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PATENTED MAY 23, 1905.

W. SCOTT & E. W. SWINDELLS.

PRINTING MACHINE.

APPLICATION FILED APR. 16, 1901.

5 SHEETS—SHEET 1.

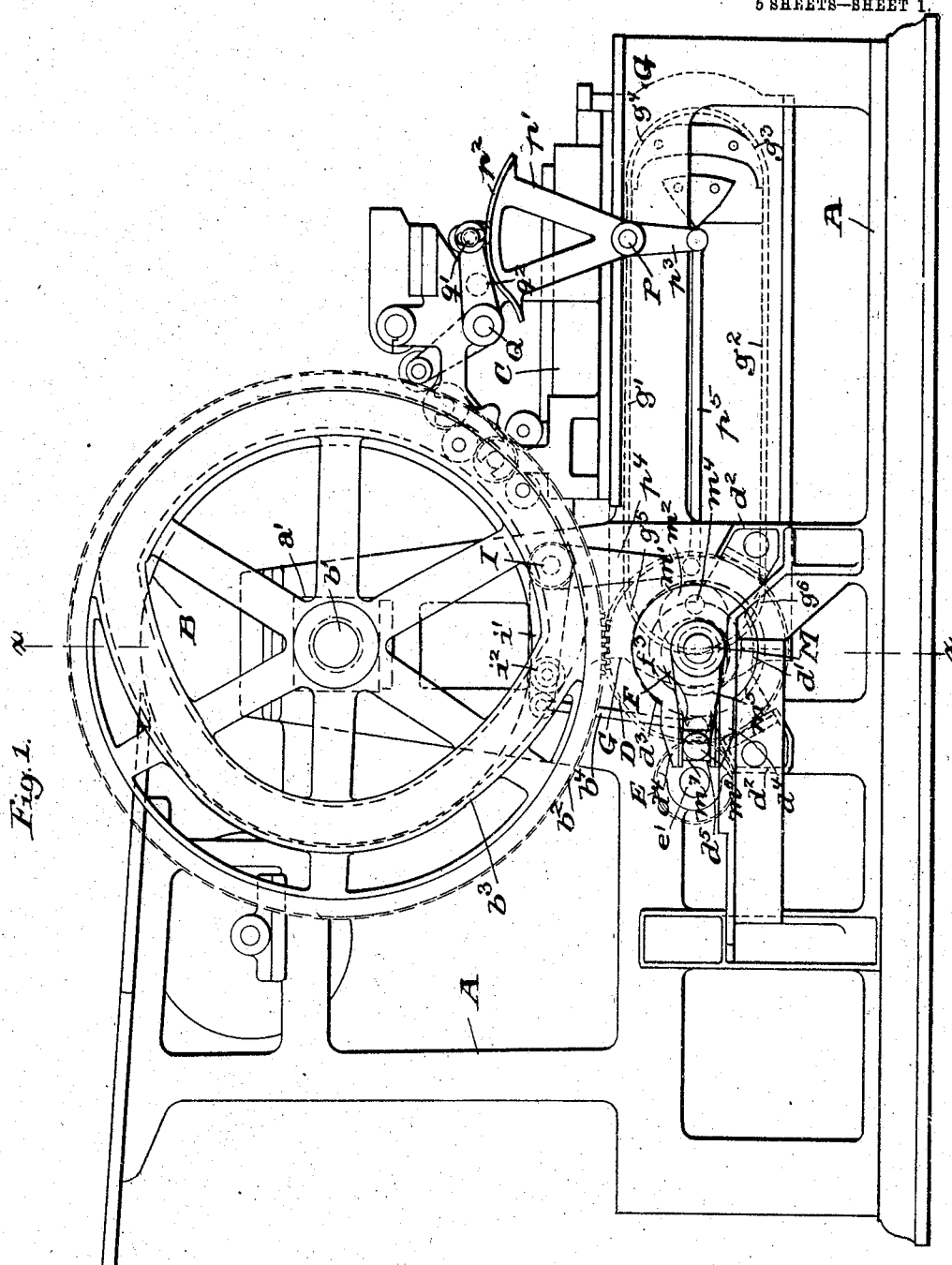


Fig. 1.

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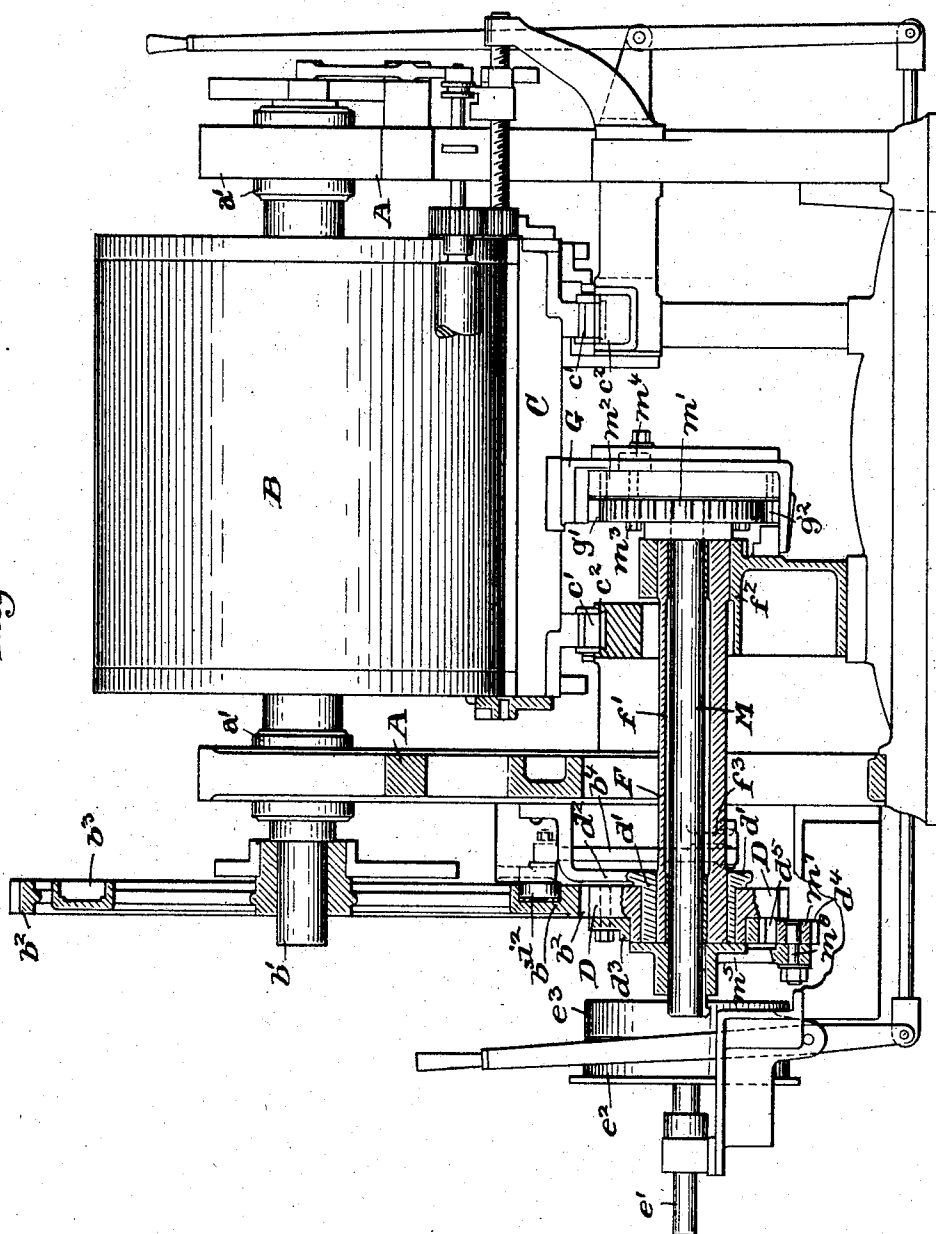
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5 SHEETS—SHEET 2.

