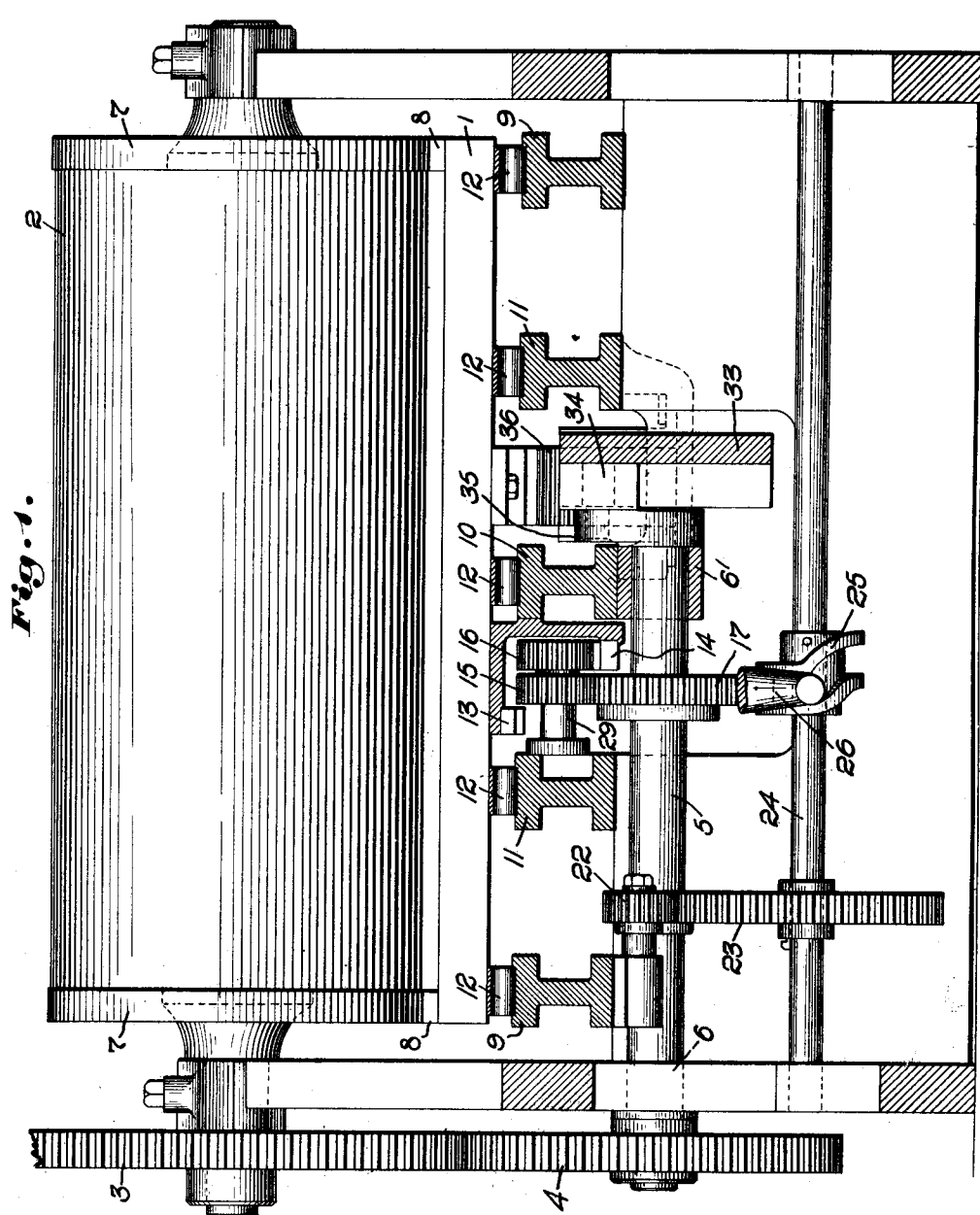


W. K. HODGMAN.
BED MOTION FOR PRINTING PRESSES.
APPLICATION FILED MAY 12, 1910.

1,066,412.

Patented July 1, 1913.

