M. A. DROITCOUR.

BED MOTION FOR TWO-REVOLUTION FLAT BED PRESSES.

APPLICATION FILED FEB. 21, 1911.

1,006,733.

Patented Oct. 24, 1911.

3 SHEETS—SHEET 1.

Fig. 7.

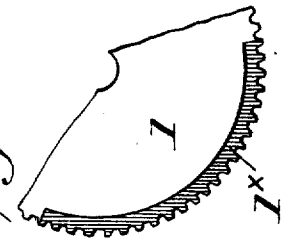


Fig. 1.

Witnesses

C. M. Walker.

James B. Mansfield.

Michael A. Droitcour

By Alexander & Ford

Attorneys

M. A. DROITCOUR.

BED MOTION FOR TWO-REVOLUTION FLAT BED PRESSES.

APPLICATION FILED FEB. 21, 1911.

1,006,733.

Patented Oct. 24, 1911.

3 SHEETS—SHEET 2.

Fig. 6.

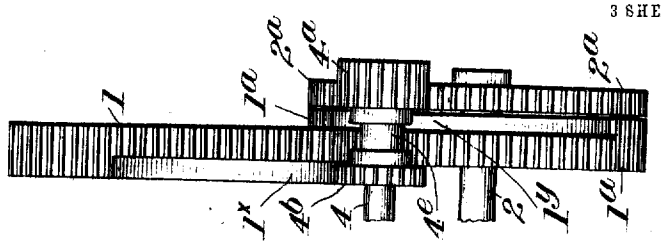
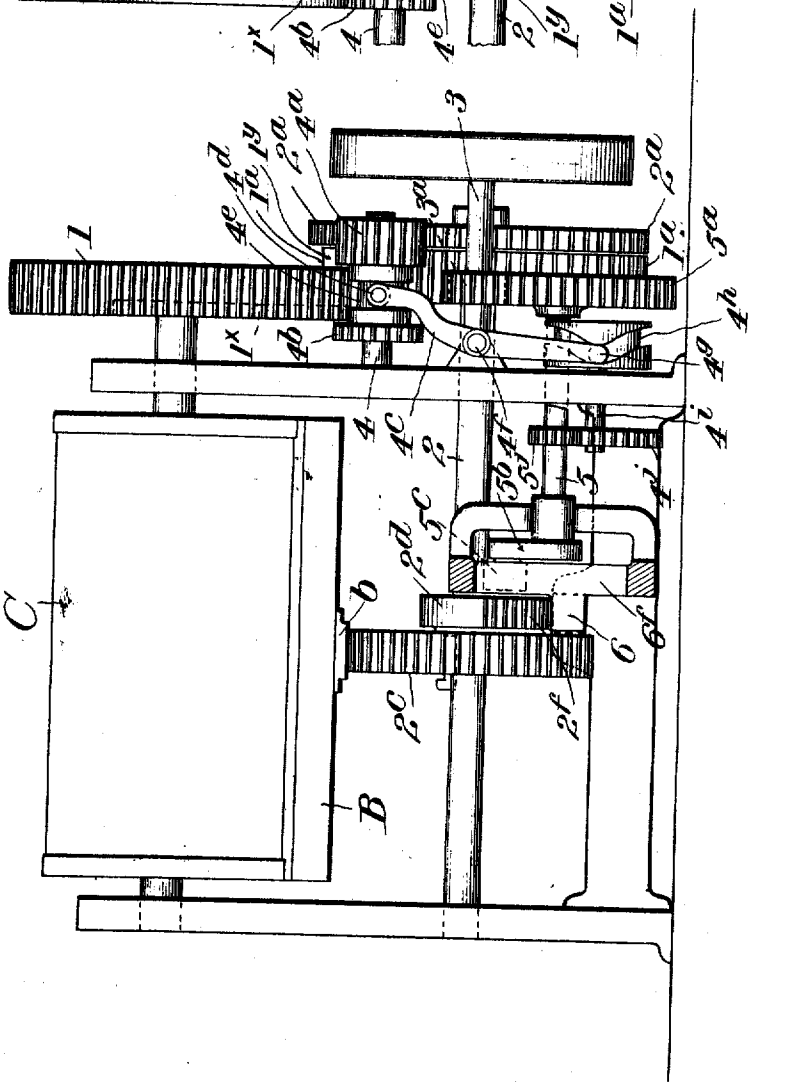


Fig. 2.



