No. 692,679. Patented Feb. 4, 1902.

E. F. LEILICH.

MECHANICAL MOVEMENT AND BED MOTION FOR CYLINDER PRINTING MACHINES.

(Application filed May 7, 1901.)

(No Model.) 5 Sheets—Sheet 1.

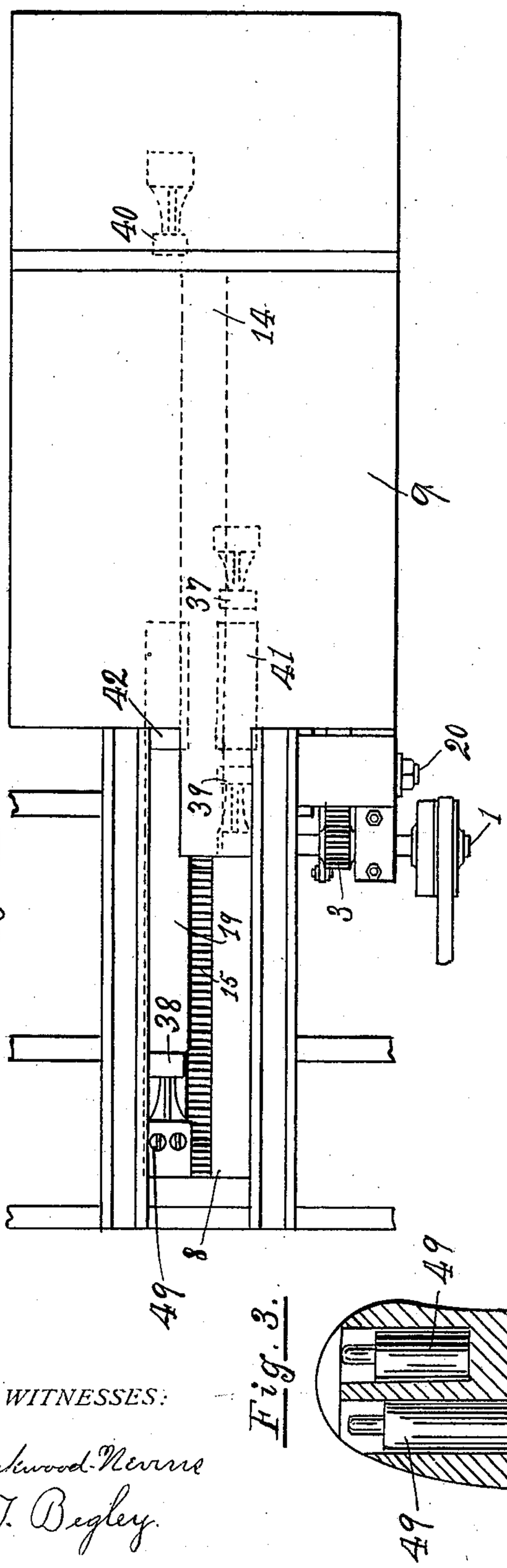


Fig. 1.

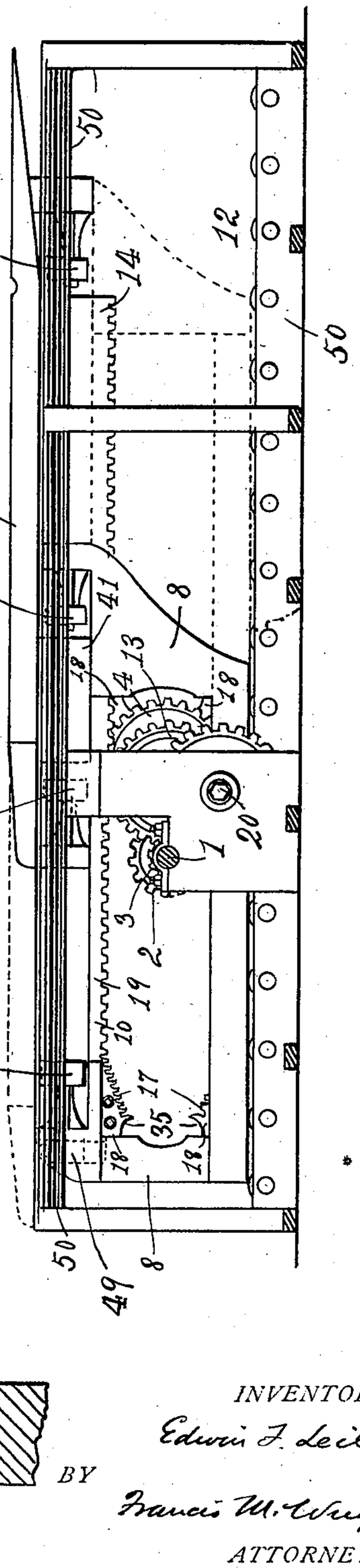


Fig. 2.

Fig. 3.

WITNESSES:

K. Lockwood-Nevins

M. J. Begley.

INVENTOR.

Edwin F. Leilich

BY

Francis M. Wright,

ATTORNEY.

No. 692,679. Patented Feb. 4, 1902.