6 SHEETS—SHEET 1.



Witnesses:
Carl L. Choate.
Ernest A. Telfer

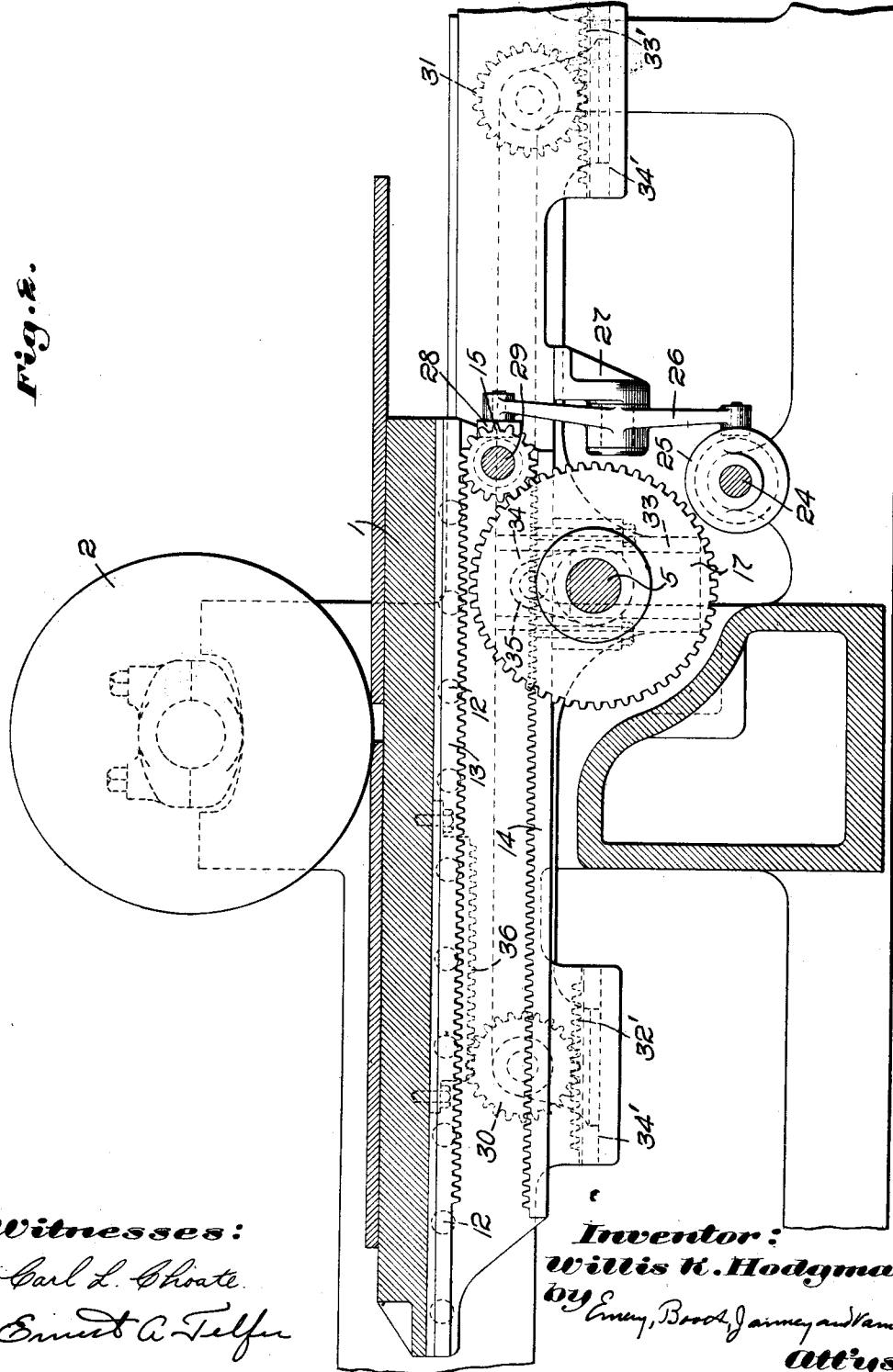
Inventor:
Willis K. Hodgman
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Attys.

1,066,412.

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5 SHEETS—SHEET 2.

Fig. 2.



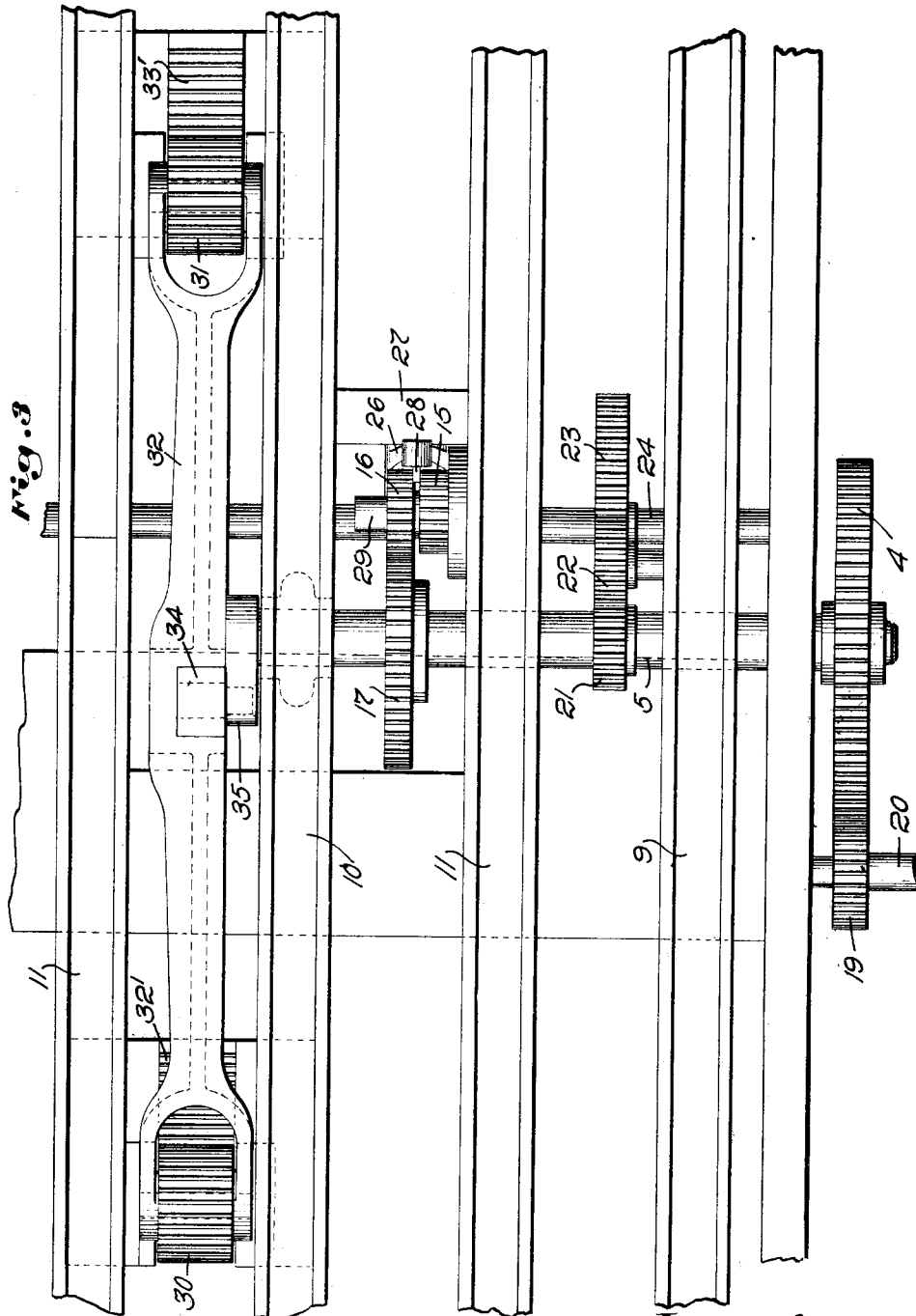
Witnesses:
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Inventor:
 Willis K. Hodgman
 by Emory, Brook, Jarney and Kamey
 Att'ys.

