(No Model.) 4 Sheets—Sheet 1.

J. H. STONEMETZ.

MECHANICAL MOVEMENT.

No. 473,562. Patented Apr. 26, 1892.

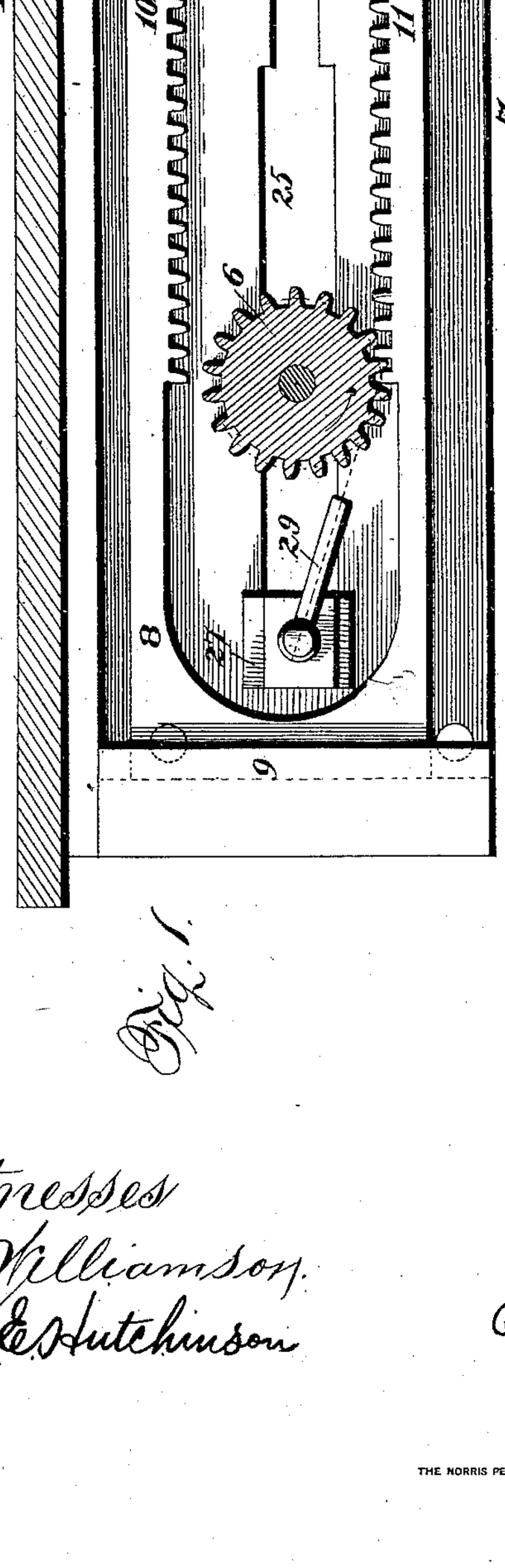


Fig. 1.

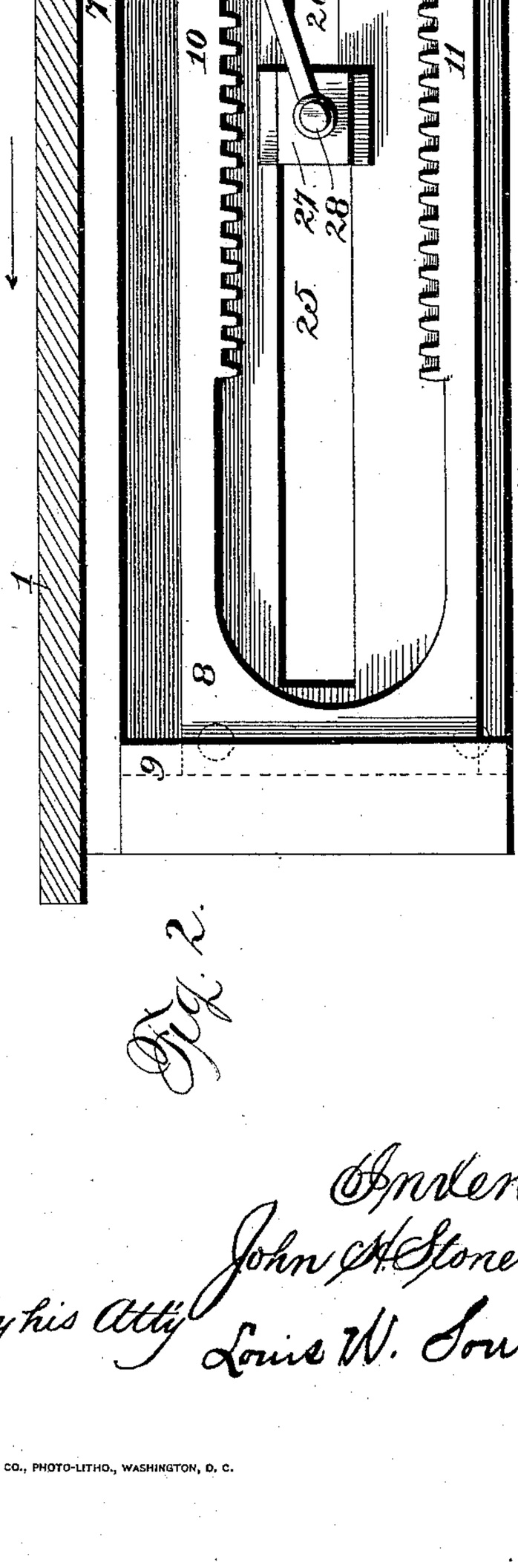


Fig. 2.

Witnesses
C. J. Williamson.
Jas. E. Hutchinson

Inventor
John H. Stonemetz.
By his Atty
Louis W. Southgate

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 2.

J. H. STONEMETZ.

MECHANICAL MOVEMENT.

No. 473,562. Patented Apr. 26, 1892.

