M. A. DROITCOUR.

BED MOTION FOR PRINTING PRESSES.

APPLICATION FILED MAR. 14, 1911.

1,032,126.

Patented July 9, 1912.

4 SHEETS—SHEET 1.

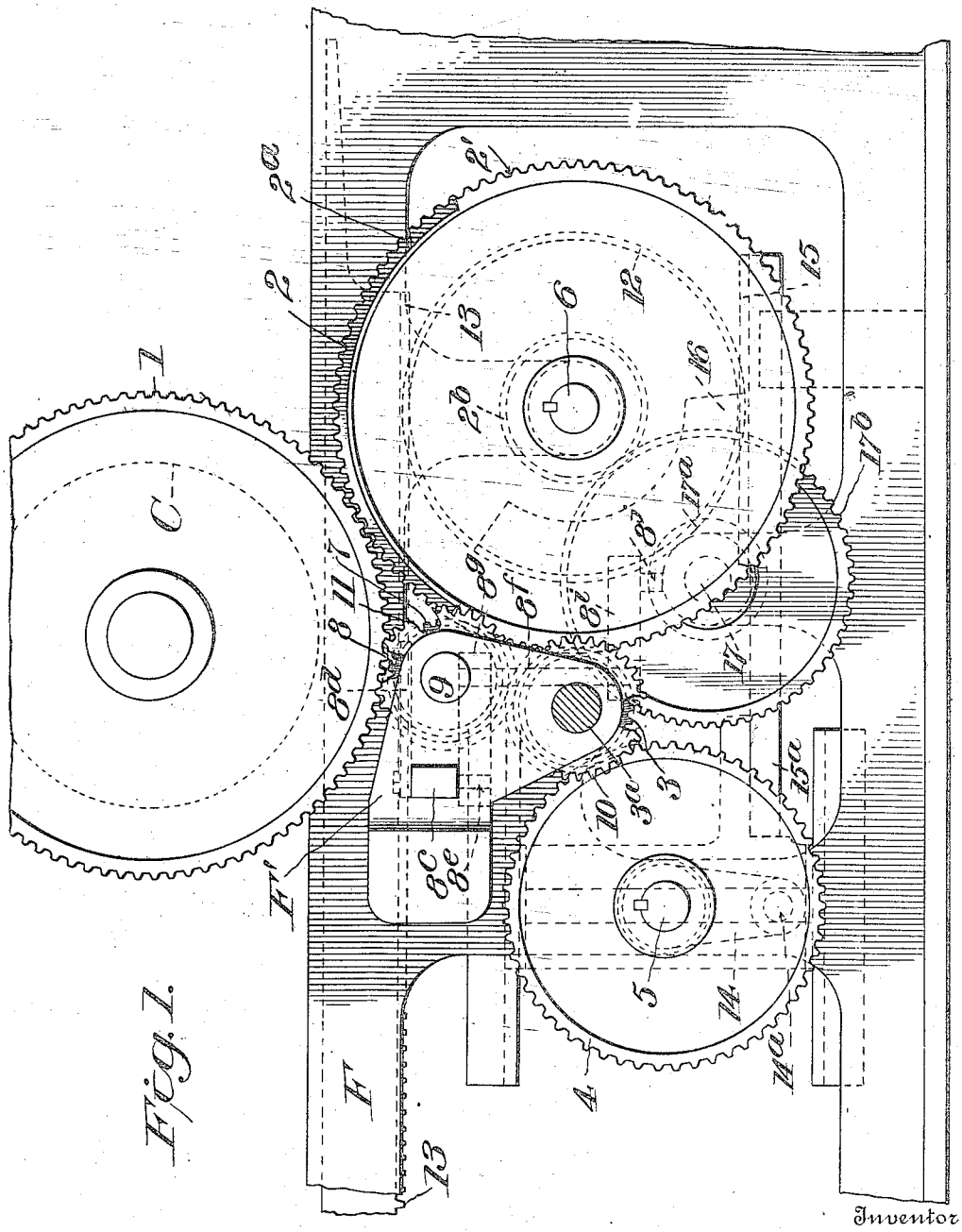


Fig. 1.

