected, as shown by dotted lines in Fig. 1; but as the arms move back under the plate the sections 5 will be straightened out by the action of the springs 7. The next lifting of the arms 4 raises the metal sheet just a little, and so the operation proceeds until the two sheets which are being rolled are sufficiently reduced in thickness to be piled together, and thereupon when piled they are received on the arms 4 after they are reheated in the furnace and, having been rolled together for a sufficient number of passes, are again doubled and reheated in the usual way. Finally, when the sheets have been finished they are delivered into a receptacle or box 39, and this is done by swinging the arms over about half a circumference, and thus carrying the sheet from one side of the shaft 15 to the other and dropping the sheets into the box. To effect this motion, I prefer the following mechanism, which causes the locking engagement of the strap 16 with the eccentric 14, and thus causes the rotation of the eccentric to move the arms radially up from the fulcrum-bar 8 and thus to swing them over. 40 40 are sliding sleeves on the shaft 15, which are pressed inwardly toward the ends of the eccentric 14 by springs 41 and carry dogs 42, which are adapted to engage slots 43 at the ends of the eccentric and afterward, as explained below, to engage also slots 44 in the straps 16 when the slots 43 and 44 are brought into register by rotation of the eccentric. These sleeves are normally held back against the tension of the springs 41 by rods 45, upwardly pressed by springs, which may be contained within cases 46 and connected with an operating crank-shaft 47, which may be rocked by a foot-lever 48. When it is desired to transfer the sheets to the box 39, as above explained, the operator depresses the foot-lever 35, so as to cause the arms to move upwardly, as above explained, and also depresses the lever 48, so as to retract the rods 45 from the sleeve 40 and to allow the springs 41 to force these sleeves inward and to bring the dogs into engagement with the slots 43 in the ends of the eccentric 14. During the first part of the upward motion of the arms the eccentric will draw them back slightly, as above explained, until the hooks 9 clear the fulcrum-bar 8; but at this time the dogs, moving with the slots 43, come opposite to the slots 44 in the straps and spring thereinto, thus locking the straps and eccentric together. During the rest of the five-eighths revolution of the eccentric the arms will be swung backward radially, carrying the sheet with them, until they pass the center, whereupon they drop the sheets into the receptacle 39. (At the end of this five-eighths revolution the motion is stopped. The arms are held from dropping farther by the engagement of the locking-rod 27′ in the end of its groove in the clutch.) The parts are reversed by releasing the levers 35 and 48, and thereupon the arms 4 swing back toward the rolls, and as they near the end of their sweep the dogs 42 are retracted from the slots by engagement of inclined shoulders 50 on the clutch-collars 40 with the locking-rods 45, which, acting in the manner of a spiral or cam, press back the collars 40 against the pressure of the spring. During the continuance of the down motion of the arms they are actuated by the normal action of the eccentric 14, which at the end of its rotation gives to the arms a slightly-forward motion, which brings the hooks 9 under the fulcrum-bar 8.

It will be understood by the skilled mechanic that within the scope of my invention as defined in the claims many changes may be made in the mechanism by which the motions above described are effected, since

What I claim, and desire to secure by Letters Patent, is—

1. The combination in a rolling-mill, of lifting mechanism adapted to raise the metal upwardly from a roll-pass, and an eccentric whereby the same is given a forward motion at the end of its travel; substantially as described.

2. The combination in a rolling-mill, of lifting-arms adapted to raise the metal upwardly from a roll-pass, and guiding mechanism whereby on the downward motion, the arms are spread to clear a metal sheet; substantially as described.

3. The combination in a rolling-mill, of tilting lifting-arms adapted to raise the metal upwardly from the roll-pass, mechanism for tilting the same, and mechanism whereby said arms may be moved in a radial sweep to transfer the metal; substantially as described.

4. The combination in a rolling-mill, of a tilting arm or arms, a fulcrum-bar on which it is supported, and actuating mechanism adapted to tilt the arm thereon and to impart to it forward motion at the end of its stroke; substantially as described.

5. In a rolling-mill, the combination of an eccentric, a tipping arm adapted to receive the metal from the rolls and to deliver it at a different level, a fulcrum for the arm, and a connection between the arm and the eccentric; substantially as described.

6. In a rolling-mill, the combination of an eccentric and strap, tipping arms mounted thereon and adapted to receive the metal, said strap being laterally movable relatively to the arms, and a guiding-groove on the eccentric adapted to move the same to spread the arms; substantially as described.

7. In a rolling-mill, the combination of an eccentric and strap, tipping arms mounted thereon, and adapted to receive the metal, and a locking device adapted to connect the eccentric with its yoke to cause the radial sweep of the arms; substantially as described.

8. The combination with the lifting-arms, of an eccentric adapted to operate them, and mechanism adapted to impart to the eccentric an oscillatory motion throughout an arc of more than half the circumference; substantially as described.

9. The combination in a rolling-mill, of lifting-arms, an eccentric for operating the same, a fulcrum-bar 8 on which they tip, and hooks 9 engaging the bar; substantially as described.

10. The combination in a rolling-mill, of lifting-arms adapted to raise the metal upwardly from a roll-pass, and guiding mechanism whereby on the downward motion the arms are spread to clear a metal sheet, said arms being pivoted and adapted to be deflected; substantially as described.

11. The combination with the eccentric, of a yoke, a pin or pins thereon, and lateral grooves adapted to receive the pin or pins, and to shift the yoke; substantially as described.

In testimony whereof I have hereunto set my hand.

JAMES M. MURPHY.

Witnesses:
GEO. B. BLEMING,
CHAS. C. BITTNER.