

No. 638,176.

Patented Nov. 28, 1899.

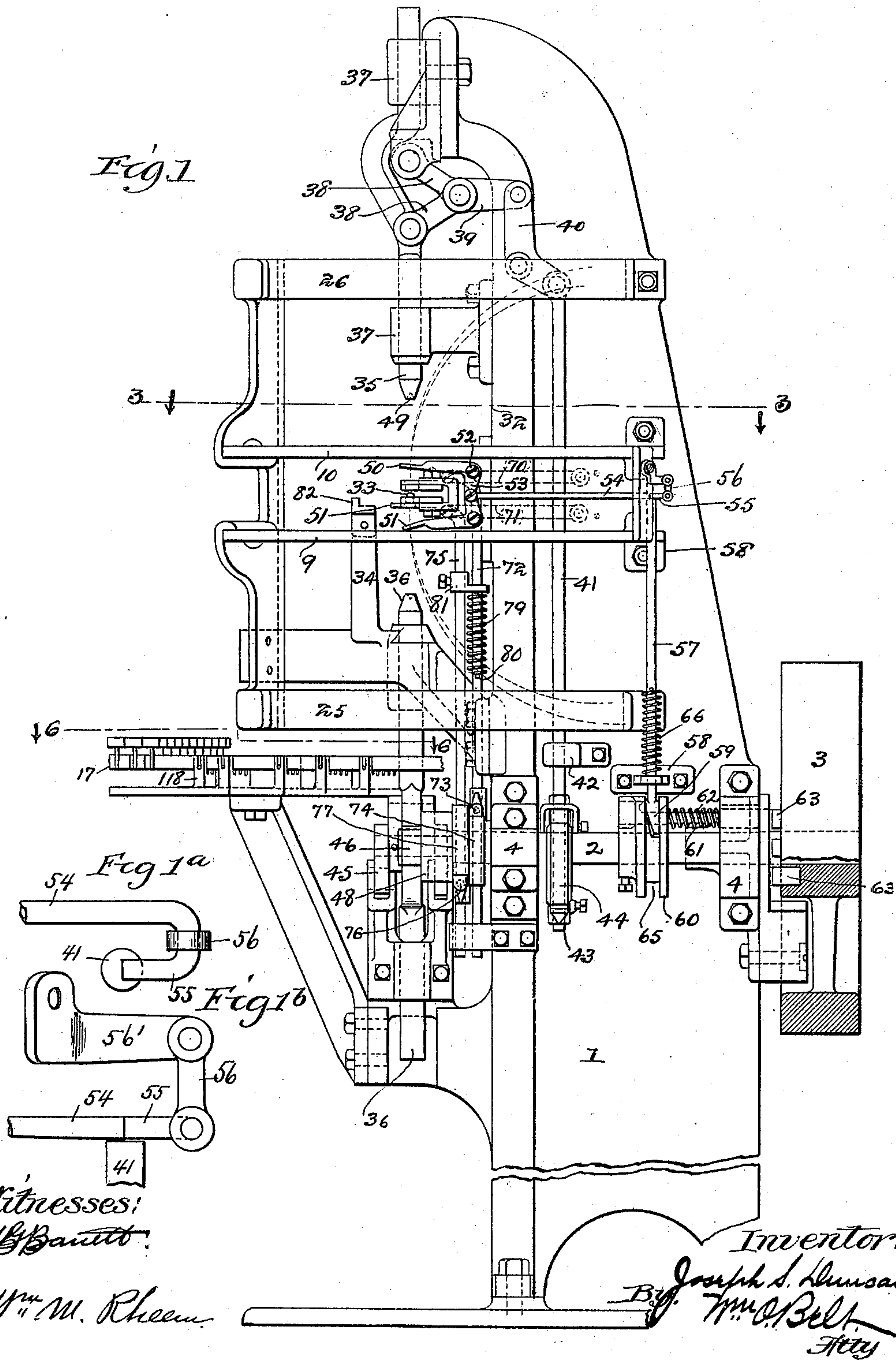
J. S. DUNCAN.

MACHINE FOR MAKING PRINTING PLATES.

(Application filed Jan. 23, 1899.)

(No Model.)

7 Sheets—Sheet 1.



No. 638,176.

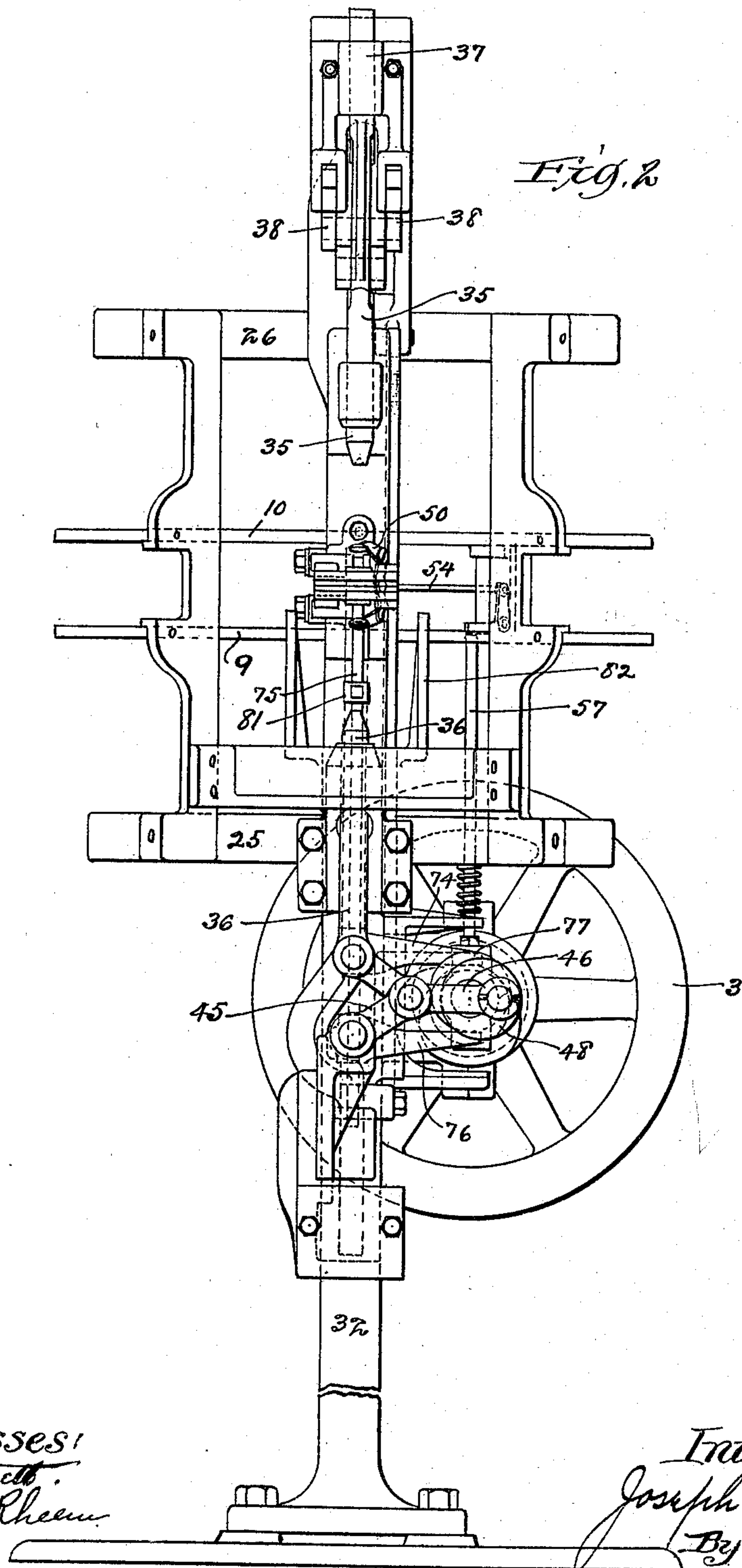
Patented Nov. 28, 1899.

J. S. DUNCAN.
MACHINE FOR MAKING PRINTING PLATES.

(No Model.)

(Application filed Jan. 23, 1899.)

7 Sheets—Sheet 2.



No. 638,176.

Patented Nov. 28, 1899.

J. S. DUNCAN.

MACHINE FOR MAKING PRINTING PLATES.

(Application filed Jan. 23, 1899.)

(No Model.)