Witnesses

C. M. Walker.

James Bransfield

Inventor

Michael A. Droitcour.

By Alexander & Sawell

Attorneys

M. A. DROITCOUR.

BED MOTION FOR TWO-REVOLUTION FLAT BED PRESSES.

APPLICATION FILED FEB. 21, 1911.

1,006,733.

Patented Oct. 24, 1911.

3 SHEETS—SHEET 3.

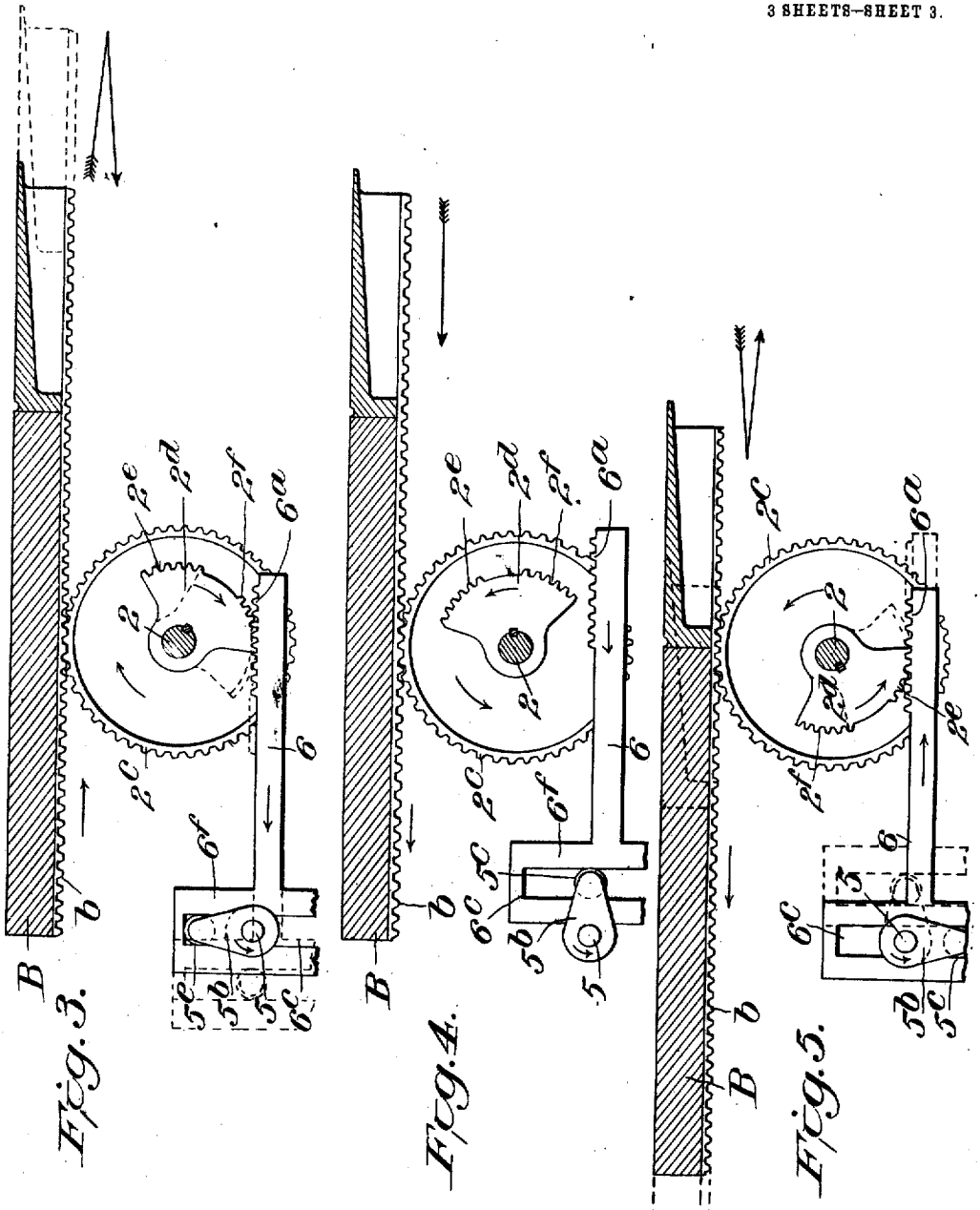


Fig. 3.

Fig. 4.

Fig. 5.

Witnesses

C. M. Walker.

James Bransfield.

Inventor

Michael A. Droitcour.

By Alexander Sprole Attorneys

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 TWO-REVOLUTION FLAT-BED PRESSES.

1,006,733. Specification of Letters Patent. Patented Oct. 24, 1911.

Application filed February 21, 1911. Serial No. 610,067.

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 Two-Revolution Flat-Bed 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 has particular reference to the means for reciprocating the type beds of flat-bed and cylinder printing presses such for example as the well known "Miehle" flat-bed printing press.

The particular object of the invention is to provide novel means for driving the bed during one part of its stroke with a uniform speed of movement, and for then reversing the motion of the bed at the end of each stroke with a practically true crank motion, so that the bed will be slowed down, stopped and started back with accelerating speed until it is again moving at the speed of the uniform driving means, and the change from the uniform motion to the reversing motion will be accomplished without shock or jar.

Another object of the invention is to drive the bed and reverse it at the end of each stroke, by means of a single bed-driving gear engaging a rack on the bed, such gear being rotated alternately in opposite directions so as to drive the bed in both directions and throughout its entire stroke; and means being provided for driving the gear at uniform speed during part of its revolution, and for then slowing down, stopping and reversing the motion of the gear so as to similarly affect the bed.

