Jan. 23, 1951 F. SPENCE 2,538,922

MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Filed May 19, 1945 8 Sheets-Sheet 1

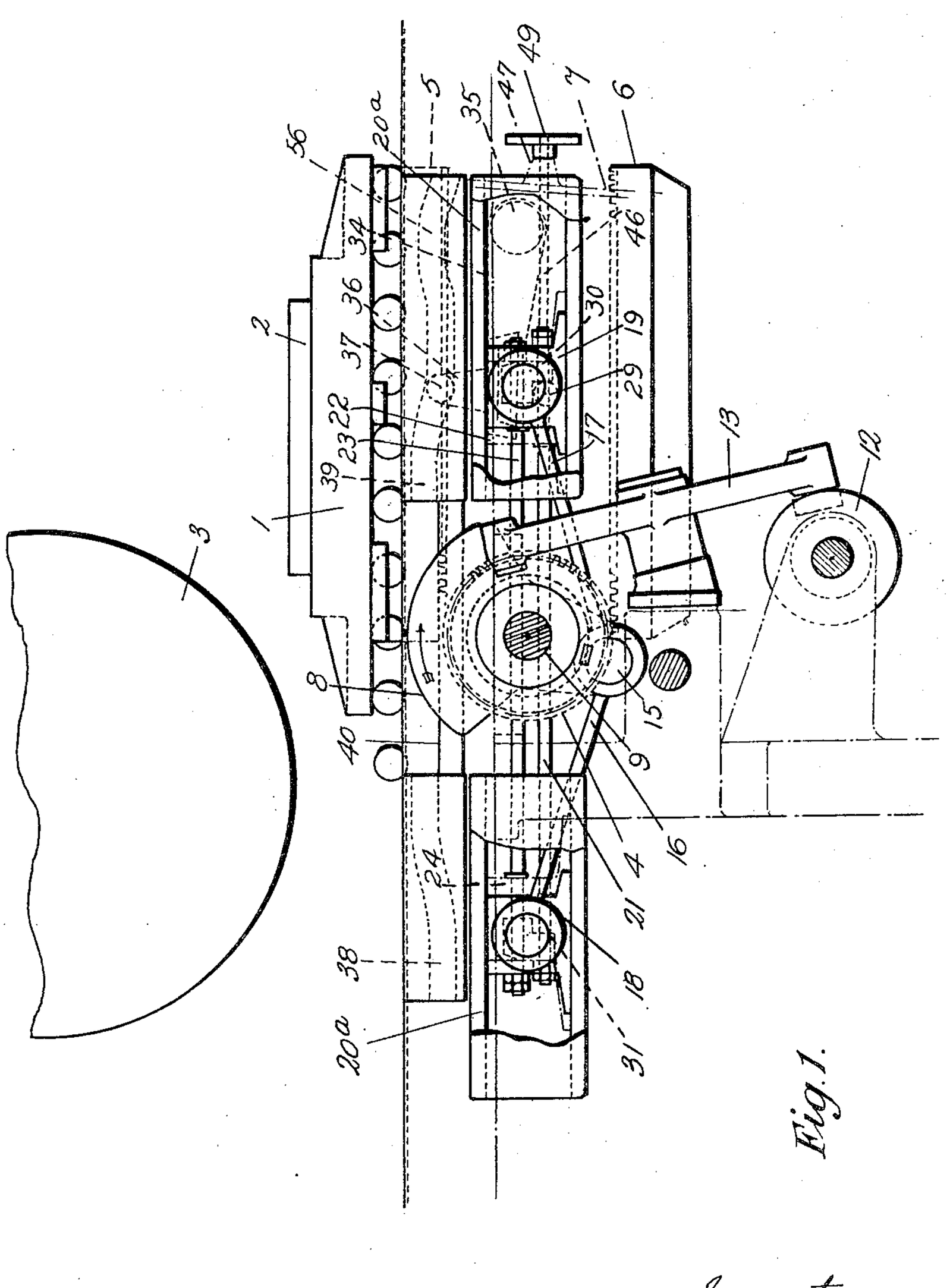

Fig. 1.

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MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Filed May 19, 1945 8 Sheets-Sheet 2

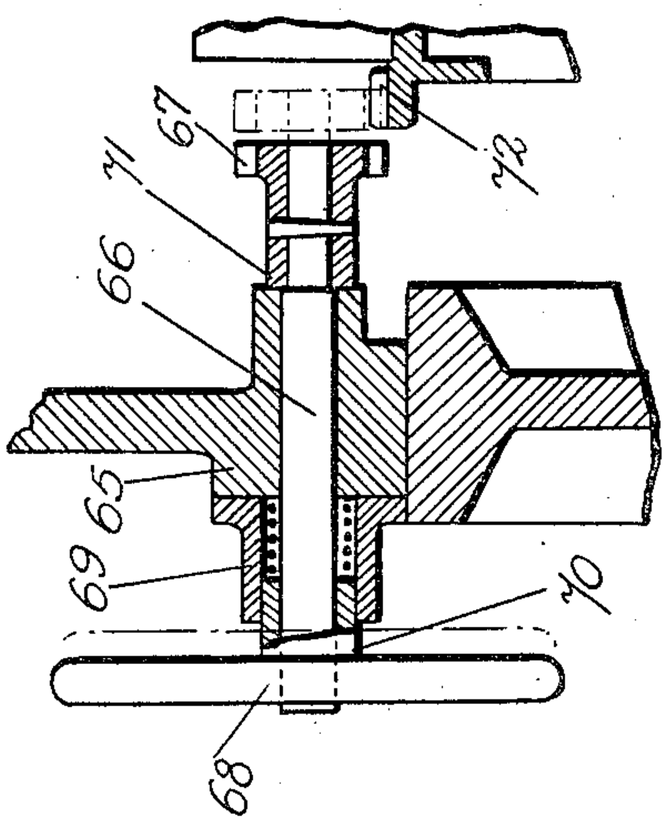

Fig. 18.

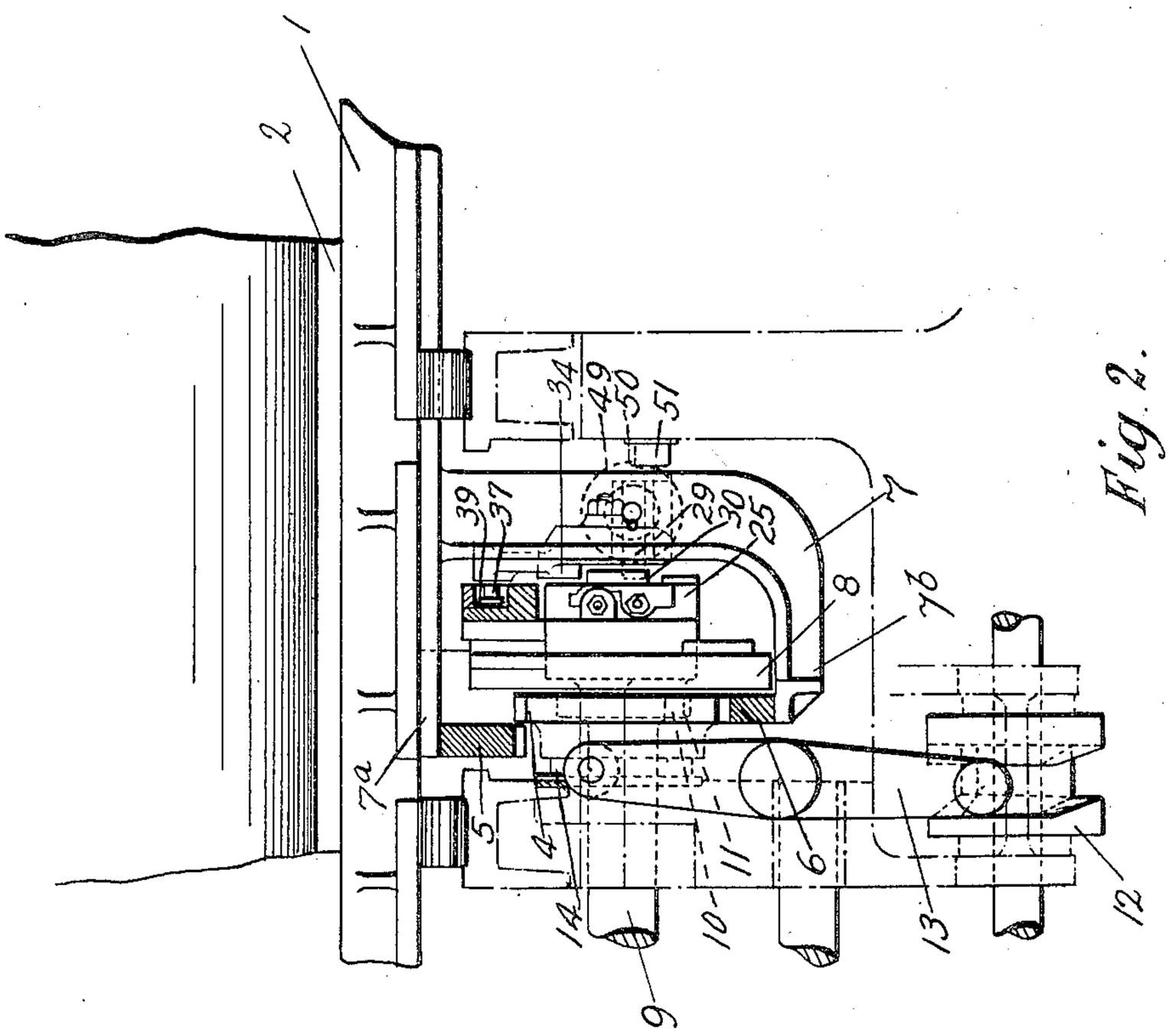

Fig. 2.

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MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Filed May 19, 1945 8 Sheets-Sheet 3

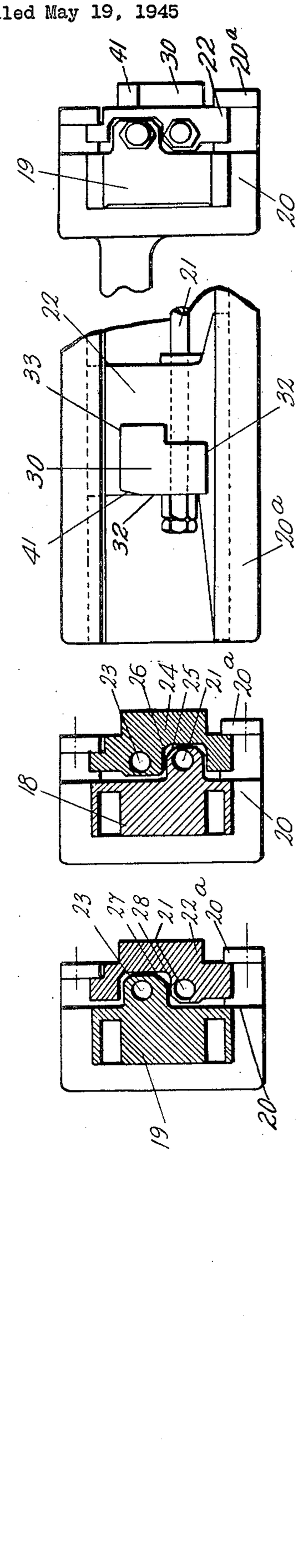

Fig 4.