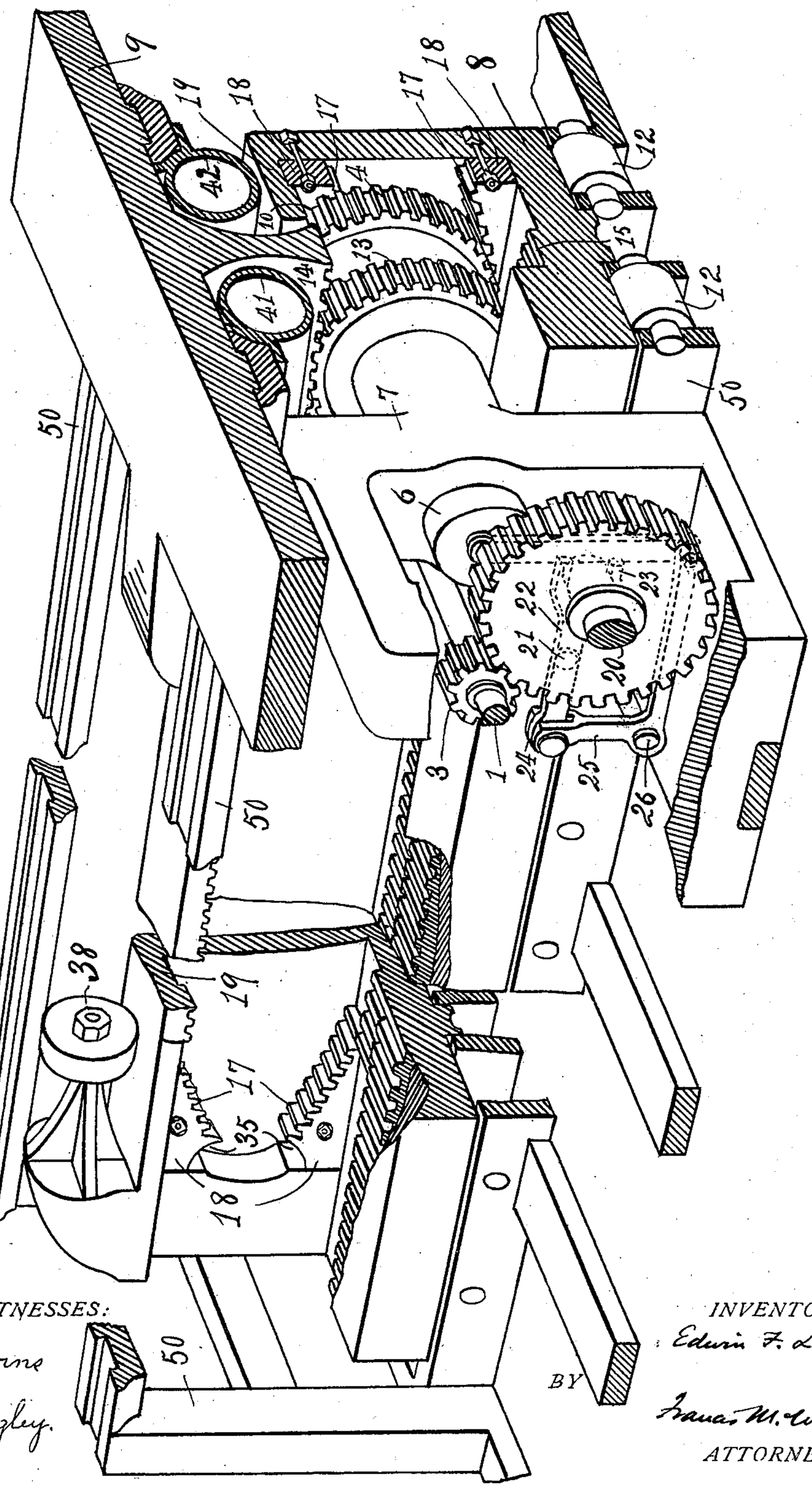
E. F. LEILICH.

MECHANICAL MOVEMENT AND BED MOTION FOR CYLINDER PRINTING MACHINES.

(Application filed May 7, 1901.)

(No Model.) 5 Sheets—Sheet 2.

Fig. 4.



WITNESSES:

K. L. Nevins

M. T. Bigley.

INVENTOR.

Edwin F. Leilich

BY

Francis M. Wright

ATTORNEY.

No. 692,679. Patented Feb. 4, 1902.

E. F. LEILICH.

MECHANICAL MOVEMENT AND BED MOTION FOR CYLINDER PRINTING MACHINES.

(Application filed May 7, 1901.)

(No Model.) 5 Sheets—Sheet 3.

Fig. 5.