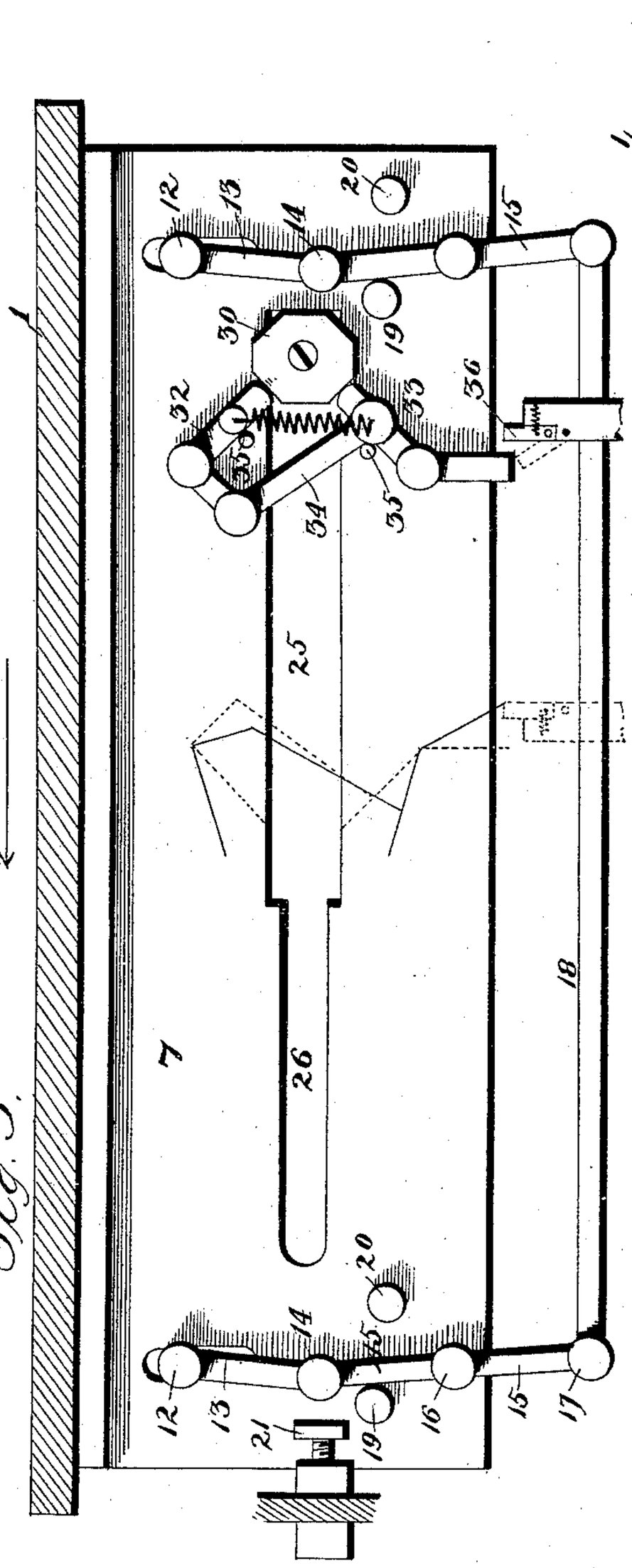


Fig. 3.

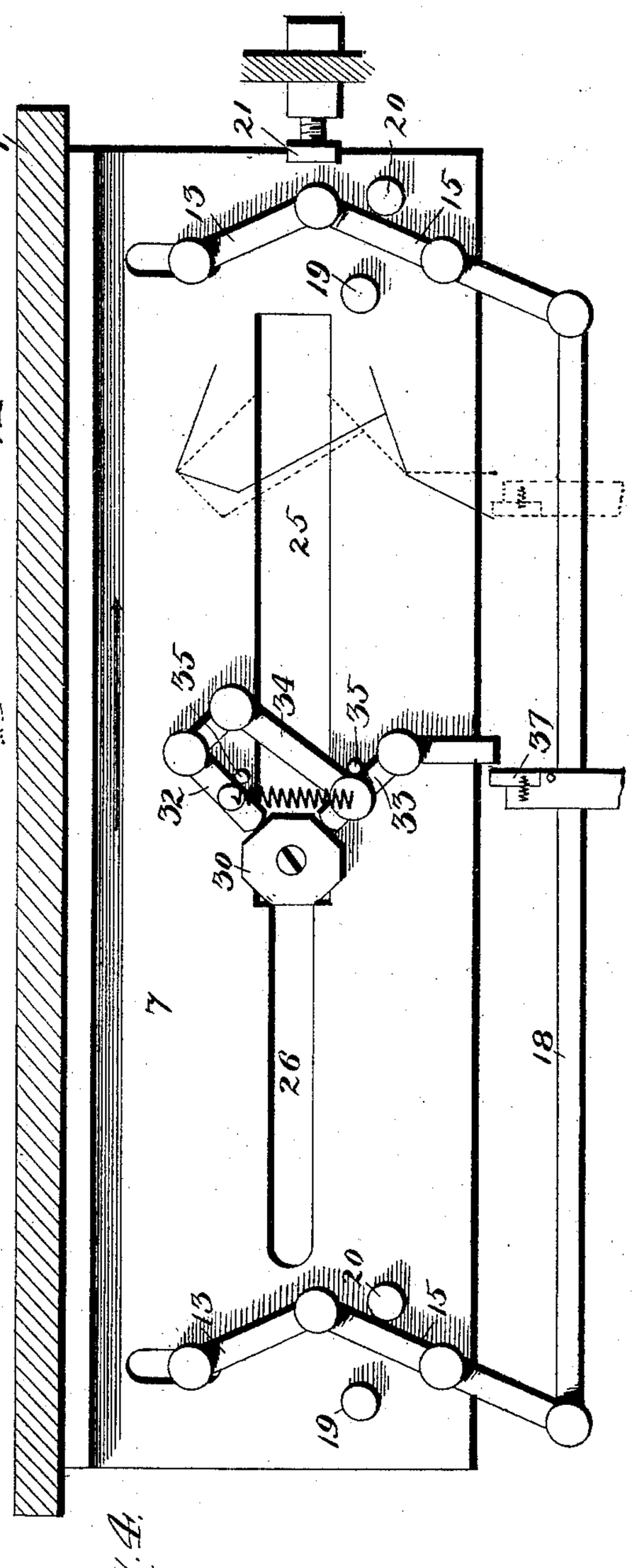


Fig. 4.