Fig. 2.



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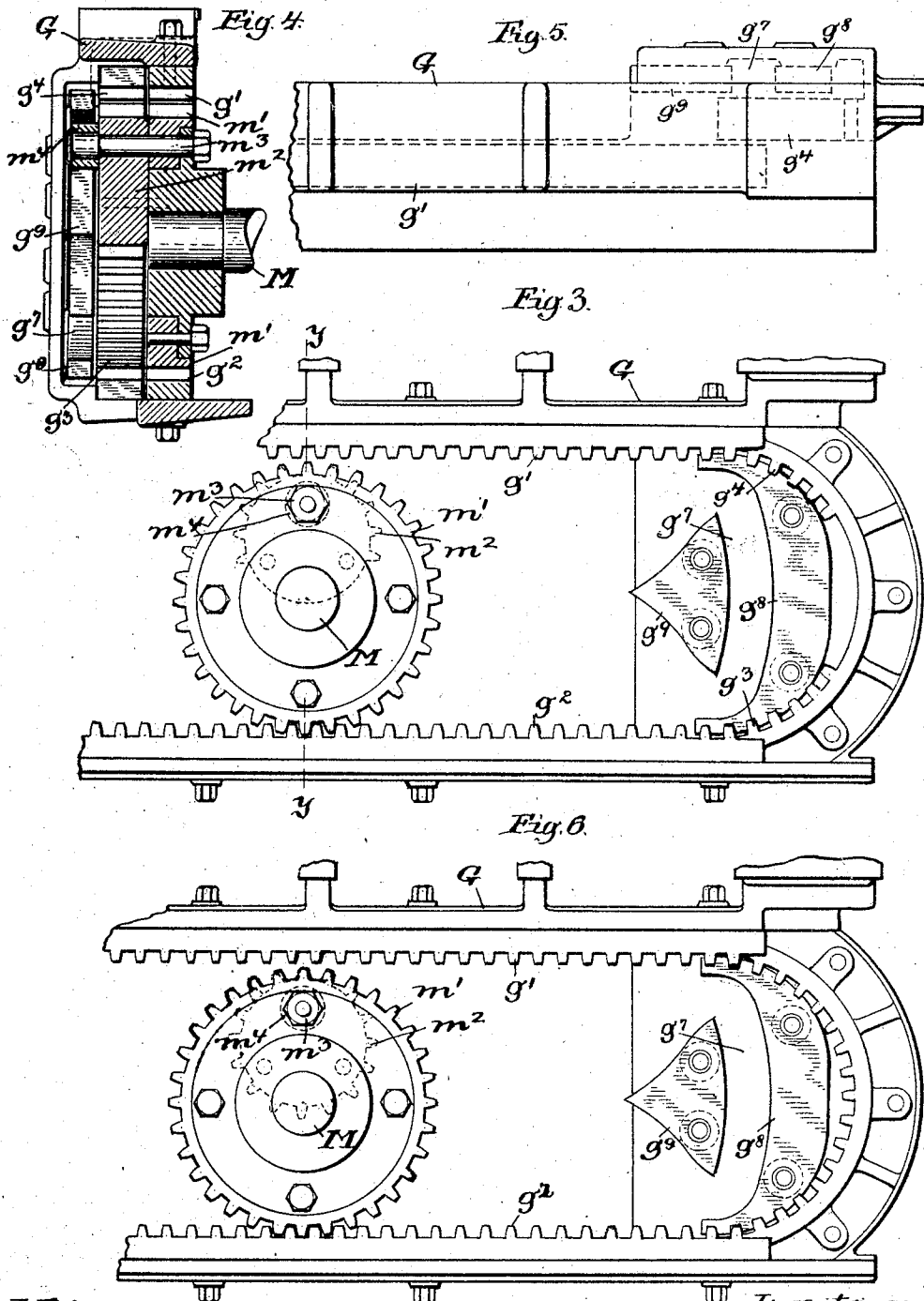
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5 SHEETS—SHEET 3.