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5 SHEETS—SHEET 3.



Witnesses:
Carl L. Choate.
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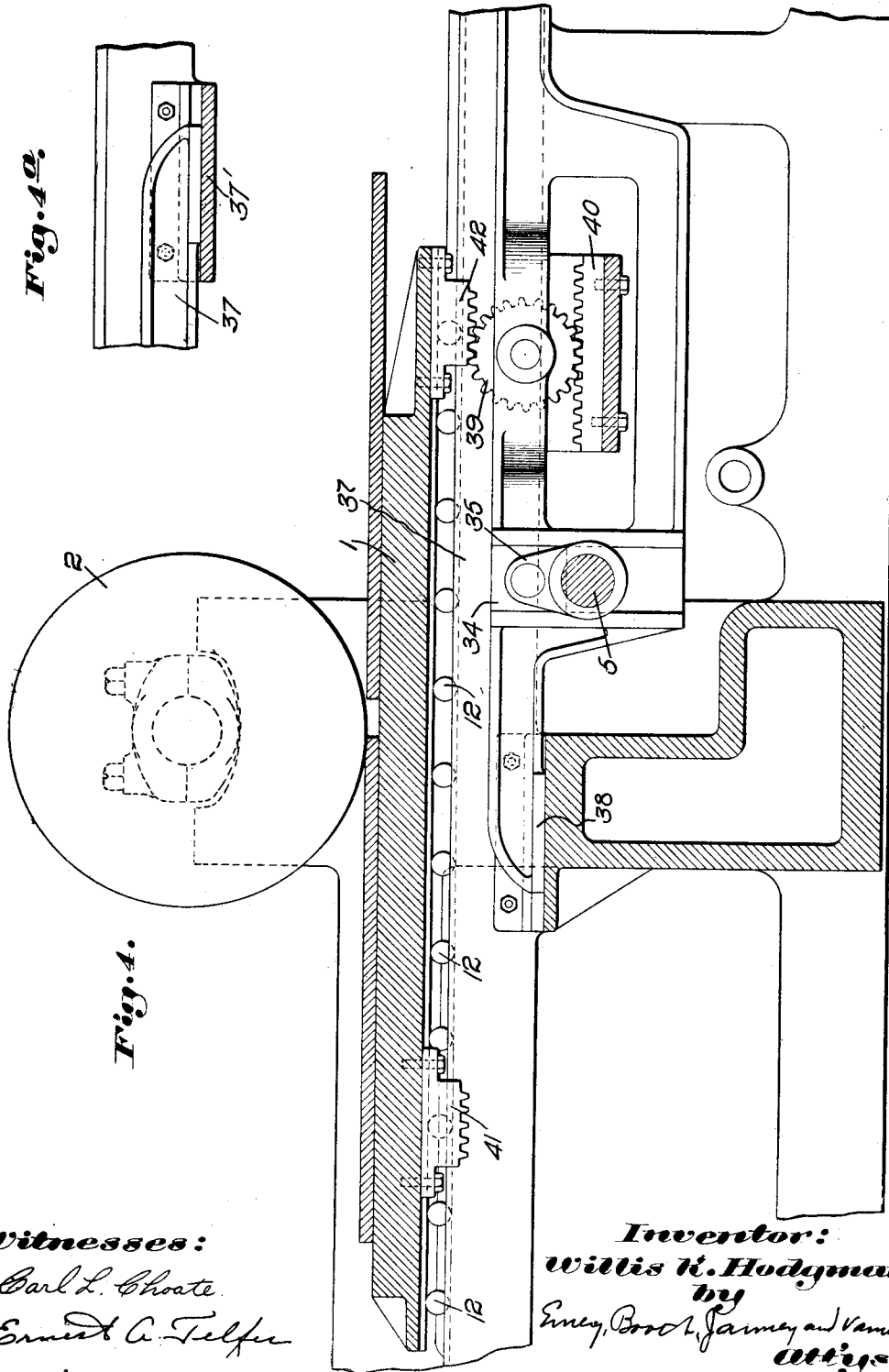
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6 SHEETS—SHEET 4.