Witnesses
C. J. Williamson.
Jas. L. Hutchinson

Inventor
John H. Stonemetz.
By his Atty
Louis W. Southgate

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 3.

J. H. STONEMETZ.

MECHANICAL MOVEMENT.

No. 473,562. Patented Apr. 26, 1892.

Fig. 5

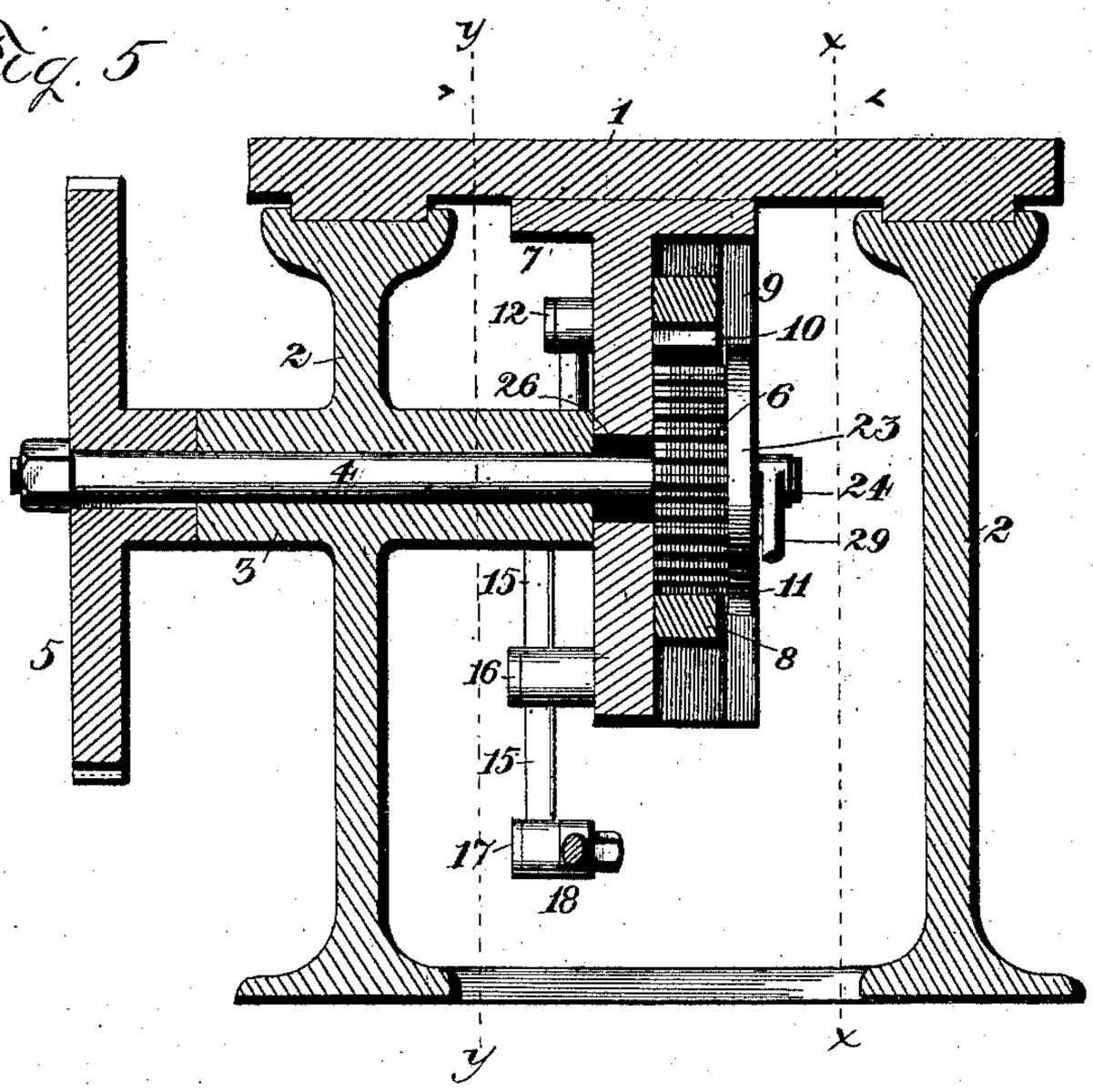


Fig. 6

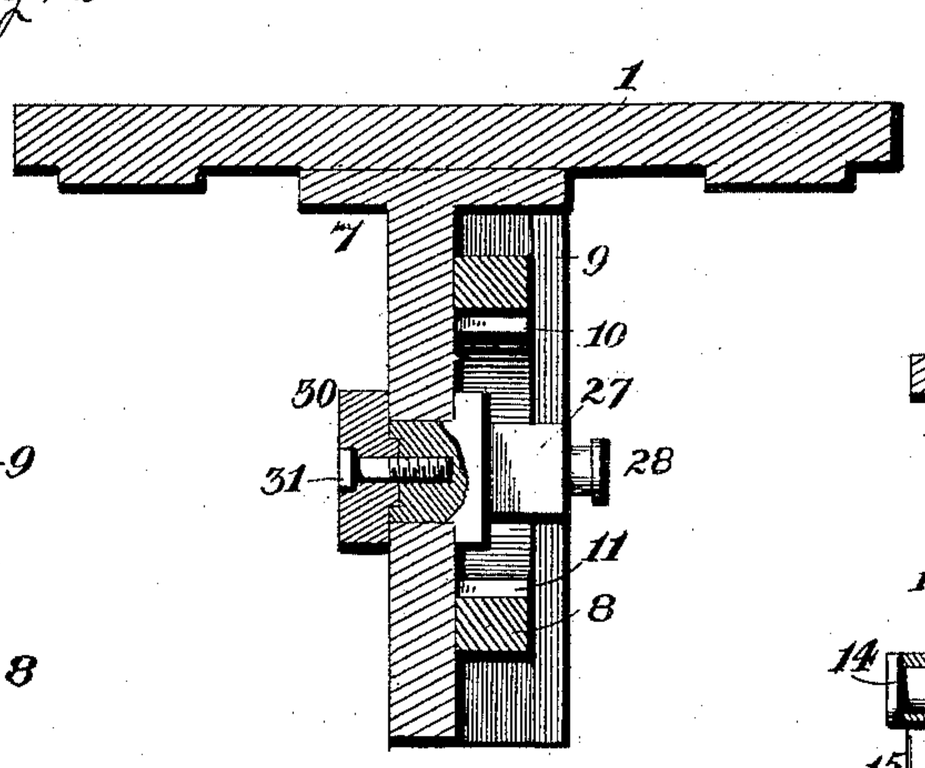


Fig. 7.

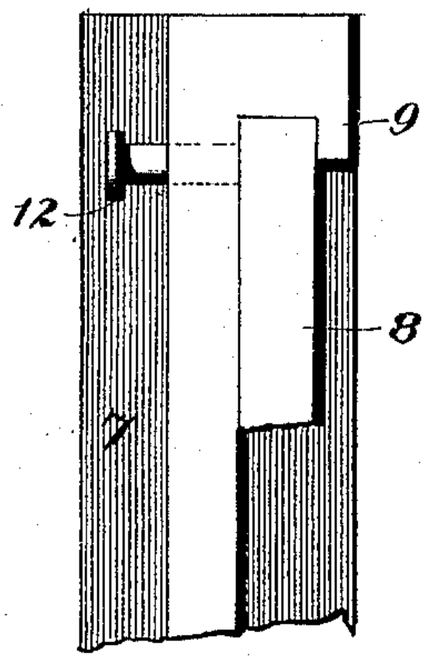