7 Sheets—Sheet 3.

Fig. 3

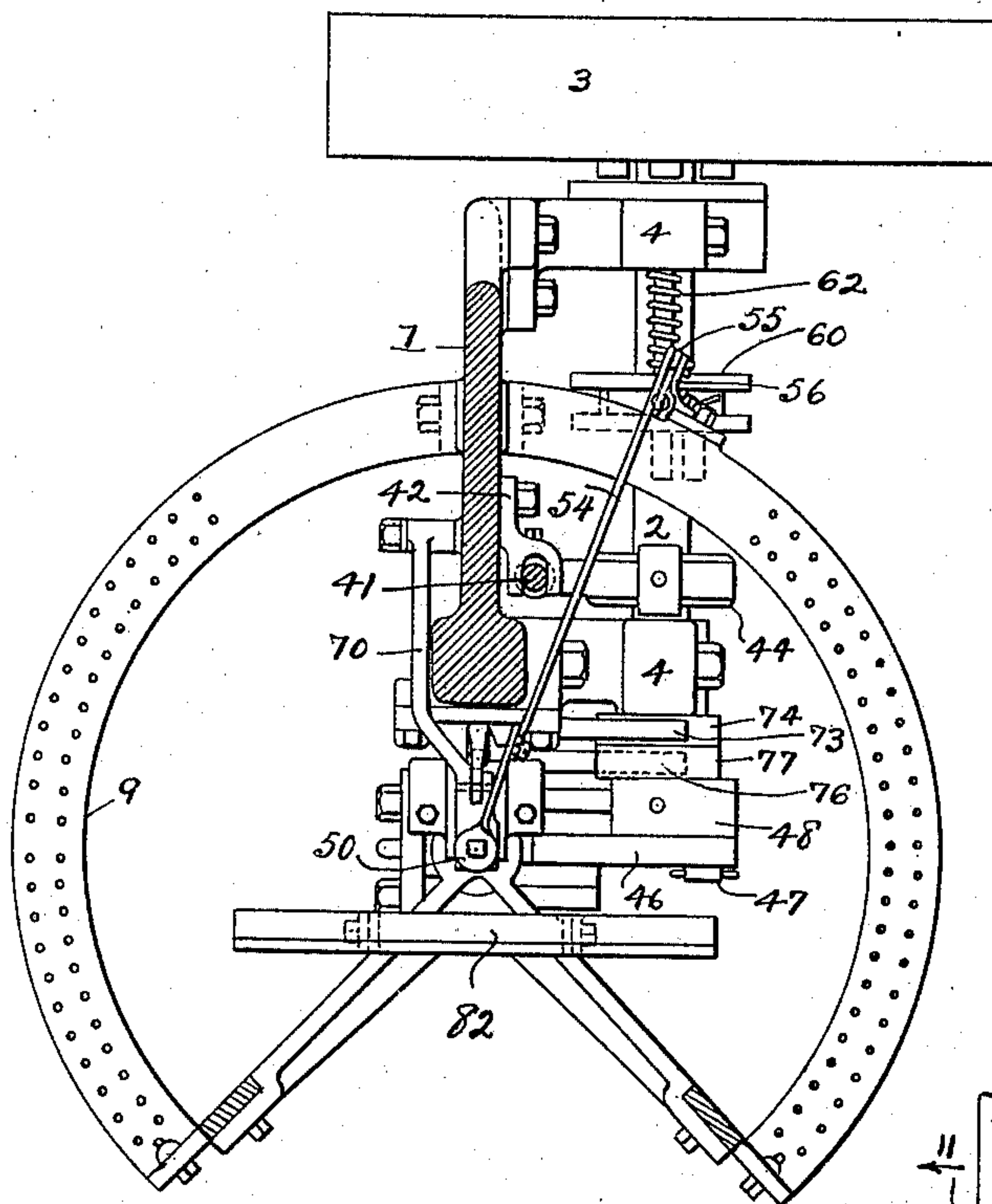


Fig. 8

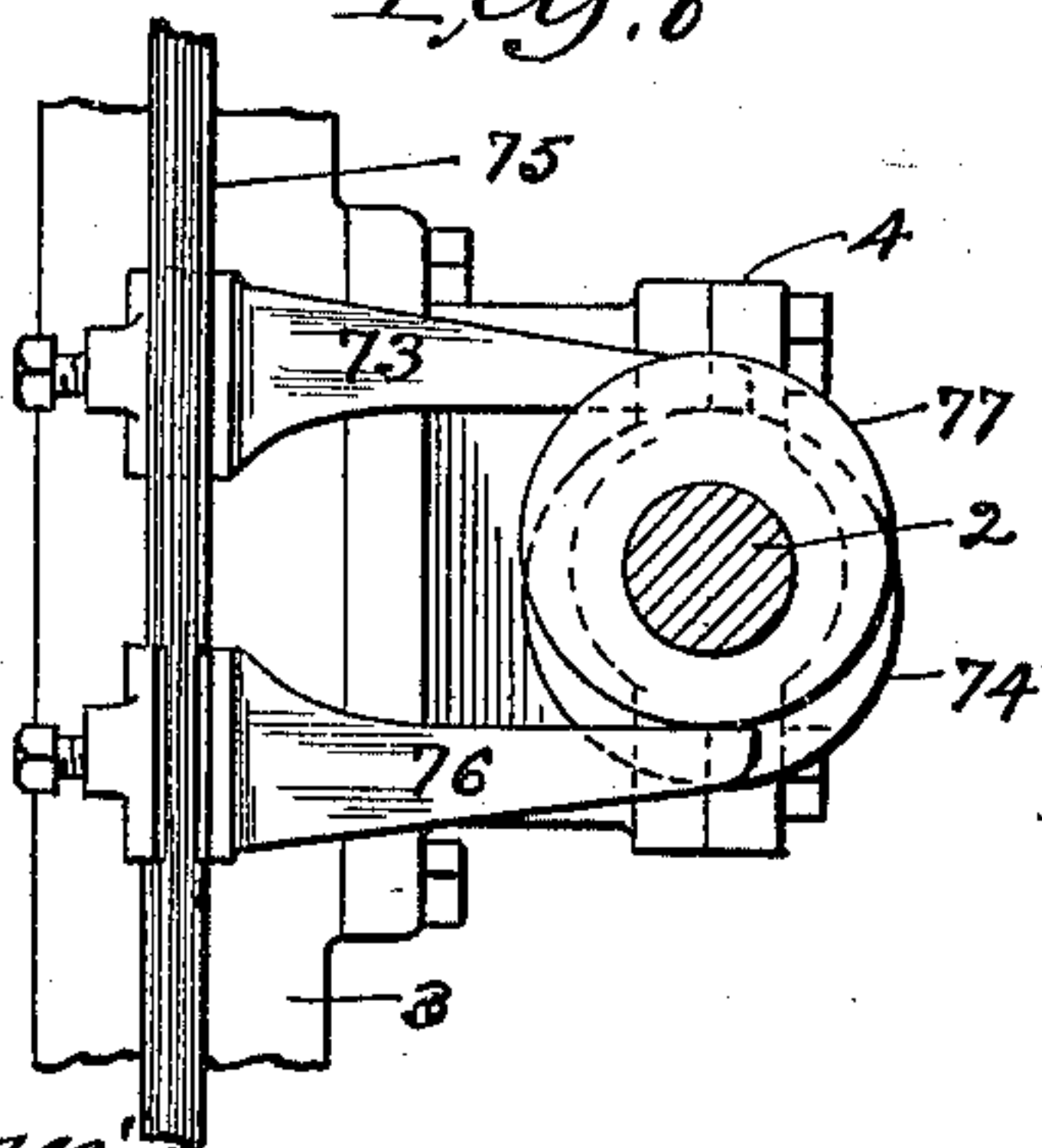


Fig. 9

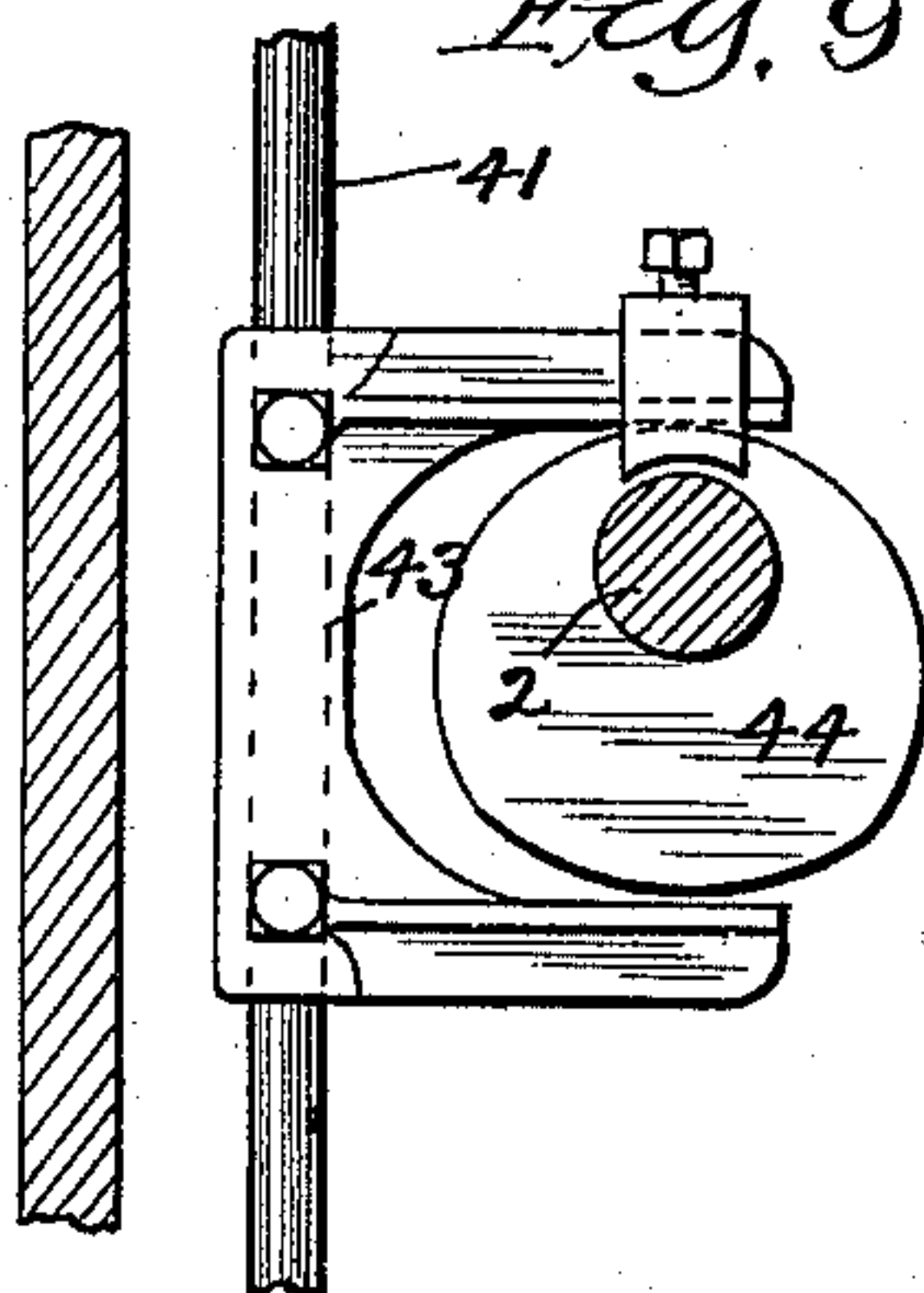


Fig. 10

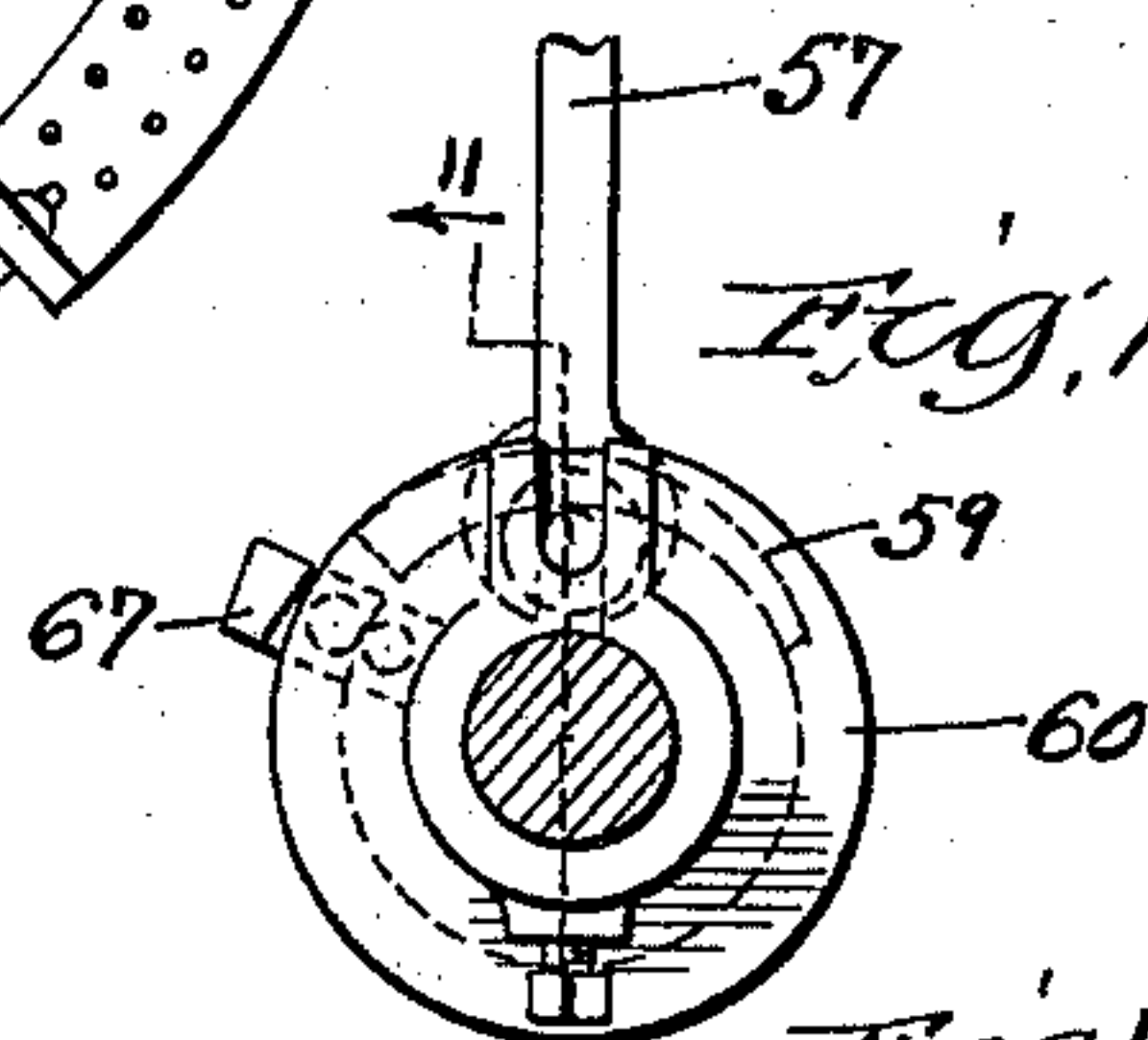
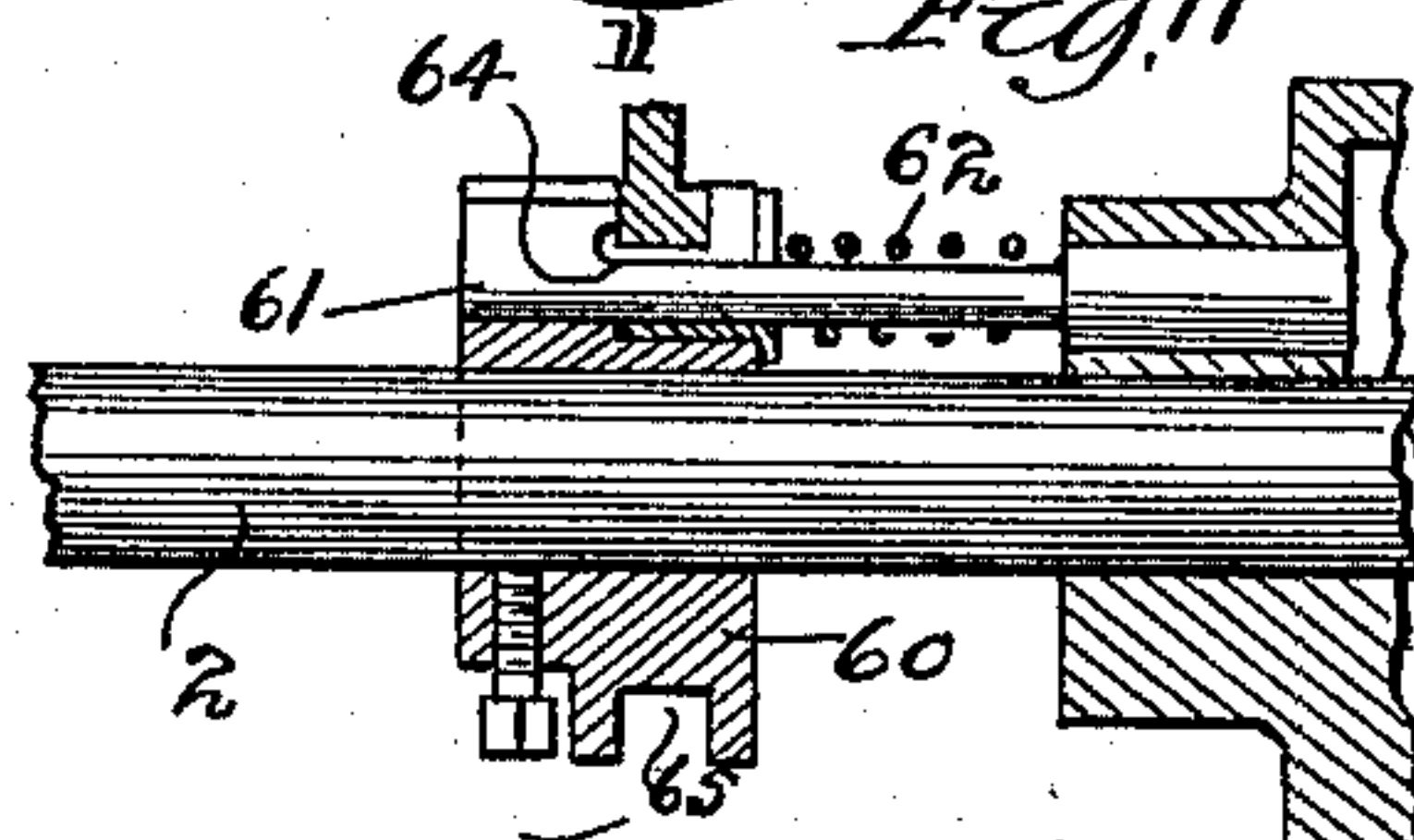


