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PATENTED MAY 5, 1908.

J. T., S. & W. MOLTRUP.
METAL DRAWING APPARATUS.

APPLICATION FILED JUNE 23, 1902. RENEWED SEPT. 20, 1907.

3 SHEETS—SHEET 1.

Fig. 1.

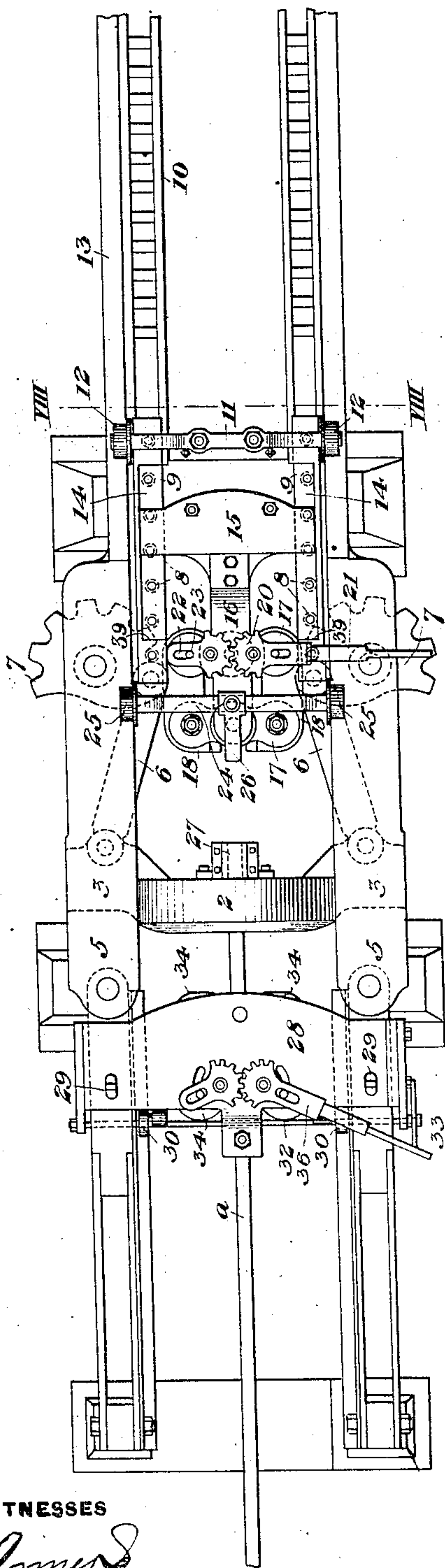
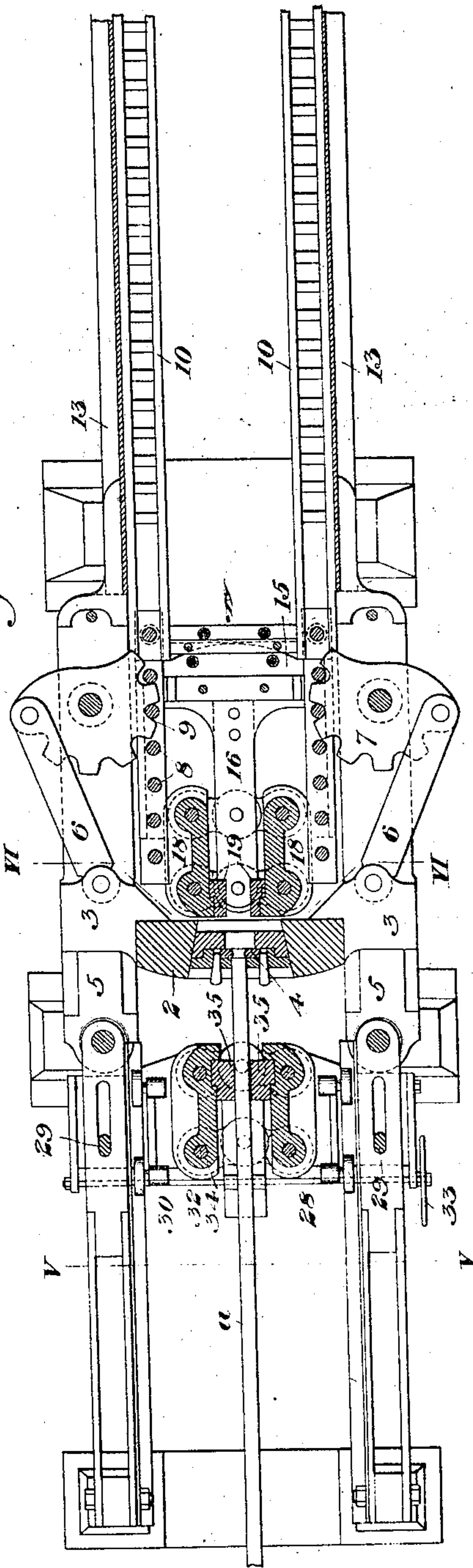


Fig. 2.