Fig 3.

Fig 6.

Fig 5.

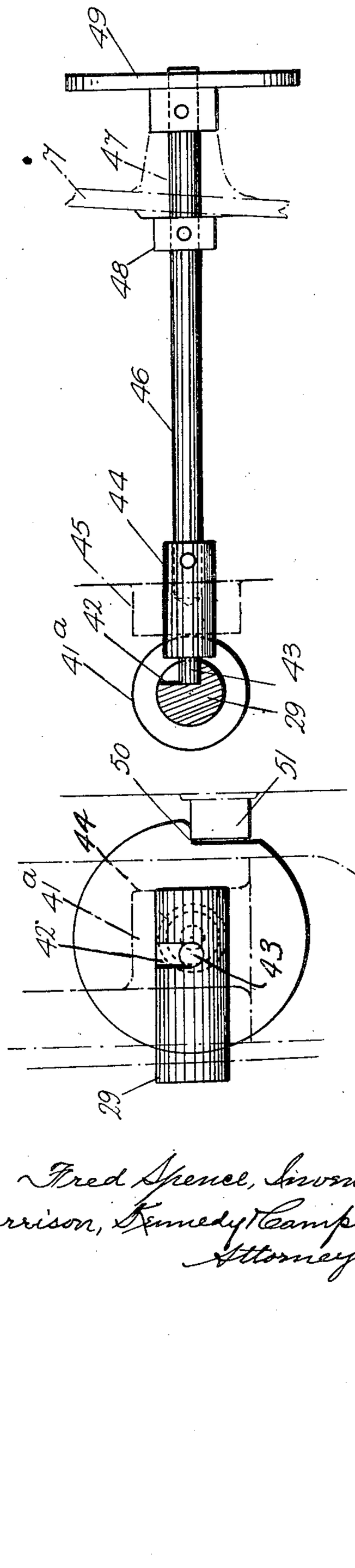

Fig 1a

Fig 2a

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MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Filed May 19, 1945 8 Sheets-Sheet 4

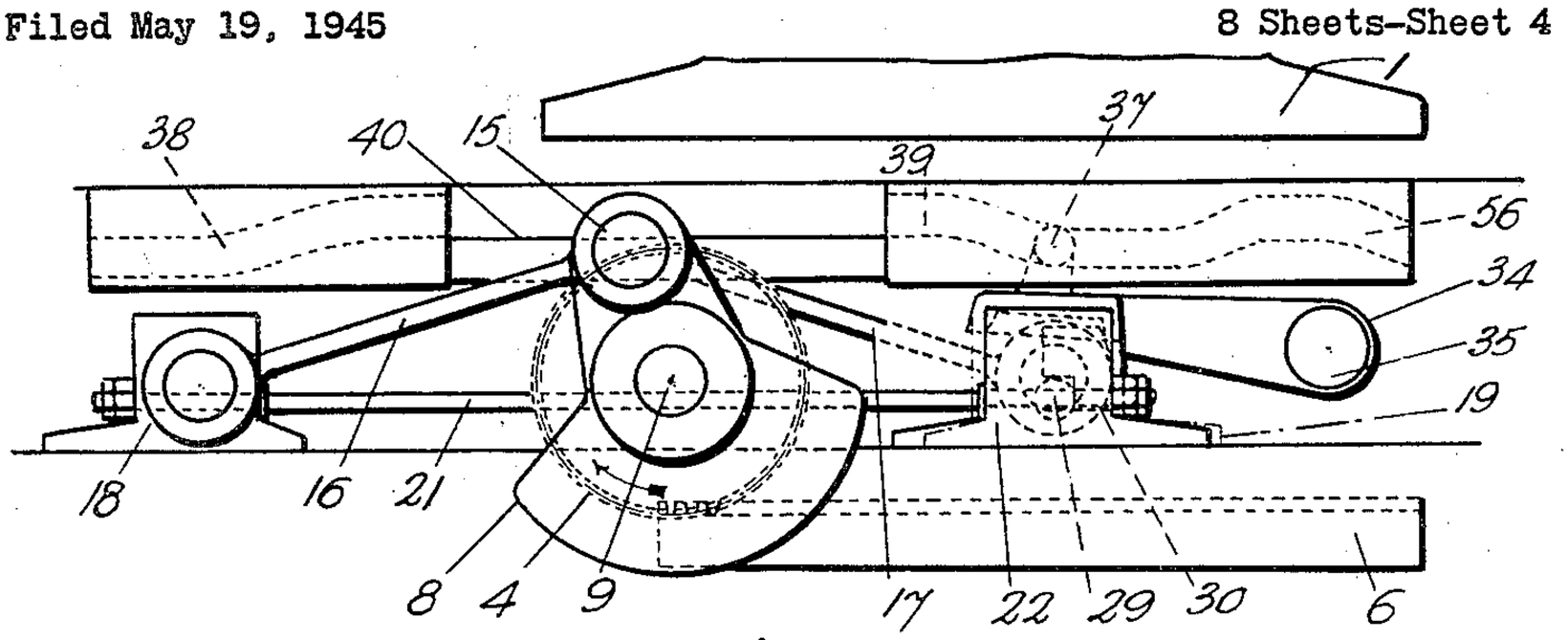

Fig. 7.

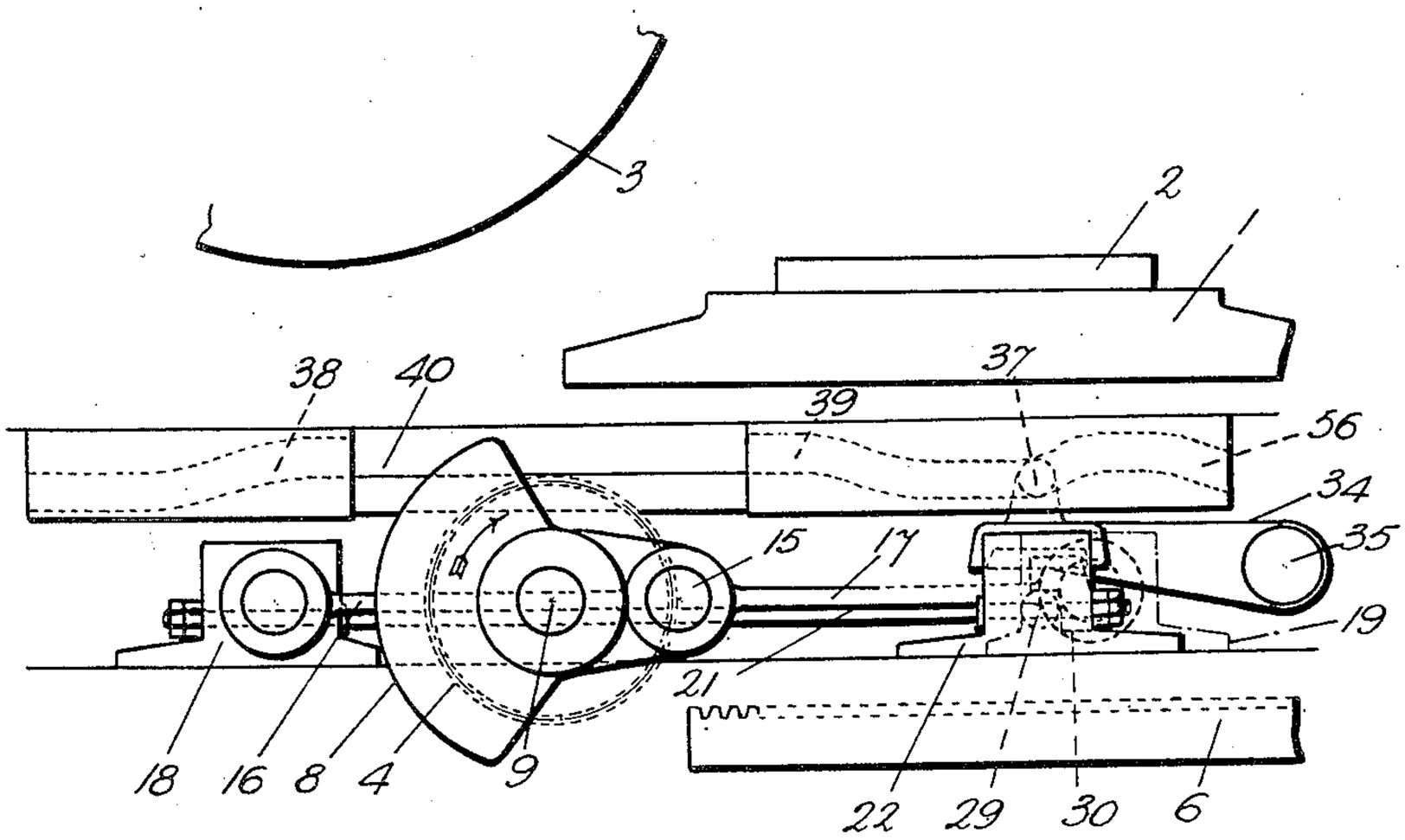

Fig. 8

Fred Spence, Inventor,
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MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Filed May 19, 1945 8 Sheets-Sheet 5