Fig. 11



Witnesses
H. B. Bant
Wm. M. Rheem

Inventor
Joseph S. Duncan,
By Wm. O. Bell, Atty

No. 638,176.

Patented Nov. 28, 1899.

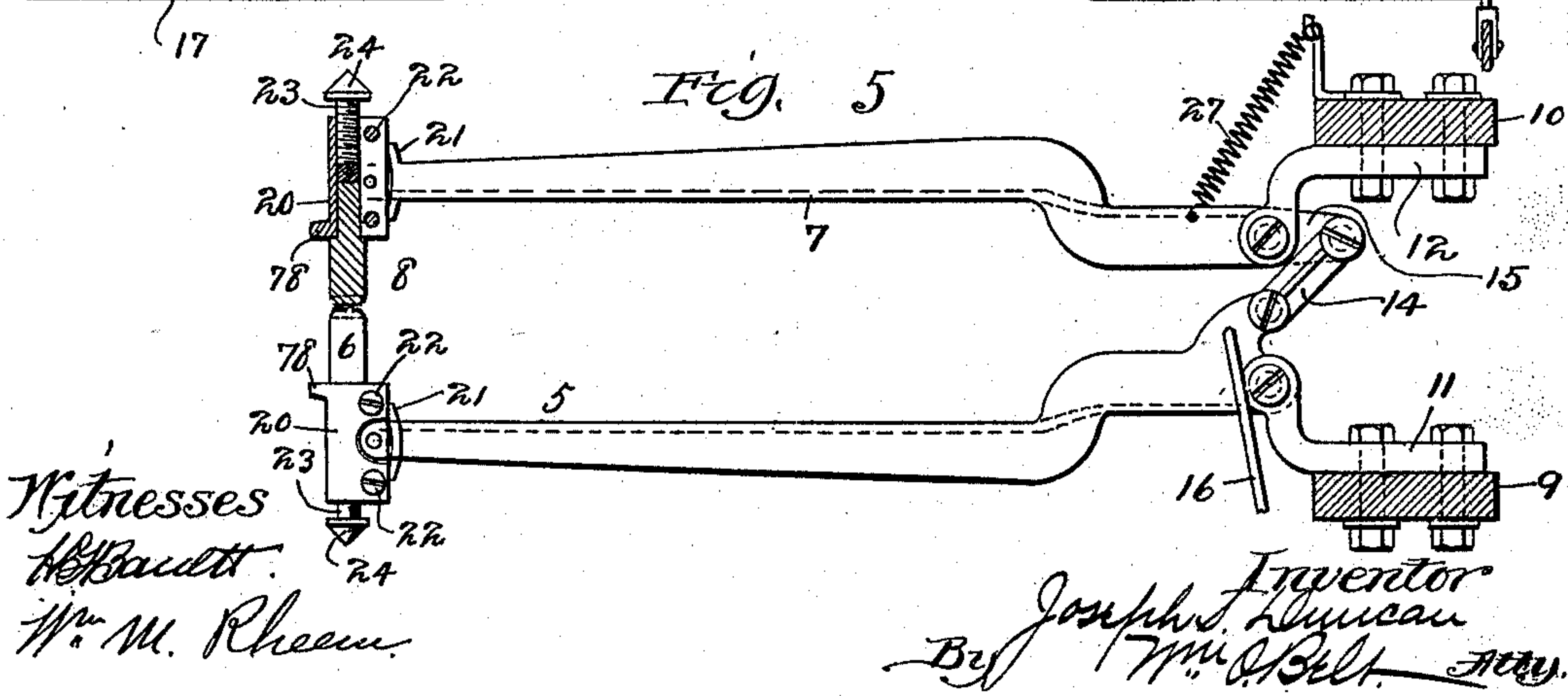
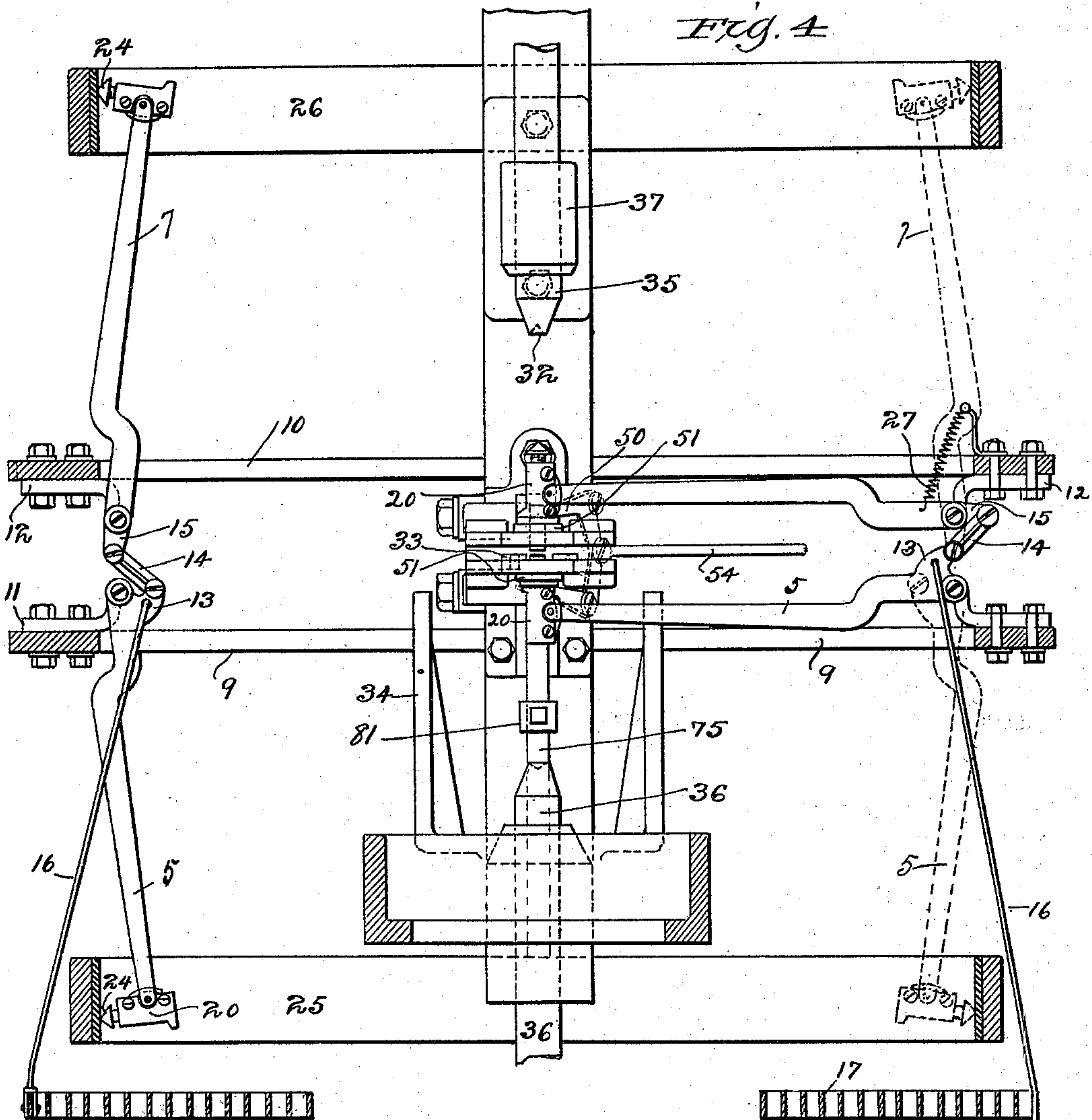
J. S. DUNCAN.