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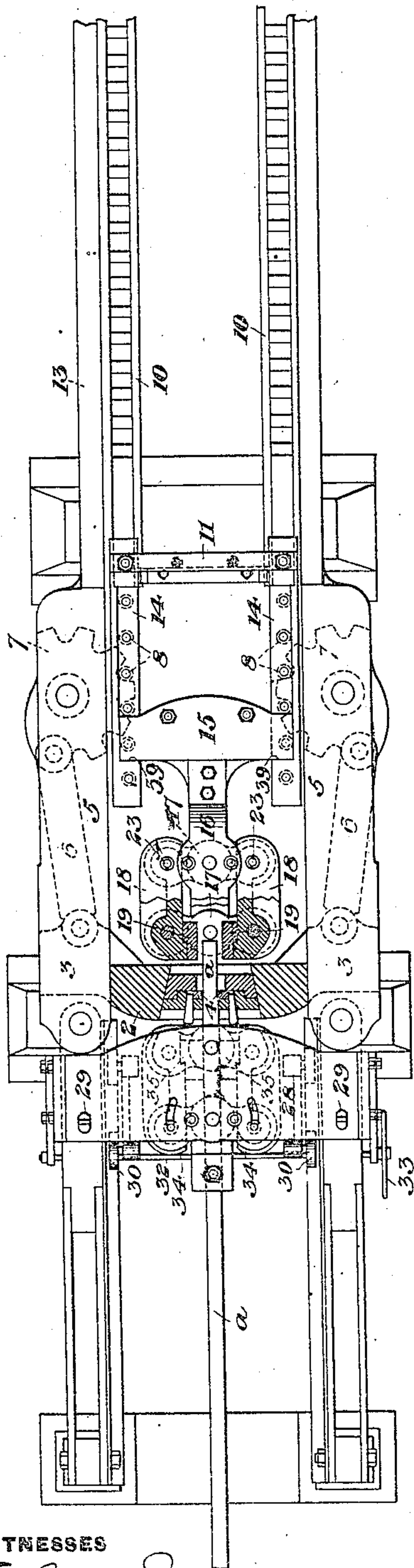
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J. T., S. & W. MOLTRUP.
METAL DRAWING APPARATUS.

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3 SHEETS—SHEET 2.

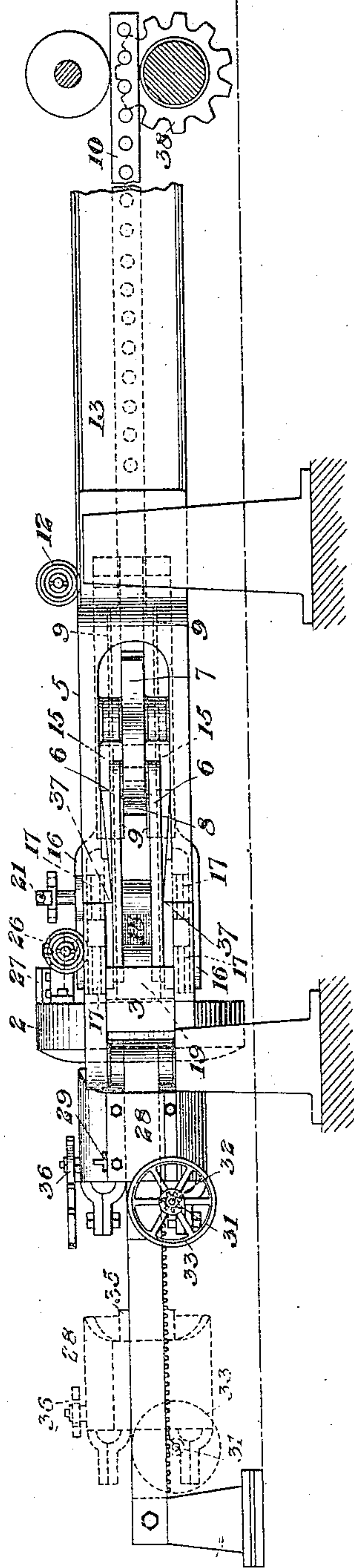
Fig. 3.



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Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 1.