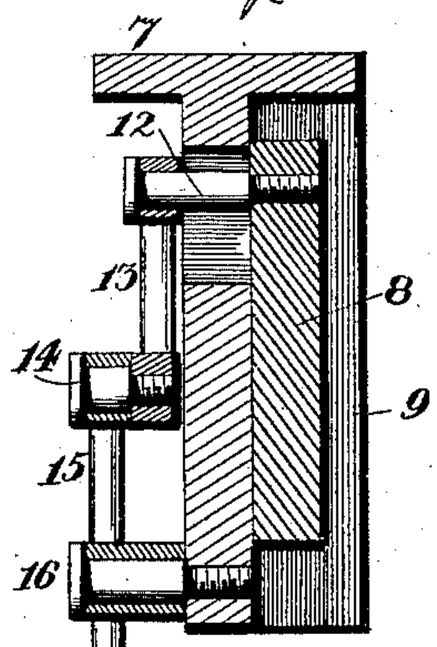


Fig. 8.



Witnesses
C. J. Williamson.
Jas. E. Hutchinson

Inventor
John H. Stonemetz
By his Atty Louis W. Southgate

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 4.

J. H. STONEMETZ.

MECHANICAL MOVEMENT.

No. 473,562. Patented Apr. 26, 1892.

Fig. 9.

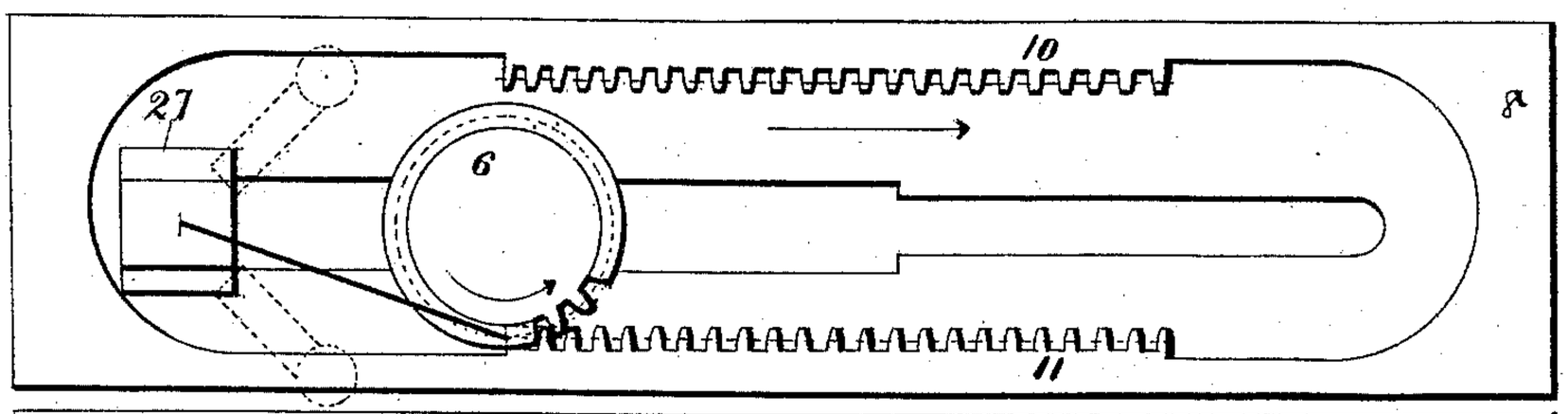


Fig. 10.