MACHINE FOR MAKING PRINTING PLATES.

(Application filed Jan. 23, 1899.)

(No Model.)

7 Sheets—Sheet 4.



Witnesses
H. B. Baudett.
W. M. Rheem.

Inventor
Joseph S. Duncan
By Wm. O. Bell, Atty.

No. 638,176.

Patented Nov. 28, 1899.

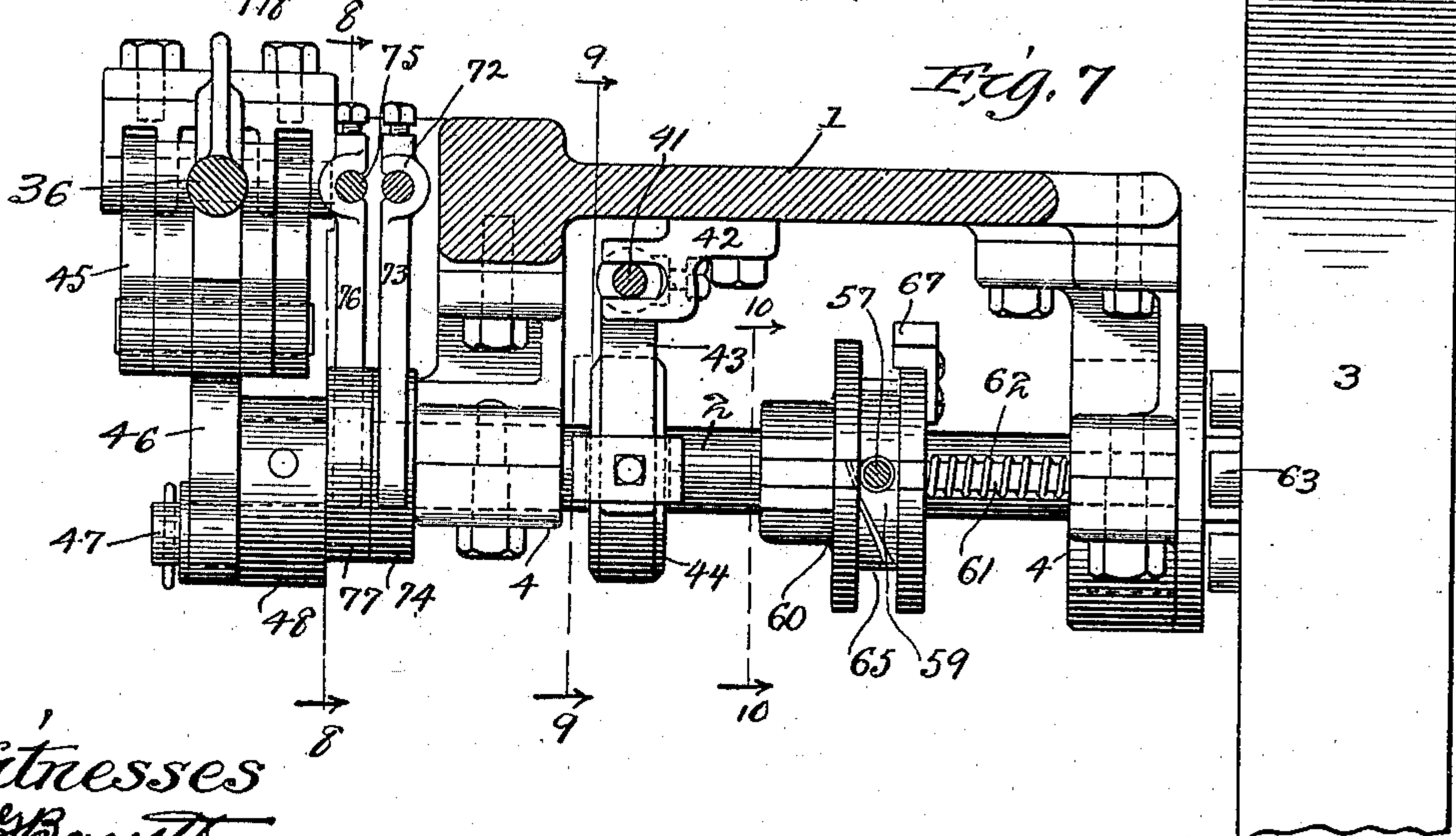
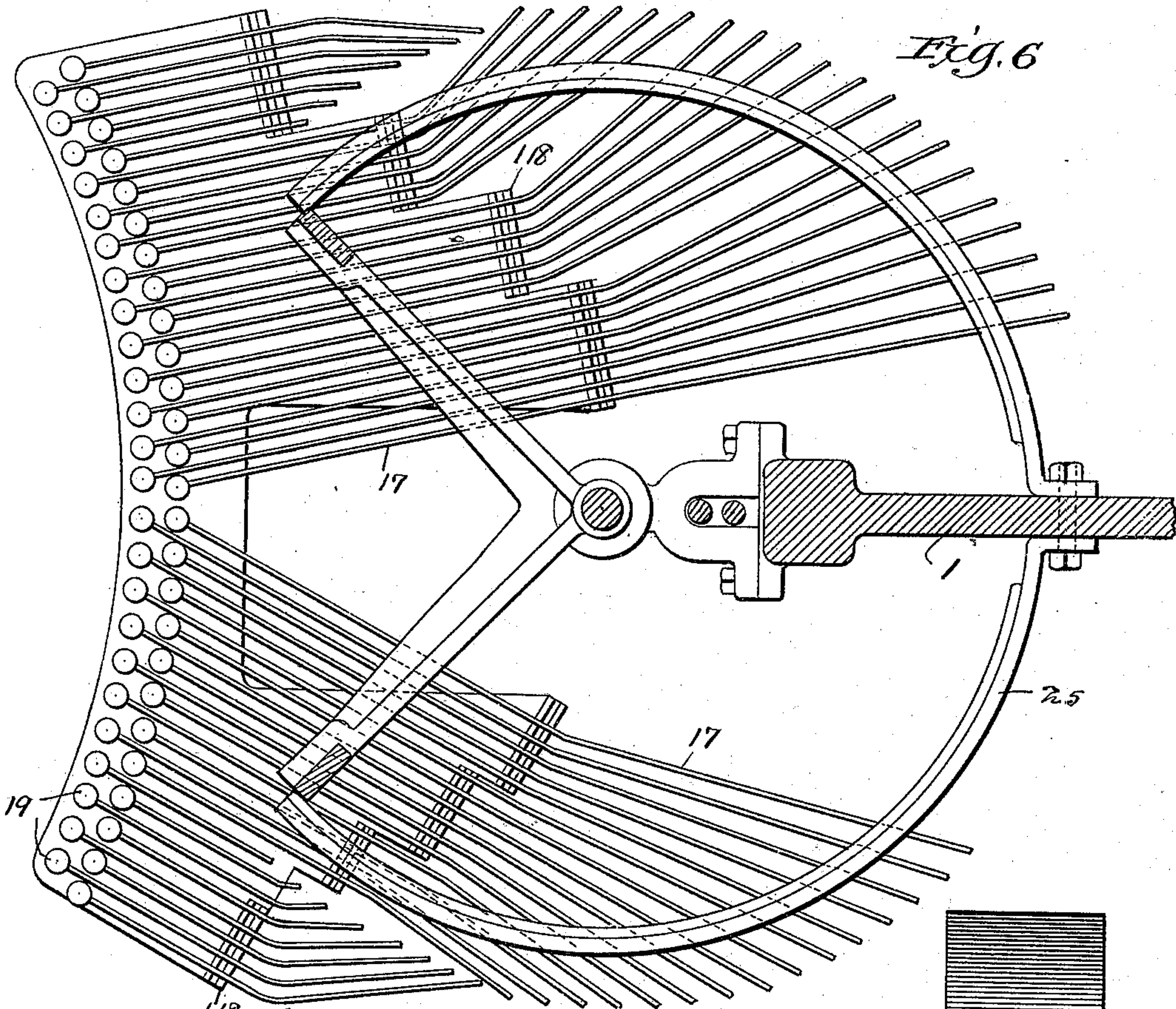
J. S. DUNCAN.

MACHINE FOR MAKING PRINTING PLATES.

(Application filed Jan. 23, 1899.)

(No Model.)

7 Sheets—Sheet 5.



Witnesses
H. B. Barlett
Wm. M. Rheem.

Inventor
Joseph S. Duncan
By, Wm. O. Bell, Atty.

No. 638,176.

Patented Nov. 28, 1899.