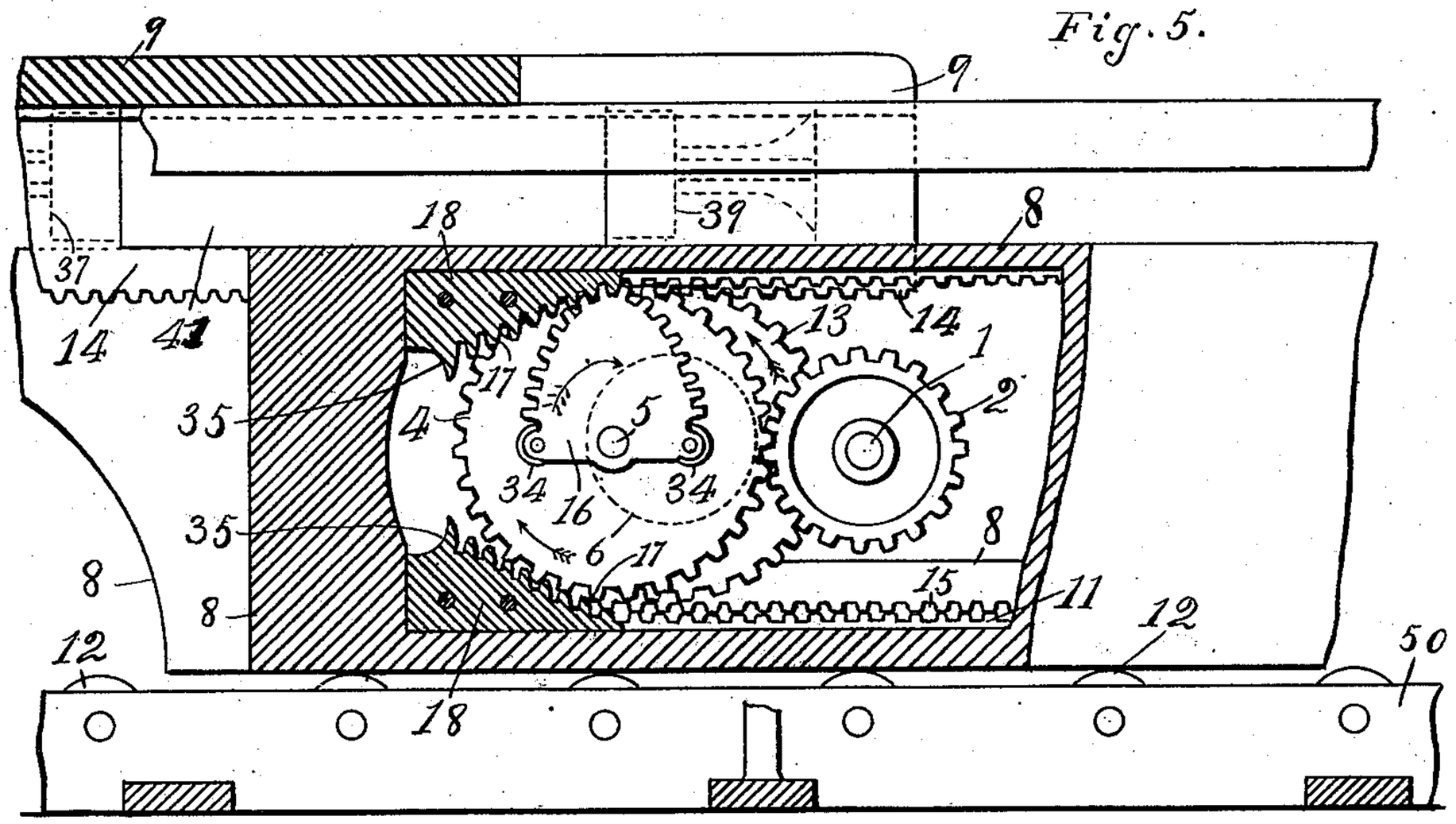


Fig. 6.