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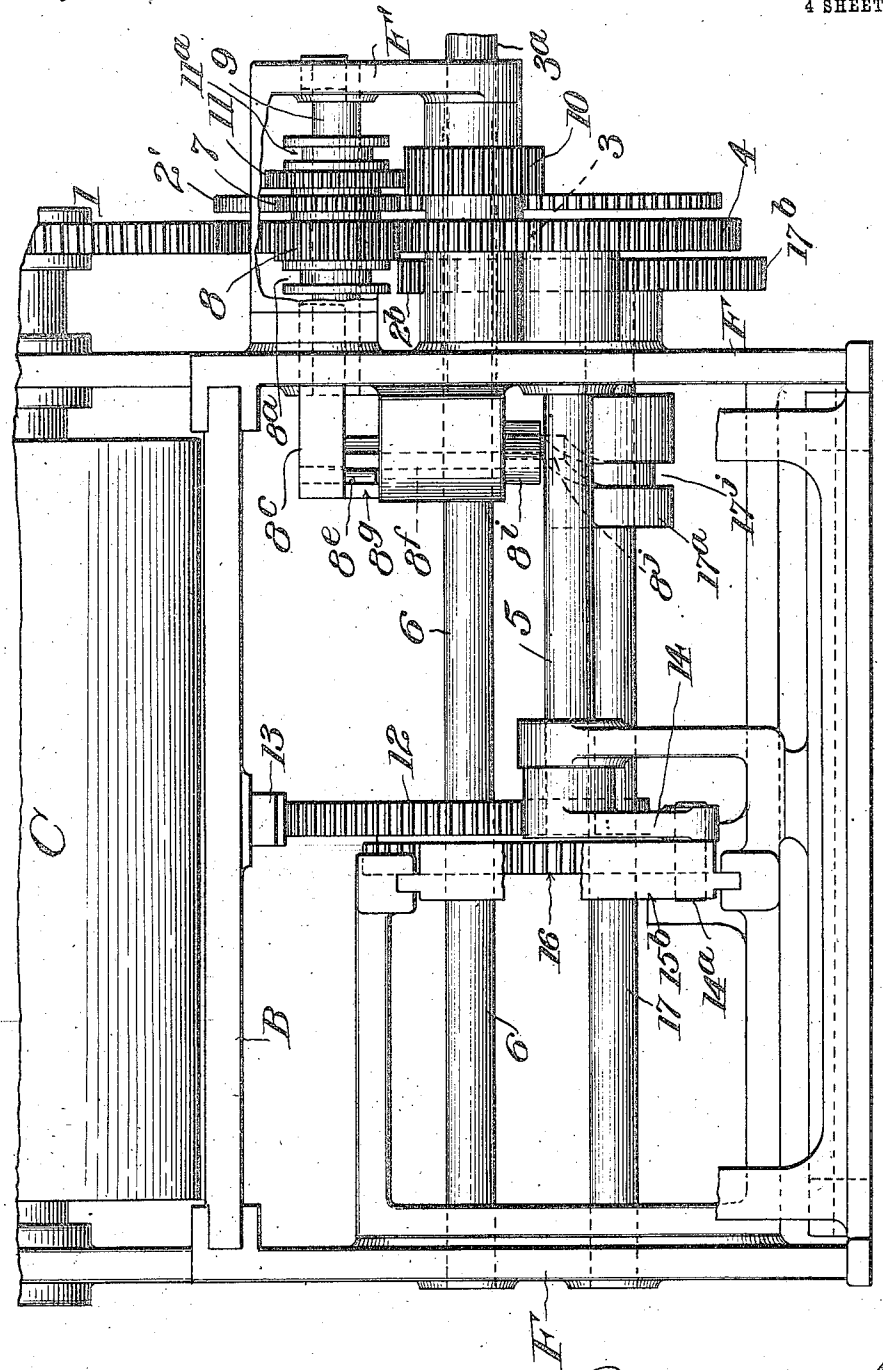


Fig. 2.