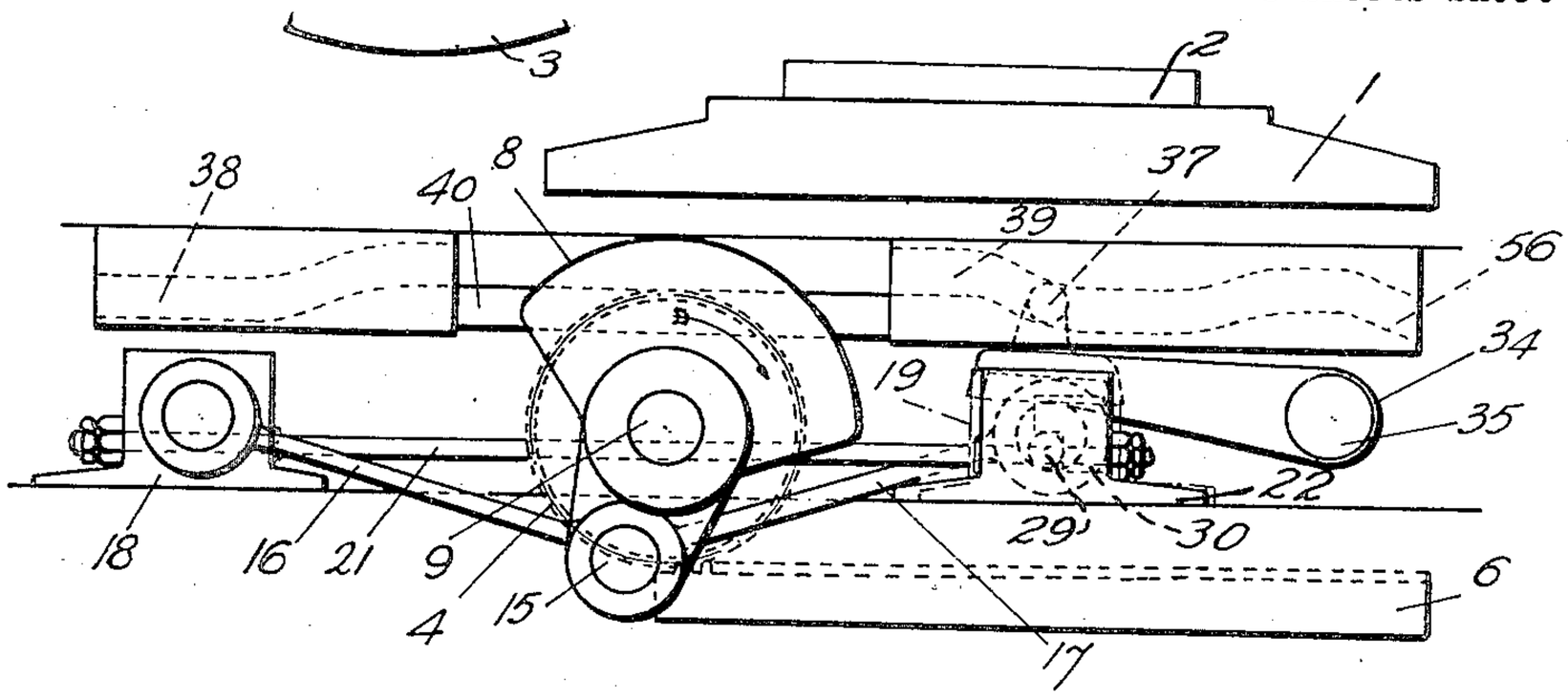

Fig. 9.

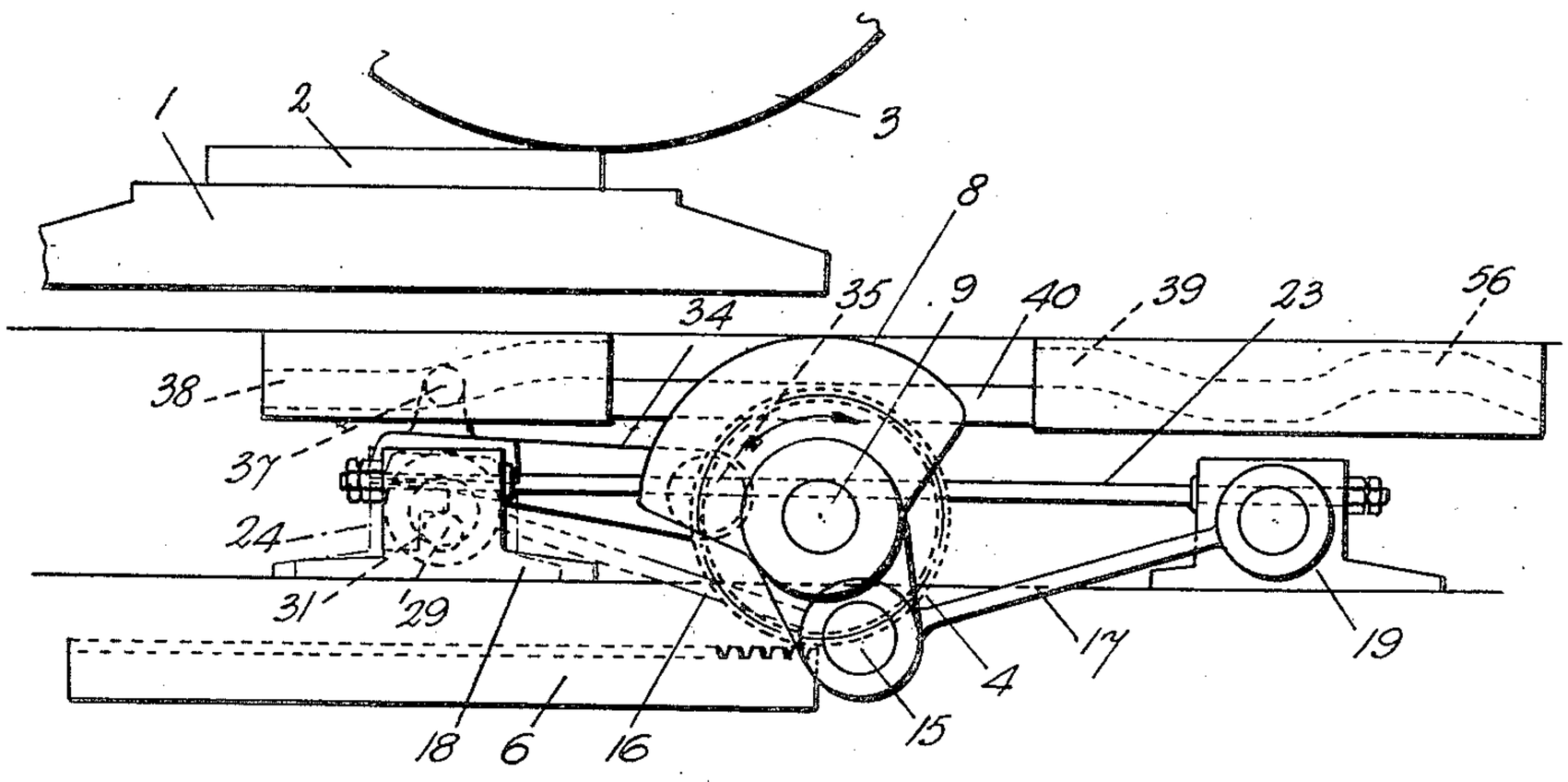

Fig. 11. Fred Spence, Inventor,
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MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Filed May 19, 1945 8 Sheets-Sheet 6

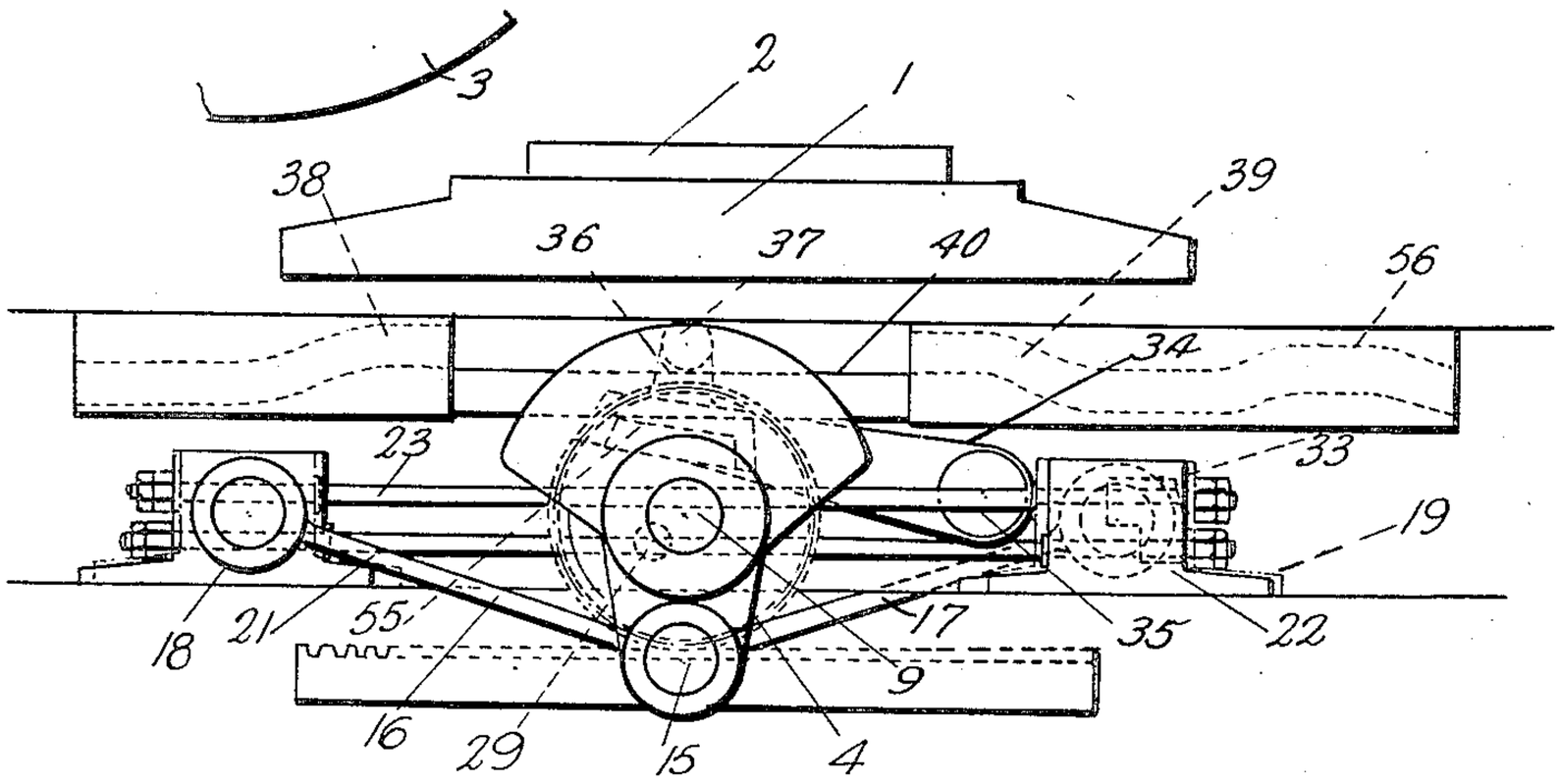

Fig 10.