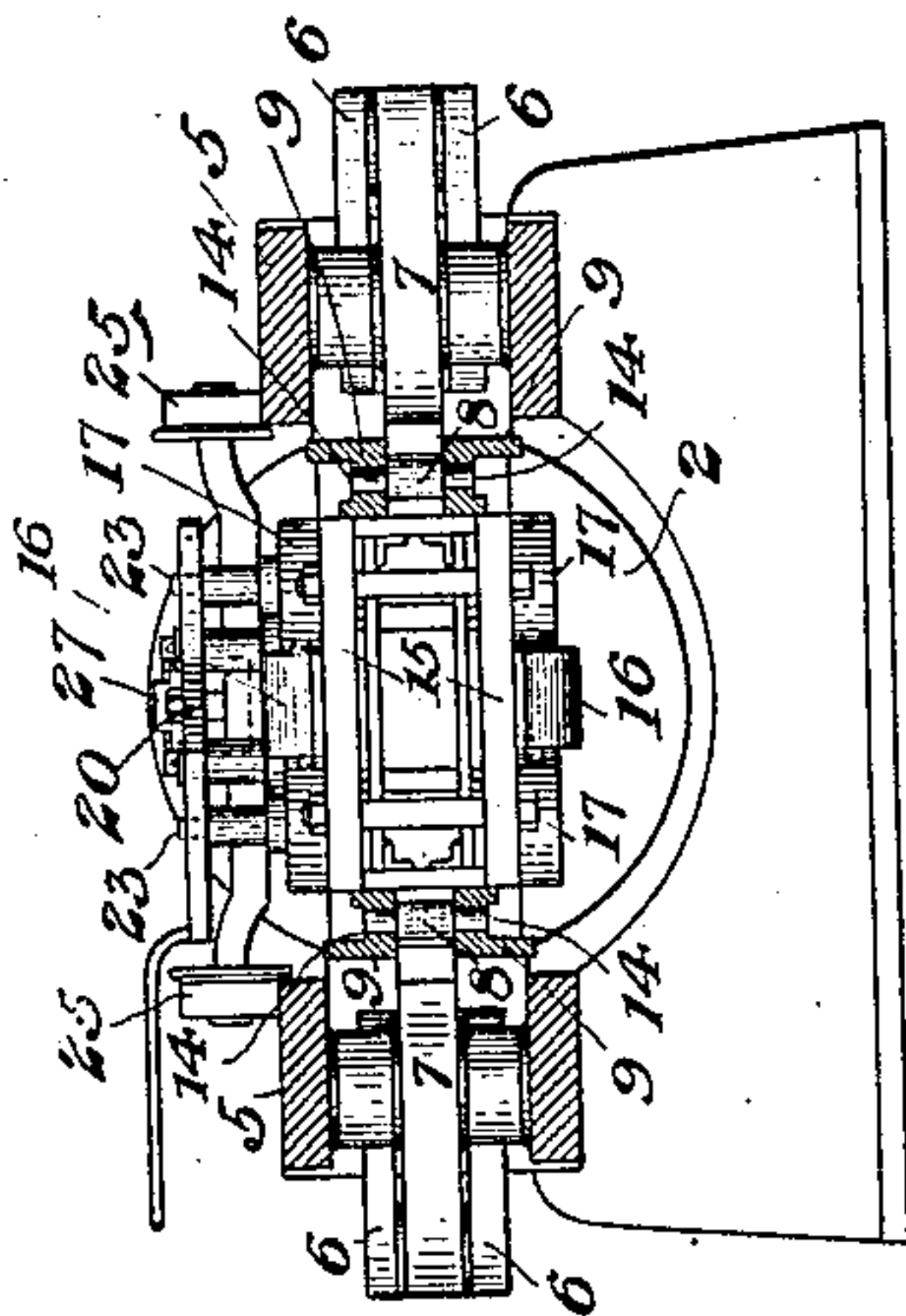


Fig. 6.