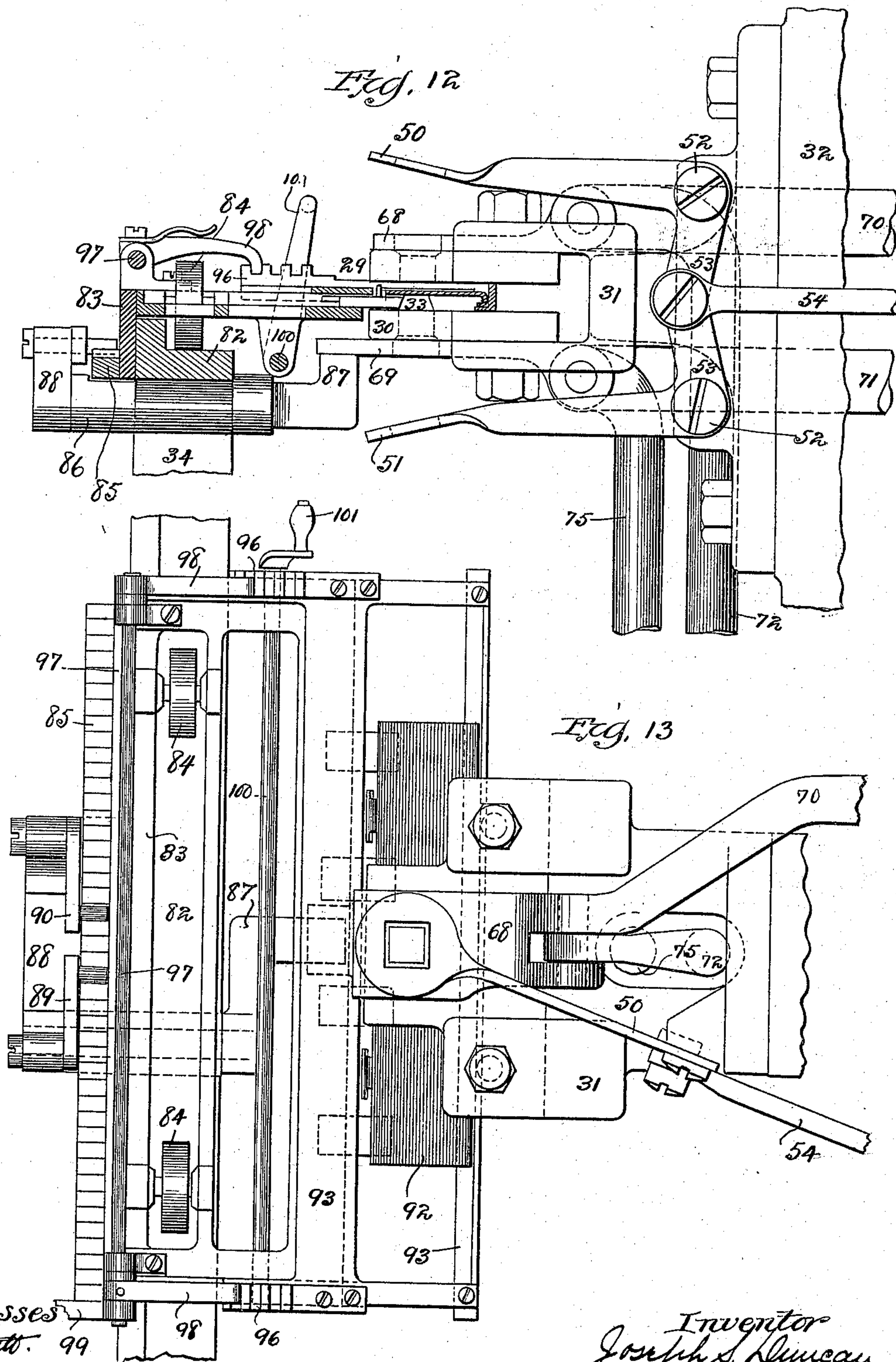
J. S. DUNCAN.

MACHINE FOR MAKING PRINTING PLATES.

(Application filed Jan. 23, 1899.)

(No Model.)

7 Sheets—Sheet 6.



No. 638,176.

Patented Nov. 28, 1899.

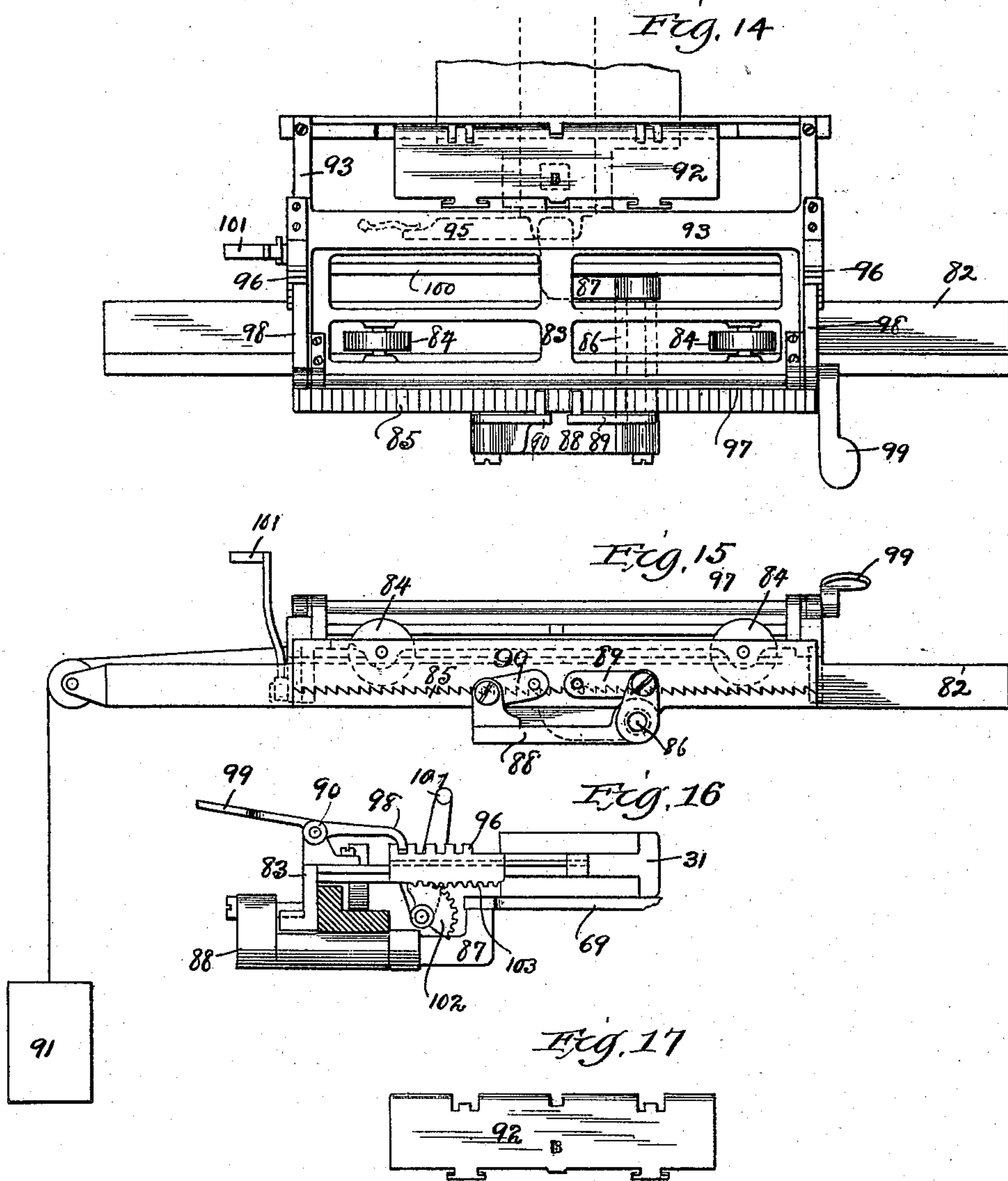
J. S. DUNCAN.

MACHINE FOR MAKING PRINTING PLATES.

(Application filed Jan. 23, 1899.)

(No Model.)

7 Sheets—Sheet 7.



Witnesses
H. B. Bant
Wm. M. Rheem.

Inventor
Joseph S. Duncan
By Wm. O. Belt. Atty.

UNITED STATES PATENT OFFICE.

JOSEPH S. DUNCAN, OF CHICAGO, ILLINOIS.

MACHINE FOR MAKING PRINTING-PLATES.

SPECIFICATION forming part of Letters Patent No. 638,176, dated November 28, 1899.

Application filed January 23, 1899. Serial No. 703,114. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH S. DUNCAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Making Printing-Plates, of which the following is a specification.

My invention relates to certain new and useful improvements in machines for producing printing-plates which are used largely in suitable machines for addressing envelopes and for many other purposes. These plates are preferably made of metal, and one or more lines of type characters are impressed thereon in relief, from which the impression is made on the envelop, &c. Each plate generally contains a complete address, although this is not important as far as my invention is concerned, and it will be understood that the plates are not restricted to this particular use, nor is the machine confined to the production of printing-plates containing addresses only.

The prime object of this invention is to provide a machine for producing printing-plates which shall be positive in character and in the movement of its various operative parts, simple in construction, and adapted to be manipulated rapidly and with accuracy to produce a printing-plate having a superior printing-surface thereon.

Another object of the invention is to provide a machine of this character constructed in such a manner that the operator may employ both hands to manipulate the keys after the manner of an ordinary type-writer.

A further object is to provide for automatically applying the power and operating the machine immediately after the key is struck and for disengaging the impression devices from the plate after the impression is made, returning said devices to their normal positions and resetting the machine.

A further object is to provide a carriage for the plate which is automatically fed along to space the character-impressions properly on the plate and which can be moved to adjust the plate for two or more lines of impressions.

My invention has many other objects of equal importance in view, which I will fully

point out hereinafter in the detailed description of the machine and its various parts.

In the accompanying drawings, Figure 1 is a side view of my improved machine, showing all the parts in operative position with the exception of the carriage and the impression devices, which are omitted. Figs. 1^a and 1^b are enlarged top and side views, respectively, of the bent end of the trip-rod. Fig. 2 is a front view of the machine, with the impression devices and the carriage omitted. Fig. 3 is a plan view, partly in section, on the line 3 3 of Fig. 1. Fig. 4 is a sectional view showing the impression devices and the way in which they operate. Fig. 5 is a detail view of one pair of the impression devices. Fig. 6 is a top plan view of the keyboard on the line 6 6 of Fig. 1. Fig. 7 is a top plan view looking down on the main shaft and its various parts. Figs. 8 and 9 are detail views taken on the lines 8 8 and 9 9 of Fig. 7. Fig. 10 is a similar view on the line 10 10 of Fig. 7. Fig. 11 is a sectional view showing the clutch-bolt and the collar fixed on the main shaft. Fig. 12 is an enlarged view, in side elevation, showing the carriage, the guide, throw-out arms, tripper, and their connections, the carriage being partly in section. Fig. 13 is a top plan view of the parts shown in Fig. 12. Fig. 14 is a top plan view of the carriage. Fig. 15 is a side elevation of the carriage. Fig. 16 is an end elevation of the carriage, the track being shown in section. Fig. 17 is a view of the printing-plate.

Referring to the drawings, in which like numerals of reference denote corresponding parts in all of the figures, the frame 1 of the machine may be of any desired form, and the power-shaft 2, carrying the belt-wheel 3, is journaled in suitable bearings 4 on said frame. This shaft carries the actuating-cams, which will be described in connection with the different groups of devices and mechanisms.