By this invention the bed is controlled at all times, and at all parts of its stroke, by direct mesh between the bed driving gear and the bed rack, so that the bed and bed driving gear are not disengaged at any time either vertically or horizontally.

The invention comprises (1) novel means for driving the bed driving gear alternately in opposite directions at full speed; (2) novel means whereby such gear is slowed down, stopped and its motion reversed independently of the means for driving the gear at uniform speed; the means for slowing down and reversing the rotation of the bed driving gear have control of such gear while the mechanisms for uniformly rotating said gear have lost control thereof; and the proper mechanism for uniformly rotating the gear has control of the bed-driving-gear when the reversing mechanism loses control thereof; the parts being so arranged that the proper mechanism for driving the gear at uniform speed will take control thereof as and before the mechanism for reversing such gear surrenders control thereof, and vice versa; so that the bed driving gear will at all times be under direct control of the proper actuating mechanism whereby certainty of its operation is assured at all times.

In the drawings—Figure 1 is a conventional side elevation of part of a printing press equipped with my improved bed movement. Fig. 2 is an end view of Fig. 1. Figs. 3, 4 and 5 are enlarged detail views illustrating different positions of the reversing mechanism. Fig. 6 is a detail view showing the pinions 4^a, 4^b in another position. Fig. 7 is a detail view of the gear 1.

The press to which the invention is applied may be of any usual construction and is simply conventionally indicated in the drawings. On the shaft of the cylinder C is a gear 1 which meshes with a gear 1^a loosely mounted on a counter-shaft 2. Gear 1^a is driven by a pinion 3^a on a driving shaft 3.