Witnesses:
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5 SHEETS—SHEET 5.

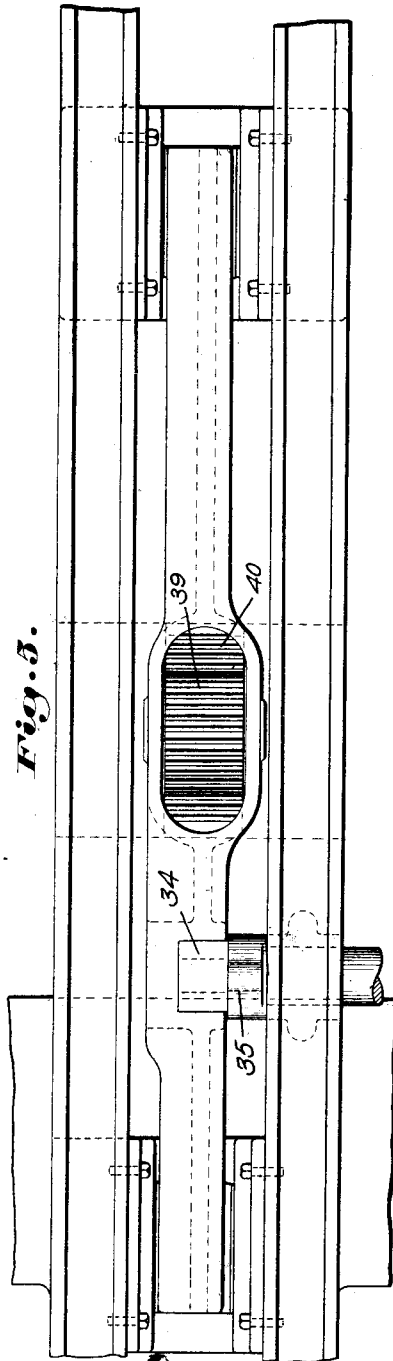
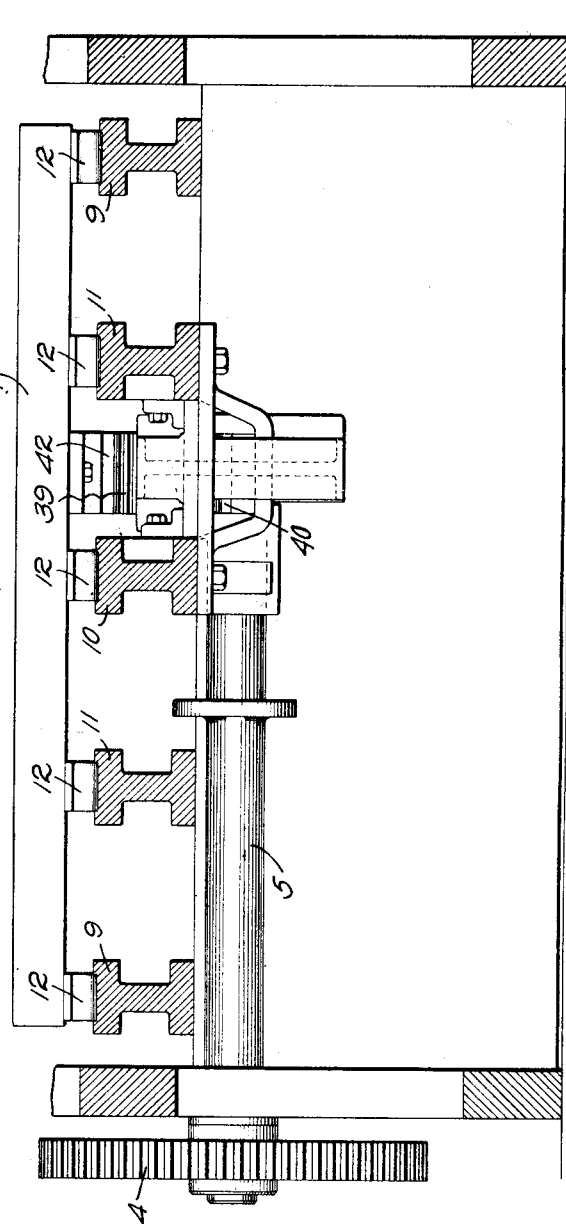


Fig. 5.