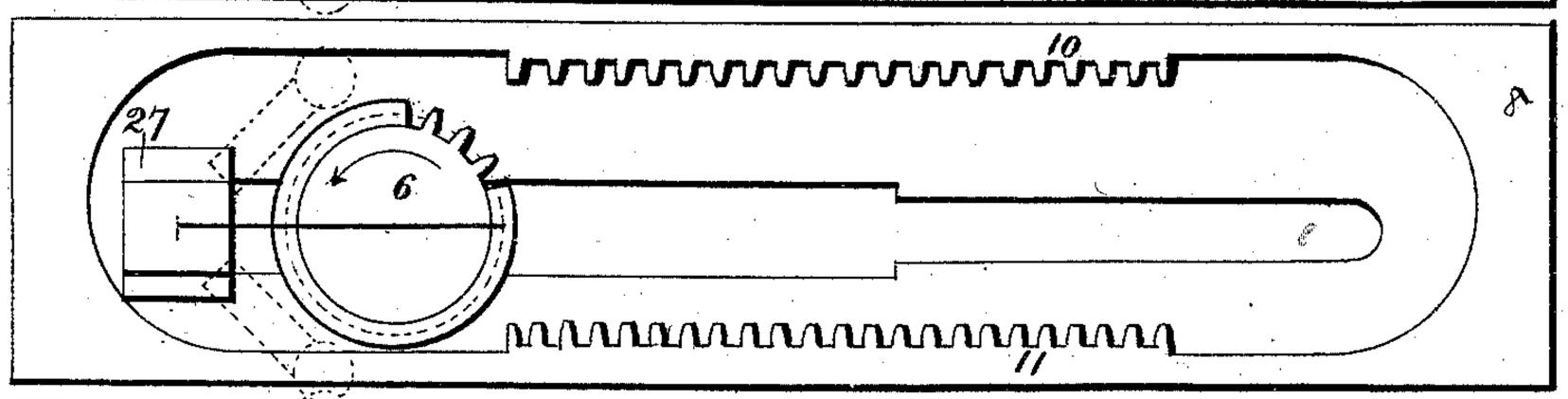


Fig. 11.

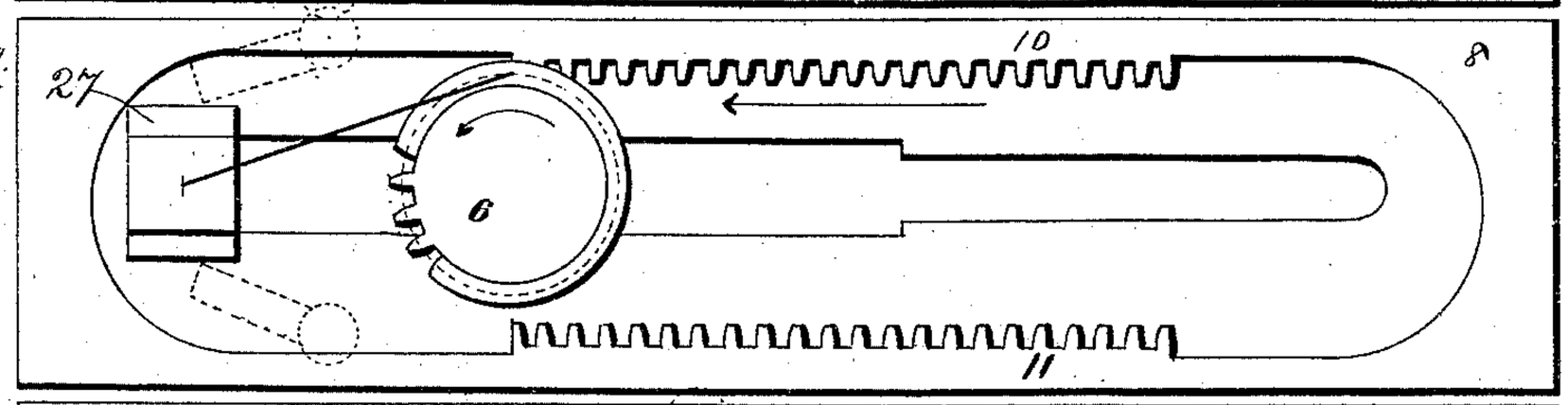


Fig. 12.