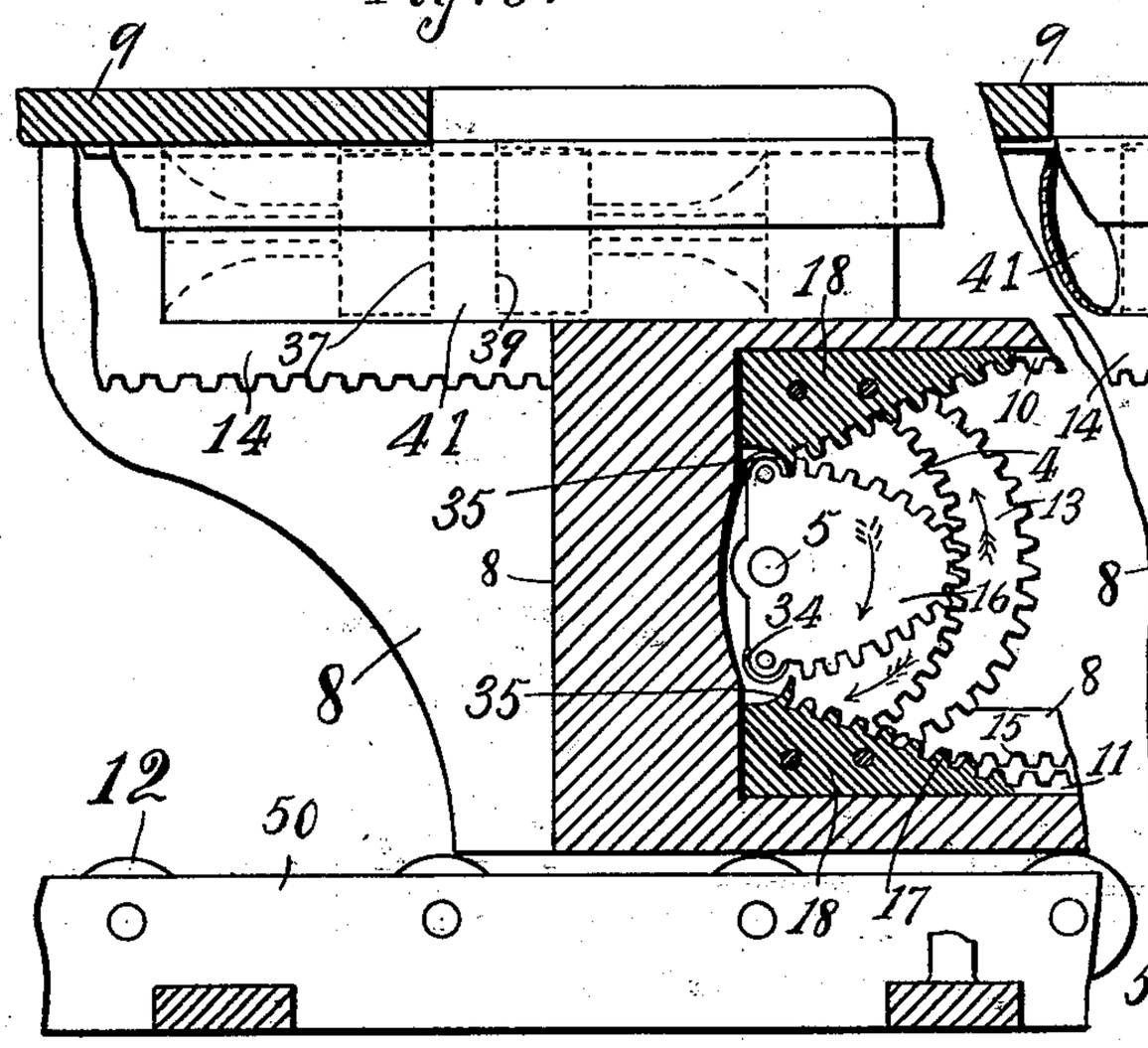
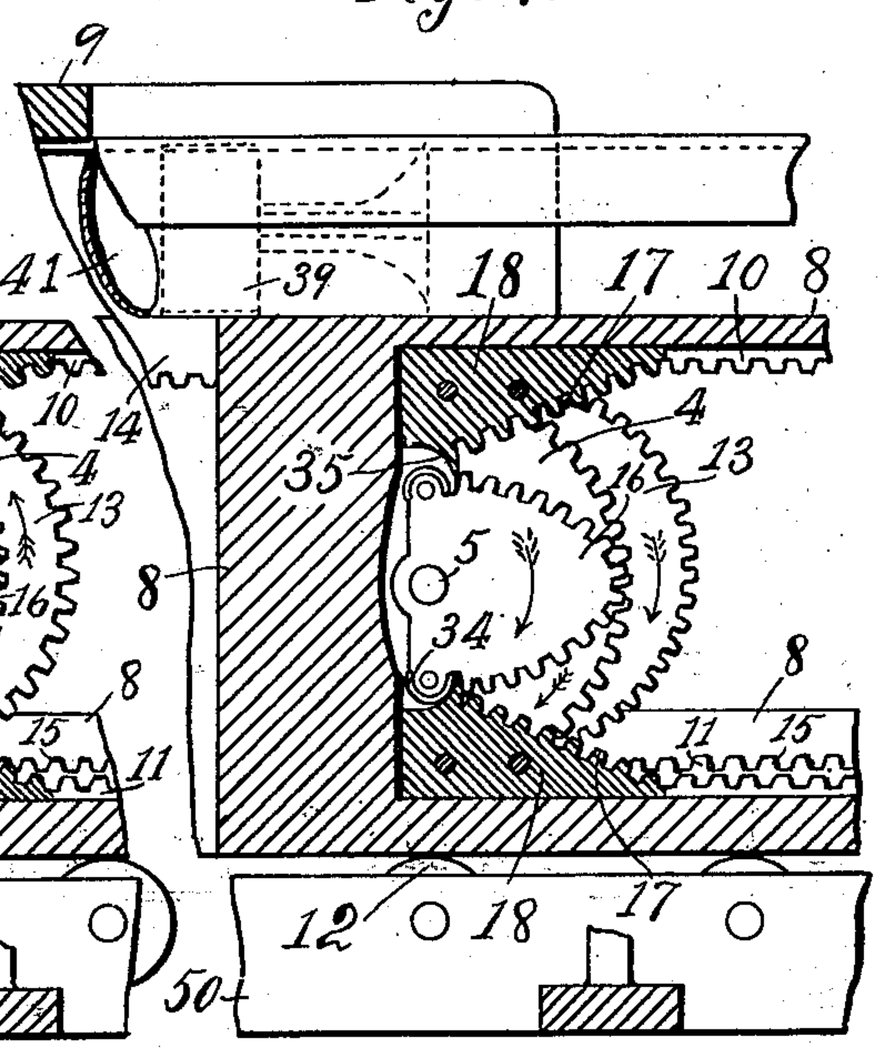