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Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIS K. HODGMAN, OF TAUNTON, MASSACHUSETTS, ASSIGNOR TO HUBER HODGMAN PRINTING PRESS CO., OF TAUNTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

BED-MOTION FOR PRINTING-PRESSES.

1,066,412.

Specification of Letters Patent.

Patented July 1, 1913.

Application filed May 12, 1910. Serial No. 560,804.

To all whom it may concern:

Be it known that I, WILLIS K. HODGMAN, a citizen of the United States, and a resident of Taunton, in the county of Bristol and State of Massachusetts, have invented an Improvement in Bed-Motions for Printing-Presses, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to mechanism for converting rotary motion into rectilinearly reciprocating motion, and is particularly designed for use in connection with the reciprocating beds of printing presses and is herein shown in connection with the reciprocating bed of a two revolution press, though it may be applied and used in any location and for any purpose to which the same is adapted.

This invention is an improvement upon that shown in the patent to Hodgman and Hall, No. 911,498.

In order that the principles of the invention may be fully apparent, I have herein disclosed for illustrative purposes one type or embodiment of the invention in the accompanying drawings, it being understood that the invention may be carried out by other embodiments thereof and by mechanism widely differing from that herein selected for illustration.

Having reference to that type of the invention herein illustrated, Figure 1 is a view, partly in vertical section and partly in end elevation, of a printing press embodying my invention; Fig. 2 is a longitudinal vertical section of the printing press shown in Fig. 1; Fig. 3 is a plan view of certain parts embodying the invention beneath the upper rack of the bed plate; Fig. 4 is a view similar to Fig. 2 of a slightly modified form of the invention; Fig. 4^a is a detail pertaining to that form of press shown in Fig. 4. Fig. 5 is a plan view of that form of my press shown in Fig. 4, but representing only the reversing mechanism; and Fig. 6 is a vertical sectional view of that form of my invention shown in Fig. 4.

Having reference to that type or embodiment of the invention herein chosen for the illustration, the bed of the printing press is indicated at 1, such bed being constructed in

any suitable manner, and operatively connected to mechanism to cause the continuously and uniformly running driving shaft, first, to propel the bed continuously and at uniform speed in one direction, and then to propel the bed continuously and at uniform speed in the opposite direction, and also to provide for the reversal movement of the bed at the end of its continuous and uniform movement in one direction, by gradually slowing down said movement until the bed is brought to rest, and then gradually accelerating its movement in the opposite direction until it acquires the speed of its uniform stroke.

In the usual operation of a printing press of the bed and cylinder type, the printing bed carrying the printing surface is reciprocated in the manner above stated, the periphery of the cylinder and paper thereon traveling in the printing operation at the same surface speed as the printing surface on the bed, so that the paper is pressed against the printing surface with a rolling action and without any slip of one surface relative to the other along the line of contact between the cylinder and printing surface. In this type of press the impression is commonly taken only in the travel of the bed in one direction under the cylinder, which continues to run in the same direction all the time that the press is in operation, and after the bed has made its forward and working movement or stroke under the cylinder the bed must be returned past the cylinder to the starting point preparatory for another working stroke. In the return movement of the bed the cylinder is commonly raised a little, so that its surface is entirely above and clear of the printing surface on the bed, which is now traveling in an opposite direction to the surface of the cylinder, which thus makes an idle revolution during the return or non-working stroke of the bed.

Generally speaking, the mechanism for driving the bed of such type of printing presses comprises a continuously rotating toothed gear and two racks connected with the printing bed so as to be positioned adjacent opposite edges of the gear, and means to cause engagement of one of the racks with said gear, to produce the principal part

of a stroke in one direction; and to cause the engagement of the other rack with the gear, to produce the principal part of the stroke in the other direction, the bed commonly running at uniform speed throughout the part of its stroke affected by the rack and gear, this being the same as the surface speed of the cylinder during the stroke. When the bed arrives at the end of such rack and gear movement, it comes under the control of another part of the bed motion, which may be termed the reversing mechanism, and which acts to bring the bed to a stop at the end of a short movement beyond the rack traveling movement, and to start the bed in the reverse direction and bring it to the velocity of the rack driven movement by the time that the second rack arrives at and comes into engagement with the gear, at which time the reversing mechanism gives up control and the bed is again driven by the rack and gear movement to the point near the other end of its stroke, where the reversing mechanism again takes control and performs a similar reversal of the movement of the bed to that just described. That is to say, the reversing mechanism is designed to take the bed at full working speed, reduce its velocity by gradual diminution, until it is stopped and then move it in the opposite direction with a gradual acceleration until it is brought up to full working velocity in said opposite direction. In such type of mechanism the gear and the racks may be relatively shifted in many different ways, among which may be enumerated the following: The racks may be opposed in the same vertical plane and the gear may be shifted vertically to engage the racks in alternation, or the racks may be opposed in different vertical planes and the gear be shifted laterally from engagement with one rack to engagement with the other, or the relative movement may be accomplished by maintaining the gear stationary and bringing the racks alternately into engagement therewith by vertical or lateral movement. The racks and gear may be otherwise opposed or arranged to accomplish the same result.

My invention is applicable to a gear and rack mechanism wherein the relative movement of said gear and racks is accomplished in any of the above indicated ways or in any other desired manner.