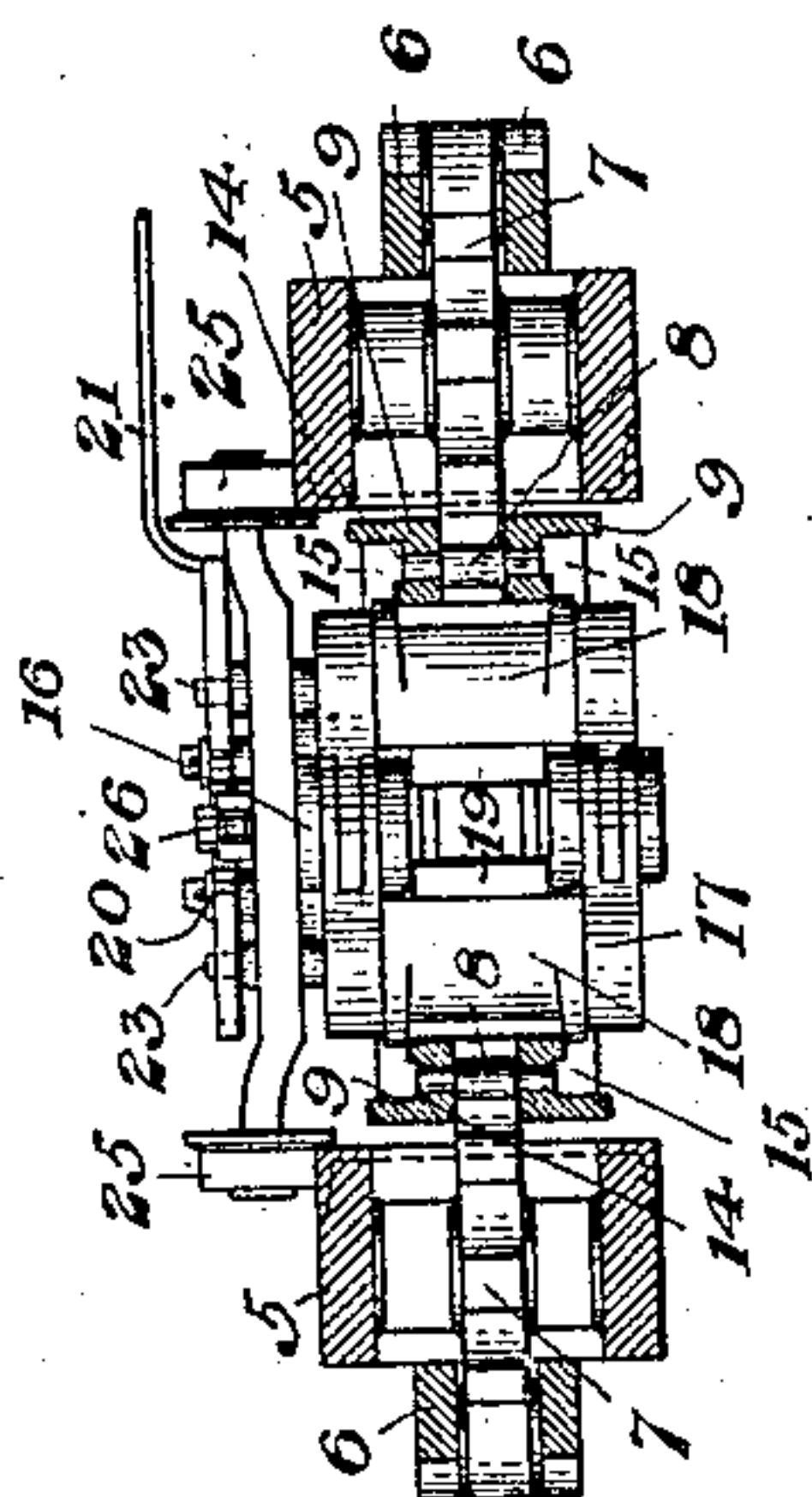


Fig. 8.