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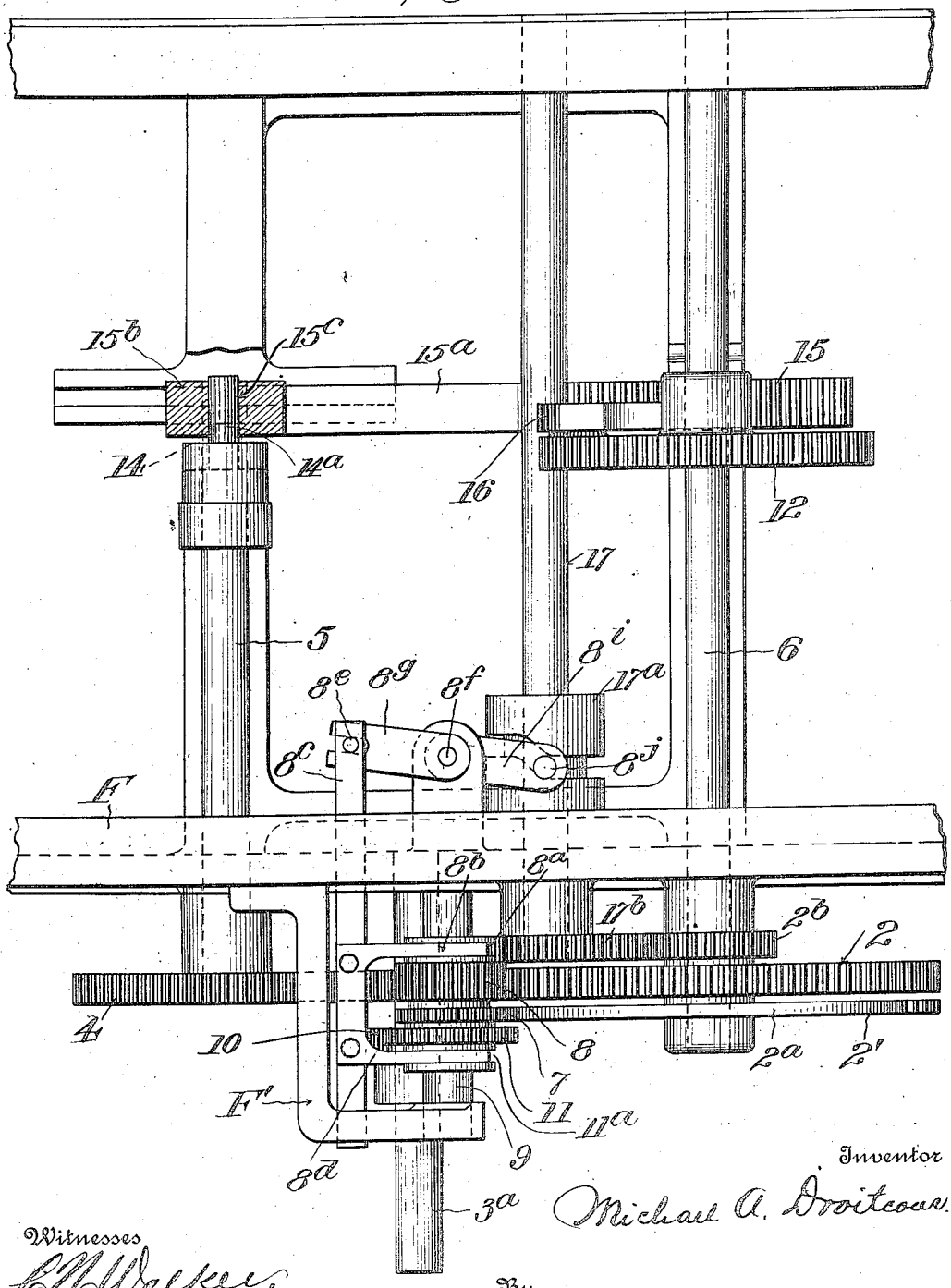
4 SHEETS—SHEET 3.

Fig. 3.

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4 SHEETS—SHEET 4.

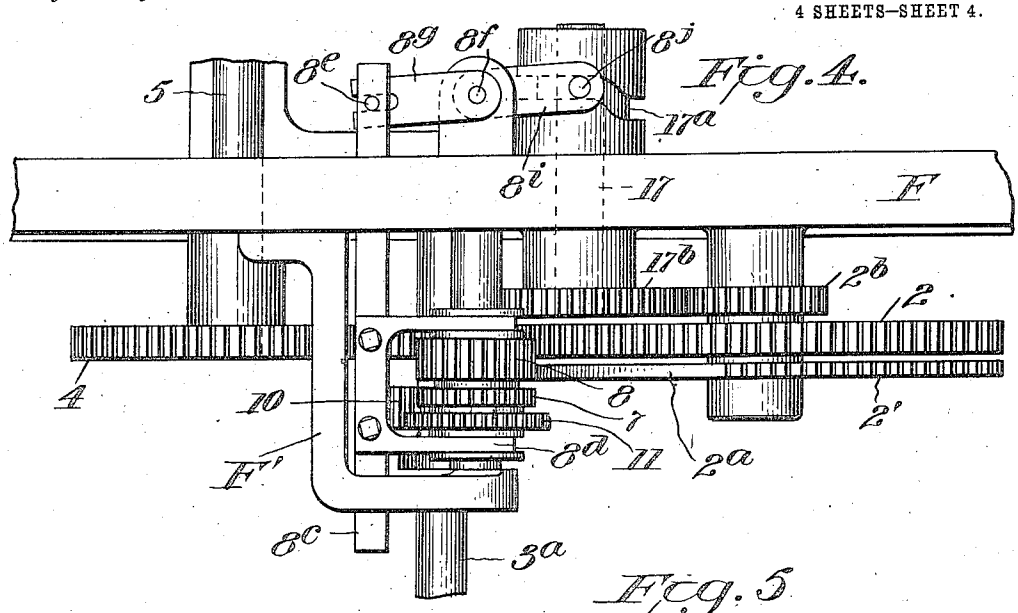



Fig. 4.