An impression cylinder is indicated at 2, said cylinder being driven in any preferred manner (see Fig. 1) as by a gear 3 at one end thereof meshing with a gear 4 upon a reversing shaft 5 mounted in suitable bearings 6, 6' in the framework of the machine.

Printing press frameworks have heretofore been provided with a series of tracks or ways to receive the bed of the press.

These tracks or ways have usually been four in number, such, for example, as indicated in said Patent No. 911,498, the two outer tracks being located at a point somewhat removed from the lateral edges of said bed as therein indicated. The impression cylinder 2 is provided as usual at its ends with bearers 7—7 and the bed is provided at its lateral edges with bearers 8—8 with which the bearers 7—7 contact during the printing, thereby to steady the parts and aid in the printing operation. Heretofore so far as I am aware the outer tracks or ways have been placed substantially inside vertical lines passing through said bearers with the result that there has been a downward strain upon the bed plate beyond said outside tracks or ways, resulting in a tendency of the bed plate to buckle up at the center. This has been found to be a serious objection and has impaired the effectiveness of printing presses as heretofore constructed. In accordance with my invention I position tracks or ways 9—9 vertically in line with or substantially vertically in line with the said bearers or with the ends of the impression cylinder. In addition to these tracks or ways I preferably provide others and have herein represented a central track or way 10 and also tracks or ways 11—11 between the central and the outer tracks or ways, as clearly indicated in Fig. 1.

Preferably I provide sets of rollers 12 in connection with each track or way. By positioning the side tracks as described and by providing the central track 10, the bed is effectively supported at its extreme edges and in the middle. I am enabled by reason of the fact that the bed is supported in the manner stated, to make it lighter because I have eliminated the tendency to upward buckling at the center while resisting the downward strains at the edges. In other words, presses heretofore constructed have been provided with beds of unnecessary thickness or weight, in order to reduce the tendency to upward buckling, to which I have referred. The lower face of the bed plate 1 is provided, as indicated in Figs. 1 and 2, with an upper rack 13 and a lower rack 14 herein shown as facing each other and out of vertical alinement. These racks receive between them two pinions 15, 16 adapted respectively to mesh with the racks 13 and 14 at the proper time. Both of these racks are positioned above the reversing shaft 5. Since in the present type of the invention the racks are shown as stationary and the relative movement between the pinion or pinions and racks is obtained by shifting movement of the pinions, the said pinions are so shifted as to be brought alternately into working relation with the upper and lower racks.

By locating both racks above the revers-

ing shaft 5, the weight of the press is largely reduced as compared with those wherein the lower rack is arranged below the reversing gear, as in such presses an increased length of parts is required to support the lower rack. In the printing presses of the type herein shown a compactness of structure is secured. By supporting both racks above the reversing shaft it is possible not only greatly to diminish the vertical length of the parts required for the support of the lower rack, but the said supports may be more lightly constructed, while still securing a firm and effective positioning for said parts. Since in the present type of the invention the lower rack is located above the reversing shaft, and inasmuch as the racks are preferably arranged with their teeth facing each other, said racks are not engaged by a gear directly mounted upon the reversing shaft but by mechanism receiving motion from the said reversing shaft and herein embodied in the pinions 15 and 16. While such mechanism may be of any desired type, I have herein shown the reversing shaft as provided with a bed reciprocating gear 17, to which motion is imparted by means of the gear 4 thereon (see Fig. 3) and receiving motion from a pinion 19 upon a driving shaft 20. The said reversing shaft is also provided with a pinion 21 meshing, as indicated in Fig. 1, with a pinion 22 suitably supported upon a stud shaft and itself meshing with a gear 23 upon the cam shaft 24 suitably supported in the framing and having thereon a suitable cam 25 with the track whereof engages a roller upon the lower arm of a lever 26 pivoted upon a suitable bracket 27 depending from the framing. The upper arm of said lever is provided with a projection 28 to enter between the pinions 15 and 16, so as at the proper time to shift said pinions, thereby to drive either the rack 13 or the rack 14. The said pinions are rigidly connected or integral, and are loose upon the stud 29 bolted to one of the tracks 11, whereby they may be slid as indicated into mesh with the respective racks. The pinion not in engagement with a rack is shifted into engagement with the bed reciprocating gear 17 as indicated in Fig. 1.

During the engagement of either pinion 15 or 16 with the racks 13 and 14 the bed of the press is driven at a uniform speed in one direction or the other. As the bed nears its limit of movement in either direction, mechanism is brought into play to control movement of the bed during the described shifting of said pinions 15, 16, such mechanism preferably being such as to receive the bed at its full speed of movement, gradually to diminish such rate of speed until the bed is brought to a stop and then to drive the bed in the opposite direction at a gradually increasing speed until the working speed of

the bed is reached, at which time the bed is again brought under the control of pinions 15, 16.