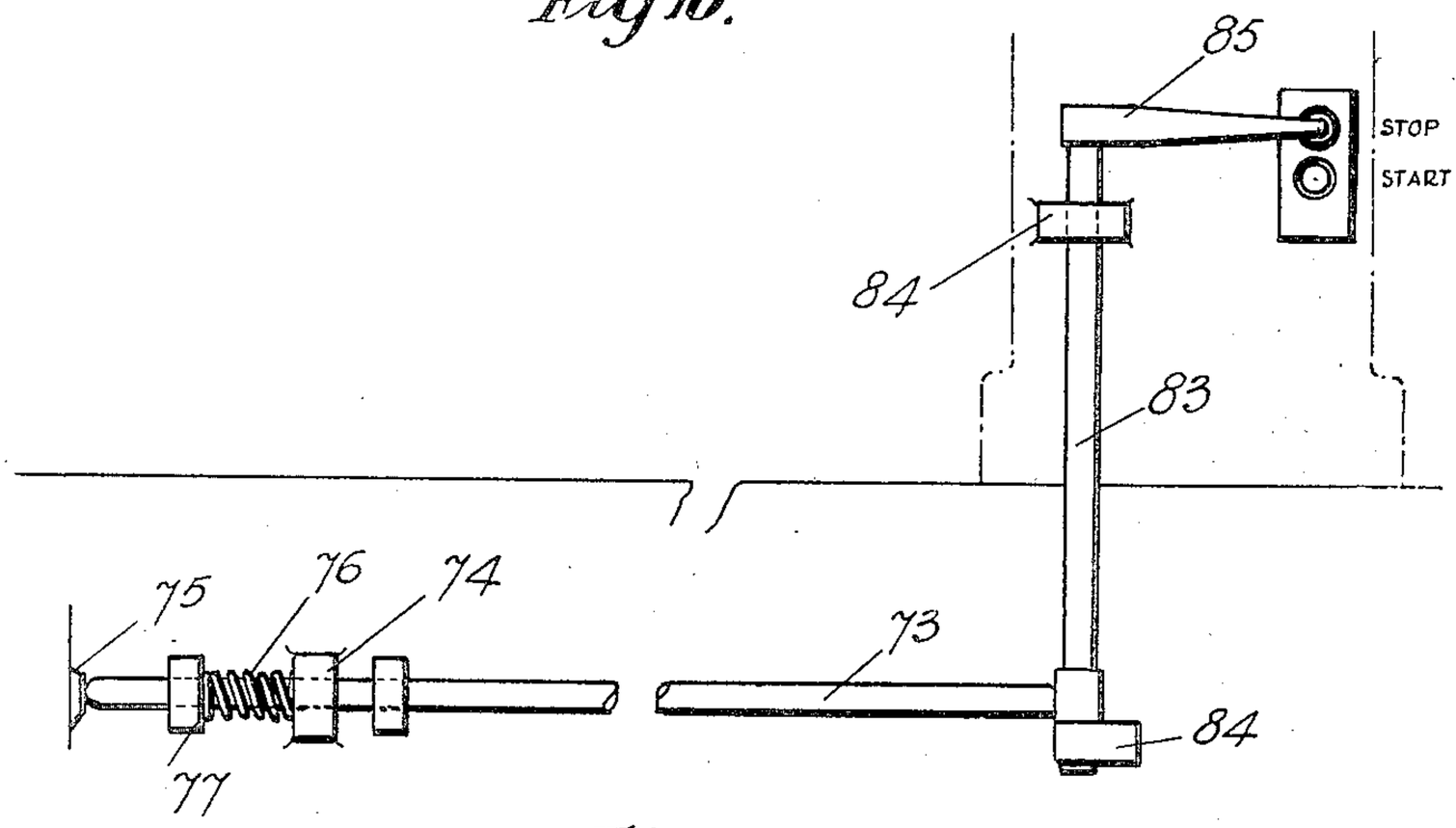

Fig 16.

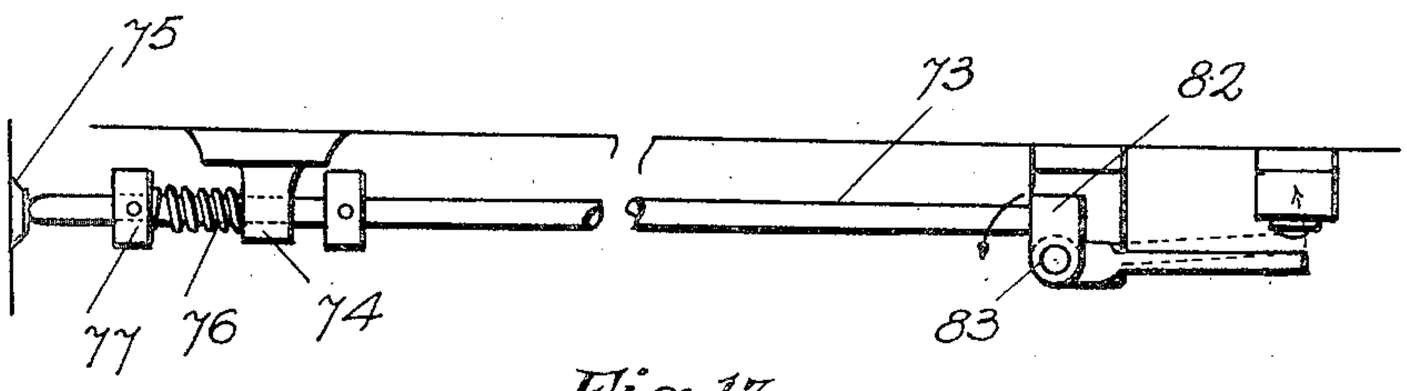

Fig. 17.

Fred Spence, Inventor,
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Jan. 23, 1951 F. SPENCE 2,538,922

MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Filed May 19, 1945 8 Sheets-Sheet 7

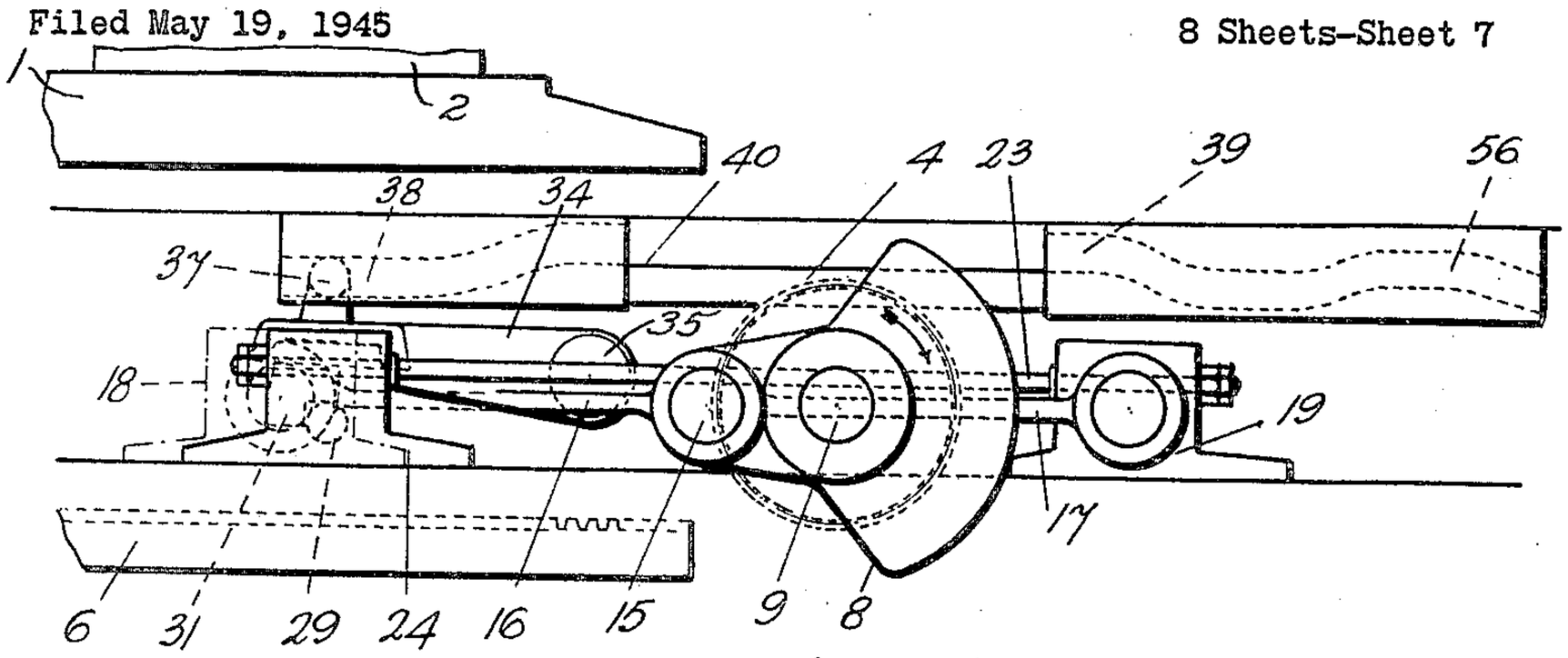

Fig. 12.