Fig. 5

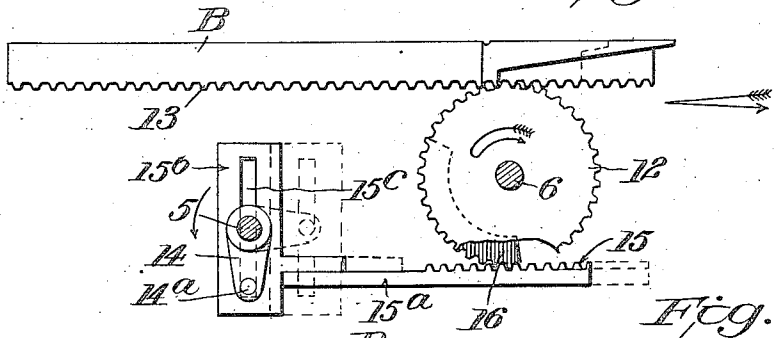



Fig. 6.

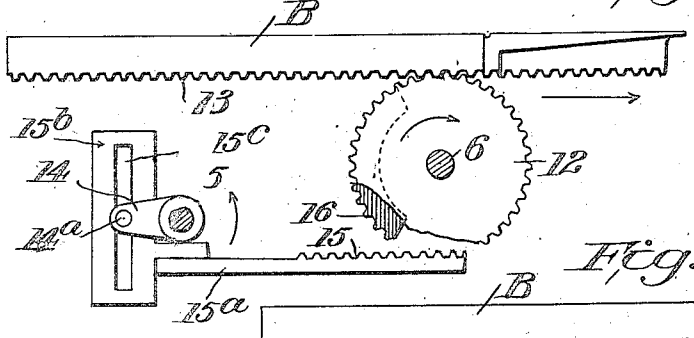
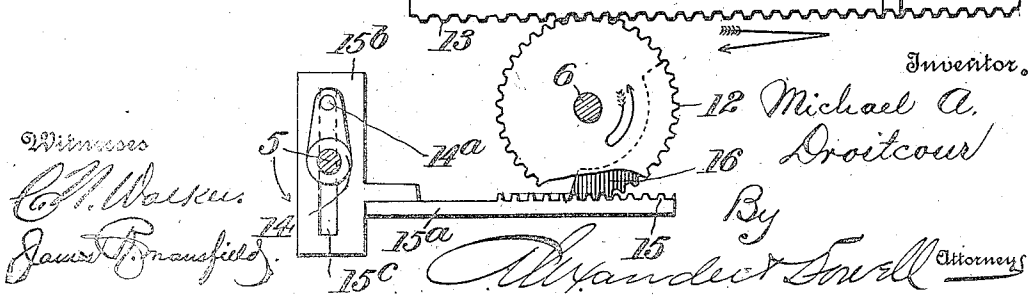



Fig. 7.

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# UNITED STATES PATENT OFFICE.

MICHAEL ANDREW DROITCOUR, OF OAK PARK, ILLINOIS, ASSIGNOR TO MIEHLE PRINTING PRESS AND MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## BED-MOTION FOR PRINTING-PRESSES.

1,032,126. Specification of Letters Patent. Patented July 9, 1912.

Application filed March 14, 1911. Serial No. 614,498.

*To all whom it may concern:*

Be it known that I, MICHAEL A. DROITCOUR, of Oak Park, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Bed-Motions for Printing-Presses; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in means for converting rotary into reciprocating motion, and is particularly adapted for reciprocating the type beds of bed and cylinder printing presses.

The particular object of the invention is to provide novel means for driving the bed at a uniform speed of movement during part of each stroke, and for reversing the motion of the bed at the end of each stroke, by novel means by which the bed will be slowed down, stopped and started back with accelerating speed until it is again moving at the full speed of the uniform driving means; the uniform driving means and the reversing means taking control of the bed without shock or jar.

In this invention the bed is directly driven and reversed by means of a single bed-driving gear engaging a rack on the bed; novel means being provided for driving the gear in either direction at uniform speed; and for slowing down, stopping and reversing the motion of such gear, so as to similarly affect the bed.

The present invention therefore comprises novel means for driving the bed driving gear alternately in opposite directions at full speed; novel means whereby such gear is slowed down, stopped and its motion reversed independently of the means for driving said gear at uniform speed; the means for slowing down and reversing the rotation of the bed driving gear has control of such gear while the mechanism for uniformly rotating said gear has lost control thereof; and the proper mechanism for uniformly rotating the gear has control of the bed-driving-gear when the reversing mechanism has lost control thereof; the parts being so arranged that the bed driving gear will at all times be under direct control of the proper actuating mechanism.

The invention is adaptable for use in many machines where it is desired to convert rotary into reciprocating motion. I will describe it in detail as used for reciprocating the beds of printing presses, and it can be readily adapted to other machines by those skilled in the art.