Fig. 7.



WITNESSES:

K. Lockwood-Nevins.
Cecelia Powning.

INVENTOR.

E. F. Leilich

BY

Francis M. Wright

ATTORNEY.

No. 692,679. Patented Feb. 4, 1902.

E. F. LEILICH.

MECHANICAL MOVEMENT AND BED MOTION FOR CYLINDER PRINTING MACHINES.

(Application filed May 7, 1901.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 9.

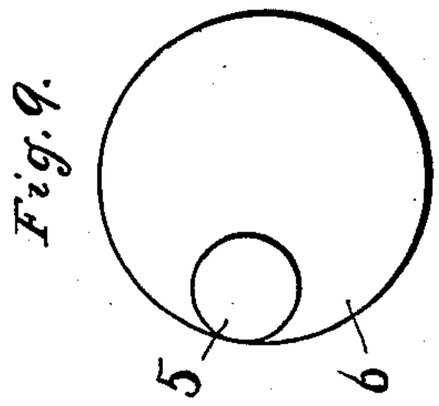


Fig. 10.

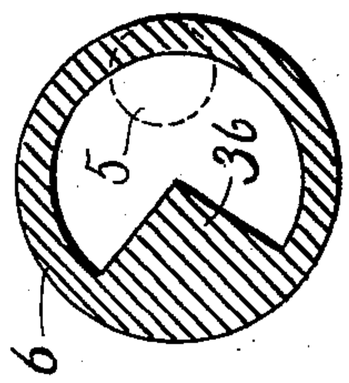
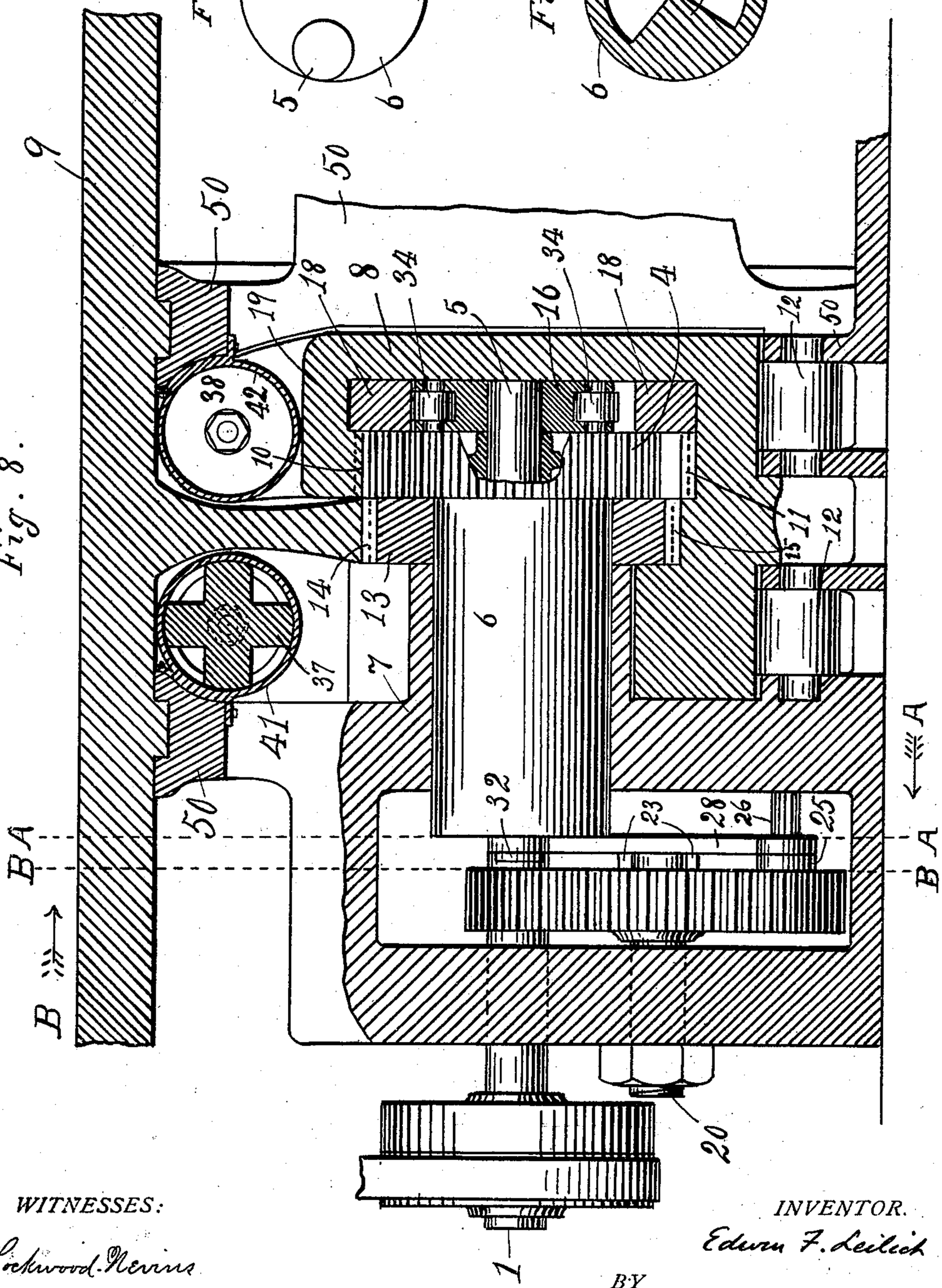


Fig. 8.



WITNESSES:

K. Lockwood Nevins

M. T. Begley.

INVENTOR.

Edwin F. Leilich

BY

Brust W. Wright

ATTORNEY.

No. 692,679. Patented Feb. 4, 1902.

E. F. LEILICH.

MECHANICAL MOVEMENT AND BED MOTION FOR CYLINDER PRINTING MACHINES.

(Application filed May 7, 1901.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 12.