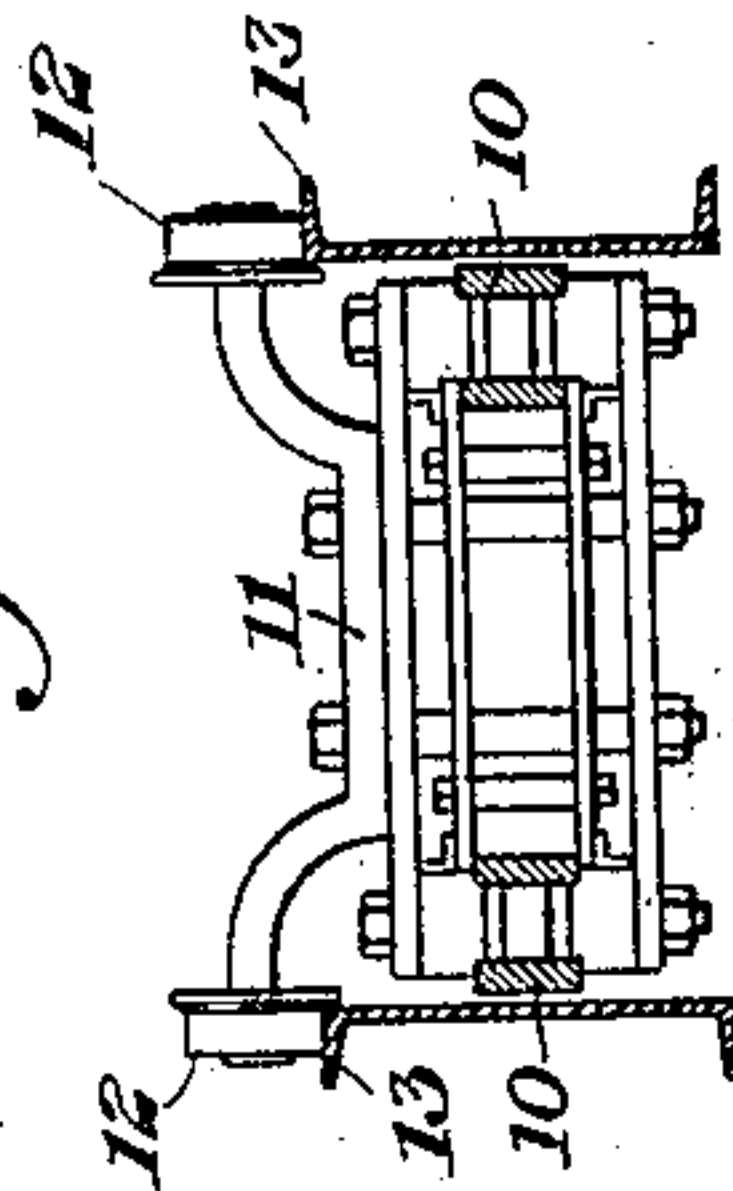
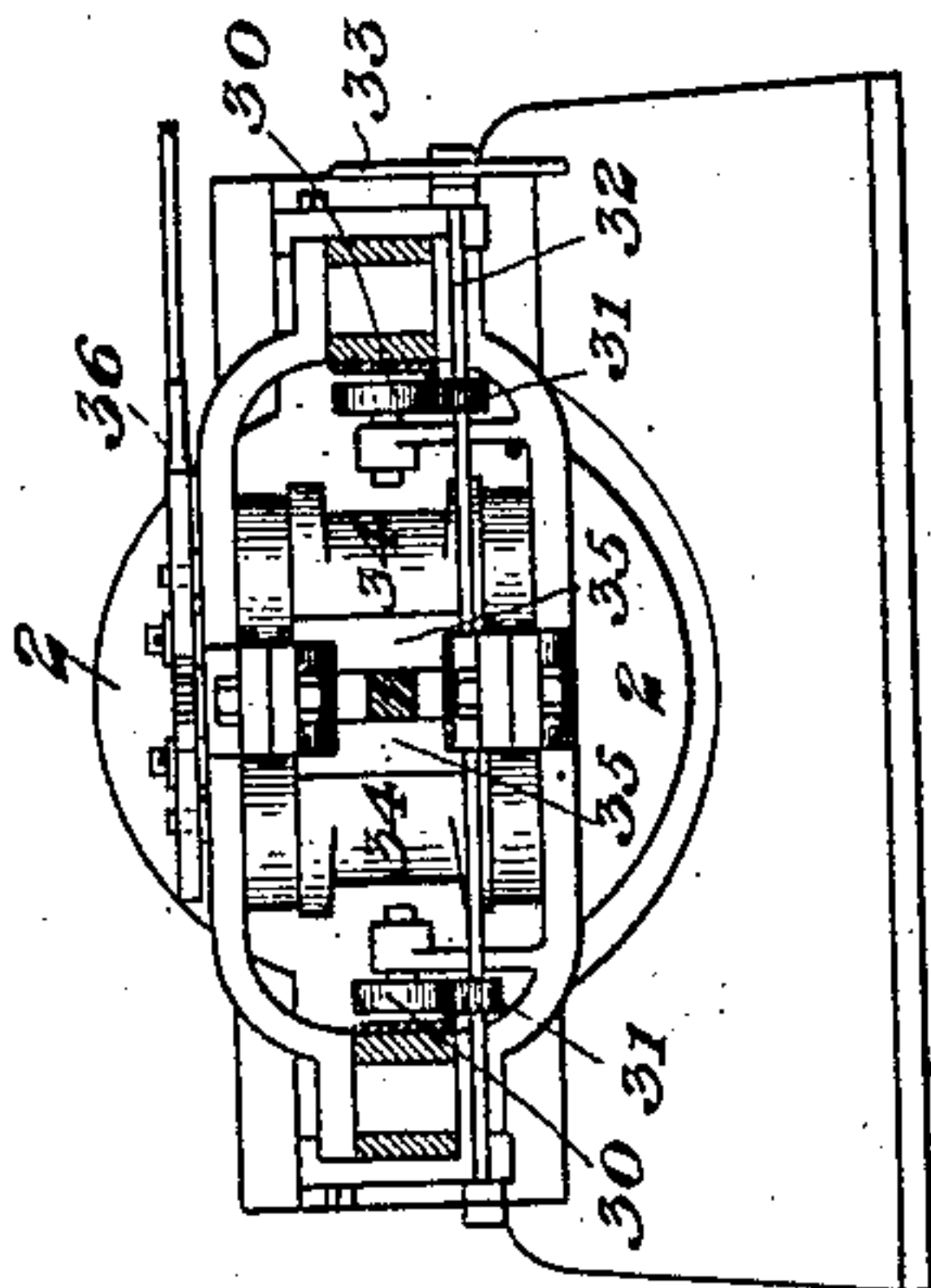


Fig. 5.