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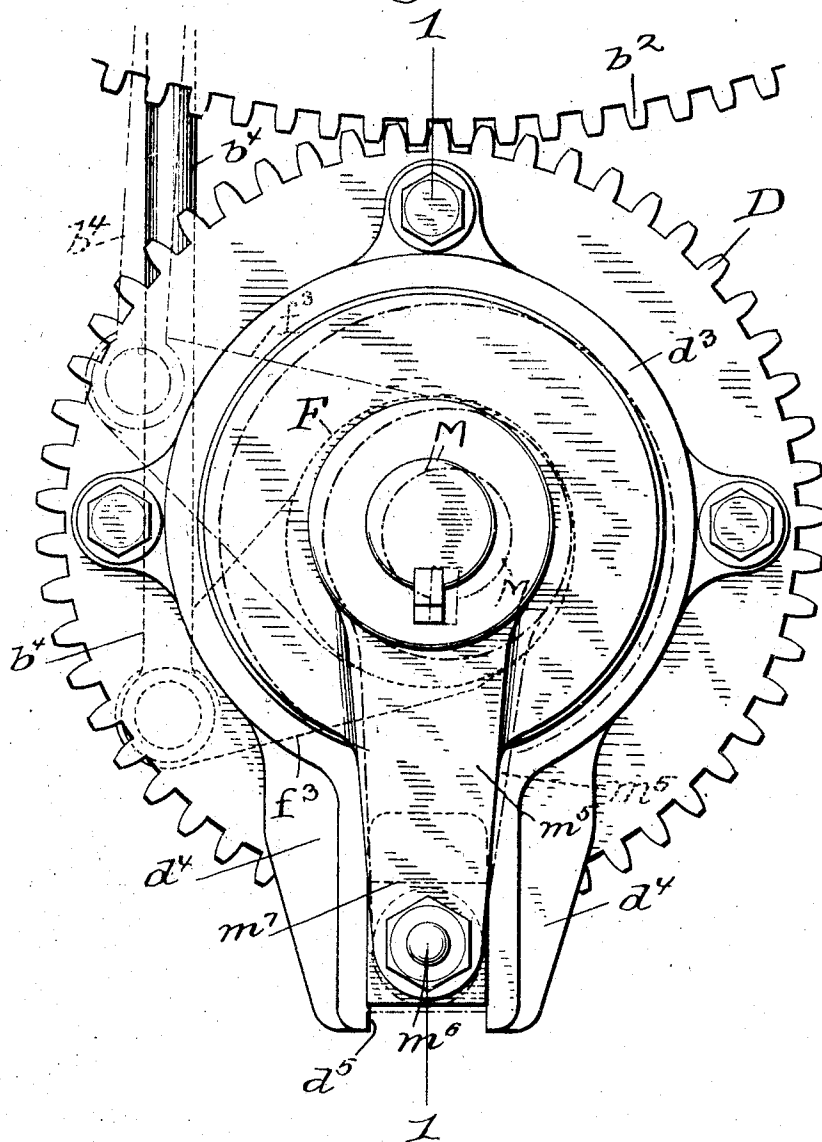
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5 SHEETS—SHEET 4.

Fig. 7.



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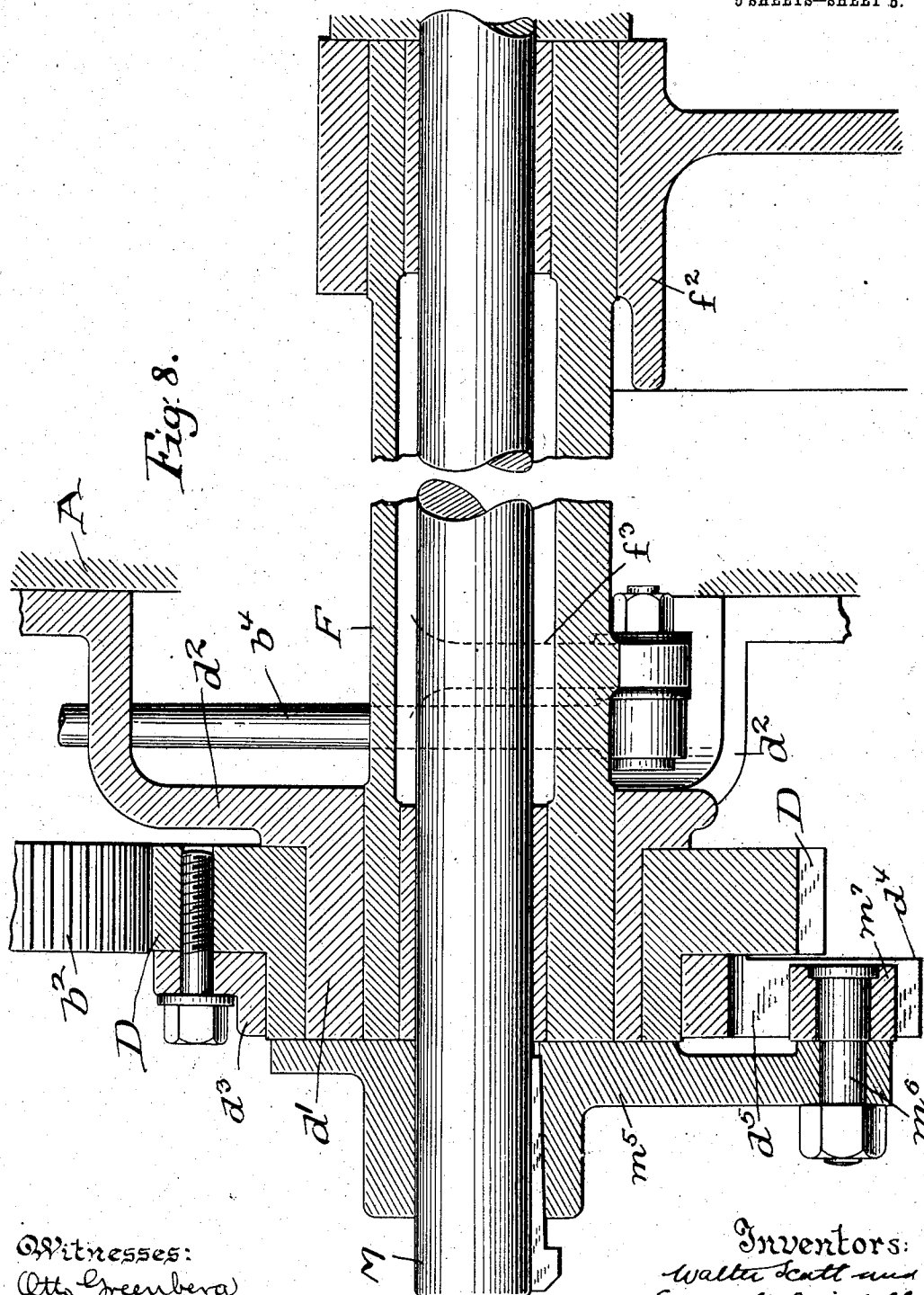
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

WALTER SCOTT, OF PLAINFIELD, NEW JERSEY, AND EUGENE W. SWINDELLS, OF ST. LOUIS, MISSOURI; SAID SWINDELLS ASSIGNOR TO SAID SCOTT.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 790,530, dated May 23, 1905.

Application filed April 15, 1901. Serial No. 55,820.

To all whom it may concern:

Be it known that we, WALTER SCOTT, residing at Plainfield, county of Union, and State of New Jersey, and EUGENE W. SWINDELLS, residing at St. Louis, in the State of Missouri, citizens of the United States, have invented certain new and useful Improvements in Printing-Machines, of which the following is a specification.

Our invention relates generally to printing-machines, and more especially to the means which impart movement to and reverse the movement of the reciprocating bed carrying the type.