I employ a double set of type-bars arranged one above the other, with the bars in each set normally pointing in opposite directions. The lower type-bars 5 carry the punches 6, and the upper type-bars 7 carry the dies 8, and I will therefore call them the "punch" and "die" bars hereinafter. The punch-bars are

pivotally mounted on a circular rack 9, secured to the frame, and the die-bars are similarly mounted on a corresponding rack 10, located above the other rack, the two racks constituting together the support for the impression devices. In the preferred construction illustrated in the drawings, Figs. 4 and 5, each punch-bar is pivoted to a bracket 11, fastened to the rack 9, and, correspondingly, each die-bar is pivoted on a bracket 12, fastened on the rack 10, this arrangement being desirable for the purpose hereinafter described. Each punch-bar is provided with a projecting heel 13 at its pivot, and each die-bar is extended beyond its pivot, and a link 14 connects the heel 13 to the end 15 of the die-bar. A rod 16 connects the heel of each punch-bar with the rear end of a key-bar 17, and the construction is such that when a key is struck the rear end of the key-bar will be elevated to raise the connecting-rod and cause the punch and die bars having the character corresponding to that on the key to swing on their pivots and bring the punch and die carried on their ends into operative position on opposite sides of the plate. This is the preferred manner of constructing and operating the impression devices; but I am aware that variations in the details may be made which would not depart from the broad scope of the invention, and without stopping to describe the different modifications that could be made I hereby reserve the right to make all such changes in the impression devices, as well as all the other devices and mechanisms of the machine, which properly can be construed to come within the scope and spirit of the invention.

The machine can be built to provide for any desired number of characters, and for every character there will be a key and key-bar, a connecting-rod, a punch-bar and punch, and a die-bar and die. The key-bars 17 are all arranged on a table 18, supported on the frame in a convenient position at the front of the machine, so that the operator may sit comfortably and manipulate the keys with either hand or both. Each key-bar is pivotally supported on a key-rack 118 on the table, and owing to the disposition of the punch and die bars around a circular support and the number of key-bars required I have found it desirable to provide a number of the key-racks 118, as shown in Fig. 6, each of which forms the pivot or fulcrum for certain key-bars. The disposition of the key-racks and the number of key-bars each accommodates, as well as the character of the key-bars, will depend entirely upon the size and character of the machine and the variety of keys provided, and will consequently vary in different machines to secure the best results. A key 19 is arranged on the end of each key-bar, and I prefer, as far as possible, to preserve the general characteristics of the universal keyboard commonly employed on typewriters for convenience.

The punches and dies are made out of steel, and each is mounted in the following manner: A holder 20, Fig. 5, consisting of a split sleeve, is pivotally secured to the end of the bar 4 or 7, and suitable stops 21 are provided to limit the swinging movement of the holder when the bar is operated. The punch or die is provided with a shoulder to rest against the holder and is held in the holder by tightening-screws 22. For the purpose of securing a proper adjustment of the punches and dies I provide each holder with an adjusting-screw 23, having a suitable head. When the punch and die bars are in their normal upright position, the headed ends 24 of the adjusting-screws engage the circular rests 25 26, which are faced with leather or other soft material to relieve the shock consequent upon the screws striking the rests.

The connection of the punch-bars with the die-bars is such that it requires but a very light stroke on the key to cause the punch and die bars to swing toward each other and bring the punch and die into operative position. To facilitate the return of these bars to their normal position, a coiled spring 27 is preferably connected to the die-bar and to the support, and when the punch and die are separated, as hereinafter described, the spring will return them to their position against the rests.

The punch and die in operation enter the openings 28 in a guide comprising the upper and lower jaws 29 30, respectively, which are carried by a bracket 31, secured on the standard 32 of the frame. The lower jaw 30 is provided with two parallel ribs 33, extending throughout its length to form a support for the plate along the line of type-impressions therein.

The carriage which carries the plate is supported on the bracket 34 and projects sufficiently between the jaws of the holder to bring the plate into proper position between the jaws and the punch and die operating through openings therein.

When the key has been depressed and the corresponding punch and die have approached each other and fit in the openings in the jaws of the guide, they are struck by the upper and lower plungers 35 36, which are automatically operated from the main or power-shaft. The upper plunger 35 is mounted in brackets 37 on the frame, and it is connected by one of the toggle-arms 38 with a link 39 on the bell-crank 40. The other arm of this bell-crank is connected to a rod 41, guided in the bracket 42 on the frame and carrying at its lower end a forked arm 43, projecting horizontally and embracing the actuating-cam 44 on the power-shaft. The lower plunger is connected by one of the toggle-arms 45 to a link 46, pivoted to a wrist-pin 47 on the cam-disk 48, secured on the end of the main or power shaft. The plunger-actuating cams 44 48 are constructed and timed so that the plungers will approach each other

and make the desired impression at the proper time. The plungers engage the headed ends of the adjusting-screws 23, and for this purpose I prefer to have the headed ends of conical shape to fit in the corresponding recesses 49 in the ends of the plungers.

To throw the machine into operation, I provide a tripper adapted to be operated by the punch and die, and comprising two fingers 50 51 in the form of bell-cranks arranged, respectively, above and below the punch and die guide, and provided with corresponding openings therein. These fingers are pivoted at 52 to the frame, and the ends of their short members 53 are pivoted together and to the trip-rod 54, Figs. 1 and 12. The other end of the trip-rod is bent in the form of a hook 55 and supported by a hanging link 56 on the frame. The end of this hook rests upon the upper end of a clutch-rod 57, operating in brackets 58 on the frame.

The lower end of the clutch-rod carries a shoe 59, beveled off at its end and operating in a grooved collar 60, fastened on the main shaft, Fig. 1, and constituting, in effect, one member of the clutch. A clutch-bolt 61 is arranged to operate horizontally through the grooved collar and is adapted to be projected forward by the coiled spring 62 into engagement with one of the studs 63 on the belt-pulley to effect the application of power to the main shaft. The clutch-bolt is provided with a recess 64 where it operates through the groove 65 of the collar to receive the shoe 59. The shoe normally engages the clutch-bolt to hold it away from the studs 63; but when the trip is actuated the hooked end of the trip-rod is moved to free it from engagement with the clutch-rod, and the spring 66 thereon raises the rod and releases the shoe from engagement with the clutch-bolt, and the spring 62 thereupon forces the latter forward to engage a stud 63. The parts remain in this position during almost a complete revolution of the belt-wheel, which is sufficient to effect the operation of all the different mechanisms and devices, and then the plate 67 on the collar comes around into engagement with the shoe and forces it down into the groove where it enters the recess in the clutch-bolt, and by the time the revolution of the belt-wheel and its connected parts is complete the shoe has withdrawn the bolt from the stud and the machine is again at rest and in its normal position.

To disengage the punch and die from the plate, where they are apt to stick after the impression has been effected, I provide two throw-out arms 68 69, Fig. 12, which are located between the jaws of the support and the fingers of the guide. These arms are carried on the levers 70 71, pivoted back on the frame, so that when they are operated to disengage the punch and die they will also assist in giving sufficient momentum to the punch and die bars to return them to their normal position against the rests, although I do not

depend upon the arms to do this. The upper throw-out arm is connected to a throw-out rod 72, and this rod carries an arm 73, which engages the cam 74 on the main shaft. The lower throw-out arm is connected to a throw-out rod 75, which also carries an arm 76, arranged in engagement with a cam 77. These cams 74 and 77 are so timed that they will operate to actuate the throw-out arms after the impression has been made on the plate, and these arms will swing apart and disengage the punch and die from the plate, at the same time opening the tripper-fingers. The punch and die holders 20 are provided with shoulders 78 to engage the tripper-fingers, so that the holders will not enter the openings in the fingers and guide with the punch and die. The throw-out arms are returned to their normal upright position, as shown in Fig. 1, by a spring 79 on the rod 72, this spring operating against a pin 80 on said rod and against a collar 81 on the rod 75.

The carriage travels on a track 82, arranged on the support 34, and the construction of this carriage may be varied greatly without in any way affecting the other parts of the machine. It is desirable, however, that the carriage should have an automatic step-by-step movement to space the character-impressions properly on the plate, and also a line-adjusting movement to provide for moving the plate to accommodate two or more lines of impressions.

I have shown in the drawings a carriage which meets all the requirements of the invention, and it is constructed as follows: A frame 83 is supported on the rollers 84, which travel on the track 82, and this frame carries a rack-bar 85 and a rock-shaft 86. One end of the rock-shaft is bent to form a crank 87, which is located beneath the end of the lower throw-out arm 69 and adapted to be engaged thereby to rock the shaft. The other end of the rock-shaft carries a rigid angle-arm 88, Fig. 15, on which the feed-dog 89 and the locking-dog 90 are pivotally mounted. These dogs engage the teeth of the rack-bar, and when the shaft 86 is rocked the angle-arm 88 will swing upward and the feed-dog 89 will move the rack and carriage-frame along the distance of one tooth, and the locking-dog will prevent the frame from moving a greater distance. A weight 91 is connected to the carriage-frame to exert a pull and tension in the direction opposite to its line of feed; but a spring or equivalent device may be substituted for the weight. By this means the carriage will be moved along the distance of one tooth on the rack-bar at each operation of the machine, and this will carry the plate one type-space, so that the impressions in the plate will be properly and evenly and regularly spaced.

The plate 92 is carried on a plate-frame 93, which slides in grooves 94 on the carriage-frame, and to hold the plate rigidly in said frame I provide a spring-actuated holding-

arm 95, Fig. 14. This plate-frame is adapted to be moved back and forth in the carriage-frame to space the lines on the plate, and to accomplish this movement I provide one or
 5 two racks 96 on the sides of the plate-frame. A rock-shaft 97 is mounted on the carriage-frame, and it is provided with the spring-controlled holding-pawls 98, which project forward and engage the racks. This shaft is
 10 operated from an arm 99, and when this arm is depressed the shaft 97 is rocked and the pawls 98 lifted from the racks, so that the plate-frame can be moved forward or backward, as desired.

15 The plate-frame is shifted by means of a shifting rock-shaft 100, operated by a shifting-lever 101. This shaft is provided at one or both ends with a segment 102, which meshes with a rack 103 on the under side of the plate-frame, Fig. 16, and when the plate-frame is
 20 unlocked by lifting the pawls 98 the lever 101 can be operated to rock the shaft 100, and thereby shift the plate-frame any desired distance for another line of type-impressions.