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UNITED STATES PATENT OFFICE.

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METAL-DRAWING APPARATUS.

No. 886,717.

Specification of Letters Patent.

Patented May 5, 1908.

Application filed June 28, 1902, Serial No. 113,604. Renewed September 20, 1907. Serial No. 392,803.

To all whom it may concern:

Be it known that we, JAMES T. MOLTRUP, STEPHEN MOLTRUP, and WILLIAM MOLTRUP, all of Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Metal-Drawing Apparatus, 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 top plan view of a portion of a drawing apparatus constructed in accordance with our invention; Fig. 2 is a top plan view partly in section showing the parts in a different position; Fig. 3 is also a top plan view partly broken away, showing the parts in the position when the gripping jaws are about to seize the end of the bar; Fig. 4 is a side elevation of the machine shown in Fig. 3; Fig. 5 is a cross-section on the line V—V of Fig. 2; Figs. 6 and 7 are cross-sections on the line VI—VI of Fig. 2, looking towards the left and right, respectively, of the machine; Fig. 8 is a cross-section on the line VIII—VIII of Fig. 1, looking toward the left, showing the carriage only.

Our invention relates to the drawing of metal bars or rods, and is designed to provide improved automatic apparatus which shall quickly and efficiently carry out the drawing operation. Heretofore in such processes the end of the bar or rod has usually been forged down to a smaller size so that this end may be pushed through the drawing dies and seized by the grippers which are then actuated to pull the bar through the dies. In some cases the full-sized end portion of the bar has been forced through the dies far enough to enable the grippers to seize this end. In all such cases heretofore the machinery must be stopped after the end portion of the bar has been pushed through the dies, and the grippers then clamped on this end portion and actuated to perform the drawing.

Our invention is designed to overcome the difficulties in these prior methods, and to provide a machine which shall operate automatically and continuously; in which the connections shall operate to return the parts to their original position after the drawing operation is completed; to provide means for

gripping the bar and pushing the dies over its end portion; and for then gripping the end portion without stopping the machine, the driving mechanism having been reversed and the bar then being drawn through the dies.

In the drawings 2 represents a massive head carried on sliding supports 3, 3 and having a central opening in which is secured the drawing dies 4 which may be of the usual construction. The supports 3, 3 slide on suitable guide-ways 5, 5 on the stationary frame of the machine and are connected by pivotal links 6, 6 with segmental racks 7, 7 which are pivoted in the side portions of the frame and are arranged to be swung in a horizontal plane by means of pins or teeth 8 which are secured between the upper and lower plates 9 which form part of a carriage at the back ends of rack-bars 10, 10 having horizontal teeth or pins, as shown. The back end portions of the rack-bars proper are hung from a cross-bar 11 carried upon end wheels 12 moving on tracks 13 outside of and above the rack-bars 10.

The plates 9 extend backwards from the rack-bars and are provided with upper and lower recesses 14 which receive the end portions of parallel upper and lower plates forming a cross-head 15 which can slide on the carriage formed at the back ends of the rack-bars. This cross-head is provided with a backwardly projecting frame 16 in which are pivoted two sets of upper and lower toggle links 17 carrying between them on common pivots the links 18, the front ends of which are provided with the removable jaws 19 which are preferably roughened to obtain a firm grip upon the end of the bar. These toggle links are actuated by the intermeshing segmental racks 20, one of which is provided with a handle 21, and both having slots 22 engaging vertical pins 23 which form the rear pivot pins of the links carrying the gripping jaws. The frame 16 is carried at its back end by a bar 24 having wheels 25 movable upon the side portions of the frame, and secured to this cross-bar is a backwardly projecting pin 26 which in certain positions of the carriage engages a socket 27 secured to the top portion of the head, the clamping action of the socket being adjusted by suitable cap bolts, as shown. This frictional connection between the carriage carrying the gripping jaws

and the head carrying the dies holds these parts in the same relative position to each other after the carriage is moved backward in the position shown in Fig. 2 until the cross-head 15 is engaged positively by the shoulders at the back ends of the recesses in which it moves. This frictional connection with the sliding of the gripping jaws relatively to its actuating mechanism we consider a broadly novel feature, and an important one, as it enables the machine to operate continuously without stoppage of the actuating mechanism.