The uniform driving motion.—Keyed on shaft 2 beside gear 1^a is a gear 2^a; gear 2^a may be driven at times from gear 1^a by means of a pinion 4^a slidably mounted on a stub-shaft 4 attached to the frame of the machine. This pinion 4^a may be shifted longitudinally on the stud 4, so as to move pinion 4^a into or out of engagement with gear 2^a, by means of a yoke-lever 4^c having a roller 4^d engaging an annular groove 4^e in the hub of gear 4^a; and lever 4^c is fulcrumed at 4^c on brackets attached to the main frame, and has a roller 4^g at its lower end engaging a race cam 4^h keyed on a shaft 4^i journaled in the frame and driven by a gear 4^j from a pinion 5^j on the counter-shaft 5, which operates the bed reversing mechanism. On shaft 5 is a pinion 5^a which

meshes with gear 3^a on shaft 3 and the proportions are such, in the machine shown, that gear 5^a will make three revolutions to two revolutions of cylinder C or gears 1, 1^a, 2^a.

The shaft 2 carries a bed driving gear 2^c which meshes with a rack b on bed B. When the gear 2^a is driven from gear 1^a by means of the intermediate 4^a (Fig. 2) the shaft 2 is rotated in one direction and consequently bed B will be moved in one direction by the engagement of gear 2^c with rack b. In order to drive the bed in the opposite direction the gear 2^a is driven from the gear 1, instead of from the gear 1^a; by means of a pinion 4^b on the inner end of the hub of pinion 4^a; the pinions 4^a, 4^b being in such relative positions that when the pinion 4^a is moved inward so as to engage gears 1^a, 2^a (Fig. 2), pinion 4^b is out of mesh with gear 1; but if pinions 4^a, 4^b are moved outward to the position shown in Fig. 6, pinion 4^a will be moved out of position to mesh with gear 1^a, but remains in mesh with gear 2^a; and at the same time pinion 4^b will be moved into position to mesh with gear 1; consequently the motion of pinions 4^a, 4^b will be reversed; and therefore the motion of gear 2^a will also be reversed and it will be rotated oppositely to a gear 1^a and therefore the bed gear 2^c will be driven in the opposite direction and move the bed B in the opposite direction also.

The gears 1, 1^a are double-width gears and a portion of the teeth at the inner side of gear 1 are preferably removed as indicated at 1^x. Similarly gear 1^a preferably has part of its teeth cut away on the outer side, as indicated at 1^y. The cut-away portions 1^x, 1^y of the gears 1, 1^a are of such length (about 120°) and are relatively so located that the intermediate pinions 4^b, 4^a can be shifted as above described on the stub shaft 4 without causing any clash between their teeth and the teeth of gears 1, 1^a, during the shifting period; and the shifts of the pinions 4^a, 4^b are caused to occur at the time that the bed driving gear 2^c is under the control of the reversing mechanism, which is constructed as follows:

The reversing mechanism.—Formed with or rigidly attached to the bed gear 2^c,—(or keyed on shaft 2 at a convenient position, preferably closely adjacent to gear 2^c)—is a segment 2^d which is provided with two toothed sectors 2^e and 2^f which may be slightly separated, and each sector 2^e, 2^f (in the example shown) extending about 60°. These sectors 2^e, 2^f are adapted to be alternately engaged with a rack 6^a on a sliding bar 6, which is mounted in suitable supports in the frame and is reciprocated back and forth by a crank motion. As shown bar 6 is reciprocated by means of a Scotch yoke crank motion comprising a head 6^f on the end of the bar provided with a vertical slot 6^c which is engaged by a roller 5^c on a crank arm 5^b attached to shaft 5.