Heretofore printing-machines of the character herein shown have usually been constructed with a great number of gears (ordinarily five) between the impression-cylinder and the bed-driving racks, thereby causing looseness between the cylinder and the bed. The bed-movement itself has generally been constructed with an upper and lower rack, a driving-gear engaging alternately with said racks, and a roll located on the pitch-line of the gear for engaging with suitable means located at each end of the racks, so as to reverse the motion of the bed while the gear disengages with one rack and engages with the other. Owing to this construction and to the position of the roll, the line of travel described by the said roll carried by the gear has been so curved that it has been necessary to construct the means in such a manner that it could be moved out of the path of the roll to allow it to properly engage and disengage and to move it back again, so as to give the roll something to bear against. The reciprocating bed has also sometimes been constructed with a round collar, affording a bearing portion for a roll carried concentric with a small gear on the large gear engaging with the horizontal racks; but this means is very unsatisfactory, as the roll does not bear properly against the collar until it is on the center of the turning movement, and then for a moment only. Besides, another bearing portion with an additional roll has to be provided to steady the elements in the other direction while turning. In our improved mechanism we obviate these difficul-

ties and make a machine more efficient and at less cost, the roll being located in such a position that it can be made to engage with the sides of a groove or slot during a considerable fraction of the time the bed-motion is being reversed. Besides, the number of gears between the impression-cylinder and the type-bed are reduced.

Other improvements and objects will appear farther on in the specification.

In the drawings we have embodied our invention in a suitable mechanism, it being of course obvious that changes may be made within the scope of the claims.

Figure 1 is a side view of a printing-machine embodying our invention, the type-bed being shown at the end of its reciprocation, parts also being omitted and indicated diagrammatically for the sake of clearness. Fig. 2 is partly an end view and partly a sectional view on the line *x x* of Fig. 1, showing the bed-driving gear at the end of its uniform motion. Fig. 3 is a detail view of the bed-racks, driving-gear, and adjacent elements. Fig. 4 is a sectional view, on the line *y y*, of the means shown in Fig. 3. Fig. 5 is a plan view of the hanger which supports the racks. Fig. 6 shows a different form of the means shown in Fig. 3. Fig. 7 is an enlarged view of the means for rotating the vibrating shaft and the adjacent elements for oscillating the eccentric sleeve F, the oscillating means and sleeve and shaft being shown in two different positions. Fig. 8 is a sectional view on the line *z z* of Fig. 7, showing also the support for the sleeve F, located at the other end of the latter.

Similar letters of reference indicate corresponding parts in the different views.

We shall describe a printing-machine embodying our invention and afterward point out the novel features in the claims.

A represents the framework of the machine, on which is mounted in suitable bearings *a* the impression-cylinder B. The type-bed C is mounted on frictional rollers *c*¹, which are carried by and slide upon the tracks *c*². Underneath the type-bed C and bolted to it is a rack-hanger G. On this rack-hanger are

mounted the upper rack g' and the lower rack g'' and further segmental racks g^3 , g^4 , g^5 , and g^6 . On each end of the rack-hanger is also formed a long groove or slot g^7 , formed in this case by the two rigid shoes g^8 and g^9 .

On the end of the shaft b' of the cylinder B is mounted the large gear b^2 , underneath and engaging with which is mounted the gear D, supported on the stationary bushing d' , carried by the brackets d^2 , bolted to the framework. This gear D is preferably one-third the diameter of the gear b^2 ; but if the impression-cylinder makes two revolutions to each reciprocation of the bed the proportions will of course be different. Adjacent to one side of the gear D is the driving-pinion E, which is fastened to the driving-shaft e' , which also carries the belt-pulleys e^2 and e^3 , transmitting motion to the machine. The fixed bushing or hub d' , on which the gear rotates, is hollow and affords a bearing for the eccentrically-located rock-shaft F, extending in toward the center of the machine. This eccentric rock-shaft F has an eccentric hole f' and is supported at its other end by the bearing f^2 . Inside the eccentric rock-shaft or sleeve F in the eccentric hole f' is placed the shaft M, which of course thereby also becomes eccentric with relation to the gear D, except when shifted to a certain position by the eccentric rock-shaft F. On the shaft M is the gear-wheel m' , adapted to engage with the racks g' and g'' . The gear m' is preferably of a circumference equal to the uniform travel of the bed in one direction. By this means the gear m' makes three revolutions to each complete back-and-forth movement of the bed. Fastened to one side of the gear m' is the pinion m^2 . This pinion m^2 is preferably made of a diameter equal to one-half the diameter of the gear m' plus one-half the distance which the said gear rises or lowers to engage or disengage with the racks g' and g'' . On the gear m' is also placed a stud m^3 , on which revolves the friction-roll m^4 , which should be practically the same diameter as the width of the slot or groove g^7 . This roll m^4 is preferably placed at one side of the pinion m^2 at a point between the pitch-line and the center of the same, the preferred position being half between the two or at a point a distance inside of the pitch-line of the driving-gear equal to substantially one-quarter of the length of the pitch radius of the said driving-gear.

On the outer end of the shaft M is fastened an arm m^5 , (shown in this instance as a part of a sleeve,) on the end of which is a pin m^6 , to which is fitted a square block m^7 . On the extended hub of the gear-wheel D is fastened a ring d^3 , on the side of which are projecting parts d^4 , placed a distance apart, so as to form a recess d^5 , into which the block m^7 extends and slides, and thereby drives the shaft M.

On the hollow eccentric shaft or sleeve F and integral therewith or fastened thereto is an

arm f^3 . On the side frame A is placed a stud I, on which is mounted the rock-arm i' , which carries friction-roll i^2 , which engages with the cam b^3 . The rock-arm i' is connected with the arm f^3 by means of the connecting-rod b^4 .

On one of the frames A is placed a stud P, on which is mounted a rocker p' , its upper end being formed into a cam p^2 of suitable shape to vibrate the ink-ductor rock-shaft Q, which may be of any well-known construction, by means of the friction-roll q' , which is mounted on the end of the arm q^2 and rests on the cam p^2 . On the lower end of the rocker p' is an arm p^3 . Connected with the arm i' is an arm p^4 , which extends downward and is connected to the arm p^3 by means of the rod p^5 and suitable bolts.