The mechanism for holding the bar in position while the dies are forced over its end portions consists of a massive cross-head 28 which slides on the rear portion of the main frame and is held in its operative position by suitable pins 29. This cross-head is supported upon wheels 30 carried on angle iron tracks secured to the side frame, the bottom portions of the tracks being provided with racks which are engaged by pinions 31 on a shaft 32 carried by the head and having an end hand wheel 33. By this means the head may be drawn back to allow access to the dies and to change the gripping mechanism, or for repairs. The cross-head 28 is provided with toggle-lever mechanism 34 which is the same as that carried on the cross-head 15, the jaws 35 being arranged to allow a bar to be pushed through them towards the die, but preventing rearward movement. These jaws are clamped by the hand-operated mechanism 36 similar to that employed upon the other gripping jaws above mentioned.

The operation of the above parts is as follows: The rack-bars 10 being actuated to move the carriage toward the dies as they move backward, the teeth or pins 8 at their back ends engage the teeth of the segmental racks 7, the parts then being in the position shown in Fig. 1. As the carriage continues its backward movement, the segmental racks swing outwardly and through the links 6 draw the head 2 containing the dies into the position shown in Fig. 2. In this position the gripping jaws on the carriage are close to the head and the pin 26 is engaged with the socket 27 of the head 2. As the head 2 is drawn forward toward the gripping jaws of the carriage, the operator pushes the bar of metal *a* forward through the head 28 and into engagement with the dies. The operator then reverses the motion of the rack-bars and the carriage, and the carriage moves forward with the bar, while the cross-head 15 and its attached parts, including the gripping jaws, are held backward by the friction between the pin 26 and its socket. As the carriage thus moves forward, the links 6 force the head 2 with its dies backwardly over the end part of the bar which is gripped in the jaws of the cross-head 28. During this period the cross-head 15 is held

to the head and travels back with it. When the cross-head 15 has reached the shoulders 39 at the ends of its guiding recesses 14, shown in Fig. 1, the links 6 are passing their dead centers and begin to draw the head forwardly, the carriage moving with it. During this period the operator clamps the jaws of the carriage upon the forwardly protruding end of the bar by the hand levers 21. After the segmental tracks have completed their rotation in this direction the shoulders upon the carriage engage the cross-head 15 and draw it positively forward, the head 2 of the dies being stationary, and the pins 8 having passed out of engagement with the segmental rack. The entire bar is thus drawn through the dies when the connections are thrown off, the jaws unclamped and the rack-bars actuated to bring the parts back to their original position, when the operations are repeated. The head 2 is held in its forward operative position by shoulder or abutments 37 upon the frame, thus taking the strain off the links 6. The head 15 is moved forward or backward by the abutments at the ends of the slide-ways 14, and the racks can move in either direction a limited distance, determined by the length of the slide-ways 14, without moving the head 15. 38 is a toothed wheel which is driven by suitable gearing which is capable of rotating the wheel 38 in either direction, and by its engagement with the rack-bars move them forward and backward, as desired. The rack bars thus constitute a rigid element connected to the supports of the movable grippers, and moved positively in both directions by the toothed wheels.

The advantages of our invention will be apparent to those skilled in the art. The forging down of the ends is done away with. The same machine which operates to draw the bars also acts to push the dies over the end portion, and the whole operation is quickly and easily carried out, and the percentage of scrap and imperfect bars reduced.

The form and arrangement of the various mechanisms, as well as the driving connections may be varied widely within the scope of our invention as defined in the claims, each of which covers a separate combination which may be used independent of those of the other claims.

We claim:

1. A metal drawing apparatus having a die which is fixed when active, means for shifting the die to place the same upon the work with the latter projecting therethrough, means for holding the work when the die is being shifted, and means for drawing the work through the die when the latter is fixed, substantially as described.

2. In metal drawing apparatus, a clamp arranged to hold the bar, a movable die, mechanism for pushing the die rearwardly

over the end portion of the bar, mechanism for automatically stopping said movement of the die and allowing it to return to its normal position, and mechanism for gripping the projecting end portion of the bar and drawing it through the die; substantially as described.

3. In metal drawing apparatus, a clamp arranged to hold the bar, a movable hollow die, a carriage carrying gripping jaws, connections between the carriage and the die arranged to push the die over the end portion of the bar, and means for stopping said movement of the die automatically, and returning it to its normal position; substantially as described.

4. In metal drawing apparatus, a clamp for the bar, a movable head having a hollow drawing die, a carriage carrying gripping jaws, mechanism for moving the carriage, and connections between the carriage and the die-head arranged to push the die rearwardly over the bar; substantially as described.