In the example shown in the drawings, the parts are so proportioned that the bed driving gear 2^c will be driven about two-thirds of a revolution in one direction by gear 2^a, while gear 2^a is driven from gear 1^a by intermediate 4^a. Then gear 4^a is shifted out of engagement with gear 1^a and leaves gear 2^a free; and while gear 2^a is thus freed from gear 1^a the motion of the bed is reversed as hereinafter explained, by action of the sector 2^e and rack 6^a (Fig. 5). During this period of reversal of the bed, the gear 2^c is slowed down, stopped and started to rotate in the opposite direction, consequently gear 2^a is also started to rotate in the opposite direction, and the pinions 4^a, 4^b are shifted so that pinion 4^a is moved out of position to mesh with gear 1^a; and pinion 4^b is moved into position to mesh with gear 1. And at, or before, the end of this reversal period the pinion 4^b comes into mesh with the teeth on gear 1, and consequently motion is transmitted from gear 1 through pinions 4^b, 4^a to gear 2^a in a direction opposite to that in which it was driven from gear 1^a; and after the reversal, the gear 2^a continues to move the bed driving gear at uniform speed for about two-thirds of a revolution of gear 2^a. Then pinion 4^b enters the mutilated portion 1^x of gear 1, and leaves gear 2^a free of both gears 1, 1^a for the time being. But just before gear 1^a is thus freed, the sector 2^f and rack 6^a take control of the bed gear 2^c (Fig. 3), and—(while the gear 2^a is freed from control of gears 1 or 1^a)—reverse the movement of the bed driving gear 2^c and the bed. While the bed is thus being reversed pinions 4^b, 4^a are shifted so as to move pinion 4^b out of position to engage gear 1 and pinion 4^a back into position to engage the teeth of gear 1^a; so that as, or before, the sector 2^f and rack 6^a lose control of the bed, the gear 2^a is again taken under control of gear 1^a through the intermediate 4^a, and therefore the bed driving gear 2^c continues to be driven in the reverse direction until the bed nears the end of its stroke, when it is again taken under control of the bed reversing mechanism as described. The pinion 4^a is shifted into or out of position to mesh with gear 1^a while rotating opposite the gap 1^y in such gear; and the pinion 4^b is likewise shifted into and out of position to engage gear 1 while rotating opposite the gap 1^x in gear 1. Assuming that the bed is moving to the left during the time gear 2^a is driven from gear 1^a; then just as or before pinion 4^a enters the gap 1^y of gear 1^a the toothed sector 2^e comes into mesh with the rack 6^a on bar 6 which is then being moved in the direction in which the sector 2^e is moving and at the same time and speed as the sector

(see Fig. 5). And while gear 2^a is freed from the driving control of either gear 1 or 1^a the rack bar 6 is reciprocated while roller 5^c is moving from the bottom to the top of slot 6^c; and as bar 6 moves to the right (through the engagement of sector 2^e and rack 6^f,) it arrests the motion of the bed driving gear 2^c, and consequently of the bed, and brings same to a full stop; and then the rack bar 6 and sector 2^e (and consequently bed driving gear 2^c) 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 2^c is driving the bed and gear 2^a at the speed of the gears 1, 1^a. In the meantime cam 4^h shifts pinions 4^b, 4^a so that pinion 4^b is brought into position to mesh with gear 1, and consequently gear 2^a will be driven from gear 1—as above explained—and will propel the bed onward, in the direction in which the sector 2^e started it, with uniform speed until (in the example shown) gears 1, 1^a, 2^a, 2^c, have made two-thirds of a revolution. Then the pinion 4^b enters the gap 1^x of gear 1 and frees gear 2^a from gear 1; and as or before pinion 4^b runs out of mesh with gear 1 sector 2^f which is moving with gear 2^c comes into mesh with the rack 6^a, Fig. 3, (which is then being moved by the crank 5^b at the speed equal to that of the bed); and while the gear 2^a is freed from gears 1, 1^a, the rack 6^a and sector 2^f have control of the bed and first slow down and stop the bed driving gear 2^c and then reverse its motion and accelerate same until gear 2^a is again rotating at the same speed and in the same direction as gear 1^a. The pinions 4^a, 4^b are meanwhile shifted so that, just as or before the sector 2^f and rack 6^a lose control of the bed, pinion 4^a again comes into mesh with gears 1^a, 2^a and consequently gear 1^a continues to drive gear 2^a in the direction in which bed gear 2^c is then rotating for about another two-thirds revolution of gear 1^a; then the sector 2^e and rack 6^a again take control of the bed, and simultaneously gear 2^a is freed from both gears 1, 1^a, by the shifting of pinions 4^a, 4^b as described.