The operation is as follows: When the end of the rack g^2 approaches the point of contact with the gear m' and is about to leave the same, the roll m^4 will pass into the slot g^7 and engage with either side wall of same, according to the direction of the pressure to control and reverse the movement of the bed. Owing to the disposition of the roll m^4 , its path will be such that it is enabled to enter the slot g^7 before the driving-gear and auxiliary gear, meshing with their respective racks, lose control of the bed. It is to make the movement when the driving-gear disengages the rack and the roll enters the slot perfectly positive that the gear-segment m^2 will engage the curved rack g^3 to continue the forward movement. This gear-segment and curved rack is capable of controlling the movement of the bed for a very short period only, but sufficiently long to give the roll an opportunity to pass in behind the shoe g^8 . On account of this it will be understood that if the position of the roll should be varied slightly the device would still be operative, with the gear-segment and curved rack controlling the bed for a short period. Before the roll leaves the slot the gear m^2 will engage the curved rack g^4 and the gear m' will then be brought into mesh with the rack g' . During this operation the gear m' has changed its position in contact with the rack g'' to a position in contact with the rack g' by means of the shaft M, on which it is mounted, being raised a sufficient distance by the movement of the eccentric rock-shaft or sleeve F, actuated by the cam b^3 . When the other end of the rack g' reaches the gear m' , the operation is again repeated and the gear m' lowered, so as to disengage with the rack g' and engage with the rack g'' . At each turning of the bed while the gear m' is being raised and lowered and by means of the cam b^3 and its connection to the cam p^2 , which operates the ductor-roller, the ductor-roller is changed in position from the fountain-roller to the distributing-roller, or vice versa, while the distributing-roller is in a state of rest or nearly so.

It is not essential that the pinion m^2 should be a complete gear, nor is it necessary to have four separate segments like g^3 , g^4 , g^5 , and g^6 . In Fig. 6 the pinion m^2 is shown as a complete gear; but in Fig. 3 it is shown in the form of a segment, and in Fig. 6 in place of the racks g^3 , g^4 , g^5 , and g^6 are shown two continuous racks g^{15} and g^{16} , or rather intermediate teeth have been added between the racks g^3 g^4 and g^5 g^6 , which latter construction insures a more positive movement, as the pinion m^2 is in mesh all the time until the gear m' again engages the rack g' or g^2 , although this construction is not necessary to the perfect operation of the machine; but it will of course be understood that the racks g^{15} and g^{16} and the segmental racks g^3 , g^4 , g^5 , and g^6 need not be in the shape of a half-circle, nor that either of them should be circular or the arc of a circle, as shown in the drawings. It is only necessary that these segments should be of a sufficient length and shape to engage with each other until the bed has moved far enough to allow the roll m^4 to enter and leave the slot or groove g^7 to reverse the motion of the bed. Likewise the slot g^7 , curved to conform to the path of the roll m^4 in the present instance, could be of a different shape if the segmental racks and the pinion m^2 were of a different shape.

The cam b^3 makes one revolution to each back-and-forth stroke of the type-bed C. In cases where the impression-cylinder makes more than one revolution to each back-and-forth movement of the bed it would be suitably located elsewhere. Furthermore, as has been stated herein, the shaft M is eccentric with relation to the gear D in the eccentric sleeve F in order that by the shifting of the said eccentric sleeve by the cam b^3 it may be moved up and down to enable the gear m to engage with the upper and lower rack and at the same time be rotated by the said gear D; but when the eccentric sleeve F is moved to a certain position (shown in full lines in Fig. 7) the eccentrically-located shaft M is concentric with relation to the gear D. This oscillation of the eccentric sleeve F of course also changes the position of the arm m^5 with relation to the guide d^5 , so that the distance which the block m^7 has to travel in a given time varies, thereby causing a variation in its speed, and consequently in the speed of the shaft M. When the shaft M is concentric with the gear D, the speed of the said shaft, and consequently of the bed, will be the same speed as the speed of the impression-cylinder, and the elements must of course be so constructed or timed that the said shaft is in its concentric position with relation to the gear D when the machine is in the act of printing, so that the impression-cylinder and the type-bed will have the same surface speed. In this way the gear m' , which engages alternately with the upper and lower racks g' and g^2 , is raised and lowered by means of the eccentric sleeve F and is driven from

another gear, as D, mounted on a fixed hub at the end of said rock-shaft and eccentrically thereto by a suitable pin-and-slot connection, in this instance by means of the square block m^7 , recess d^5 , and shaft M.

In practice the straight racks would probably be somewhat longer than the uniform movement of the bed or the circumference of the gear m' and the ends of the teeth cut off, so as to relieve any undue contact when passing from the straight racks to the curved ones. The curved racks might also be made to overlap in the same way, so that the gear m^2 would be in mesh with the curved racks before the end of the straight rack reaches the gear m' , or vice versa.

The diameter of the pinion m^2 should be substantially one-half the diameter of the gear m' plus one-half the distance the said gear rises and lowers. It could be larger or smaller than this relative to the gear m' ; but this construction is preferred, as it is thereby possible to make the segmental racks appear as continuations of the straight racks, as shown in the drawings.

Having thus described our invention, what we claim is—

1. A reciprocating bed supporting two racks, two curved segments at each end, and two slots, in combination with a driving-gear arranged to engage alternately with the racks, an auxiliary gear engaging with the curved segments, and a roll to engage with either side of the slots to reverse the motion of the bed and to control it while turning, substantially as described.

2. The combination of a reciprocating body carrying two racks, two curved segments at each end, and two slots, a driving-shaft having thereon a gear to engage with the racks, an auxiliary gear to engage with the segments, and a roll to engage with either side of the slots to reverse the motion of the body and to control it while turning, and means to raise and lower the shaft after the ends of the racks have reached the gear, substantially as described.

3. The combination of a frame carrying two racks, two segments at each end, and two slots, a driving-gear caused to engage alternately with the racks, an auxiliary gear of a lesser diameter attached to the driving-gear to engage with the segments, and a roll to engage with either side of the slots to reverse the motion of the frame and to control it while turning placed a distance inside of the pitch-line of the auxiliary gear, substantially as described.

4. The combination of a frame carrying two racks, two segments at each end, and two slots, a driving-gear caused to engage alternately with the racks, an auxiliary gear or gear-segment, of a diameter somewhat greater than the radius of the driving-gear, attached to the latter, and a roll to engage with either

side of the slots to reverse the motion of the frame and to control it while turning, placed at a point intermediate the center and the pitch-line of the auxiliary gear, substantially as described.

5. The combination of a frame carrying two racks, two segments at each end, and two grooves or slots, a driving-gear caused to engage alternately with the racks, means to raise and lower the driving-gear after the ends of the racks have reached the said gear, a gear or gear-segment of a diameter equal to one-half the diameter of the driving-gear plus one-half the distance the said gear is raised or lowered, carried by said driving-gear to engage with the segments, and a friction-roll to engage with either side of the grooves or slots to reverse the motion of the frame and to control it while turning, carried inside of the pitch-line of the second gear or gear-segment, substantially as described.

6. The combination of a frame carrying two racks, two segments at each end, and two slots, a driving-gear caused to engage alternately with the racks, an auxiliary gear of a lesser diameter attached to the driving-gear, to engage with the segments, and a roll to engage with either side of the slots to reverse the motion of the frame and to control it while turning, carried at a point substantially half-way between the pitch-line and the center of the said auxiliary gear or gear-segment, substantially as described.