In the accompanying drawings—Figure 1 is a conventional side elevation of parts of a printing press provided with my invention. Fig. 2 is an end view of Fig. 1. Fig. 3 is a plan view of the movement; partly in section. Fig. 4 is a detail view showing the pinions shifted outward to bring pinion 8 into position to engage gear 2′. Fig. 5 is a diagrammatic view indicating the reversal of the bed at the left hand end of its stroke. Fig. 6 is a similar view illustrating the operation of the bed when free from the reversing mechanism. Fig. 7 is a similar view indicating the reversal of the bed at the right hand end of its stroke.

The machine to which the invention is applied may be of any desired usual construction and a printing press is simply conventionally illustrated in the drawings.

On the shaft of the cylinder C is a gear 1 which meshes with a gear 2, mounted loosely upon a countershaft 6. Gear 2 is driven by means of a pinion 3 mounted upon a shaft $3^a$, to which power may be applied by belt pulleys or gearing (not shown) from any suitable driver. Gear 3 also meshes with a gear 4 keyed on a crank shaft 5, hereinafter referred to.

A short shaft 9 is mounted in one of the adjacent side frames F and a bracket F′ attached thereto, (Figs. 1 and 2) and on this shaft 9 are slidably mounted three pinions 8, 7 and 11. Pinion 8 may be shifted facewise on shaft 9 by any suitable means. As shown the hub of gear 8 has an annular groove $8^a$ which is engaged by an arm $8^b$ on a bar $8^c$ which is slidably supported in the side frame F and bracket F′, and is shifted at the proper time, as hereinafter explained. The pinion 8 is continually in mesh with gear 2.

The pinion 7 is rigidly connected with pinion 11 but spaced apart therefrom. Pinion 11 continually meshes with a gear 10 keyed on shaft $3^a$. The pinions 7 and 11 might be formed integral and revolve as one piece. The pinions 7 and 11 rotate independently of pinion 8 but may be caused to

move facewise on the shaft 9 by means of a finger $8^d$ on bar $8^c$ engaging an annular groove $11^a$ in the hub of pinion 11.

When shaft $3^a$ is driven in the proper direction pinion 8 will constantly revolve clockwise; while pinions 7 and 11 will revolve counter-clockwise. In other words gear 2 is driven by gear 3 on shaft $3^a$ constantly counter-clockwise, and in turn drives pinion 8 constantly clockwise; while gear 10 on shaft $3^a$ drives the pinion 11 (and 7) constantly counter-clockwise when the machine is in operation.

A gear 2′ is keyed on shaft 6 beside gear 2. Gear 2′ is alternately driven by pinions 7 and 8; which latter are shifted alternately into mesh with gear 2′, as hereinafter described; and consequently as pinions 7 and 8 rotate in opposite directions the gear 2′ will be alternately driven in opposite directions. The gear 2′ will thus turn shaft 6 alternately in opposite directions, and drive the bed alternately in opposite directions.

On shaft 6 is keyed a gear 12 which meshes with a rack 13 on the underside of the bed B and consequently when pinion 8 is driving gear 2′ the bed will be moved in one direction; and when pinion 7 is driving gear 2′ the bed will be moved in the opposite direction.

The gear 2′ is a segmental gear, its teeth being removed or cut away for about 120°, or one-third the circumference of the gear as shown at $2^a$. Pinion 8 is of such width that when the pinions 8, 7, 11 are shifted outward—(to the position shown in Fig. 4)—pinion 7 is out of position to mesh with gear 2′ and pinion 8 is in position to mesh with both gears 2 and 2′; and consequently will transmit motion from gear 2 to gear 2′ and cause gear 2′ to rotate with, and in the same direction as, gear 2. When the pinions 7, 8, 11 are shifted inward to the position indicated in Fig. 3 pinion 8 is moved out of position to mesh with gear 2′, and pinion 7 is brought into position to mesh therewith, and consequently will drive gear 2′ in a direction opposite to the rotation of gear 2. Pinion 8 preferably drives gear 2′ while the bed is making its impression stroke; and pinion 7 drives gear 2′ while the bed is making its return stroke.

While the bed is being driven from and by the rotation of gear 2′, as described, it is moved at substantially uniform speed; but gear 2′ loses control of the bed when the teeth of pinion 7, or 8, enter the gap $2^a$ of gear 2′; and while gap $2^a$ is opposite pinions 7 and 8 the latter are shifted laterally on shaft 9; and at such times the bed is under the control of the reversing mechanism which slows down, stops and starts the bed in opposite directions and accelerates its speed until gear 2′ and pinions 7 and 8 are turning at the same peripheral speed, and when gear 2′ again comes into mesh with pinion 8, or 7, it will be turning in the proper direction and at the peripheral speed of said pinion, so that the proper pinion 8, or 7, will come into mesh with gear 2′ without clash. The pinions 7 and 8 may be shifted at the proper times during the reversal periods by any suitable means.