In order to control the bed during the described shifting of the pinions 15 and 16, I have indicated for that purpose in that form of my invention shown in Figs. 1, 2 and 3 reversing gears 30, 31, as shown in Figs. 2 and 3, mounted respectively in the outer forked ends of a slide bar or member 32 having a cross head 33, shown most clearly in Fig. 1, and receiving therein the cross head block 34 projecting from the crank arm or primary reversing element 35 fast on and preferably forged or otherwise integral with the reversing shaft 5. By forming said crank arm integrally with said reversing shaft, the said crank arm and therefore the slide bar 32 move exactly in unison with the reversing shaft 5, which might not be the case were the said crank arm merely keyed to the reversing shaft as now customary.

Viewing Fig. 1, it will be apparent that the bearing 6' for the reversing shaft 5 is positioned between the bearing 6 and the cross head. Preferably also the bearing 6' is positioned between the bed reciprocating gear 17 and said cross head and also preferably vertically or substantially vertically in line with the central track or way 10. Owing to the fact that the crank arm 35 is preferably integral with the reversing shaft 5, the bearing 6' is located as described and moreover by positioning said bearing as shown the said reversing shaft is more solidly supported.

The outer forked ends of the slide bar or member 32 provide movable fulcrums for the gears 30, 31, which are constantly in reciprocating mesh with and are rotated by stationary reversing racks 32', 33', suitably mounted upon the framing of the press, as indicated in Figs. 2 and 3. The outer ends of the slide bar or member 32 are down turned and engage with suitable ways 34' at either side of the racks 32', 33' as indicated in Fig. 2, thereby to steady the movement of said slide bar.

As indicated in Figs. 1 and 2, the bed of the press is provided with a short, downwardly facing, reversing rack 36, with which the reversing gears 30, 31 are adapted alternately to be brought into engagement. As the bed 1 nears its limit of travel to the right viewing Fig. 3, the bed reversing rack 36 is brought into engagement with the reversing gear 31, at which time the shifting movement of the pinions 15, 16 commences, the said gear 31 being rotated because of its meshing engagement with the frame reversing rack 33' and the crank arm connection with the reversing shaft 5. The said crank arm connection is such that under the control of the said gear 31 the movement of

said bed to the right is gradually reduced to zero and is then gradually augmented in the opposite direction until the full working speed of the bed has been secured, at which time the pinions 15, 16 have been shifted to bring them into driving relation with the other rack, the bed then passing from the control of the gear 31 to that of said pinions 15, 16. As the bed nears the end of its movement in the opposite direction, a similar operation occurs through the instrumentality of the bed reversing rack 36, frame reversing rack 32' and the gear 30.

In Figs. 1, 2 and 3, I have indicated two reversing gears 30, 31 in mesh with the stationary racks 32', 33', and adapted alternately to engage the bed reversing rack 36. In Figs. 4, 5 and 6, I have shown a slightly modified form of my invention, wherein I employ a single reversing gear adapted constantly to mesh with a single stationary reversing rack and alternately to engage two bed reversing racks. As clearly shown in said figures, the slide bar or member 37 is guided at its left hand end 38, viewing Fig. 4, upon the framing of the machine, the opposite end of said slide bar being preferably similarly guided as shown in Fig. 4^a, at 37' and having mounted thereon the reversing gear 39 having a meshing engagement with the stationary reversing rack 40, upon which it is constantly reciprocated by reason of the crank arm 35 upon the reversing shaft 5 as previously described. The bed is provided with two short bed reversing racks 41, 42. When the bed approaches the limit of its movement toward the left, viewing Fig. 4, the bed reversing rack 42 is brought into mesh with the reversing gear 39, whereby the speed of the bed is gradually reduced to zero and its direction of movement reversed and its speed of movement increased to full working speed. When the bed, 1, reaches the limit of its movement toward the right, viewing Fig. 4, the bed reversing rack 41 engages the said reversing gear 39, thereby again to reverse the direction of movement of said bed in the manner described.

The number of teeth upon the gears 3 and 4 driving the impression cylinder, upon the bed racks 13 and 14, upon the pinions 15 and 16 therebetween, and upon the bed reciprocating gear 17 is such that the said pinions 15 and 16 make a whole number of turns to each complete cycle of the press. This is important, as the teeth of these parts wear somewhat in the continued use of the press and were different teeth to mesh upon different cycles of the press there would be an uneven movement thereof. In the press herein shown, there occurs during a single cycle of the press two turns of the cylinder gear 3, three turns of the bed reciprocating gear 17 and ten complete turns of the rack

driving pinions 15 and 16. While these proportions may be varied, it is important that for the reasons stated a complete number of turns of said rack driving pinions 15 and 16 be made during each complete cycle of the press.

It will be apparent from the foregoing description that the press herein described is of simplified and lighter construction and that although the bed of the press is of reduced thickness and less weight, it has no tendency to upward buckling in the center. Moreover the reversing mechanism is of simplified construction, and is such as to secure a movement in unison of the various parts.

Having thus described one specific embodiment of my invention, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims—

1. A printing press comprising in combination a reciprocable bed carrying a plurality of racks, an impression cylinder having a gear, a reversing shaft located below said racks and having a gear meshing with said cylinder gear, an odd number of bed tracks, one of which is substantially central with respect to said bed and two of which are substantially beneath the extreme edges of the bed, a bed reciprocating element carried by said reversing shaft and located at one side of said central bed track, a bed reversing element carried by the reversing shaft and located at the other side of the said central bed track, and a bearing for the reversing shaft located between the bed reciprocating element and the bed reversing element.