7. The combination of a frame carrying two racks, two segments at each end, and two grooves or slots, a driving-gear caused to engage alternately with the racks, means to raise and lower the driving-gear after the ends of the racks have reached the gear, a gear or gear-segment of a diameter equal to one-half the diameter of the driving-gear plus one-half the distance the said gear is raised or lowered carried by said driving-gear to engage with the segments, and a friction-roll to engage with either side of the grooves or slots to reverse the motion of the frame and to control it while turning, carried at a point substantially half-way between the pitch-line and the center of the said gear or gear-segment, substantially as described.

8. The combination of a frame carrying two racks, two segments at each end, and two slots, a driving-gear caused to engage alternately with the racks, an auxiliary gear of a lesser diameter attached to the driving-gear to engage with the segments, a roll to engage with either side of the slots to reverse the motion of the frame and to control it while turning, placed a distance inside the pitch-line of the auxiliary gear, and means to raise and lower the driving-gear after the ends of the racks have reached the gear, substantially as described.

9. The combination of a frame carrying two racks, two segments at each end, and two slots,

a driving-gear caused to engage alternately with the racks, an auxiliary gear of a lesser diameter attached to the driving-gear to engage with the segments, and a roll to engage with either side of the slots to reverse the motion of the frame and to control it while turning, placed at a point intermediate the center and pitch-line of the auxiliary gear substantially as described.

10. The combination of a frame carrying two racks, two segments at each end, and two slots, a driving-gear caused to engage alternately with the racks, an auxiliary gear of a lesser diameter attached to the driving-gear to engage with the segments, a roll to engage with either side of the slots to reverse the motion of the frame and to control it while turning, placed at a point intermediate the center and pitch-line of the auxiliary gear, and means to raise and lower the driving-gear after the ends of the racks have reached the gear, substantially as described.

11. The combination of a frame carrying two racks, two segments at each end, and two slots, a driving-gear caused to engage alternately with the racks, an auxiliary gear or gear-segment of a diameter somewhat longer than the radius of the driving-gear attached to the latter, a roll to engage with either side of the slots to reverse the motion of the frame and to control it while turning, placed at a point intermediate the center and pitch-line of the auxiliary gear, and means to raise and lower the driving-gear after the ends of the racks have reached the gear, substantially as described.

12. The combination of a reciprocating body, an upper and lower rack on same, a driving-gear adapted to engage alternately with the said racks to reciprocate the body, a long slot or groove, having rigid sides, at each end of the racks, a friction-roll carried by the gear adapted to engage with either side of said slots to reverse the motion of the body and to control it while turning, two rack-segments carried by said body located intermediate the upper and lower racks at each end, and an auxiliary gear carried by the driving-gear adapted to coact with the said rack-segments to continue the movement of the body while the racks disengage the driving-gear and while the roll is entering into engagement with the slots, or vice versa, substantially as described.

13. The combination of a rock-shaft having a longitudinal eccentric hole, a rotatable shaft resting in said hole, means for rotating the rotatable shaft continuously and means for operating the rock-shaft periodically, substantially as described.

14. In a printing-machine, the combination of a gear, a rock-shaft eccentric with relation thereto and having a longitudinal eccentric hole, a rotatable shaft resting therein, means for operating the rotatable shaft from the

gear, and means for periodically operating the rock-shaft.

15. In a printing-machine, the combination of a gear, a rock-shaft eccentric with relation thereto and having a longitudinal eccentric hole, a rotatable shaft resting therein, means for operating the rotatable shaft from the gear aforementioned, the said shaft normally running eccentrically with relation to the said gear, a cam making one revolution to each impression, and means operated by said cam for periodically operating the eccentric rock-shaft so that the rotatable shaft is alternately eccentric and concentric with relation to the gear.

16. The combination of a gear-wheel, a bushing forming a hub or shaft for said gear-wheel, a rock-shaft located eccentrically in said bushing and having a longitudinal eccentric hole, a rotatable shaft resting therein, a guide rotating with said gear, and an arm carrying a block on the rotatable shaft adapted to engage with the guide to impart the motion of the gear to the rotatable shaft.

17. In a printing-machine, the combination of a gear-wheel, a bushing forming a hub or shaft for said gear-wheel, a rock-shaft located eccentrically in said bushing and having a longitudinal eccentric hole, a rotatable shaft resting therein, a guide rotating with said gear, an arm carrying a block on the rotatable shaft adapted to engage with the guide to impart the motion of the gear to the rotatable shaft, a cam making one revolution to each impression, and connections between the cam and the rock-shaft whereby the rock-shaft is operated periodically by the movement of the cam.

18. In a printing-machine the combination of an impression-cylinder, a reciprocating type-bed, a rock-shaft, an eccentrically-located rotatable shaft resting in said rock-shaft, means for operating the reciprocating bed from the rotatable shaft, a gear mounted on a fixed hub at the end of said rock-shaft and eccentrically thereto imparting motion to the impression-cylinder and to the rotatable shaft, a cam making one revolution with each impression, and means operated by said cam for rocking the rock-shaft periodically, substantially as described.

19. In a printing-machine, the combination of a reciprocating type-bed carrying two racks, two segments at each end and two grooves, a driving-gear for engaging with the racks carrying a pinion for engaging the segments and a friction-roll for engaging the slots to reverse the motion of the bed, a rotatable shaft mounting said driving-gear, a rock-shaft having a longitudinal eccentric hole, the rotatable shaft resting in said hole, and means for periodically operating the rock-shaft to raise and lower the rotatable shaft after the ends of the racks have reached the driving-gear, substantially as described.

20. In a printing-machine, the combination of a reciprocating type-bed carrying two racks, two segments at each end and two grooves, a driving-gear for engaging with the racks carrying a pinion for engaging the segments and a friction-roll for engaging the slots to reverse the motion of the bed, a rotatable shaft mounting said driving-gear, a rock-shaft having a longitudinal eccentric hole, the rotatable shaft resting in said hole, and means for periodically operating the rock-shaft to raise and lower the rotatable shaft after the driving-gear is disengaged from the upper and lower racks, substantially as described.

21. In a printing-machine, the combination of a reciprocating type-bed carrying two racks, two segments at each end and two grooves, a driving-gear for engaging with the racks carrying a pinion for engaging the segments and a friction-roll for engaging the slots to reverse the motion of the bed, a rotatable shaft mounting said driving-gear, a rock-shaft having a longitudinal eccentric hole, the rotatable shaft resting in said hole, and means for periodically operating the rock-shaft to raise and lower the rotatable shaft while the motion of the bed is being reversed, substantially as described.