As shown the slide bar $8^c$ has a pin $8^e$ on its inner end engaging a notch in an arm $8^g$ on the upper end of a rock-shaft $8^f$, to the lower end of which shaft is attached an arm $8^i$ having a pin or roller $8^j$ engaging a cam groove $17^j$ in a cam $17^a$ on a counter-shaft 17, which is driven by a gear $17^b$ from a gear $2^b$ beside and fast to the gear 2. During the time that the gap $2^a$ in gear 2′ is passing the pinions 7 and 8; the movement of the bed is reversed by the following means:

*The reversing mechanism.*—A toothed segment 16 may be fast to gear 12, or to the shaft 6 beside gear 12. This segment is about 120° in extent, and during the reversal periods is adapted to engage with a rack 15 on a sliding bar $15^a$, which is guided in suitable supports in the main frame, and has a Scotch yoke head $15^b$ on one end provided with a vertical slot $15^c$ which is engaged by a crank pin or roller $14^a$ on a crank 14 attached to the shaft 5; which is driven by gear 4 from gear 3 as above described. The parts are so arranged that the segment 16 and rack 15 will have control of the gear 12 while the gear 2′ is out of mesh with both pinions 7 and 8; and the segment 16 and rack 15 surrender control of the bed when pinion 7, or 8, comes into mesh with gear 2′.

In the example shown in the drawings the parts are so proportioned that the bed driving gear 12 will be driven about two-thirds of a revolution in one direction while gear 2′ is in mesh with pinion 7; then as pinion 7 enters gap $2^a$ in gear 2′ segment 16 comes into mesh with rack 15; and the bed is reversed by the segment and rack. During this period of reversal pinions 7 and 8 are shifted facewise on shaft 9, so as to bring pinion 8 into position to mesh with gear 2′, and when the segment and rack lose control of the bed, gear 2′ and pinion 8 continue to drive the bed on its printing stroke until pinion 8 again runs into gap $2^a$ of gear 2′; at which moment segment 16 and rack 15 again take control of the bed, and reverse the motion of the bed while the pinions 7 and 8 are being shifted so as to bring pinion 7 into position to mesh with gear 2′ at the end of such reversal period.

In the example shown, the rack bar $15^a$ is caused to make three complete reciprocations for each reciprocation of the bed. In other words shaft 5 is geared to rotate three times to every two revolutions of the shaft 6.

In the example shown in the drawings, the parts are so proportioned that the bed

driving gear 12 will be driven about two-thirds of a revolution in one direction by gear 2′, while gear 2′ is driven from gear 2 by pinion 8. Then pinion 8 runs into gap 2ª out of engagement with the teeth of gear 2′; and while gear 2′ is freed from pinions 7 and 8 the motion of the bed is reversed as hereinafter explained, by action of the segment 16 and rack 15 (Fig. 7). During this period of reversal of the bed, the gear 2′ is slowed down, stopped and started to rotate in the opposite direction; and the pinions 7—8—11 are shifted so that pinion 8 is moved out of position to mesh with gear 2′; and pinion 7 is moved into position to mesh with gear 2′. And at, or before, the end of this reversal period the pinion 7 runs into mesh with the teeth on gear 2′, and consequently motion is transmitted from shaft 3ª through gear 10 and pinions 11 and 7 to gear 2′ in a direction opposite to that in which it was driven by pinion 8; and after the reversal, the gear 2′ continues to move the bed driving gear 12 at uniform speed for about two-thirds of a revolution of gear 2′. Then pinion 7 runs into the gap 2ª of gear 2′ and leaves gear 2′ free of both pinions 7 and 8 for the time being. But just before gear 2′ is thus freed, the segment 16 and rack 15 again take control of the bed gear 12 (Fig. 5), and—(while the gear 2′ is freed from control of pinions 7 and 8)—reverse the movement of the bed driving gear 12 and the bed. While the bed is thus being reversed pinions 7—8—11 are shifted so as to move pinion 7 out of position to engage gear 2′ and pinion 8 back into position to engage the teeth of gear 2′; so that as, or before, the segment 16 and rack 15 lose control of the bed the gear 2′ is again taken under control of gear 2 through the pinion 8; and therefore the bed driving gear 12 continues to be driven in the reverse direction until the bed nears the end of its stroke,—and is again taken under control of the reversing mechanism as described.