In the example shown the rack bar 6 makes three complete reciprocations for each reciprocation of the bed; that is it makes one-half reciprocation while the roller or wrist-pin 5^c is moving from the upper to the lower side of the slot 6^c, while the press is being reversed at the right hand end of its stroke (Fig. 3), which is sufficient to reverse the bed at that end of its stroke; the bar then makes a complete reciprocation while the roller 5^c is making a complete orbital rotation during the time that the bed is under the control of the gears 1^a and 2^a; and bar 6 then makes another one-half reciprocation while the roller 5^c is traveling from the bottom to the top of the slot (see Fig. 5), and which suffices to reverse the bed at the left hand end of its stroke, and bar 6 makes another reciprocation while the bed is under the control of the gears 1 and 2^a before it begins to again reverse the bed at the right hand end of its stroke. In other words shaft 5 is geared to rotate three times to every two revolutions of the shaft 2. The segment 2^d attached to the side of the gear 2^c enables me to reverse the bed, as above described, and at he same time the subsequent movement of the segment by the gear prevents any clash or interference between the segment and the rack bar 6 during the idle strokes of the rack bar 6, or the time when the bed is under control of the gears 1^a or 2^a, and therefore I do not have to provide any means to shift the rack bar 6^a to prevent clash. In the example shown bed gear 2^c makes practically one revolution in moving the bed a complete stroke in either direction, including the starting and stopping at the ends of the uniform portions of its stroke,—and is rotated alternately in opposite directions.

The relative speed of movement of the bed as compared with the speed of rotation of the gears 1^a, 2^a can be varied by varying the size of the gear 2^c. The length of movement imparted to the bed for each rocking motion of the shaft 2 can be varied by changing the size of the gear 2^c. The length of time, or proportion of extent of revolution of gear 2^c, required for a reversal can be varied by properly designing the sectors 2^e, 2^f and the length of the crank 5^b.

Preferably when gear 2^a is being driven directly from gear 1^a the bed is on its printing stroke; and when gear 2^a is being driven directly from gear 1 the bed is on its return idle stroke. When pinions 4^b, 4^a are in mesh with gears 1, 2^a respectively, they serve as an intermediate to rotate gear 2^a opposite to gear 1^a. But when pinion 4^a is in mesh with gears 1^a, 2^a it merely serves to cause these two gears to rotate together in the same direction.

Pinions 4^a, 4^b are practically a unit,—and may be formed in one piece. Pinion 4^a remains constantly in mesh with gear 2^a. They impart motion to gear 2^a in alternate directions. When pinions 4^a, 4^b are in the gaps 1^x, 1^y of gears 1, 1^a, then the pinions are driven by gear 2^a and are reversed with said gear, and then continue to drive gear 2^a in the proper direction.

The gaps 1^x, 1^y in gears 1, 1^a may be varied in extent but should be sufficient in length to permit the segment 2^d and rack 6^a to reverse the motion of the bed driving gear 2^c while the pinions 4^b, 4^a are not in operative mesh with either gear 1 or 1^a. When the bed driving gear 2^c attains normal speed (*i. e.* when gear 2^a is running at the same speed as gear 1^a) the intermediate 4^a (or 4^a, 4^b as the case may be) again comes

into mesh with the proper gears, as described, so as to cause gear 2ª to keep control of the bed while the reversing devices are not in control thereof.

The rack bar 6 moves oppositely to the bed during the periods of reverse, and so has a tendency to neutralize the jars of reverse. For instance, if rack bar 6 weighs 100 pounds, its momentum would neutralize the momentum of 100 pounds weight in or on the bed; in other words, the tendency of the press to slide on floor during reverse is reduced.