22. In a printing-machine, the combination of a reciprocating type-bed carrying two racks, two segments at each end and two slots, a driving-gear for engaging with the racks carrying a pinion for engaging the segments and a friction-roll for engaging the slots to reverse the motion of the bed, a rotatable shaft mounting said driving-gear, a rock-shaft having a longitudinal eccentric hole, the rotatable shaft resting in said hole, means for periodically operating the rock-shaft to raise and lower the rotatable shaft after the driving-gear is disengaged from the upper and lower racks, a gear mounted on a fixed hub, and means for operating the rotatable shaft from said gear, substantially as described.

23. In a printing-machine, the combination of a reciprocating type-bed carrying two racks, two segments at each end and two grooves, a driving-gear for engaging the racks carrying a pinion for engaging the segments and a friction-roll for engaging the slots to reverse the motion of the bed, a rotatable shaft mounting said driving-gear, a rock-shaft having a longitudinal eccentric hole, the rotatable shaft resting in said hole, a gear mounted on a fixed hub, an impression-cylinder having a gear meshing with the gear on the fixed hub, and means for operating the rotatable shaft from the gear on the fixed hub, substantially as described.

24. In a printing-machine, the combination of a reciprocating type-bed carrying two racks, two segments at each end and two slots, a driving-gear for engaging the racks carrying a pinion for engaging the segments and a friction-roll for engaging the slots to reverse

the motion of the bed, a rotatable shaft mounting said driving-gear, a rock-shaft having a longitudinal eccentric hole, the rotatable shaft resting in said hole, a gear mounted on a fixed
 5 hub, an impression-cylinder having a gear meshing with the gear on the fixed hub, means for operating the rotatable shaft from the gear on the fixed hub, and means for operating the
 10 shaft after the driving-gear is disengaged from the upper or lower rack, substantially as described.

25. In a printing-machine, the combination of a reciprocating type-bed carrying two
 15 racks, two segments at each end and two slots, a driving-gear for engaging the racks carrying a pinion for engaging the segments and a friction-roll for engaging the slots to reverse the motion of the bed, a rotatable shaft mounting
 20 said driving-gear, a rock-shaft having a longitudinal eccentric hole, the rotatable shaft resting in said hole, a gear mounted on a fixed hub, an impression-cylinder having a gear meshing with the gear on the fixed hub, means
 25 for operating the rotatable shaft from the gear on the fixed hub, a cam making one revolution to each impression, and means connecting the cam and the rock-shaft whereby the latter raises and lowers the rotatable shaft after the
 30 driving-gear is disengaged from the upper and lower rack, substantially as described.

26. The combination of a rotatable gear mounted in stationary bearings at the end of one shaft, a second gear mounted at and on the
 35 other end of said shaft adapted to vibrate up and down to engage alternately between two racks, and means whereby the rotation of the first gear causes the rotation and up-and-down vibration of the second gear, substantially as
 40 described.

27. The combination with a rotatable gear mounted in stationary bearings and a reciprocating bed having an upper and a lower rack, of a shaft located eccentric but inside the circumference of and driven by said gear, and a
 45 gear on the opposite end of the shaft adapted to vibrate between the two racks, to engage the same by the rotation of the first-mentioned gear, substantially as described.

28. The combination of a reciprocating bed having an upper and a lower rack, an impression-cylinder, a gear on the shaft of same, a gear meshing with said gear, a gear adapted to engage alternately with the upper and lower
 55 rack, and means whereby the rotation of the gear meshing with the gear on the impression-cylinder, causes the rotation and up-and-down vibration of gear engaging with the racks, substantially as described.

29. The combination of a reciprocating bed, having an upper and a lower rack in the same vertical plane fixed to its under side, an impression-cylinder, a gear driving same, a gear meshing with said gear, a shaft driven by said
 65 gear extending under the bed and having on

its opposite end a gear which engages alternately with the racks on the bed, substantially as described.

30. The combination of a reciprocating bed, having an upper and a lower rack fixed to its
 70 under side, an impression-cylinder, a gear driving same, a gear meshing with said gear and driving a shaft eccentrically mounted and extending under the bed, having on its opposite end a gear which engages alternately with
 75 the racks on the bed, and of less pitch diameter than the distance between the racks, substantially as described.

31. The combination of a reciprocating bed, having an upper and a lower rack fixed to its
 80 under side, an impression-cylinder, a gear driving same, a gear meshing with said gear and driving a shaft extending under the bed, and having on its opposite end a gear which engages alternately with the racks on the bed,
 85 and of less pitch diameter than the distance between the racks, and a driving-pinion engaging with the gear driving the bed-driving shaft, substantially as described.

32. In a printing-press, the combination of
 90 a reciprocating bed, an impression-cylinder, a gear on the impression-cylinder shaft of greater diameter than the cylinder, a gear meshing with said gear and driving a shaft which extends inwardly underneath the bed,
 95 a gear fixed on the opposite end of said shaft and which is caused to vibrate up and down between the two driving-racks fixed on the bed, the said gear being of less diameter than the diameter of the gear driving the shaft,
 100 substantially as described.

33. In a printing-press, the combination of a reciprocating bed, an impression-cylinder, a gear on the impression-cylinder shaft of greater diameter than the cylinder a gear fixed
 105 on a hollow stud and meshing with said gear and driving a shaft which extends inwardly underneath the bed, a gear fixed on the opposite end of said shaft and which is caused to vibrate between the two driving-racks fixed
 110 on the bed, the said gear being of less diameter than the diameter of the gear driving the shaft, substantially as described.

34. In a printing-press, the combination of a reciprocating bed, an impression-cylinder,
 115 a gear on the impression-cylinder shaft of greater diameter than the cylinder, a gear meshing with said gear and driving a shaft which extends inwardly underneath the bed, a gear fixed on the opposite end of said shaft
 120 and which is caused to vibrate between the two driving-racks fixed on the bed, the said gear being of less diameter than the distance between the racks and the diameter of the gear driving the shaft, substantially as described.
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35. In a printing-press, the combination of a reciprocating bed, an impression-cylinder, a gear on the impression-cylinder shaft of greater diameter than the cylinder, a gear fixed
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on a hollow stud and meshing with said gear and driving a shaft which extends inwardly underneath the bed, a gear fixed on the opposite end of said shaft and which is caused to

5 vibrate between the two driving-racks fixed on the bed, the said gear being of less diameter than the distance between the racks, and the diameter of the gear driving the shaft, substantially as described.

10 36. The combination of a reciprocating bed, having an upper and a lower rack in the same vertical plane fixed to its under side, an impression-cylinder, a gear driving same, a gear meshing with said gear driving a shaft extending under the bed, and a gear on the opposite end of said shaft adapted to engage alternately with the racks on the bed, substantially as described.