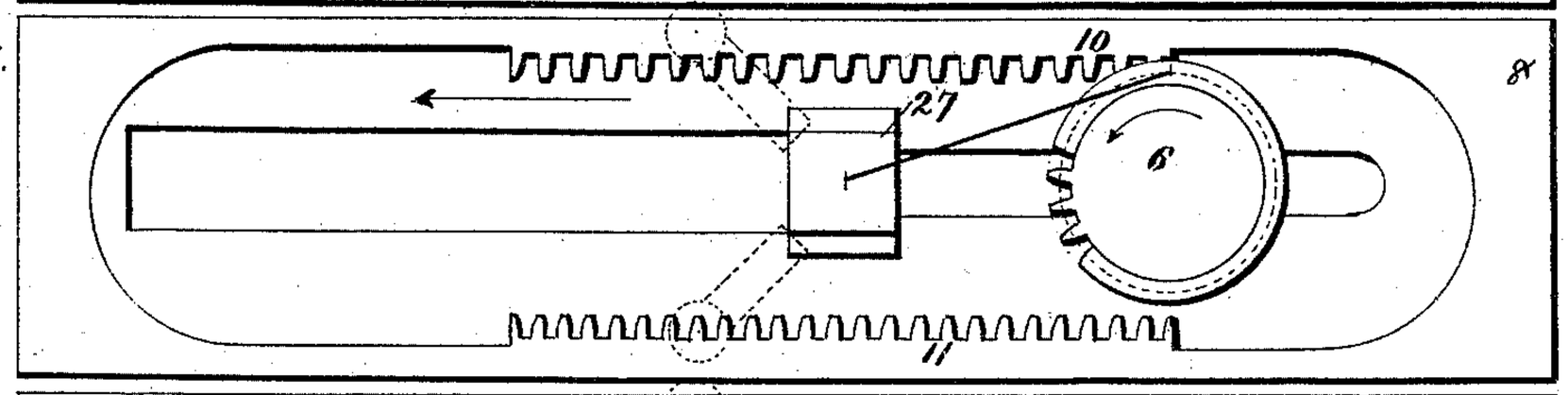


Fig. 13

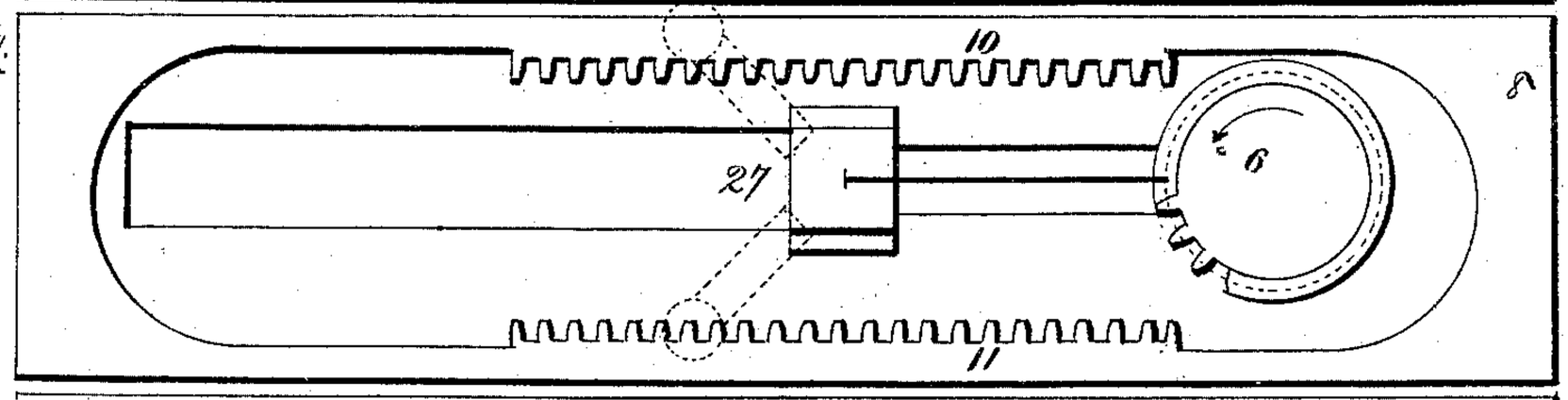
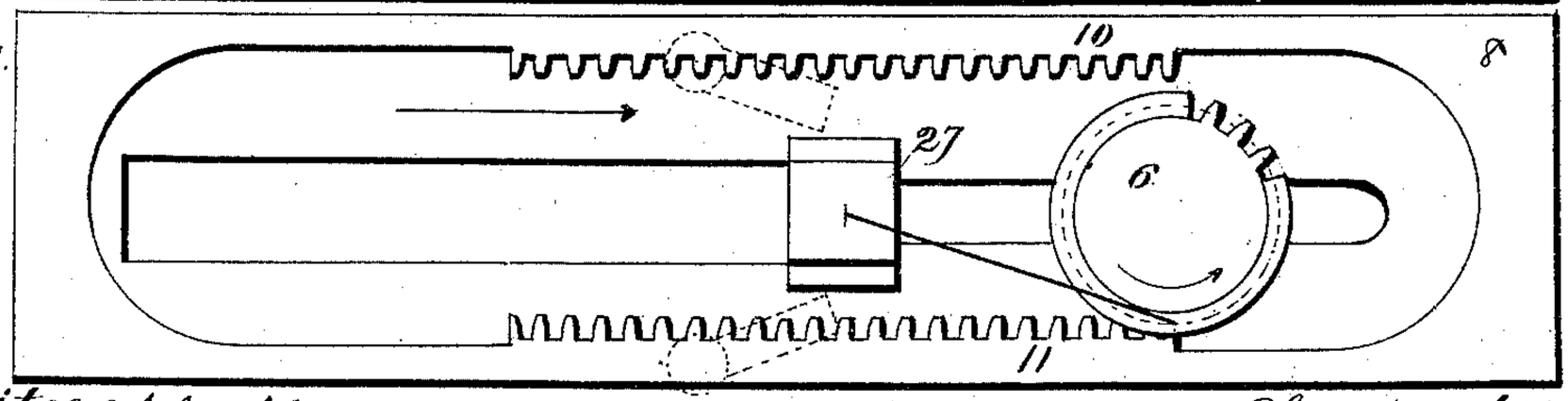


Fig. 14.



Witnesses
C. J. Williamson.
Jas. E. Hutchinson

Inventor
John H. Stonemetz
By his Att'y Louis W. Southgate

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN H. STONEMETZ, OF MILLBURY, MASSACHUSETTS, ASSIGNOR TO THE STONEMETZ PRINTERS' MACHINERY COMPANY, OF SAME PLACE.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 473,562, dated April 26, 1892.

Application filed July 15, 1891. Serial No. 399,624. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. STONEMETZ, a citizen of the United States, residing at Millbury, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Mechanical Movements, of which the following is a specification.

The aim of this invention is to produce a new mechanical movement by which rotary motion may be transformed into reciprocating motion, with certain advantages further forth set at length. The movement has been designed, primarily, to drive the reciprocating beds of printing-presses, but of course may be adapted to any other use—as, for example, to the reciprocating beds of planing-machines, to pump-pistons, &c.

The invention is illustrated in the accompanying four sheets of drawings; and the invention consists of the device described and claimed in this specification, and illustrated in said drawings.

Referring to said drawings, Figures 1 and 2 are sectional views on line *x x* of Fig. 5, illustrating the bed or reciprocating member in different positions relatively to the driving pinion or gear. Figs. 3 and 4 are similar views on line *y y* of Fig. 5. Fig. 5 is a cross-section through the center of the driving-gear of the reciprocating bed and its supporting-frame. Fig. 6 is a cross-section of the bed, illustrating how the slider is guided. Fig. 7 is a plan of one end of the rack and the rack-frame, showing how the rack is held at its ends. Fig. 8 is a cross-section of the rack-frame, showing one end of the toggle by which the rack is raised and lowered. Figs. 9 to 14, inclusive, are diagrams illustrating the movement.

In detail 1 represents the reciprocating bed or member. This bed may have planed ways or guides, as shown, and the same rests upon and is adapted to reciprocate upon a suitable frame 2. This frame has a suitable bearing 3, formed in or bolted to the same, and journaled in this bearing is the shaft 4, on the outside of which is fastened the driving-gear 5 and on the inside the gear or pinion 6. The gear 5 is driven from any suitable source of power, and the motion of the pinion 6 is by means of the mechanism hereinafter described transformed so as to reciprocate the bed 1.