25 The operation of the machine has been pretty fully described in the foregoing description. The machine being in its normal position at rest, one of the keys 19 is depressed, and this raises the rear end of the key-bar to
 30 actuate the punch and die bars corresponding to the key and cause the punch and die to swing toward each other and strike the tripper-fingers 50 51 and close them against the throw-out arms, which lie against the
 35 guide, as shown in Fig. 1. When the trip is tripped in this manner by the punch and die, which enter the openings in the guide, throw-out arms, and tripper-fingers, the trip-rod is moved rearward to disengage the hooked end
 40 thereof from the clutch-rod and permit the spring 66 to raise the clutch-rod and disengage the shoe 59 from the clutch-bolt. The spring 62 then forces the clutch-bolt into engagement with a stud 63, and this sets the
 45 machine in motion, rotating the main shaft and causing the cams 44 48 to actuate the plungers, which approach each other and strike the adjusting-screws 23 and effect the desired impression in the plate. The punch
 50 and die holders are pivotally mounted on the punch and die bars, so that they will enter the openings in the guide, tripper, and throw-out arms properly and adjust themselves therein without binding against the walls of
 55 the openings. The impression being made in the plate, the plungers are separated again, and the cams 74 77 operate to raise the rod 72 and lower the rod 75, thereby opening the throw-out arms. This opening of the throw-out
 60 arms also opens the tripper-fingers and also in a measure throws the punch and die back to their normal upright position adjacent to the rests. However, I employ the spring 27 to insure the return of the punch
 65 and die. The plate 67 on the collar engages the shoe at the proper time and forces it down into the groove 65, where it enters the recess

in the clutch-bolt and withdraws that bolt from the stud 63, causing the machine to
 come to rest. At the same time the tripper 70 is operated to draw the hooked end of the trip-rod into position over the clutch-rod again to bear thereon and hold the rod down in its normal position and the shoe in the groove. When the throw-out arms are opened, 75 the lower arm 69 engages the crank 87 and rocks the shaft 86, which swings the angle-arm 88. This causes the feed-dog 89 to draw the carriage-frame along one tooth, the locking-dog sliding over the next tooth to the one 80 it had been engaging and coming into engagement with that tooth to lock the frame in place and the plate in position for another impression. When one line has been printed
 85 on the plate, the arm 99 may be depressed to release the pawls 98 from the racks 96 and the lever 101 operated to shift the plate-frame to carry the plate into position for another line of impressions.

The type characters may be of any desired 90 style or kind, and any number may be employed. I also employ a blank key for the purpose of making spaces between characters or words, and of course the punch and die may be omitted, as the operation of the 95 mechanisms is accomplished by the holder striking the tripper-fingers.

The plate-frame projects between the jaws of the guide, as heretofore stated, and the plate rests upon the ribs 33 on the lower jaw, 100 so that the shock and jar during the impression operation will not injure the mechanism of the carriage.

Having thus fully described my invention, what I claim, and desire to secure by Letters 105 Patent, is—

1. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of means adapted to be actuated by the impres- 110 sion devices for applying power to the mechanism and setting the machine in operation, substantially as described.

2. In a machine for producing printing-plates, the combination with devices for im- 115 pressing characters in an interposed plate, of vertically-alined plungers located within the circle of the impression devices when the latter are at rest, and means for actuating the plungers to engage the impression devices 120 after they are brought into operative position and effect the impression in the plate, substantially as described.

3. In a machine for producing printing-plates, the combination of a punch and die 125 each movable in the arc of a circle and adapted to be swung into operative position with relation to an interposed plate, plungers arranged above and below the plate, and means for actuating the plungers to engage the punch 130 and die and effect the impression in the plate, substantially as described.

4. In a machine for producing printing-plates, the combination of a punch-bar and a

die-bar pivotally mounted in the frame of the machine, a punch carried by the punch-bar and a die carried by the die-bar, and means connected with the bars for actuating them to swing the punch and die into operative position relative to an interposed plate, substantially as described.

5. In a machine for producing printing-plates, the combination of a series of keys, a corresponding series of character-impression devices connected directly with the keys and adapted to be actuated thereby to be carried into position for operating upon an interposed plate, and means adapted to be actuated by the impression devices to apply the power to the machine, substantially as described.

6. In a machine for producing printing-plates, the combination of a series of character-impression devices comprising dies and punches arranged in circular rows one above the other and in aligned pairs, a key device connected with each pair of dies and punches for bringing the same into operative position relative to a plate, and means adapted to be actuated by the impression devices to apply the power to the machine, substantially as described.

7. In a machine for producing printing-plates, the combination with a punch-bar and a die-bar pivotally mounted in the frame of the machine, of a punch carried by the punch-bar, a die carried by the die-bar, means connected with the bars for operating them to bring the punch and die into operative position relative to an interposed plate, and plungers adapted to be operated to engage the punch and die and effect the impression in the plate, substantially as described.

8. In a machine for producing printing-plates, the combination with a support, of a number of punch and die bars pivotally mounted on the support and carrying punches and dies, said punch and die bars being connected together in pairs, means for swinging said bars on their pivots to bring a punch and die into operative relation with an interposed plate and devices normally parallel with said bars to operate upon the punch and die when the latter have been swung into operative position, substantially as described.

9. In a machine for producing printing-plates, the combination with a support, of a number of punch-bars pivoted thereon, a corresponding number of die-bars pivoted on the support opposite to the punch-bars, links connecting said punch and die bars in pairs, punches and dies carried by said bars, and means for swinging said bars on their pivots to bring a punch and die into operative relation with an interposed plate, substantially as described.

10. In a machine for producing printing-plates, the combination with a set of punch-bars carrying punches and a set of die-bars carrying dies, said punch and die bars being pivotally mounted on the frame of the machine and extending in opposite directions,

of means connected with the pivoted ends of one set of said bars for swinging any pair of punch and die bars on their pivots simultaneously to bring the punch and die into operative position relative to an interposed plate, substantially as described.

11. In a machine for producing printing-plates, the combination with a circular support, comprising a pair of parallel circular racks, of a set of punch-bars pivoted on one of said racks and extending in one direction, a set of die-bars pivoted on the other rack and extending in the opposite direction, punches and dies carried by said bars, and means connected with the pivoted ends of said punches and dies for swinging the bars into operative position relative to an interposed plate, substantially as described.

12. In a machine for producing printing-plates, the combination with a circular support, comprising a pair of circular racks, of a set of punch-bars pivoted on one rack of the support and extending in one direction, a set of die-bars pivoted on the other rack of the support and extending in the opposite direction, punches and dies carried by said bars, a connection between the pivoted ends of each pair of punch and die bars, and means connected therewith for swinging the pair of bars on their pivots to bring the punch and die into operative relation with an interposed plate centrally located relative to the punches and dies, substantially as described.

13. In a machine for producing printing-plates, the combination of punch and die devices for impressing characters in an interposed plate, said devices being arranged in circular series one above the other, a carriage carrying the plate and located centrally of the impression devices and between the two series thereof, and means for swinging the impression devices into operative position relative to the plate, substantially as described.

14. In a machine for producing printing-plates, the combination of punch and die devices for impressing characters in an interposed plate, said devices being arranged in circular series one above the other, a carriage carrying the plate and located centrally of the impression devices and between the two series thereof, and means for moving said carriage after each impression on the plate, substantially as described.

15. In a machine for producing printing-plates, the combination of punch and die devices for impressing characters in an interposed plate, said devices being arranged in circular series one above the other, a carriage carrying the plate and located centrally of the impression devices and between the two series thereof, means for swinging the impression devices into operative position relative to the plate, and means for moving said carriage after each impression in the plate, substantially as described.

16. In a machine for producing printing-plates, the combination of punch and die de-

vices for impressing characters in an interposed plate, said devices being arranged in circular series one above the other, a carriage carrying the plate and located centrally of the impression devices and between the two series thereof, and means for moving said plate forward or backward on the carriage substantially as described.

17. In a machine for producing printing-plates, the combination of punch and die devices for impressing characters in the plate, said devices being arranged in circular series one above the other, a carriage located centrally of the impressing devices and between the two series thereof and carrying the plate, means for swinging the impression devices into operative relation to the plate, and means for moving the plate forward or backward on the carriage, substantially as described.

18. In a machine for producing printing-plates, the combination of punch and die devices for impressing characters in an interposed plate, said devices being arranged in circular series one above the other, a carriage located centrally of the impressing devices and between the two series thereof and carrying the plate, means for moving said carriage after each impression in the plate, and means for moving said plate forward or backward on the carriage, substantially as described.

19. In a machine for producing printing-plates, the combination of punch and die devices for impressing characters in an interposed plate, said devices being arranged in circular series one above the other, a carriage located centrally of the impression devices and between the two series thereof and carrying the plate, means for swinging the impression devices on their pivots into operative relation to the plate, means for moving said carriage after each impression, and means for moving the plate forward or backward on the carriage, substantially as described.

20. In a machine for producing printing-plates, the combination with a circular support, of a number of punch and die bars pivotally mounted on the support, said bars being connected together and carrying punches and dies, a carriage located centrally of said support and between the punches and the dies and carrying the plate, and means for swinging said bars on their pivots to bring the punch and die into operative position on opposite sides of the plate, substantially as described.

21. In a machine for producing printing-plates, the combination with a circular support, of a carriage located centrally of the support and carrying the plate, a number of punch and die bars pivotally mounted on the support and extending in opposite directions, said bars carrying punches and dies on their outer ends, arranged in series above and below the carriage, and having their pivoted ends connected together, and means for swinging the bars on their pivots to bring

the punch and die into operative relation with the plate, substantially as described.

22. In a machine for producing printing-plates, the combination with a circular support, of a number of punch-bars carrying punches pivotally mounted on said support and extending in one direction, a number of die-bars carrying dies pivoted on the support and extending in the opposite direction, a connection between the pivoted ends of each pair of punch and die bars, a carriage located centrally of the bars and between the punches and dies and carrying the plate, and means for swinging the bars on their pivots to bring them into operative relation with the plate, substantially as described.

23. In a machine for producing printing-plates, the combination with a circular support, of a number of punch and die bars carrying punches and dies pivotally mounted on the support and extending in opposite directions, a connection between the pivoted ends of each pair of punch and die bars, a carriage located centrally of the bars and between the punches and dies and carrying the plate, a series of keys, and a connection between each key and its corresponding pair of bars whereby any pair of punches and dies may be swung into operative relation with the plate by striking the proper key, substantially as described.

24. In a machine for producing printing-plates, the combination of a carriage carrying the plate to be operated upon, a circular support arranged around the carriage, impression devices mounted on said support and comprising a series of bars pivoted on the support and extending downward and carrying punches below the carriage, a corresponding series of bars pivoted to the support and extending upward and carrying dies above the carriage, and a series of key devices connected with each pair of impression devices for swinging the bars into horizontal position to bring the punch and die into operative relation to the plate, substantially as described.

25. In a machine for producing printing-plates, the combination of devices for impressing characters in an interposed plate, said devices being arranged in circular form, and normally extending in opposite directions, a carriage carrying the plate and located centrally of the impression devices, means for swinging the impression devices inward in pairs to a common center into operative relation to the plate, and plungers adapted to be operated to engage the impression devices to effect the impression in the plate, substantially as described.

26. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of a tripper adapted to be operated by the impression devices for applying the power to the machine, substantially as described.

27. In a machine for producing printing-

plates, the combination with devices for impressing characters in an interposed plate, of a main shaft, a clutch device on said shaft, a tripper adapted to be operated by the impression devices, and a connection between the tripper and said clutch device whereby the tripper throws and opens the clutch, substantially as described.

28. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of a tripper adapted to be operated by the impression devices, and means for returning the tripper to its normal position, substantially as described.

29. In a machine for producing printing-plates, the combination with a series of swinging impression devices, of a tripper for throwing the actuating mechanism of the machine into operation arranged in the path of movement of the impression devices, substantially as described.

30. In a machine for producing printing-plates, the combination with a series of swinging impression devices adapted to be brought into operative relation with an interposed plate, of a tripper arranged between the plate and said impression devices and adapted to be operated by said impression devices, substantially as described.

31. In a machine for producing printing-plates, the combination with a series of swinging impression devices arranged in circular form and adapted to be brought into operative relation with an interposed plate, of a tripper located centrally of the impression devices and adapted to be operated thereby, substantially as described.