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 gears, and means whereby said driven gears may be alternately caused to drive the gear fixed on said shaft; with means for reversing the rotation of the shaft while both gears are disengaged therefrom, said means comprising a segment on the shaft and a reciprocating rack bar.

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 intermediate pinions adapted to transmit motion from either of the driven gears to the gear keyed on the shaft; with means for shifting said intermediate pinions so as to alternately drive the said keyed gear from said driven gears.

3. In combination, a bed driving gear, a shaft carrying said gear, a gear keyed to said shaft; a pair of oppositely rotating driven gears, and intermediate pinions whereby said driven gears may be alternately locked to the gear keyed on said shaft, said driven gears being provided with gaps to permit shifting of the intermediates; with means for reversing the rotation of the shaft while both driven gears are disengaged therefrom.

4. 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 loose driven gear on said shaft, beside the latter gear; a second driven gear, and intermediate pinions adapted to transmit motion from either of the driven gears to the gear keyed on the shaft; with means for shifting said intermediate pinions so as to alternately drive the said keyed gear from said driven gears; with means for reversing the rotation of the shaft while the driven gears are not in control thereof, comprising a segment on said shaft and a reciprocating crank actuated rack bar.

5. 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 loose driven gear on said shaft, a second driven gear, and means to transmit motion from either of the driven gears to the gear keyed on the shaft; 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 driven gears are out of control of the shaft.

6. 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 gear keyed on said shaft, a loose driven gear on said shaft beside the keyed gear, a second driven gear meshing with the loose gear; intermediate pinions adapted to transmit motion from either of the driven gears to said keyed gear on the shaft, said driven gears being provided with gaps to permit the shifting of the intermediate pinions without clash; and means for shifting said intermediate pinions so as to alternately drive the said keyed gear from said driven gears; with means for reversing the motion of the shaft, while the driven gears are freed therefrom, comprising sectors on the shaft, and a crank actuated rack bar adapted to be engaged by the sectors, substantially as described.

7. The combination of a shaft, a gear fixed thereon, oppositely rotating gears and shifting pinions adapted to transmit motion alternately from the oppositely rotating gears to the gear fixed on the shaft, thereby rotating said shaft alternately in opposite directions, and means independent of the said gear for reversing the rotation of the shaft while said gears are not in control thereof.

8. In combination, a reciprocating member, a rack attached thereto, a gear meshing with said rack, oppositely rotating gears and shifting pinions adapted to transmit motion alternately from said oppositely rotating gears to said rack engaging gear in opposite directions, and means for reversing the motion of said gear while the said driving gearing is freed therefrom; the driving gearing and the reversing means acting alternately.

9. The combination of a reciprocating member, a rack attached thereto, a shaft, a gear fixed on said shaft and meshing with said rack, oppositely rotating gears and shifting pinions adapted to transmit motion alternately from the oppositely rotating gears to the gear fixed on the shaft, thereby driving the latter gear in opposite directions at uniform speed, and crank actuated means for reversing the motion of the latter gear while the said oppositely rotating gears are freed therefrom.

10. In combination, a bed driving gear, a shaft carrying said gear, a gear keyed to said shaft; a pair of oppositely rotating gapped driven gears, and a set of inter-

mediates whereby motion may be alternately transmitted from one of said driven gears to the gear keyed on said shaft, and means for shifting the intermediates when opposite the gaps in the driven gears.

11. In combination, a driving gear, a shaft, a gear thereon, a pair of oppositely rotating gapped driven gears, and means whereby motion may be transmitted alternately from said driven gears to the gear on said shaft to drive said shaft alternately in opposite directions, and means for shifting the intermediates when opposite the gaps in the driven gears; with a segment connected with the gear on said shaft, and a crank actuated rack-bar adapted to be engaged by said segment and reverse the motion of the shaft, while both said driven gears are freed from said driving gear.

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

MICHAEL ANDREW DROITCOUR.

Witnesses:
CHAS. HICKMAN,
PERCY G. SHAW.