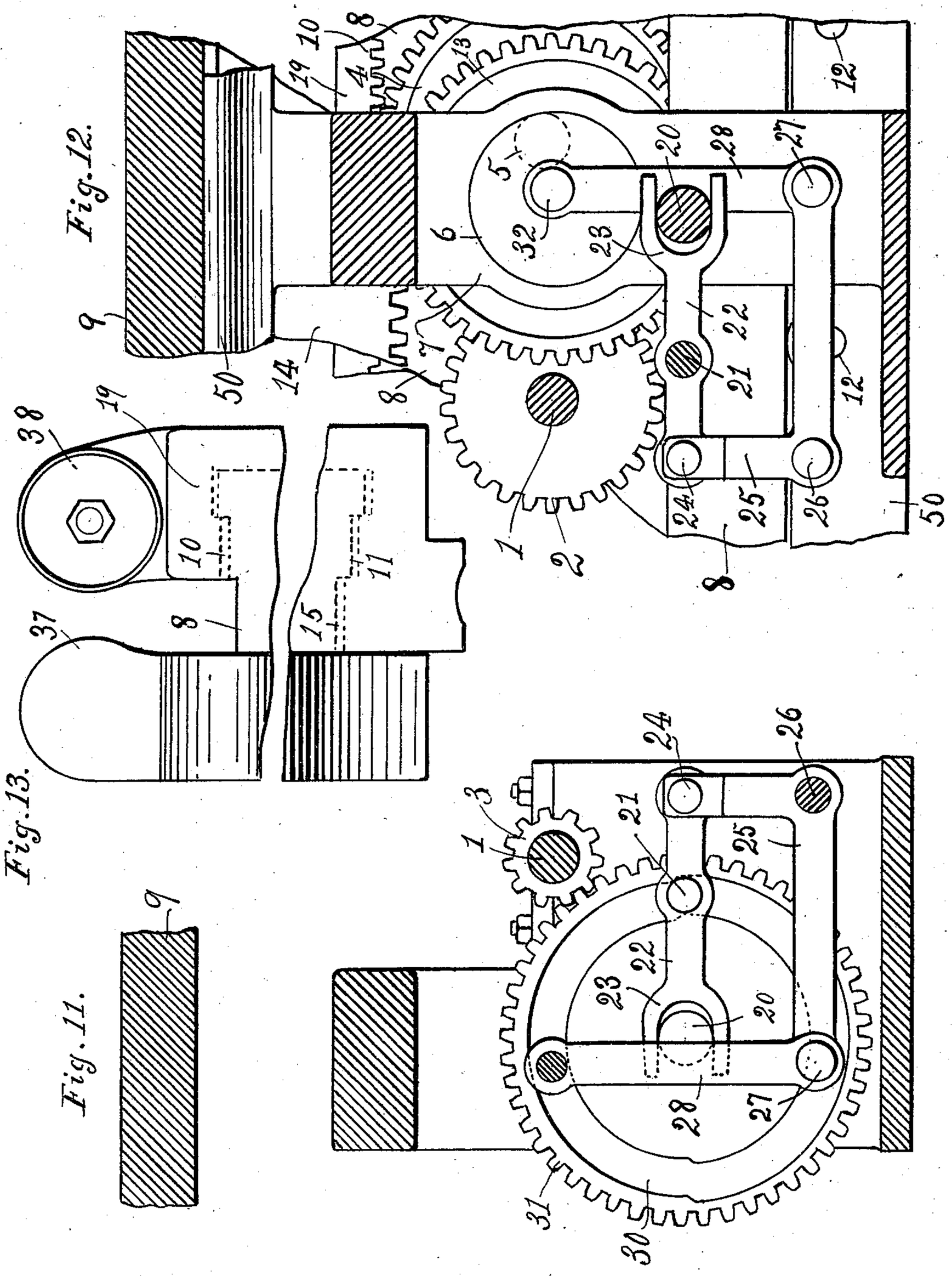


Fig. 13.

Fig. 11.

WITNESSES:

K. Lockwood-Nevins

M. T. Begley.

INVENTOR.

Edwin F. Leilich

BY

Francis M. Wright

ATTORNEY.

UNITED STATES PATENT OFFICE.

EDWIN FRANCIS LEILICH, OF SAN FRANCISCO, CALIFORNIA.

MECHANICAL MOVEMENT AND BED-MOTION FOR CYLINDER PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 692,679, dated February 4, 1902.

Application filed May 7, 1901. Serial No. 59,181. (No model.)

To all whom it may concern:

Be it known that I, EDWIN FRANCIS LEILICH, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Mechanical Movements and Bed-Motions for Cylinder Printing-Machines, of which the following is a specification.

My invention relates to an improved mechanical movement and bed-motion for cylinder printing-machines, the object of my invention being to provide an apparatus of this character in which, so far as possible, the shock and jar due to the sudden stoppage of the printing-bed at each end of the stroke shall be done away with.

Cylinder printing-beds with the forms thereon are often of great weight, and the rapid stoppage of this heavy body moving with considerable velocity tends at each end of the stroke to lift the press at the other end and to cause strain on the parts and vibration of the press. I remove this vibration and jar by causing a heavy weight to move synchronously with the printing-bed, but in the opposite direction, at the same velocity therewith. The force or momentum transmitted to the frame by the stoppage of the printing-bed moving in the one direction is thus neutralized by the force or momentum transmitted by the stoppage of an equal body moving in the opposite direction with the same velocity.

Since my invention is a new mechanical movement, it will be equally applicable to other machinery besides printing-presses, in which a heavy body makes rapid reciprocations, and I desire to claim the same in connection with all such machinery.

My invention therefore resides in the novel construction, combination, and arrangement of the parts for the above ends, hereinafter fully specified, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of a printing-bed constructed in accordance with my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a detail in cross-section of the end of the weight, showing the auxiliary weights in position. Fig. 4 is an enlarged perspective view of a portion of the press. Figs. 5, 6, and 7 are details showing the positions of the segmental gear and driving-gear relatively to the upper and lower weight-racks and upper and lower auxiliary racks when approaching the end of a stroke, when at the end of the stroke, and when beginning the next stroke, respectively. These views show the opposite side of the mechanism to that shown in Fig. 2. Fig. 8 is a cross-section of the apparatus on one side of the driving-gear. Fig. 9 is an end view of the cylinder which carries the driving-gear. Fig. 10 is a section of the same. Fig. 11 is a vertical section on the line A A of Fig. 8 looking in the same direction of the arrow. Fig. 12 is a vertical section on the line B B of Fig. 8 looking in the same direction of the arrow, and Fig. 13 is a broken end view of the weight.

Before describing the apparatus in detail it will assist in understanding the nature of the invention to first describe the same in general terms.

The movements which must be obtained are a general reciprocating movement of the printing-bed and a simultaneous and equal reciprocation in the opposite direction of a weight or counterbalance of about the same weight as the printing-bed. These movements have to be derived from the continuous revolution of the shaft. To accomplish this result, the motion of the printing-bed is derived from the rotation of the shaft indirectly through the motion of the weight. The weight reciprocates on rollers and transmits movement to the printing-bed through an oscillating gear-wheel meshing at opposite ends of a diameter with racks on the weight and printing-bed, respectively. By means of this oscillating gear-wheel, then, a reciprocation of the printing-bed simultaneous with and equal and opposite to that of the weight is assured. Next, as to the derivation of the reciprocation of the weight from the continuous revolution of the driving-shaft. This is accomplished by providing upper and lower oppositely-facing racks on the weight, arranged to mesh alternately with a continuously-revolving driving gear-wheel on the stud-shaft. A cam 30 is suitably connected to the gear-wheel 31 and is used to bring the driving gear-wheel alternately into engagement with the upper and lower racks.