32. In a machine for producing printing-plates, the combination with a series of impression devices, of a tripper comprising two fingers located on opposite sides of the plate and adapted to be operated by the impression devices, substantially as described.

33. In a machine for producing printing-plates, the combination with swinging impression devices, of a pivoted tripper adapted to be actuated by said impression devices, a main shaft, a clutch device on said shaft, and a connection between said tripper and the clutch device whereby the clutch is thrown when the tripper is actuated, substantially as described.

34. In a machine for producing printing-plates, the combination with swinging impression devices, of a tripper adapted to be actuated by said impression devices, a main shaft, a clutch device on said shaft, a clutch-rod adapted to operate the clutch, and a trip-rod connected with the tripper and adapted to actuate the clutch-rod, substantially as described.

35. In a machine for producing printing-plates, the combination with swinging impression devices, of a tripper adapted to be actuated by said impression devices, a main shaft, a clutch device on said shaft, a clutch-

bolt, a clutch-rod carrying a shoe to operate said bolt, and a trip-rod adapted to be actuated by the tripper to operate said clutch-rod and throw the clutch, substantially as described.

36. In a machine for producing printing-plates, the combination with impression devices, of a tripper adapted to be operated by said impression devices, a main shaft, a clutch device on said shaft, a clutch-bolt, a clutch-rod, a shoe carried by the clutch-rod, a trip-rod connected with the tripper and provided with a hooked end normally engaging the clutch-rod and holding said rod down and the shoe in engagement with the clutch-bolt to keep the clutch open, substantially as described.

37. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of a main shaft, a clutch device on said shaft, one member of said device being a grooved collar fixed to the shaft, a spring-controlled clutch-bolt operating through said collar, a shoe device normally engaging said bolt to hold the clutch open, and means for operating said shoe device adapted to be actuated by the impression devices, substantially as described.

38. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of a main shaft, a clutch device on said shaft, one member of said device being a grooved collar fixed to the shaft, a spring-controlled clutch-bolt operating through said collar, a shoe device normally engaging said bolt to hold the clutch open, a tripper adapted to be actuated by the impression devices, and a connection between said tripper and the shoe device, substantially as described.

39. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of a main shaft, a clutch device on said shaft, one member of said device being a grooved collar fixed to the shaft, a spring-controlled clutch-bolt operating through said collar, a shoe device normally engaging said bolt to hold the clutch open, a tripper adapted to be actuated by the impression devices, a clutch-rod carrying the shoe device and normally holding the same in engagement with the clutch-bolt, and a spring on the clutch-rod for raising said rod and releasing the clutch-bolt when the tripper is actuated, substantially as described.

40. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of a guide for said devices, constructed to receive the plate during the impressing operations, substantially as described.

41. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of a bifurcated guide for said devices located

centrally of the devices and adjacent to the plate, substantially as described.

42. In a machine for producing printing-plates, the combination with devices for impressing characters in an interposed plate, of a guide for the devices comprising two jaws adapted to receive the plate between them and provided with openings for the impression devices, substantially as described.

43. In a machine for producing printing-plates, the combination with devices for impressing characters in the plate, of a guide for said devices comprising two jaws adapted to receive the plate between them and provided with openings for the impression devices, the lower jaw having ribs on its upper face to form a rest for the plate, substantially as described.

44. In a machine for producing printing-plates, the combination with devices for impressing characters in the plate, of a guide for said devices comprising two jaws, the lower jaw having a rest for the plate, substantially as described.

45. In a machine for producing printing-plates, the combination with devices for impressing characters in the plate, of a bifurcated guide for the impression devices provided with a rest on the upper face of the lower member thereof to receive the plate, substantially as described.

46. In a machine for producing printing-plates, the combination with devices for impressing characters in the plate, of means located adjacent to the plate and centrally of the impression devices for disengaging said devices from the plate after the impression is made, substantially as described.

47. In a machine for producing printing-plates, the combination with a series of oppositely-disposed swinging punches and dies, each pair of said punches and dies being adapted to be brought into operative relation with an interposed plate located centrally of the punches and dies, and means for disengaging the punches and dies from the plate arranged between the plate and the punches and dies, substantially as described.

48. In a machine for producing printing-plates, the combination with devices for impressing characters in the plate, of a guide for said devices, arms located on opposite sides of the guide and means for operating said arms to disengage the impression devices from the plate after the impression is made, substantially as described.

49. In a machine for producing printing-plates, the combination with devices for impressing characters in a plate, of a guide, arms pivoted on the frame of the machine, a main shaft, and cam devices on the main shaft for operating said arms to disengage the impression devices from the plate after the impression is made, substantially as described.

50. In a machine for producing printing-plates, the combination with devices for impressing characters in a plate, of a guide, arms

pivoted on the frame of the machine, a main shaft, cam devices on said shaft, rods connected to said arms and adapted to be operated by said cam devices to operate the arms, substantially as described.

51. In a machine for producing printing-plates, the combination with a series of swinging impression devices, of means operating upon the impression devices to disengage the same from the plate after each impression is made, substantially as described.

52. In a machine for producing printing-plates, the combination with a circular series of impression devices, of a carriage located centrally of said devices, means for feeding said carriage after each impression is made, and throw-out devices for disengaging the impression devices from the plates and actuating the feeding means of the carriage, substantially as described.

53. In a machine for producing printing-plates, the combination with a circular series of impression devices traveling to a common center, of a carriage located centrally of said device and comprising a carriage-frame, a plate-frame on the carriage-frame, means for automatically feeding the carriage-frame, after each impression, in one direction, so that the type-space adjacent to the last impression will be adjusted centrally of the impression devices, and means for adjusting the plate-frame in a horizontal direction at an angle to the movement of the carriage-frame, substantially as described.

54. In a machine for producing printing-plates, the combination with devices for impressing characters in the plate, of a tripper adapted to be operated by said devices, to set the machine in action, and means for returning the tripper to its normal position, substantially as described.

55. In a machine for producing printing-plates, the combination with devices for impressing characters in a plate, of a tripper adapted to be operated by said impression devices, and arms adapted to be operated to disengage the impression devices from the plate and return the tripper to its normal position, substantially as described.

56. In a machine for producing printing-plates, the combination with devices for impressing characters in a plate, of a guide for said impression devices, a tripper, a throw-out device located between the guide and the tripper for disengaging the impression devices from the plate and returning the tripper to its normal position, and means for actuating said throw-out arms after each impression is made, substantially as described.

57. In a machine for producing printing-plates, the combination with devices for impressing characters in a plate, of a plate-carriage, means for disengaging the impression devices from the plate after each impression and a device automatically operated by the disengaging means to cause the carriage to move a step and bring the plate in position

for another character, substantially as described.

58. In a machine for producing printing-plates, the combination with devices for impressing characters in a plate, of a plate-carriage, a throw-out device to disengage the impression devices from the plate, said throw-out device being arranged to engage the carriage and cause the same to move a step after each impression is made, substantially as described.

59. In a machine for producing printing-plates the combination with a circular series of impression devices traveling to a common center, a carriage located centrally of said devices and comprising a carriage-frame and a plate-frame secured on the carriage-frame and adapted to be moved forwardly and horizontally to bring the plate into position centrally of the impression devices for receiving impressions on different lines, substantially as described.

60. In a machine for producing printing-plates, the combination of a holder comprising a split sleeve, an impression device in one end of said sleeve and an adjusting-screw in the other end, and means for securing the impression device and screw in the sleeve, substantially as described.

61. In a machine for producing printing-plates, the combination of a series of swinging punches and dies arranged in circular rows of coacting pairs, the members of each pair being independently movable toward and from each other, means for operating said dies and punches, and means for adjusting a plate in position centrally of the punches and dies, to receive a number of successive impressions properly spaced and alined, substantially as described.

62. In a machine for producing printing-plates, the combination of a series of swinging punches and dies arranged in circular form in rows of coacting pairs with the acting faces of the pairs normally separated, of a plate-carrier adapted to support the plate centrally of the punches and dies and in position to be acted upon thereby, and means for feeding said plate to receive a number of successive impressions properly spaced and alined, substantially as described.

63. In a machine for producing printing-plates, the combination with a tripper device and means connected therewith for throwing the machine into operation, of impression devices mounted to travel in the arc of a circle and adapted to engage and operate said tripper, substantially as described.

64. In a machine for producing printing-plates, the combination with a carriage carrying a plate, of a series of circularly-disposed impression devices around the carriage, all of said impression devices being mounted to swing inwardly to a common center, and a tripper device located between the plate and the impression devices and adapted to be engaged by the latter when thrown into position

for operation upon the plate, substantially as described.

65. In a machine for producing printing-plates, the combination with a carriage carrying a plate, of a circular support around the carriage, two series of arms pivotally mounted on said support and extending in opposite directions and carrying punches and dies respectively, said punch and die arms being connected together for simultaneous operation in pairs, and a tripper device adapted to be operated by any pair of said arms on their travel into position for effecting an impression in the plate, substantially as described.

66. In a machine for producing printing-plates, the combination of a series of circularly-disposed punches and dies mounted to travel in pairs in arcs of a circle to a common center, a carriage carrying a plate, and devices for disengaging the punch and die from the plate and returning them to their normal position after each impression in the plate, substantially as described.

67. In a machine for producing printing-plates, the combination with a carriage carrying a plate, of a series of circularly-disposed impression devices adapted to be operated in pairs to act on the plate, a tripper device arranged in the path of the impression devices and operated thereby, and plungers above and below the tripper to operate upon the impression devices after a pair thereof have been brought into position for operation on the plate, substantially as described.

68. In a machine for producing printing-plates, the combination with a carriage carrying a plate, of a series of circularly-disposed impression devices adapted to be operated in pairs to act on the plate, a tripper device arranged in the path of the impression devices to be engaged by each member of the pair of impression devices, plungers above and below the tripper to operate upon the impression devices to effect an impression in the plate, and devices for opening the tripper and disengaging the impression devices from the plate, substantially as described.

69. In a machine for producing printing-plates, the combination with a series of impression devices, of a carriage carrying a plate, means for disengaging the impression devices from the plate after each impression, a rack and a feed-dog engaging the rack and operated by said disengaging means to feed the carriage after each impression, substantially as described.

70. In a machine for producing printing-plates, the combination with a series of impression devices, of a carriage carrying a plate, means for disengaging the impression devices from the plate after each impression, a rack, a feed-dog and a locking-dog engaging the rack, and means operated by said disengaging means for operating the dogs after each impression to feed and lock the carriage, substantially as described.

71. In a machine for producing printing-plates, the combination with a double series of supporting devices pivotally mounted and extending in opposite directions, one series
5 of said devices carrying punches and the other series carrying dies, a carriage carrying the plate located centrally of the punch and die supporting devices and in substantially the same plane with the pivots of said devices,

and means for actuating said punches and dies in pairs to swing inwardly to a common center on opposite sides of said plate and in alinement with each other, substantially as described.

JOSEPH S. DUNCAN.

Witnesses:

WM. O. BELT,
C. L. WOOD.