5. In metal drawing apparatus, a relatively stationary head having grippers arranged to clamp the bar, a movable head carrying a hollow shaping die, a carriage carrying gripping jaws, connections between the carriage and the die arranged to force the die rearwardly over the end of the bar and then allow the die to return to its normal position, and mechanism for moving the carriage, the grippers thereon being actuated while the machine is in motion; substantially as described.

6. In metal drawing apparatus, a movable hollow drawing die, a movable carriage having connections with the die and arranged to push it rearwardly over the end portion of the bar, and a head slidably mounted on the carriage and having gripping jaws arranged to seize the end of the bar after the die is forced rearwardly over it; substantially as described.

7. In metal drawing apparatus, a stationary clamp for the bar, a movable drawing die, a carriage, mechanism for moving the carriage positively in both directions, and gear devices engaged by the carriage and connected to the die to force it over the bar; substantially as described.

8. In metal drawing apparatus, a hollow head containing a drawing die, a movable carriage having a sliding head carrying gripping jaws, and a detachable connection between the sliding head and the drawing die; substantially as described.

9. In metal drawing apparatus, a clamp for the bars, a movable head containing the drawing die, a movable carriage having a sliding head thereon, connections between the carriage and the die-head arranged to force said head rearwardly over the end of the bar, and a detachable connection be-

tween the sliding head and the die carrying head; substantially as described.

10. In metal drawing apparatus, a clamp for the bar, a movable drawing die having gear connections, a movable carriage arranged to engage and actuate said connections to force the die over the head, a slide on the carriage, and arranged to engage shoulders thereon in certain positions of the parts, said slide carrying gripping jaws arranged to seize the protruding end of the bar, and a friction connection between the slide and the movable drawing die; substantially as described.

11. In metal drawing apparatus, a relatively stationary head carrying grippers arranged to clamp the bar, a movable head carrying drawing dies, a carriage, mechanism for moving the carriage positively toward and from the gripping head, links connecting the die-carrying head to the toothed segmental racks, teeth upon the carriage arranged to engage said racks, a slide upon the carriage with end stops to limit its relative movement, and grippers carried by said slide; substantially as described.

12. In metal drawing apparatus, a clamp arranged to hold the bar, a movable hollow die, a movable carriage having gripping jaws arranged to seize the end of the bar, mechanism for moving the carriage in one direction during the operations upon the rod, and connections arranged to force the die over the ends of the rod and allow it to return to its normal position during the continued movement of the carriage in the same direction; substantially as described.

13. A metal drawing apparatus having a die which is stationary when active, a work-holding clamp in rear of the die, and means in front of the die for gripping the work and drawing the same from the clamp through the die, said die capable of being moved rearwardly upon the work and permit the latter to project in front of the die for engagement by the gripping means substantially as described.

14. A metal drawing apparatus having a die which is stationary when active, a work-holding clamp at one side of the die, and means at the other side of the die for gripping the work and drawing the same from the clamp through the die, said die capable of being moved towards the work-holding clamp upon the work and permit the latter to project through the die towards the gripping means for engagement by the latter substantially as described.

15. A metal drawing apparatus having a die which is stationary when active, a work-holding clamp at one side of the die, means at the other side of the die for gripping the work and drawing the same from the clamp through the die, said die capable of being moved towards the work-holding clamp upon

the work to permit it to project through the die towards the gripping means for engagement by the latter, and means for stopping the movement of the die at a predetermined point substantially as described.

16. A metal drawing apparatus having a die which is stationary when active, a work-holding clamp in rear of the die, means in front of the die for gripping the work and drawing the same from the clamp through the die; said die capable of being moved rearwardly upon the work and permit it to project in front of the die for engagement by the gripping means, and means for stopping the rearward movement of the die at a predetermined point substantially as described.

17. A metal drawing apparatus having a die which is fixed when active, means to move the die rearwardly over the forward end portion of the work to permit it to project through the die, means for holding the work when the die is being shifted, and means for drawing the work away from the

work-holding means and through the die to reduce the work, substantially as described.

18. A metal drawing apparatus having a die which is fixed when active, means for shifting the die to place the same upon the work with the latter projecting therethrough, means for holding the work when the die is being shifted, means to automatically stop the shifting movement of the die when a predetermined portion of the work is projecting through it, and means for drawing the work through the die and away from the work-holding means to reduce the work, substantially as described.

In testimony whereof, we have hereunto set our hands.

JAMES T. MOLTRUP.
STEPHEN MOLTRUP.
WILLIAM MOLTRUP.

Witnesses:

SUSIE W. ROUZER,
J. BLAINE MCGOUN.