Referring to the drawings for a more detailed description, it will be seen that 1 represents the main driving-shaft. From said shaft power is derived through a gear-wheel 2 thereon to reciprocate the printing-bed and weight, and through a pinion 3 is obtained power to operate the cam which disengages the driving-gear from one of the weight-racks and causes it to engage with the other. The gear-wheel 2 meshes with the driving gear-wheel 4, which is mounted on a stud-shaft 5, placed eccentrically on the end of a cylinder 6, the latter having a pivotal bearing in the frame 7. Supposing that the wheels 2 and 4 are moving in the direction of the arrows and that the weight 8 is moving to the right and printing-bed 9 to the left, the driving-wheel 4 will then be in mesh with the upper weight-rack 10 and out of mesh with the lower weight-rack 11. Both of said racks are rigidly attached to said weight, which reciprocates on rollers 12 in the frame 50 of the apparatus. When the weight 8 moves to the left, the printing-bed 9 is necessarily moved with an equal velocity to the right, this simultaneous movement being due to an oscillating gear-wheel 13, which is axially and loosely mounted on the cylinder 6, as shown in Fig. 8, and is operatively connected at opposite ends of a diameter with both the printing-bed 9 and the weight 8, meshing with a bed-rack 14, depending from the printing-bed, and meshing with an auxiliary rack 15, secured to the weight alongside the lower weight-rack 11. The weight will move to the right so long as the rack 10 is in engagement with the driving gear-wheel 4, since the latter moves continuously. When the end of the rack 10 arrives at the driving-wheel 4, so that the propelling force of the latter on the former ceases, it will then be necessary to positively arrest the movement of the weight, and therefore also of the printing-bed, instead of merely allowing it to come to rest, and it will be necessary to control said further movement, reducing the speed gradually until the weight and printing-bed come to rest and then starting them in the opposite direction and gradually accelerating their speed until they move in said opposite direction with the same velocity as before derived from the driving-wheel 4.

In order to positively control the movement of the weight while diminishing the speed to zero, there is mounted on the stud-shaft 5, side by side with the driving gear-wheel 4 and secured to said gear-wheel, a segmental gear-wheel 16, which is of the form of about half an ellipse divided near the minor axis. This segmental gear-wheel is arranged to engage alternately with two auxiliary racks 17, which are mounted on wedge-shaped blocks 18, extending upward from the lower portion of the weight and downward from the upper overhanging portion 19 thereof, so that said auxiliary racks 17 converge toward each other. They occupy positions which would be alongside of the upper and lower racks if the latter were extended beyond their ends. They are thus adapted to engage the segmental gear 16, which, as already stated, is secured at the side of the driving gear-wheel 4. The segmental gear 16 is so secured to the gear-wheel 4 that at the time the end of the rack 10 arrives at the driving gear-wheel 4, and therefore goes out of engagement therewith, the central point of the segmental gear 16 at the end of its major axis and farthest from the axis of revolution of said gear is vertical and comes into engagement with the advancing end of the oblique upper auxiliary rack 17. Motion is now communicated to the weight no longer from the gear-wheel 4 through the rack 10, but through the medium of the segmental gear 16 and the auxiliary rack 17, and this is a constantly-diminishing motion, notwithstanding that the angular velocity of the gear-wheel 4 and segmental gear 16 is constant, because the distance from the center of rotation to the point of transmission of the motion continually diminishes, owing to the elliptical form of segmental gear and the oblique and downward direction of the upper rack 17. Provision must now be made for disengaging the segmental gear 16 from the upper auxiliary rack 17 and causing it to engage the lower auxiliary rack, so as to produce a motion of the weight in the opposite direction. This is effected by means of a cam-groove 30 in the gear-wheel 31 on the stud-shaft 20, said wheel 31 being driven by a pinion 3 on the main driving-shaft. In said cam-groove 30 rides a roller 21, carried by a link 22, having an end 23, forked to pass over the projecting end of the shaft 20 to be guided thereby, said link 22 being jointed, as at 24, to a bell crank-lever 25, pivoted at 26, and the other arm of said lever 25 being jointed, as at 27, to a link 28, the upper end of which is connected to a stud 32, eccentrically located on the end of a cylinder 6. When the roller 21 passes from the high to the low dwell of the cam-groove 30, the link 22 is moved inwardly, thereby moving the link 28 downwardly and rotating the cylinder downwardly through a small arc. The stud-shaft 5, which, as before stated, is eccentrically carried on the other end of said cylinder 6, is thus depressed, thereby depressing also the gear-wheel 4 and the segmental gear 16, both of which are mounted on said stud-shaft 5. By this movement of the roller 21 in the cam-groove 30, then, the segmental gear 16 is thrown out of engagement with the upper rack 17 and into engagement with the lower rack 17.

Rollers 34 are provided at and fixed to the end of the segmental gear 16, and these rollers engage shoes 35 at the ends of the auxiliary racks 17. The object of these rollers is to reduce friction while retaining control of the weight and printing-bed on changing from movement in one direction of the reciprocation to the opposite and also to properly aline the parts so that on making the change the teeth of the segmental gear shall enter into

mesh with the teeth of the lower auxiliary rack 17.

As shown in Fig. 10, the cylinder 6 is suitably weighted on one side, as at 36, to compensate for the weight of the studs 32 and 5 and the parts carried thereby. The weight 8 at opposite ends carries pistons 37 38, and the printing-bed 9 carries at opposite ends pistons 39 40. The pistons 37 39 are in alinement with each other, and at the end of the movement of the weight to the left and the printing-bed to the right said pistons 37 39 enter opposite ends of a cylinder 41, fixedly secured to the frame 50, thereby compressing the air in said cylinder, which compressed air thus acts as a cushion to partly overcome the momentum of the weight and printing-bed. When the weight and printing-bed move in the other direction, the pistons 38 40 compress air in a cylinder 42 and effect the same result.

In order that the momentum of the weight may counterbalance the momentum of the printing-bed, including the forms, as nearly as possible, there are provided auxiliary weights 49, which may be added to the weight as necessary to equalize the weight of the printing-bed when the forms are placed thereon.