The pinion 7 is shifted into or out of position to mesh with gear 2′ while it is rotating opposite the gap 2ª in said gear; and the pinion 8 is likewise shifted into and out of position to engage gear 2′ while it is rotating opposite the gap 2ª in gear 2′. Assuming that the bed is moving to the left during the time gear 2′ is driven from gear 2; then just as or before pinion 8 enters the gap 2ª of gear 2′, the toothed segment 16 comes into mesh with the rack 15, which is then being moved in the direction in which the segment is moving, and at the same time and speed as the segment (see Figs. 1 and 5). And while gear 2′ is freed from the driving control of either pinion 7 or 8 the rack 15 is reciprocated while roller 14ª is moving from the bottom to the top of slot 15ᶜ; and as rack 15 moves to the right it will, by reason of the engagement of segment 16 therewith, gradually arrest the motion of the bed driving gear 12, and consequently the bed, and bring same to a full stop; and then the rack and segment (and consequently bed driving gear 12) are started in the reverse direction, and while the rack bar is moving to the left the speed of the bed is accelerated until gear 12 is driving the bed and gear 2′ at the peripheral speed of the pinions 7 and 8. In the meantime, cam 17ª causes the pinions 7, 8 and 11 to move facewise on shaft 9 until pinion 7 is brought into position to mesh with gear 2′, and pinion 8 moved out of position to mesh therewith (Fig. 3); and consequently gear 2′ will be driven by pinion 7—as above explained—and will propel the bed onward, in the direction in which the segment started it, with uniform speed until—(in the example shown)—gears 2′ and 12 have made two-thirds of a revolution. Then the pinion 7 enters the gap 2ª of gear 2′ and frees gear 2′; and as or before pinion 7 runs into gap 2ª, segment 16 which is moving with gear 12 again comes into mesh with the rack 15, Fig. 5, (which is then being moved by the crank 14 at a speed equal to that of the bed); and while the gear 2′ is freed from pinions 7 and 8 the rack 15 and segment 16 have control of the bed and first slow down and stop the bed driving gear 12, and then reverse its motion (Fig. 7), and accelerate same until gear 2′ is again rotating at the same peripheral speed and in the same direction as pinion 8. The pinions 7 and 8 are meanwhile shifted on shaft 9 so that, just as or before the segment 16 and rack 15 again lose control of the bed, pinion 8 again comes into mesh with gear 2′ and continues to drive gear 2′ in the direction in which bed gear 12 is then rotating for about another two-thirds revolution of gear 2′; then the segment 16 and rack 15 again take control of the bed, and simultaneously gear 2′ is freed from both pinions 7 and 8, as described.

In the example shown the gear 12 makes practically one revolution to move the bed a complete stroke in either direction, including the reversing of the bed at the end of the uniform portion of its stroke. The relative speed of movement of the bed, as compared with the speed of rotation of the gear 2′ can be varied by varying the size of the gears 2′ or 12. The length of movement imparted to the bed for each rocking movement of the shaft 6 can be varied by changing the side of the gear 12. The length of time, or proportion of extent of revolution of gear 2′ required for a reversal can be varied by properly designing the segments 16 and the length of the crank 14.

What I claim is:

1. In combination, a bed driving gear, a shaft carrying said gear, a gear keyed to

said shaft, a pair of oppositely rotating driven pinions at one side of said shaft, and means whereby said pinions may be alternately caused to mesh with the gear keyed to said shaft; with a segment on the shaft and a reciprocating rack bar adapted to reverse the rotation of the shaft while both pinions are disengaged therefrom.

2. In combination, a reciprocating bed, a rack attached thereto, a bed driving gear, a shaft carrying said gear, a gear keyed on said shaft, a driven gear loose on said shaft beside the latter gear; a second driven gear; and oppositely rotating pinions adapted to transmit motion from the respective driven gears to the gear keyed on the shaft; with means for shifting said pinions so as to alternately engage them with the said keyed gear.

3. In combination, a reciprocating bed, a rack attached thereto, a bed driving gear, a shaft carrying said gear, a gear keyed on said shaft, a driven gear loose on said shaft beside the latter gear; a second driven gear, a pair of oppositely rotating pinions adapted to transmit motion from the driven gears to the gear keyed on the shaft; and means for shifting said pinions alternately into mesh with the said keyed gear; with means for reversing the rotation of the shaft while the pinions are not in control thereof.

4. In combination, a shaft, a gear keyed to said shaft, a pair of oppositely rotating pinions at one side of said shaft adapted to be alternately engaged with the gear keyed on said shaft, said gear being provided with a gap to permit lateral shifting of the pinions, and means for shifting the pinions while the gap is adjacent them.

5. In combination, a shaft, a gear keyed to said shaft; a pair of oppositely rotating pinions at one side of said shaft adapted to be alternately engaged with the gear keyed on said shaft, said gear being provided with a gap to permit lateral shifting of the pinions; with means for reversing the rotation of the shaft while both pinions are disengaged from said gear, and means for shifting the pinions while the gap is adjacent them.

6. In combination, a reciprocating bed, a rack attached thereto, a bed driving gear, a shaft carrying said gear, a gapped gear keyed on said shaft, and a pair of oppositely rotating pinions at one side of said shaft respectively adapted to mesh with the said gapped gear, and means for shifting said pinions when the gap is adjacent them.