Bolted or fastened to the under side of the bed 1 is what I term the "rack-frame" 7, and mounted so as to move up and down in the same is the rack 8. This rack 8 fits into the rack-frame from the bottom and is held against lateral displacement by the ledges 9. The rack-frame is nicely planed where the rack bears against the same, and of course as the rack is firmly held at the ends a longitudinal movement given the rack will be transmitted to the rack-frame, and thus to the bed.

The rack 8 is double and has two sets of teeth 10 and 11, one above and the other below the pinion 6. The distance between the outside edges of the teeth 10 and 11 is slightly greater than the outside diameter of gear 6, so that the rack 8 may be raised and lowered, so that either set of teeth will engage pinion 6. It is evident, of course, that when the pinion engages one set of teeth the bed will be moved in one direction and that when the same engages the other set the bed will be moved in the other direction. A large clearance-space is left beyond the ends of the teeth 10 and 11, so that the bed may be moved beyond what it would be carried in either direction by pinion 6, meshing with the teeth 10 or 11. The rack 8 is given the proper up-and-down movement as the bed is at its extreme of travel in either direction by a toggle movement, which will now be described. Pins or studs 12 are fastened to the rack near each upper end thereof and extend through slots in the rack-frame and have journaled thereon the ends of the links or levers 13. The other end of lever 13 is pivotally connected to the end of the link or lever 15, and the lever 15 turns on a fixed stud 16, fast in the rack-frame 7. The lower ends of the levers 15 are pivotally connected by the rod 18, which fits at each end on studs 17, set in the ends of levers 15, as shown in Figs. 3 and 4. Now it will be seen that the levers 13 and 15 form a toggle by which the rack may be raised and lowered. Mounted in the frame at the extreme limits of travel are the screws 21, which are adapted to bear against the ends

of levers 13 and 15. Pins 19 and 20, set into the rack-frame, limit the movement of the lever 15, and thus the up-and-down movement of the rack. As shown in Fig. 3, the bed is supposed to be moving toward the left and to have nearly reached its extreme in this direction. The rack is in its raised position and the pinion 6 is in mesh with the lower set of teeth 11.

It will be seen that the levers 13 and 15 are slightly out of line and that any downward pressure or pull on pin 12, due either to the weight of the rack or the action of gear 6 on teeth 11, would tend to force lever 15 against pin 19. In other words, the rack is locked in this raised position. Now as the bed reaches its extreme of travel in the direction indicated the toggle will be thrown to the position shown in Fig. 4 by the ends of the left-hand levers 13 and 15 coming into contact with the screw 21, and the motion of the left-hand lever 15 is of course transmitted to the right-hand lever 15 by rod 18, so that both ends of the rack will be raised and lowered alike. When the rack is in its lowest position, the gear 6 will engage the teeth 10 and the bed will be driven in the direction indicated in Fig. 4 until the bed reaches its extreme of travel in this direction, and here the rack is again raised by the knee-joint coming in contact with the left-hand screw 21.

As will be further explained, the weight of the rack is sufficient to keep the teeth 10 in engagement with gear 6 as the bed is moved in the direction indicated in Fig. 4. Thus it will be seen that a complete movement is provided just by this rising-and-falling double rack; but, as will be further described, I prefer to gradually stop the motion of the bed as the same reaches its extremes until the same is stationary, then gradually start the same back until the bed is moving at the speed that the same is driven by gear 6. I do this by making the teeth 10 and 11 shorter than the travel and stopping and starting the bed by a crank motion.

Fastened on the outside of the gear 6 is the disk 23, and fastened in this disk is the wrist-pin 24, which is set at a distance from the center equal to the pitch radius of gear 6. The rack-frame is slotted, as 25 26, and working in the portion 25 is the slider 27, which has wrist-pin 28, which latter is connected to wrist-pin 24 by connecting-rod 29. The limits of movement of the slider on the rack-frame are the end of slot 25 and the shoulder between the slots 25 and 26. The slot 26 is to accommodate the shaft 4. The slider consists of the portion 27, fitted into slot 25, and the rear portion 30, which is fitted into and fastened to portion 27 by screw 31. The piece 30 has its corners chamfered off to engage catches on the back of the rack-frame, which will now be described. The same consists of the two bell-crank levers 32 33, pivoted to the frame 7 and which are connected together by the link 34, so as to move in opposite directions. The long arms of these levers catch normally on the corners of the piece 30, and the levers are pulled into this position by a suitable spring fastened at each end to the bell-crank levers 32 and 33. Pins 35 35 act to limit the motion of the levers in this direction. The depending arm of lever 33 is adapted to engage pawl 36, which is fastened to the frame or to a fixed point, and as the bed moves to the right in Fig. 3 the catches on the left will open and release the slider, as indicated in dotted lines at the right in Fig. 4.

The catches on each side of the rack-frame are just the same in construction, except it will be noted that the same, as well as the actuating-pawls 36 37, are set to face each other or are set in opposite directions. It will be seen that the slider may run in and engage the catches and then pull on the same, then push back on the end of the slot or the shoulder between the slots, as the case may be, and thus reverse the motion, and that as this reverse motion takes place the catches will open and allow the slider to pass back as the lever 33 co-operates with the pawl 36 or 37, as the case may be.

With this explanation the following is the operation of the complete device, reference being had to the diagrams.