The counterbalancing of the momentum of the printing-bed may be accomplished by employing not only a weight of equal mass traveling in the opposite direction with equal velocity, but also a weight of less mass traveling with greater velocity, or vice versa, the necessary condition being that the momentum of the printing-bed shall be substantially equal to that of the weight.

I claim—

1. In an apparatus of the character described, the combination of a rotating shaft, a longitudinally-reciprocating body, means operated by said shaft for reciprocating said body, a second longitudinally-reciprocating body of substantially the same mass as the first, and an operative connection between them whereby they reciprocate in opposite directions with equal velocities, substantially as described.

2. In an apparatus of the character described, the combination of a rotating shaft, a longitudinally-reciprocating body, a wheel driven by said shaft and operatively connected alternately at opposite sides thereof with said body to reciprocate the same, a second longitudinally-reciprocating body of substantially the same mass as the first, and an operative connection between them whereby they reciprocate in opposite directions with equal velocities, substantially as described.

3. In an apparatus of the character described, the combination of a rotating shaft, a gear-wheel thereon, a second gear-wheel meshing with the first, a longitudinally-reciprocating body, upper and lower racks thereon, means operated by the first-named shaft for moving the latter gear-wheel into mesh with said upper and lower racks alternately, a second longitudinally-reciprocating body, of substantially the same mass as the first, and an operative connection between the two bodies whereby they reciprocate in opposite directions with equal velocities, substantially as described.

4. In an apparatus of the character described, the combination of a shaft, a continuously-driven gear-wheel thereon, a longitudinally-reciprocating body, upper and lower racks thereon, means for moving said shaft to bring said gear-wheel into mesh with said racks alternately, upper and lower auxiliary racks at each end of said body, provided with the shoes 35, and a segmental gear provided with the rollers 34, mounted on said shaft and engaging with said auxiliary racks at points near the ends of the strokes, substantially as described.

5. In an apparatus of the character described, the combination of a shaft, a continuously-driven gear-wheel thereon, a longitudinally-reciprocating body, upper and lower racks thereon, means for moving said shaft to bring said gear-wheel into mesh with said racks alternately, upper and lower auxiliary racks at each end of said body provided with the shoes 35, said auxiliary racks being out of alinement with the main racks, and a segmental gear provided with the rollers 34, mounted on said shaft and engaging said auxiliary racks at points near the ends of the strokes, substantially as described.

6. The combination of a printing-bed, a rack thereon, an oscillating gear-wheel meshing with said rack, a weight having a rack with which said gear-wheel meshes on its opposite side, and means for reciprocating said weight, substantially as described.

7. The combination of a printing-bed, a rack thereon, an oscillating gear-wheel meshing with said rack, a weight having a rack with which said gear-wheel meshes on its opposite side, means for varying the weight to equalize its mass with that of the printing-bed, and means for reciprocating said weight, substantially as described.

8. The combination of a printing-bed, a weight, means for reciprocating the weight, and an operative connection between the weight and the printing-bed whereby the latter is moved in the opposite direction to the former and with the same momentum, substantially as described.

9. The combination of a printing-bed, a weight, means for varying the mass of the weight, means for reciprocating the weight, and an operative connection between the weight and the printing-bed whereby the latter is moved in the opposite direction to the former and with the same momentum, substantially as described.

10. The combination of a printing-bed, a weight, means for reciprocating the weight, means for reducing the speed at each end of its reciprocation gradually before bringing it to rest, and for gradually increasing the speed at the beginning of the reciprocation, and an

operative connection between the weight and the printing-bed whereby the latter is moved in the opposite direction to the former and with the same momentum, substantially as described.

11. The combination of a printing-bed, a weight, means for reciprocating the weight, an operative connection between the printing-bed and weight whereby the latter is moved in the opposite direction to the former and with the same momentum, and means carried by said bed and weight for reducing the shock on the stoppage of said bed and weight at the end of the stroke, substantially as described.

12. The combination of a printing-bed, a weight, means for reciprocating the weight, means for reciprocating the bed in the opposite direction to the weight and with the same momentum, and means for reducing the shock on the stoppage of said reciprocating elements at the end of their stroke, said means comprising cylinders, and pistons arranged to enter said cylinders at the ends of the stroke and compress the air therein, substantially as described.

13. The combination of a driving gear-wheel and a segmental gear rotating together, a weight having upper and lower main racks and upper and lower oblique auxiliary racks, means operated at predetermined intervals for reciprocating the driving gear-wheel and segmental gear relatively to said upper and lower racks, whereby the gear-wheel and segmental gear are thrown out of engagement with the upper main and auxiliary racks and brought into engagement with the lower main and auxiliary racks or vice versa, a printing-bed, and an oscillating wheel driven by the weight and driving the printing-bed in the opposite direction to the weight, substantially as described.

14. The combination of a rotating shaft, a gear-wheel mounted thereon, a driving gear-wheel meshing with the first gear-wheel, a weight having upper and lower racks, a cam-wheel driven by means of the rotating shaft, a lever operated by said cam-wheel to reciprocate the shaft of the driving gear-wheel into mesh alternately with the upper and lower racks of the weight, oblique auxiliary upper and lower racks at the ends of the weight, a segmental gear reciprocated with the driving gear-wheel, and brought into mesh alternately with the upper and lower oblique auxiliary racks, rollers carried by said segmental gear and engaging shoes on said weight, a printing-bed, a rack thereon, a rack on the weight, an oscillating gear-wheel engaging both of said latter racks whereby the printing-bed and the weight move in unison in opposite directions, cylinders, and pistons carried by said weight and printing-bed and entering said cylinders in opposite directions at the ends of a stroke, substantially as described.

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

EDWIN FRANCIS LEILICH.

Witnesses:

FRANCIS M. WRIGHT,

M. T. BEGLEY.