7. In combination, a reciprocating rack, a rack driving gear, a shaft carrying said gear, a gapped gear keyed on said shaft, and a pair of oppositely rotating pinions at one side of said shaft respectively adapted to transmit motion to the said gapped gear; with means for reversing the motion of the shaft while the pinions are out of mesh with the segmental gear, and means for shifting said pinions when the gap is adjacent them.

8. In combination, a reciprocating rack, a rack driving gear, a shaft carrying said gear, a segmental gear keyed on said shaft, and a pair of oppositely rotating pinions respectively adapted to transmit motion to the said segmental gear; with means for reversing the motion of the shaft comprising a segment on the shaft, and a crank actuated rack bar adapted to be engaged by the segment while the pinions are out of mesh with the segmental gear.

9. In combination, a reciprocating rack, a rack driving gear, a shaft carrying said gear, a segmental gear keyed on said shaft, a loose driven gear on said shaft beside the segmental gear; a second driven gear, and a pair of oppositely rotating pinions respectively adapted to transmit motion from one of the driven gears to the said segmental gear; with means for reversing the motion of the shaft while the pinions are out of mesh with said segmental gear.

10. In combination, a reciprocating rack, a rack driving gear, a shaft carrying said gear, a segmental gear keyed on said shaft, a loose driven gear on said shaft beside the segmental gear; a second driven gear, and a pair of oppositely rotating pinions respectively adapted to transmit motion from one of the driven gears to the said segmental gear; with means for reversing the motion of the shaft comprising a segment on the shaft, and a crank actuated rack bar adapted to be engaged by the segment while the pinions are out of mesh with said segmental gear.

11. Means for reciprocating type beds, comprising a rack attached to the bed, a bed driving gear engaging the rack, a shaft carrying said gear, a segmental gear keyed on said shaft, and oppositely rotating pinions adapted to transmit motion to the segmental gear, said segmental gear being provided with a gap to permit the shifting of the pinions without clash; with means for shifting said intermediate pinions so as to alternately drive the said segmental gear, and means for reversing the bed while the pinions and segmental gear are out of mesh.

12. In means for reciprocating type beds, the combination of a rack attached to the bed, a bed driving gear engaging the rack, a shaft carrying said gear, a segmental gear keyed on said shaft, and oppositely rotating pinions adapted to transmit motion to the segmental gear, said segmental gear being provided with a gap to permit the shifting of the pinions without clash; with means for shifting said intermediate pinions so as to alternately drive the said segmental gear; a segment on the shaft, and a crank actuated rack bar adapted to be engaged by the seg-

ment, and reverse the motion of the bed while the pinions are out of mesh with the segmental gear.

13. Means for reciprocating type beds, comprising a rack attached to the bed, a bed driving gear engaging the rack, a shaft carrying said gear, a segmental gear keyed on said shaft, a loose driven gear on said shaft beside the segmental gear, a second driven gear meshing with the loose gear; and oppositely rotating pinions adapted to alternately transmit motion from the driven gears to the segmental gear; said segmental gear being provided with a gap to permit the shifting of the pinions without clash; with means for shifting said intermediate pinions so as to alternately drive the said segmental gear from said driven gears, and means for reversing the motion of the bed while the pinions are out of mesh with said segmental gear.

14. In combination, a bed driving gear, a shaft carrying said gear, and a gapped gear keyed to said shaft; with a pair of oppositely rotating driven pinions at one side of said shaft, and means for shifting the pinions alternately into position to mesh with the teeth of the gapped gear while the gap is passing the pinions.

15. In combination, a bed driving gear, a shaft carrying said gear, a gapped gear keyed to said shaft, a pair of axially alined oppositely rotating driven pinions at one side of said shaft, and means whereby said pinions may be alternately shifted into position to mesh with the teeth of the gapped gear while the gap is passing said pinions; with means for reversing the rotation of the gapped gear while both pinions are disengaged therefrom.

16. The combination of a reciprocating type bed having a rack on its under side, a bed driving gear meshing with said rack, and means for rotating said gear alternately in opposite directions to move the bed during the uniform portions of its strokes, and means for disengaging the rotating means from said gear at the ends of such uniform portions of the strokes; with a segment connected with said gear, and of substantially the same pitch diameter as the gear, a reciprocating rack bar having a Scotch yoke on one end, a crank engaging said yoke, and gearing between the crank-actuating shaft and the means for rotating the bed driving gear, whereby the rack is shifted to engage said segment and reverse the rotation of the said gear and the bed while the means for rotating the bed driving gear is out of control thereof.

In testimony that I claim the foregoing as my own, I affix my signature in presence of two witnesses.

MICHAEL ANDREW DROITCOUR.

Witnesses:
GEO. R. WHATLEY,
CHAS. HICKMAN.