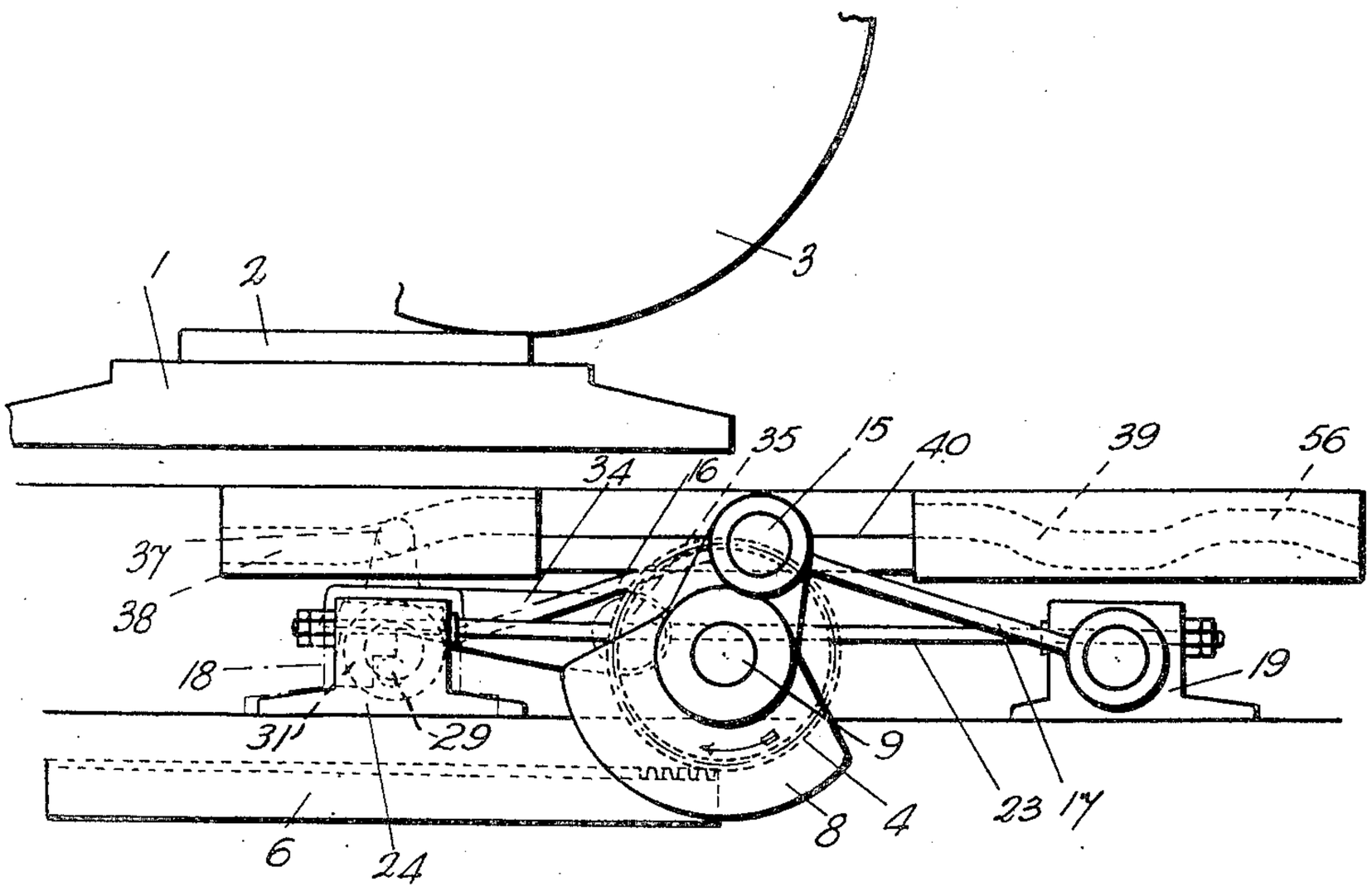

Fig. 13.

Fred Spence, Inventor,
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Jan. 23, 1951 F. SPENCE 2,538,922

MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Filed May 19, 1945 8 Sheets-Sheet 8

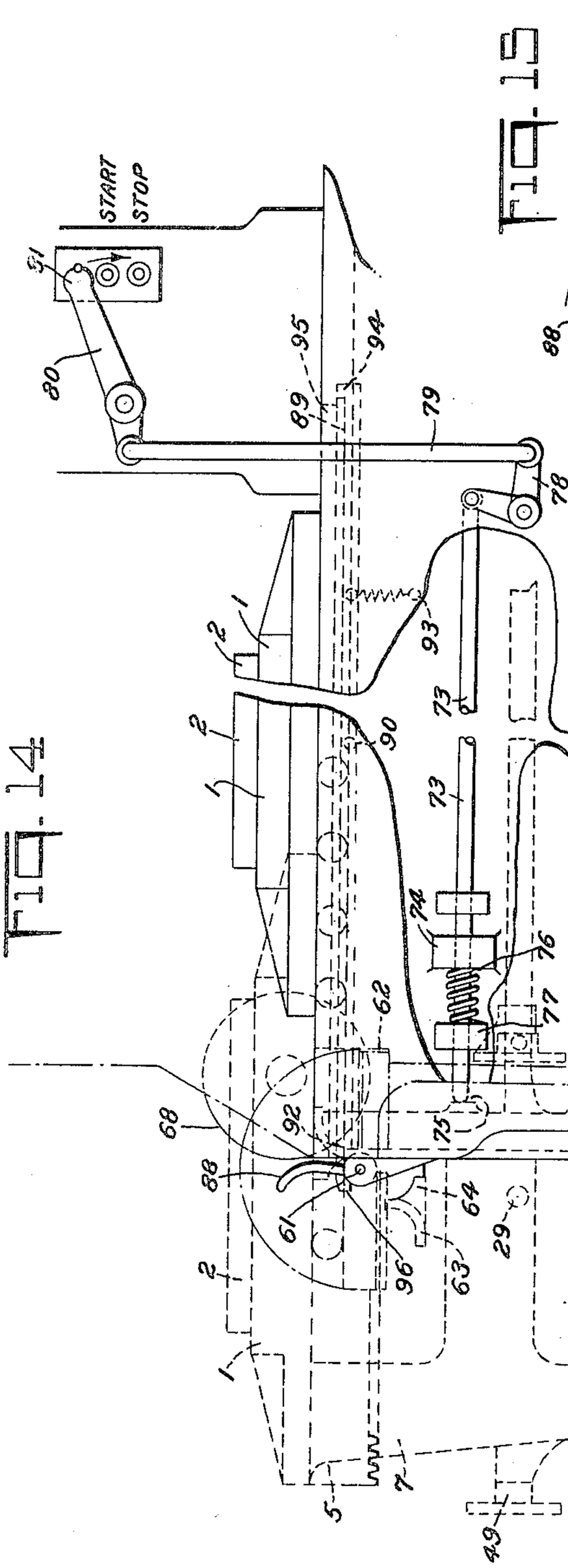

Fig. 14

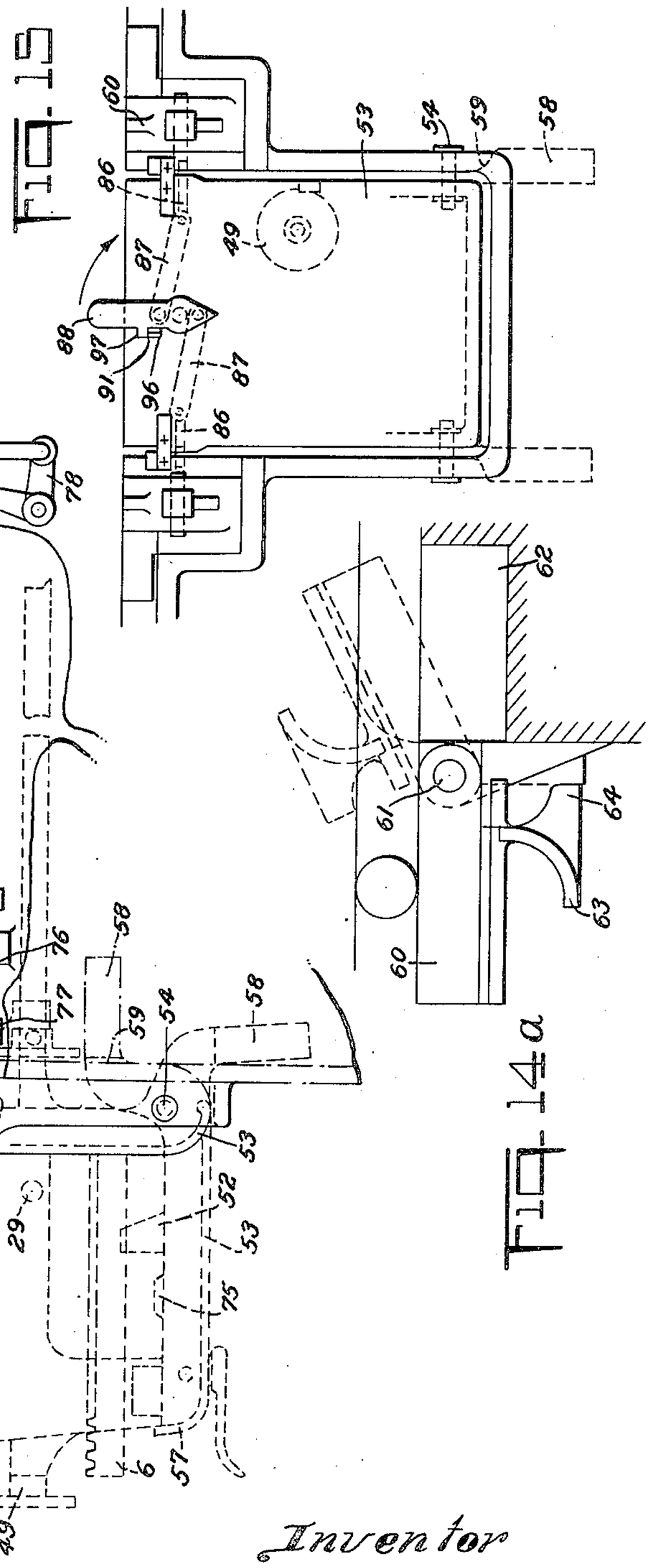

Fig. 14a

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Patented Jan. 23, 1951

2,538,922

UNITED STATES PATENT OFFICE

2,538,922

MEANS FOR RECIPROCATING PRINTING PRESS BEDS

Fred Spence, Sale, England, assignor to Linotype and Machinery Limited, London, England, a limited liability company of Great Britain

Application May 19, 1945, Serial No. 594,751
In Great Britain April 5, 1944

Section 1, Public Law 690, August 8, 1946
Patent expires April 5, 1964

28 Claims. (Cl. 74—27)

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This invention relates to improvements in means for reciprocating printing press beds, and relates more particularly to the type of flat bed and cylinder machine in which the normal drive of the reciprocating bed is transferred to and from mechanism which effects the slowing down, stopping, reversing and acceleration of the bed at opposite ends of the travel of the latter.

In a known machine of this kind, the normal drive of the bed at uniform speed is effected by a driven gear wheel rotating uniformly in one direction, the gear wheel being moved laterally to engage alternately two transversely offset racks attached to the bed at respectively different levels. The mechanism for controlling the bed during the reversal thereof comprises a crank on a driving shaft which engages with the gear in such manner as to admit of the latter being laterally moved independently of the crank. The crank carries a bed motion roller which engages vertical gates fixed at each end of the bed for effecting reversal of the bed during a half revolution of the driving shaft.

In another known machine, the bed is normally driven by either of two oppositely-driven pinions which are moved laterally to engage alternately two racks attached to the bed. Reversal of the bed is effected by a crank on the driving shaft connected by means of two rods to two sliders which are thus reciprocated on guides at each end of the machine. When the bed is approaching either end of its stroke a stud carried by a bracket depending from the bed engages with a hook on one of the sliders and a cam-actuated latch also carried by the bracket engages the hook to ensure the bed moving as if in one piece with the particular hook with which it is engaged.

While these known arrangements have been generally satisfactory in operation, the demand for printing machines running at higher speeds has shown that such arrangements have inherent limitations to any considerable increase in speed. For example, in the first-mentioned kind of machine, the force necessary to accelerate or retard the bed is applied by contact between a roller of comparatively large curvature and a plane surface so causing a high intensity of pressure. To keep the stress reasonably low, the roller has to be of fairly large diameter, resulting in considerable energy of rotation which is absorbed by slip between the roller and the plane surface and causing wear of both.