In Fig. 9 the rack is represented as traveling toward the right, the rack being in its raised position, gear 6 in engagement with and just leaving the lower teeth 11, and the slider just caught by the catches at the left. Now as the gear leaves the teeth 11 the rack will be given a farther motion to the right by means of the slider and connecting-rod until the crank comes to the position shown in Fig. 10. As the radius of the crank is the same as the pitch radius of gear 6, this motion imparted to the rack by the crank will be a motion which will commence at the same speed as the rack is driven by the gear and which will gradually decrease to zero, as understood by any one familiar with the crank motion. Now during the next quarter-revolution of the crank the rack will be started back at a speed gradually increasing from zero, as at Fig. 10, to the full speed, as indicated in Fig. 11. During this motion or at the very commencement of it the rack will be lowered and the catches opened, as before described. It will be seen that the catches open very easily, as at this time there is no pressure on the same. Thus when the parts reach the position shown in Fig. 11 the rack will be moving at full speed toward the left, and the gear 6 will catch the rack 10 and continue this movement. This raising and lowering the rack when the gear is not in mesh with either set of teeth and starting the rack back so that when the gear engages the teeth forms a perfect gear motion and one which relieves the teeth from the strain incident to stopping and reversing the reciprocating part. This has not been done in any rack motion with which I am familiar. In actual practice

the teeth 10 and 11 are extended two or three teeth beyond the points indicated, and these teeth are cut away, so as to have the necessary clearance, so that when the crank ceases to drive the rack that the gear will be fairly in mesh with the teeth. The gear now drives the rack to the left the length of the teeth 10. This length is equal to one or more pitch circumferences of the gear, so that the parts will again come to the same position as when started, as last described, or to the position shown in Fig. 12. Thus the total stroke of the rack is the length of the crank, plus one or more pitch circumferences, plus the length of the crank; or, in other words, a pitch diameter plus one or more pitch circumferences of the gear 6. Now when the parts are in the position shown in Fig. 12 the right-hand catches engage the left-hand side of the slider, and the crank therefore drives the rack a distance equal to a pitch radius farther to the left at a speed gradually decreasing from the maximum to zero, or until the parts are brought to the position shown in Fig. 13. Now the crank will draw the rack toward the right a distance equal to a pitch radius at a speed gradually increasing from zero to the maximum. During this movement the rack will be lowered and the right-hand catches opened, so that as the parts come to the position shown in Fig. 14 the gear will engage the teeth 11, and thus drive the rack to the right. The catches open easily as thus described, as during this movement there is no pressure on the same. This movement to the right will continue until the parts come to the position shown in Fig. 9, and thus the cycle is completed. Thus a perfect motion is provided for a printing-press bed—that is, the bed is driven forward and backward by a uniform motion in either direction; but at the completion of the movement in either direction the bed is gradually stopped and then gradually started back; or, in other words, the starting and stopping is done by a crank motion. As the bed is moving to the right the printing or work is done, and during this movement the rack is locked in its raised position, as before described. When the bed is on its reverse stroke, no work is being done, and I find that the weight of the rack is sufficient to keep the same in mesh with the gear 6, though in some instances, as where the motion is applied to the bed of a double-cylinder press, a double toggle or some suitable device to hold the rack down may be used.

While the motion is designed for a printing-press bed, the invention is strictly a mechanical movement and the same may be used in any mechanical device where its use would be advantageous without departing from the scope of my invention.

The details of construction herein shown may be greatly varied by a skilled mechanic without departing from the scope of my invention.

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

1. In a mechanical movement, the combination of the gear, the double rising-and-falling rack co-operating therewith, means for raising and lowering said rack, and a crank mechanism connected to positively reverse the movement of said rack, substantially as described.

2. In a mechanical movement, the combination of the gear, the double rack co-operating with the same, and a toggle arranged to raise and lower said rack, the knee of said toggle being adapted to strike a stationary part as the rack reaches its extreme of travel, substantially as described.

3. The combination of the reciprocating part, the rack-frame fastened to the same, the double rack sliding vertically on the rack-frame, the actuating-gear, and the double-connected toggle adapted as the reciprocating part reaches its extremes to strike against a fixed point and thus raise and lower the rack, substantially as described.

4. The combination of bed 1, frame 2, the rack-frame 7, fastened to the bed, the double rack mounted to move vertically in the rack-frame, the actuating coacting gear 6, and the double toggle 13 15 and connecting-rod 18, and the fixed screws 21, adapted to strike on the knee of the toggle as the bed reaches its extreme of travel in either direction, substantially as described.

5. In a mechanical movement, the combination of the gear, the double rack co-operating with the same, and a toggle arranged to raise and lower said rack, and a pin limiting the movement of the toggle so arranged that when the rack is in its highest position the toggle will be slightly out of line and thus locked to resist downward pressure on the rack, substantially as described.

6. The combination, in a mechanical movement, of the gear, the double rack, the rack-frame in which said rack is mounted, the slider working in a slot in the rack-frame, and a crank connection between the said gear and slider, substantially as described.

7. The combination of the reciprocating part, the rack-frame attached to the same, the double rack mounted in the same, the actuating-gear, the slider working in a slot in the rack-frame, and a crank connection between said disk and gear, the length of the crank being the same as the pitch radius of the gear, substantially as described.

8. The combination of the bed, the rack-frame fastened to the same, the slider working in a slot in said rack-frame, the catches on said rack-frame, and means for actuating the slider, substantially as described.

9. The combination of the bed, the rack-frame fastened to the same, the double rack and its actuating-gear, the slider working in a slot in the rack-frame, a crank connection between the gear and the slider, and the double set of catches mounted on the rack-

frame, adapted to engage the slider in the manner specified.

10. The catches consisting of the connected pivoted bell-crank levers, means for holding the same normally in one position, and the actuating means consisting of the pawl adapted to engage one of the bell-crank levers, substantially as described.

11. In a mechanical movement, the combination of the reciprocating part, the actuating-gear, the double rack mounted on the reciprocating part and having clearance-spaces, and means for reversing the movement of the reciprocating part when the gear is in the clearance-spaces and not in mesh with either set of teeth on the rack, substantially as described.

12. In a mechanical movement, the combination of the reciprocating part, the actuating-gear, the double rack mounted on the reciprocating part and having clearance-spaces and means for reversing the movement of the reciprocating part, and means for moving said rack, both operating only when the rack is in the clearance-spaces and not in mesh with either set of teeth on the rack, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN H. STONEMETZ.

Witnesses:

LOUIS W. SOUTHGATE,

JAMES J. RAFFERTY.