20 37. The combination of a gear-wheel, a bushing forming a hub or shaft for said gear-wheel, a rock-shaft located eccentrically in said bushing, a longitudinal eccentric hole in the rock-shaft, a rotatable shaft resting therein, and means for operating the rotatable shaft from the gear-wheel, substantially as described.

25 38. A reciprocating bed supporting two main racks and two slots, in combination with a driving-gear, arranged to engage alternately with the main racks, to reciprocate the said bed, and a roll to engage with either side of the said slots to reverse the motion of the bed and to control it while turning, curved racks located intermediate the main racks at each end, and an auxiliary gear carried by the driving-gear to engage with the curved racks, substantially as described.

30 39. A reciprocating bed supporting two main racks and two slots, in combination with a driving-gear, arranged to engage alternately with the main racks to reciprocate the said bed, and a roll to engage with either side of the slots to reverse the motion of the bed and to control it while turning, curved racks located intermediate the main racks at each end, intermediate teeth connecting the curved racks, and an auxiliary gear to engage with the curved racks, substantially as described.

35 40. The combination of a reciprocating body carrying two main racks and two slots, a driving-shaft having thereon a driving-gear to engage with the main racks to reciprocate the said body, and a roll to engage with either side of the slots to reverse the motion of the bed and to control it while turning, curved racks located intermediate the main racks at each end, an auxiliary gear carried by the driving-gear to engage with the curved racks, and means to raise and lower the shaft after the ends of the racks have reached the driving-gear, substantially as described.

40 41. The combination of a reciprocating body carrying two main racks and two slots, a driving-shaft having thereon a driving-gear to engage with the main racks to reciprocate the said body, and a roll to engage with either

side of the slots to reverse the motion of the body and to control it while turning, curved racks located intermediate the main racks, intermediate teeth connecting the curved racks at each end, an auxiliary gear carried by the driving-gear to engage with the curved racks, and means to raise and lower the shaft after the ends of the racks have reached the driving-gear, substantially as described.

42. The combination of a reciprocating body, an upper and a lower rack on same, a driving-gear adapted to engage alternately with the said racks to reciprocate the body, a long slot or groove, having rigid sides, at each end of the racks, a friction-roll carried by the driving-gear adapted to engage with either side of said slots to reverse the motion of the body and to control it while turning, two rack-segments at each end carried by said body located intermediate the racks, intermediate teeth connecting said rack-segments at each end, and an auxiliary gear carried by said driving-gear adapted to coact with the said rack-segments to continue the movement of the body while the racks disengage the driving-gear and while the roll is entering into engagement with the slots, or vice versa, substantially as described.

43. A reciprocating body having two racks, a driving-gear engaging alternately therewith, a slot located at each end of the racks, and a reversing-roll to engage with the slot carried by the driving-gear at a point a distance inside of the pitch-line of the driving-gear equal to substantially one-quarter of the length of the pitch radius of the said driving-gear, substantially as described.

44. A reciprocating body having two racks, a driving-gear engaging alternately therewith, a slot located at each end of the racks, and a reversing-roll, adapted to engage with either side of the slot according to the direction of the pressure to reverse the body and control it on the turning movement, carried by the driving-gear at a point a distance inside of the pitch-line of the driving-gear equal to substantially one-quarter of the length of the pitch radius of the said driving-gear, substantially as described.

45. A reciprocating body having two racks, a driving-gear engaging alternately therewith, a slot located at each end of the racks, a reversing-roll, adapted to engage with either side of the slot according to the direction of the pressure to reverse the motion of the body and control it on the turning movement, carried by the driving-gear at a point a distance inside of the pitch-line of the driving-gear equal to substantially one-quarter of the length of the pitch radius of the said driving-gear, and means for continuing the movement of the body while the main rack is disengaging the driving-gear and the roll is entering into engagement with the slot, or vice versa, substantially as described.

46. A reciprocating body having two racks, a driving-gear engaging alternately therewith to impart the main reciprocating stroke, two curved racks at each end of the main racks on the reciprocating body, an auxiliary gear carried by the driving-gear engaging therewith, a slot at each end of the main racks, and a roll carried by the driving-gear adapted to engage with either side of the slot before the above-mentioned elements lose control of the body and to remain in engagement with either side of the slot until the said above-mentioned elements regain control of the reciprocating body, substantially as described.
47. The combination of a frame carrying two racks, two segments at each end, and two slots, a driving-gear caused to engage alternately with the racks, an auxiliary gear or gear-segment attached to the driving-gear, and a roll to engage with either side of the slots to reverse the motion of the frame and to control it while turning, placed at a point intermediate the center and the pitch-line of the auxiliary gear, substantially as described.
48. The combination of a frame carrying two racks, two segments at each end, and two grooves or slots, a driving-gear caused to engage alternately with the racks, means to raise and lower the driving-gear after the ends of the racks have reached the said gear, a gear or gear-segment carried by the said driving-gear to engage with the segments, and a friction-roll to engage with either side of the grooves or slots to reverse the motion of the frame and to control it while turning, carried inside of the pitch-line of the second gear or gear-segment, substantially as described.
49. The combination of a frame carrying two racks, two segments at each end, and two grooves or slots, a driving-gear caused to engage alternately with the racks, means to raise and lower the driving-gear after the ends of the racks have reached the gear, a gear or gear-segment carried by said driving-gear to engage with the segments, and a friction-roll to engage with either side of the grooves or

slots to reverse the motion of the frame and to control it while turning, carried at a point substantially half-way between the pitch-line and the center of the said gear or gear-segment, substantially as described.

50. A reciprocating bed supporting two racks, two curved segments at each end, and two long slots having rigid sides, in combination with a driving-gear arranged to engage alternately with the racks, an auxiliary gear engaging with the curved segments, and a roll to engage with either side of the slots to reverse the motion of the bed and to control it while turning, substantially as described.

51. The combination of a reciprocating body carrying two racks, two curved segments at each end, and two long slots having rigid sides, a driving-shaft having thereon a gear to engage with the racks, an auxiliary gear to engage with the segments, and a roll to engage with either side of the slots to reverse the motion of the body and to control it while turning, and means to raise and lower the shaft after the ends of the racks have reached the gear, substantially as described.

52. The combination of a frame carrying two racks, two segments at each end, and two long slots having rigid sides, a driving-gear caused to engage alternately with the racks, an auxiliary gear of a lesser diameter attached to the driving-gear to engage with the segments, and a roll to engage with either side of the slots to reverse the motion of the frame and to control it while turning placed at a distance inside of the pitch-line of the auxiliary gear, substantially as described.

WALTER SCOTT.

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Witnesses to the signature of Eugene W. Swindells:

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