In the second kind of machine mentioned, reversal of the bed is effected in less than half a revolution of the bed-driving gear, and if the

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machine is running at a high speed, such a short reversal period necessitates the provision of a buffer or recuperator mechanism. A further disadvantage in too brief a period of reversal is the tendency of the inking rollers to slip or over-run when the direction of rotation thereof is reversed, thus causing defective inking.

It is an object of the present invention to provide improved means for reciprocating a printing press bed wherein the before-mentioned disadvantages are overcome. To attain this object, the means for reciprocating a printing press bed according to the invention comprise a driving shaft having a gear wheel adapted to engage alternately with upper and lower racks connected to the printing press bed, a crank on the driving shaft having a crank pin located near the periphery of the gear wheel connected to sliding cross-heads at either end of the machine, a coupling rod connecting each cross-head to a slider block at the opposite end of the machine and means whereby the printing press bed may be connected to either slider block for effecting reversal of the printing press bed.

The printing press bed is connected to a slider block when both are moving at the same velocity and the gear wheel is moved out of mesh with its respective rack. The crank rotates through more than 180 degrees until it again reaches the position in which the slider block and printing press bed are moving at maximum velocity in the opposite direction, and at this juncture the printing press bed is disengaged from the slider block and the gear wheel is moved into mesh with the other rack. A comparatively longer period for reversal of the bed is thus attained and during this period the bed is gradually slowed down, stopped, reversed, and accelerated to the uniform driving speed.

The upper and lower racks connected to the printing press bed are secured to a rack frame depending from the bed and a reversing stud is provided on the rack frame for contacting with an abutment formed on a slider block. After engagement of the stud with the abutment, a cam-actuated latch pivoted to the rack frame is brought into engagement with the abutment to assist in connecting the rack frame to the slider block. The latch may be given an initial lifting movement just before the stud is disengaged from the abutment.

A further feature of the invention resides in the provision of means whereby the printing press bed may be withdrawn beyond the normal limit of its working stroke to provide more com-

plete access to the printing surface. To this end, means may be provided whereby the printing press bed may be disconnected from the reversing mechanism. Preferably the before-mentioned stud is slidably mounted in the rack frame depending from the bed and is controlled by manually operated mechanism which is mounted in the rack frame and locked in position during normal operation of the machine. The latch engaging with the abutment on each of the slider blocks and the cam race controlling the latch when the bed is at the end of the machine from which it may be withdrawn, may be so constructed that a slight movement of the bed beyond its normal stroke causes the latch to be lifted away from the abutment. A cover may be provided at the bed-withdrawal end of the machine, the opening of such cover providing access to the manually operated mechanism and unlocking the same when it is in the bed-withdrawal position.

A preferred constructional form of apparatus according to the invention is illustrated in the accompanying drawings in which:

Figure 1 is a side elevation of part of a printing press with the improved bed-reciprocating mechanism applied thereto;

Figure 1*a* is an enlarged view of the means for withdrawing the reversing stud which is mounted on a frame depending from the printing press bed;

Figure 2 is an end elevation, partly in section;

Figure 2*a* is an enlarged view of the reversing stud;

Figure 3 is an enlarged view of the right-hand slider block of Figure 1 as seen from the rear;

Figure 4 is an end view;

Figure 5 is an enlarged cross section showing the slider block, cross-head and guideways at the right of Figure 1;

Figure 6 is an enlarged cross section showing the slider block, cross-head and guideways at the left of Figure 1;

Figures 7, 8, 9, 10, 11, 12 and 13 are diagrammatic side elevations of certain parts of the mechanism in the different positions respectively assumed by them at seven different stages of their cycle of operation;

Figure 14 is a side elevation of part of the printing press as seen from the rear of Figure 1 and indicating in dotted lines the printing press bed in the withdrawn position;

Figure 14*a* is a view of the arms for supporting the printing press bed in the withdrawn position;

Figure 15 is a view of the bed-withdrawal end of the printing press showing the end cover in closed position;

Figure 16 is a side elevation of an alternative form of safety device;

Figure 17 is a plan of the safety device shown in Figure 16, and

Figure 18 is an enlarged sectional view of the mechanism for withdrawing the printing press bed.

Referring to Figures 1 and 2 of the drawings, a printing press bed 1 carrying a type forme 2 is reciprocated during its printing and return strokes relatively to an impression cylinder 3 by means of a driven gear wheel 4 which is adapted to engage alternately with two racks 5, 6, secured to a rack frame 7 depending from the bed 1, the upper rack 5 being secured to a part 7*a* of the rack frame bolted to the underside of the bed 1 and the lower rack 6 being secured to the depending part 7*b* of the rack frame.

The gear wheel 4 is constantly driven in a clockwise direction (as viewed from Figure 1) by a crank 8 secured to a transverse driving shaft 9, the crank 8 having at one end a finger 10 which projects through a slot 11 in the gear wheel 4. The gear wheel 4 is moved axially at the appropriate time along the driving shaft 9 by means of a rotating grooved cam 12 actuating an arm 13 in engagement with the grooved hub 14 of the gear wheel 4 so as to mesh with either of the two racks 5, 6.

The crank 8, at a position near the periphery of the gear wheel 4, is provided with a pin 15 on which is pivoted the meeting ends of two connecting rods 16, 17, the rod 16 being pivotally connected to a lefthand cross-head 18 (Figure 1) and the rod 17 being pivotally connected to a right-hand cross-head 19. Each cross-head is capable of sliding in a direction parallel with the movement of the bed 1 in horizontal guideways 20 (see Figures 5 and 6) secured to the framework of the machine. The left-hand cross-head 18 (Figures 1 and 6) is rigidly connected by means of a coupling rod 21 to a slider block 22 (Figures 1 and 5) located at the right-hand end of the machine, and the right-hand cross-head 19 (Figures 1 and 5) is rigidly connected by means of a coupling rod 23 to a slider block 24 (Figures 1 and 6) at the left-hand end of the machine. As will be seen from Figures 5 and 6 the slider blocks 22 and 24 slide in guideways 20*a* secured to the framework of the machine, and all such guideways are located in the same horizontal plane. The cross-head 18 is formed with a portion 25 underlapping an overlapping portion 26 formed on the slider block 24, and the cross-head 19 (Figure 5) is formed with a portion 27 overlapping a portion 28 formed on the slider block 22. The portions 25 and 28 are connected together by means of the coupling rod 21 and the portions 26 and 27 are connected together by means of the coupling rod 23, both coupling rods being located in the same vertical plane.

The rack frame 7 depending from the bed 1 is provided with a stud 29 (hereinafter termed a reversing stud—see Figures 1 and 2) which extends transversely from the rack frame and is located midway between the ends of the top and bottom racks 5, 6. When the reversing stud 29 and slider block 22 or 24 are travelling at the same speed, the reversing stud contacts either with an abutment 30 (Figures 1 and 3) on the slider block 22 or with an abutment 31 on the slider block 24 and the gear wheel 4 is moved out of mesh with the rack 5 or 6, so that the control of the bed 1 is transferred to one of the crank-operated slider blocks 22 or 24.

Each abutment is in the form of a hook turned inwardly towards the reversing stud 29 and consists of a vertical member 32 (see Figure 3) and a short horizontal member 33 between which members the reversing stud 29 engages.

A latch 34 (see Figures 1 and 10) pivoted at 35 to the rack frame 7 is arranged so that after the reversing stud has contacted with an abutment the latch engages with the abutment so as to prevent any inward displacement of the bed 1. The latch 34 is provided with an upstanding arm 36 (Figure 1) carrying a roller 37 which engages with cam races 38, 39, near each end of the bed's travel so as, at the required times, to move the latch 34 into and out of engagement with the respective abutment 30 or 31. A bar 40 con-

nected between the two cam races 38, 39, holds the roller 37 and latch 34 in a raised or inoperative position when the bed 1 is being driven by the gear wheel 4. The cam races 38, 39, are so shaped that the latch 34 engages with an abutment after the reversing stud 29 has contacted therewith and, prior to the disengagement of the stud 29 from an abutment, the latch 34 is given an initial lifting movement. The outside edge of each abutment is formed with an inclined surface 41 (see Figures 3 and 4) which facilitates the engagement and disengagement of the latch 34.

The operation of the above-described mechanism is as follows: Assuming that the bed 1 is just about to complete a normal stroke under the control of the gear wheel 4 and the rack 5, the reversing stud 29 gradually approaches the crank-controlled slider abutment 30 which is moving at a velocity which gradually increases until it is equal to that of the reversing stud. At this juncture the stud 29 contacts with the abutment 30 (see Figure 7) and the gear wheel 4 is disengaged from the rack 5 by operation of the cam 12, so that the bed 1 is now controlled by the slider block 22. In the position shown in Figure 7, it will be seen that the roller 37 is still on an inclined part of the cam race 39 and the latch 34 is not completely in engagement with the abutment 30. As the roller 37 enters the horizontal part of the cam race 39 the latch 34 is brought completely into engagement with the abutment 30 and so prevents any inward displacement of the bed 1 which might occur as a result of the decreased speed at which the bed begins to travel. Continued rotation of the crank 8 moves the slider block 22 (and consequently the bed 1) at a speed which gradually decreases until the crank 8 reaches the horizontal position shown in Figure 8 and movement of the block 22 is arrested. Further rotation of the crank 8 reverses the direction of movement of the slider block 22 and causes it to move inwardly at a speed which gradually increases until the crank (having rotated through more than 180 degrees from the position shown in Figure 7) reaches the position shown in Figure 9 wherein the slider block 22 is moving at its maximum speed which is equal to the speed of travel of the bed 1 when driven by the gear wheel 4. As will be seen from Figure 9, the roller 37 has entered the inclined part of the cam race 39 and the latch 34 is given an initial lifting movement away from the abutment 30. The gear wheel 4 is now engaged with the rack 6 by operation of the cam 12 and the slider block 22, due to continued rotation of the crank 8, begins to move at a decreasing speed so that the reversing stud 29 moves away from the abutment 30 and the latch 34 is raised to its maximum height. The bed 1 is moved, through the gear wheel 4 and rack 6, towards the left as seen in Figure 10 and the roller 37 travels along the bar 40 so holding the latch 34 in its fully raised position. As the bed approaches the position shown in Figure 11 the roller 37 enters the cam race 38 and the latch 34 is initially lowered. When the bed reaches the position shown in Figure 11, the reversing stud 29 contacts with the abutment 31 on the slider block 24 and the gear wheel 4 is disengaged from the rack 6. The latch 34 is finally lowered into engagement with the abutment 31 and the slider block 24 moves the bed 1 at a speed which gradually decreases until the bed reaches the position shown in Figure 12 wherein movement is arrested. The bed now begins to move in the reverse direction at a gradually increasing speed until it reaches the position shown in Figure 13 wherein the latch 34 is initially lifted and control of the bed passes to the gear wheel 4 and rack 5.

In order to allow the bed 1 to be withdrawn beyond the normal limit of its working stroke to provide more complete access to the type forme 2, the reversing stud 29 is slidably mounted in a bearing 41*a* (see Figures 1*a* and 2*a*) on the rack frame 7. The reversing stud 29 is provided with a slot 42 which is engaged by a cylindrical projection or peg 43 eccentrically disposed upon a member 44 rotatably mounted in a bearing 45 located longitudinally of the rack frame 7 and forming part thereof, the axis of the bearing 45 intersecting the axis of the stud 29 at right-angles thereto. The member 44 is secured to a shaft 46 which projects through a bearing 47 concentric with the bearing 44 and situated at the end of the rack frame 7 adjacent to one end of the bed 1. The shaft 46 may be constrained from endwise movement by means of a collar 48 secured thereto and a hand-wheel 49 attached to the end of the shaft 46.

A notch 50 (Figure 2) in the periphery of the hand-wheel 49 engages a bar 51 secured to the frame of the machine and extending longitudinally of the machine for a distance corresponding to the stroke of the bed with the exception of a small gap at the bed-withdrawal end of the machine. The gap is normally closed by a short extension 52 (Figure 14) of the bar 51 secured to a cover 53 hinged at 54 to the bed-withdrawal end of the framework of the machine so that when the cover is closed, the hand-wheel 49 is completely constrained from movement relatively to the rack frame 7. Thus, the hand-wheel can be rotated only when the cover is open and the bed is at the withdrawal end of its stroke, i. e. at the position shown in Figure 8.

With the reversing stud 29 in its outer or active position as seen in Figure 2*a*, the position of the slot 42 formed therein is such that the peg 43 is bearing on the bottom of the slot 42 and the hand-wheel 49 cannot be moved in a counter-clockwise direction. When the hand-wheel 49 is rotated for half a revolution in a clockwise direction, the peg 43 is moved upwardly against the side of the slot 42 and the reversing stud 29 is moved laterally for a distance equal to twice the eccentricity of the peg 43 until the peg 43 is bearing on the bottom of the slot 42. The reversing stud 29 is thus laterally withdrawn from the abutment 30 with which it is contacting in the position shown in Figure 8. The latch 34 is, however, engaging the abutment 30 and it is necessary to provide means for lifting such latch away from the abutment before the bed can be withdrawn. For this purpose the latch 34 is formed with a shallow U-shaped gap 55 which is longer than the horizontal member 32 of the abutment 30 (see Figure 10). Thus, with the bed in the position shown in Figure 8 and the reversing stud 29 withdrawn, the bed may be given a slight initial withdrawing movement. The cam race 39 is extended as at 56 to form a track which the roller 37 enters during such initial withdrawing movement so raising the latch 34 away from the abutment 30.

The bed 1 is now free from the reversing mechanism and can be withdrawn to any convenient distance which will give access to the type forme 2.

The cover 53 is shaped to provide a stop 57 for limiting the distance to which the bed may be withdrawn (see Figure 14). The lower end of the cover 53 is formed with a counterweight 58 having a shoulder 59 which in the opened position of the cover abuts against the machine frame so as to maintain the cover in the horizontal position.

For supporting the bed 1 when it is withdrawn, swing extensions in the form of arms 60 (see Figures 14 and 14*a*) are pivoted at 61 to the front ends of the tracks for the reciprocating bed and are normally turned inwardly to rest in recesses 62 formed in such tracks. Each arm 60 is provided with a lip 63 shaped in conformity with the curved stop 57 formed on the cover 53, and the underside of the lip 63 is gripped by hand so as to swing the arm 60 to the extended horizontal position shown in Figure 14. A stop 64 formed on each arm bears against the machine frame and maintains the arm in the extended horizontal position. The arms 60 are so arranged that the centre of gravity of the bed is kept well behind the support of the outermost roller of the track rollers which are interposed in known manner between the bed and the track. Bed gibs may be provided in the ordinary way to prevent the bed from rising or tilting.

The bed may be withdrawn or returned by hand or by means of manually-operated mechanism or by means of power-operated mechanism. In one form of manually-operated mechanism for this purpose, a bearing 63 (see Figure 18) in the machine frame carries a slidable and rotatable shaft 66 having a pinion 67 secured thereto at one end and a hand wheel 68 secured thereto at the other end. A compression spring 69 surrounding the shaft 66 and extending between the wall of the bearing 65 and the boss 70 of the hand wheel 68 normally holds the hand wheel 68 in the outward position shown in Figure 18 with the boss 71 of the pinion 67 abutting against the bearing 65. Inward pressure on the hand wheel 68 brings the pinion 67 into mesh with a rack 72 which is normally provided on the bed for operation of the form inking rollers, and rotation of the hand wheel 68 in either direction, while maintaining such inward pressure, causes the bed to be withdrawn or returned. Release of the hand wheel 68 allows the pinion 67 to return to its original position out of mesh with the rack 72 on the bed.

A safety device is provided to prevent operation of the machine when the bed is withdrawn. Such safety device is preferably arranged so that an opening movement of the cover 53 renders the machine driving mechanism inoperative.

In one form of safety device, a horizontal push rod 73 (Figure 14) carried by a bracket 74 on the machine frame is held at one end against a projection 75 on the closed cover 53 by means of a compression spring 76 surrounding the rod and located between the bracket 74 and a collar 77 on the rod 73. The other end of the rod is connected to a bell-crank arm 78 which is connected through a link 79 to a pivoted arm 80 provided with a shield 81. Opening of the cover 53 allows the spring 76 to move the rod 73 to the left so moving the arm 80 downwardly to bring the shield 81 in front of the "start" button of the push-button box controlling the electric motor driving the machine to prevent the depression of such button.

In an alternative form of safety device the push-rod 73 is connected to an arm 82 (see Figures 16 and 17) attached to a vertical rod 83 which turns in bearings 84 on the side of the machine frame and has secured to the top thereof an arm 85. When the cover 53 is opened and the rod 73 moves to the left the arm 85 is turned inwardly to depress the "stop" button of the push-button box.

The cover 53 is held in the closed position by means of bolts 86 (Figure 15) engaging sockets in the machine frame and connected through links 87 to a cover locking lever 88 pivoted on the cover. For opening the cover, the lever 88 is turned in an anti-clockwise direction from a horizontal to a vertical position so as completely to withdraw the bolts. Means may be provided for preventing the opening and closing of the cover 53 when the bed 1 is not at the withdrawal end of its stroke. For this purpose there is provided a lever 89 (Figure 14) pivoted to the machine frame at 90 and passing through a slot 91 in the cover 53. The lever 89 is formed with a notch 92 which (as shown in Figure 14) normally engages with the upper end of the slot 91 under the influence of a spring 93 so as to hold the cover in the closed position. The rear end of the lever 89 has a projection 94 which is arranged so as to be just clear of the underside of an extension 95 on the printing press bed 1 only when the bed is in the withdrawal position shown in Figure 14. The combined length of the extension 95 and the bed 1 is such that it is not less than the length of the stroke of the bed and consequently the lever 89 can be depressed only when the bed is in the withdrawal position shown in Figure 14 to release the notch 92 from the upper end of the slot 91 in the cover 53.

The slot 91 is arranged so that the end 96 of the lever 89 passing therethrough is located adjacent to the cover locking lever 88 (see Figure 15). The lever 88 is formed with a projection 97 which abuts against the end 96 when the lever 88 is turned towards the vertical position and prevents the complete withdrawal of the bolts 86. When the lever 89 is depressed the projection 97 passes over the end 96 and the lever 88 may be turned to its vertical position to withdraw the bolts 86. Depression of the lever 89, however, causes the projection 94 to press against the underside of the bed or the extension 95 except when the bed is at the withdrawal end of its stroke with the projection 94 just clear of the extension 95. Thus, the lever 88 can be turned to the vertical position and the cover 53 opened or closed only when the bed is at the withdrawal end of its stroke.

Having described my invention, I declare that what I claim and desire to secure by Letters Patent is:

1. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, an upper rack connected to the bed, a lower rack connected to the bed, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block lo-

cated near the cross-head, means for rigidly connecting the second slider block to the second cross-head, and means whereby the printing press bed when the gear wheel is out of engagement with a rack may be connected to either slider block for effecting the reversal of the printing press bed.

2. Apparatus for reciprocating a printing press bed according to claim 1 including adjacent longitudinal guideways for a cross-head and slider block at each end of the machine, all such guideways being located in the same horizontal plane.

3. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, an upper rack connected to the bed, a lower rack connected to the bed, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, said slider block and second sliding cross-head being formed with underlapping and overlapping portions, adjacent longitudinal guideways for the slider block and second sliding cross-head, a second slider block located near the cross-head said second slider block and cross-head being formed with overlapping and underlapping portions, adjacent longitudinal guideways for the second slider block and cross-head, coupling rods located in the same vertical plane and rigidly connecting the underlapping and overlapping portions of the slider block and second sliding cross-head at one end of the machine to the underlapping and overlapping portions of the cross-head and second slider block at the other end of the machine, and means whereby the printing press bed when the gear wheel is out of engagement with a rack may be connected to either slider block for effecting reversal of the printing press bed.

4. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed and an abutment formed on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed.

5. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on

the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed and located between the ends of the upper and lower racks, an abutment formed on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed, and a cam-controlled latch for preventing inward displacement of the bed said latch being arranged so as to engage with an abutment after the reversing stud has contacted therewith, and so as to be given an initial lifting movement prior to the disengagement of the reversing stud from the abutment.

6. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed and located between the ends of the upper and lower racks, an abutment on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed said abutment being in the form of a vertical member and a short horizontal member having an inclined outer surface to facilitate the engagement therewith and disengagement therefrom of a latch, and a cam-controlled latch for preventing inward displacement of the bed said latch being arranged so as to engage with an abutment after the reversing stud has contacted therewith and so as to be given an initial lifting movement prior to the disengagement of the reversing stud from the abutment.

7. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for

moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed and located between the ends of the upper and lower racks, an abutment on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed said abutment being in the form of a vertical member and a short horizontal member having an inclined outer surface to facilitate the engagement therewith and disengagement therefrom of a latch, a latch engaging said abutment pivoted to the rack frame said latch being formed with a shallow U-shaped gap having a horizontal inner surface which is longer than the horizontal abutment member so as to allow when desired a slight outward movement of the rack frame relatively to the horizontal abutment member, and cam mechanism whereby the latch is caused to engage with an abutment after the reversing stud has contacted therewith and is given an initial lifting movement prior to the disengagement of the reversing stud from the abutment.

8. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, said slider block and second sliding cross-head being formed with underlapping and overlapping portions, adjacent longitudinal guideways for the slider block and second sliding cross-head, a second slider block located near the cross-head said second slider block and cross-head being formed with overlapping and underlapping portions, adjacent longitudinal guideways for the second slider block and cross-head, coupling rods located in the same vertical plane and rigidly connecting the underlapping and overlapping portions of the slider block and second sliding cross-head at one end of the machine to the underlapping and overlapping portions of the cross-head and second slider block at the other end of the machine, a reversing stud mounted in the rack frame depending from the bed and located between the ends of the upper and lower racks, an abutment on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed said abutment being in the form of a vertical member and a short horizontal member having an inclined outer surface to facilitate the engagement therewith and disengagement therefrom of a latch, a latch engaging said abutment and pivoted to the rack frame said latch being formed with a shallow U-shaped gap having a horizontal inner surface which is longer than the horizontal abutment member so as to allow when desired a slight outward movement of the rack frame relatively to the horizontal abutment member, and cam mechanism whereby the latch is caused to engage with an abutment after the reversing stud has contacted therewith and is given an initial lifting movement prior to the disengagement of the reversing stud from the abutment.

9. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed and located between the ends of the upper and lower racks, an abutment on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed said abutment being in the form of a vertical member and a short horizontal member having an inclined outer surface to facilitate the engagement therewith and disengagement therefrom of a latch, a latch engaging said abutment and pivoted to the rack frame said latch being formed with a shallow U-shaped gap having a horizontal inner surface which is longer than the horizontal abutment member so as to allow when desired a slight outward movement of the rack frame relatively to the horizontal abutment member, a cam controlling the latch so that the latch is caused to engage with an abutment after the reversing stud has contacted therewith and is given an initial lifting movement prior to the disengagement of the reversing stud from the abutment and an extended cam track for raising the latch away from the abutment when a slight outward movement beyond the normal stroke is imparted to the rack frame.

10. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting

the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed, an abutment formed on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed, and means whereby the reversing stud may be withdrawn laterally from contact with an abutment to permit the printing press bed to be withdrawn beyond the normal limit of its working stroke.

11. Apparatus for reciprocating a printing press bed according to claim 9 including means whereby the reversing stud may be withdrawn laterally from contact with an abutment to permit the printing press bed to be withdrawn beyond the normal limit of its working stroke.

12. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed, an abutment formed on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed, manually operated mechanism mounted on the rack frame for laterally withdrawing the reversing stud from contact with an abutment to permit the printing press bed to be withdrawn beyond the normal limit of its working stroke, and means for locking said manually operated mechanism in position during the normal operation of the machine.

13. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed, an abutment formed on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed, a member mounted in a bearing located longitudinally of the rack frame the axis of the bearing intersecting the axis of the reversing stud at right-angles thereto, a projection eccentrically disposed upon said member engaging with a slot formed in the reversing stud, and means for rotating the member so as to withdraw the reversing stud from contact with an abutment to permit the printing press bed to be withdrawn beyond the normal limit of its working stroke.

14. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed, an abutment formed on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed, a member mounted in a bearing located longitudinally of the rack frame the axis of the bearing intersecting the axis of the reversing stud at right-angles thereto, a projection eccentrically disposed upon said member engaging with a slot formed in the reversing stud, a shaft to which said member is secured, a hand-wheel fastened to said shaft for rotating the member and withdrawing the reversing stud from contact with an abutment to permit the printing press bed to be withdrawn beyond the normal limit of its working stroke, and a bar located longitudinally of the machine and engaging a notch in the periphery of the hand-wheel so as to prevent rotation thereof during the normal operation of the machine.

15. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack on the frame for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed, an abutment formed on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed, a member mounted in a bearing located longitudinally of the rack frame the axis of the bearing intersecting the axis of the reversing stud at right-angles thereto, a projec-

tion eccentrically disposed upon said member engaging with a slot formed in the reversing stud, a shaft to which said member is secured, a hand-wheel fastened to said shaft for rotating the member and withdrawing the reversing stud from contact with an abutment to permit the printing press bed to be withdrawn beyond the normal limit of its working stroke, a bar engaging a notch in the hand-wheel and secured to the framework of the machine and extending longitudinally thereof for a distance corresponding to the stroke of the bed with the exception of a gap at the end of the machine, a short extension for closing said gap and a cover to which the extension is secured so that when the printing press bed is at the end of the machine the hand-wheel cannot be turned until the cover is opened.

16. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on the driving shaft, a rack frame depending from the bed carrying upper and lower racks, means for moving the gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the driving shaft, a crank pin on the crank located near the periphery of the gear wheel, a sliding cross-head at one end of the machine, means for connecting the crank pin to the sliding cross-head, a second sliding cross-head at the other end of the machine, means for connecting the crank pin to the second sliding cross-head, a slider block located near the second sliding cross-head, means for rigidly connecting the slider block to the cross-head, a second slider block located near the cross-head, means for rigidly connecting the second slider block to the second cross-head, a reversing stud mounted in the rack frame depending from the bed, an abutment formed on each slider block with which abutment the reversing stud contacts for effecting reversal of the bed, a member mounted in a bearing located longitudinally of the rack frame the axis of the bearing intersecting the axis of the reversing stud at right-angles thereto, a projection eccentrically disposed upon said member engaging with a slot formed in the reversing stud, a shaft to which said member is secured, a hand-wheel fastened to said shaft for rotating the member and withdrawing the reversing stud from contact with an abutment to permit the printing press bed to be withdrawn beyond the normal limit of its working stroke, a bar engaging a notch in the hand-wheel and secured to the framework of the machine and extending longitudinally thereof for a distance corresponding to the stroke of the bed with the exception of a gap at the end of the machine, a short extension for closing said gap, a cover hinged to the framework of the machine to which cover the extension is secured so that when the printing press bed is at the end of the machine the hand-wheel cannot be turned until the cover is opened, and a stop provided on the cover to limit the withdrawal of the printing press bed when the cover is in the opened position.

17. Apparatus for reciprocating a printing press bed according to claim 16 including a counterweight on the cover having a shoulder which in the opened position of the cover bears against a surface of the machine frame and maintains the cover in a horizontal position.

18. Apparatus for reciprocating a printing press bed according to claim 16 including a horizontal spring-pressed rod bearing at one end against the closed cover, an arm connected to the other end of the spring-pressed rod, a vertical rod to which the arm is attached, a horizontal finger secured to the vertical rod, and a stop button controlling an electric motor driving the machine which button is depressed by the horizontal finger when the cover is opened.

19. Apparatus for reciprocating a printing press bed according to claim 16 including a horizontal spring-pressed rod bearing at one end against the closed cover, a bell-crank arm connected to the other end of the spring-pressed rod, a link connected to the bell-crank arm, a pivoted arm connected to the link, a start button controlling an electric motor driving the machine, and a shield on the pivoted arm which shield is moved in front of the start button to prevent the depression thereof when the cover is opened.

20. Apparatus for reciprocating a printing press bed comprising a driving shaft, means for transmitting a reciprocating movement to said printing press bed from said shaft, a track along which said printing press bed is reciprocated, and an auxiliary track mounted to be drawn outwardly to support said printing press bed when it is withdrawn.

21. Apparatus for reciprocating a printing press bed comprising a machine frame, a driving shaft mounted in said machine frame, means for transmitting a reciprocating movement to said printing press bed from said shaft, a track along which said printing press bed is reciprocated, said track being carried by said machine frame, an auxiliary track pivoted to said machine frame, said auxiliary track adapted to be swung outwardly to a horizontal position to support said printing press bed when it is withdrawn, and steps for supporting said auxiliary track in such horizontal position.

22. Apparatus for reciprocating a printing press bed comprising a machine frame, a driving shaft mounted in said machine frame, means for transmitting a reciprocating movement to said printing press bed from said shaft, a track along which said printing press bed is reciprocated, said track being carried by said machine frame, a rack secured to said printing press bed, a bearing carried by said machine frame, a transverse shaft carried by said bearing, a pinion secured to the inner end of said shaft, a hand wheel secured to the outer end of said shaft and a compression spring extending between said bearing and said hand wheel so that said pinion is normally held out of engagement with said rack but can be brought into engagement with the rack by inward pressure on the hand wheel which is then rotated in either direction to withdraw or return said printing press bed.

23. Apparatus for reciprocating a printing press bed comprising a driving shaft, means for transmitting a reciprocating movement to said printing press bed from said shaft, a connecting device settable in an operative position to make connection between the transmitting means and the printing press bed or in an inoperative position to break connection between said parts and permit the bed to be withdrawn, an actuating device to set the connecting device in the desired position, and operative connections between the actuating device and the connecting device.

24. Apparatus for reciprocating a printing press bed comprising a driving shaft, means for connecting said printing press bed to said driving shaft so that a reciprocating movement is imparted thereto by rotation of said shaft, a crank on said driving shaft, abutments located at either

end of the machine and connected to said crank so as to be slidable by rotary movement thereof, a reversing stud connected to the printing press bed and settable in an operative position to make contact with said abutments in effecting the reversal of said bed or in an inoperative position to break contact with said abutments and permit the bed to be withdrawn, an actuating device to set the reversing stud in the desired position, and operative connections between the actuating device and the reversing stud.

25. Apparatus for reciprocating a printing press bed comprising a driving shaft, a gear wheel on said driving shaft, a rack frame secured to the said printing press bed carrying upper and lower racks, means for moving the said gear wheel into engagement with the upper rack for moving the bed in one direction or into engagement with the lower rack for moving the bed in the opposite direction, a crank on the said driving shaft, abutments located at either end of the machine and connected to said crank so as to be slidable by rotary movement thereof, a reversing stud carried by the rack frame and settable in in operative position to make contact with said abutments in effecting the reversal of said bed or in an inoperative position to break contact with said abutments and permit the bed to be withdrawn, an actuating device also carried by the rack frame to set the reversing stud in the desired position, and operative connections between the actuating device and the reversing stud.

26. An apparatus according to claim 23 and including, as an additional element, safety means

rendered effective by the setting of the connecting device in its inoperative position to guard against the operation of the driving shaft when the connection between the transmitting means and the printing press bed is broken.

27. An apparatus according to claim 23 including, as an additional element, safety means controlled by the position of the printing press bed to guard against the setting of the connecting device in its inoperative position at an improper time.

28. An apparatus according to claim 23 including, as additional elements, a cover enclosing the actuating device to render it inaccessible for operation, and means controlled by the position of the printing press bed to guard against the opening of the cover at an improper time.

FRED SPENCE.

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