2. A printing press comprising in combination a reciprocable bed, an impression cylinder having a gear, said bed and cylinder having co-acting bearers, a reversing shaft having a gear meshing with said cylinder gear, an odd number of bed tracks, one of which is substantially central with respect to the bed, and two of which are respectively substantially vertically under each of the bearers, a bed reciprocating gear carried by the reversing shaft and located at one side of said central track, and a primary reversing element carried by the reversing shaft and located upon the other side of said central track, said reversing shaft having a bearing located in substantially the vertical plane of the said central track and supporting the reversing shaft between the bed reciprocating gear and the said primary reversing element.

3. A printing press having a reciprocable bed carrying opposed racks, a single bed reciprocating and reversing shaft located be-

low said racks and carrying a bed reciprocating gear, rack driving means in mesh with said bed reciprocating gear, shifting mechanism to shift said rack driving means into alternate engagement with said opposed racks, and a single bodily movable reversing pinion operatively connected to said shaft and adapted periodically to be brought into driving relation to said bed to reverse the movement thereof at the end of each stroke.

4. A printing press having a reciprocable bed carrying opposed racks and also adjacent opposite ends a pair of bed reversing racks, a single bed reciprocating and reversing shaft located below said racks, rack driving means oppositely rotated with respect to said bed reciprocating and reversing shaft, means to impart relative movement to said rack driving means and said opposed racks, a single reversing gear, a sliding member carrying the same, and means to impart to and fro movement to said sliding member from said reversing shaft, and a stationary rack mechanism to rotate said reversing gear, said reversing gear being adapted to be brought alternately into engagement with said bed reversing racks.

5. A bed and cylinder printing press comprising in combination a reciprocable bed, an impression cylinder, said bed having an odd number of bed tracks, one of which is substantially central of said bed, a reversing shaft directly geared to said cylinder and having one of its bearings adjacent said cylinder driving gear, and another bearing in substantially the vertical plane of said central track, a uniform motion bed driving element and a bed reversing element, said elements being fixed upon the reversing shaft upon opposite sides of the said central bearing.

6. A printing press comprising in combination a reciprocable bed carrying a plurality of opposed racks and having bearers, an impression cylinder having a gear, a reversing shaft located below said racks and having a gear directly meshing with said cylinder gear, an odd number of bed tracks, two of which are substantially vertically beneath the bearers of the bed, and one of which is substantially central with respect to the bed, a primary reversing element integral with said reversing shaft, and two bearings for said reversing shaft at the same side of said primary reversing element, and one of said bearings supporting the central bed track.

7. A printing press comprising in combination a reciprocable bed carrying a plurality of opposed racks, an impression cylinder having a gear, a reversing shaft located below said racks and having a gear directly meshing with the cylinder gear, an odd number of bed tracks, two of which are

substantially beneath the extreme edges of the bed, another of which is substantially central with respect to the bed, and one of which is between said central bed track and that bed track nearest the cylinder gear, a stud shaft carried by said last enumerated bed track and having a pair of pinions thereon to engage said racks, and a primary reversing element carried by said reversing shaft and between said central bed track and the bed track most remote from the cylinder gears.

8. A printing press comprising in combination a reciprocable bed carrying a plurality of opposed racks, an impression cylinder having a gear, a gear 4 upon said reversing shaft directly meshing with said cylinder gear, a driving shaft 20 having a pinion 19 thereon directly meshing with said gear 4, a primary reversing element integral with said reversing shaft, a single bed reciprocating gear 17 upon the reversing shaft, a stud shaft 29, sliding pinions 15, 16 thereon adapted alternately to mesh with said bed reciprocating gear and said opposed racks, a cam shaft 24, and means operated from said cam shaft for sliding said gears.

9. A printing press comprising in combination a reciprocable bed carrying a plurality of opposed racks, an impression cylinder having a gear, a reversing shaft located below said racks, a gear 4 upon said reversing shaft, a driving shaft 20 having a pinion 19 thereon directly meshing with said gear 4, a primary reversing element integral with said reversing shaft, a single bed reciprocating gear 17 upon the reversing shaft, an odd number of bed tracks of which one is substantially central with respect to the bed, two of which are substantially vertically beneath the extreme edges of the bed and one of which is between said central bed track and the bed track nearest the cylinder gear, a stud shaft 29 carried by said last enumerated bed track, sliding pinions 15, 16 thereon adapted to engage said racks and said bed reciprocating gear 17, and a plurality of bearings for said reversing shaft, all of the bearings for the reversing shaft being upon the same side of the primary reversing element.

10. A printing press comprising in combination a reciprocable bed carrying a plurality of opposed racks, an impression cylinder having a gear, a reversing shaft located below said racks and having a gear directly meshing with the cylinder gear, an odd number of bed tracks, two of which are substantially beneath the extreme edges of the bed, another of which is substantially central with respect to the bed, and one of which is between said central bed track and that bed track nearest the cylinder gear, a stud shaft carried by said last enumerated bed track and having gearing

thereon to engage said racks, and a primary reversing element carried by said reversing shaft.

11. A printing press comprising in combination a reciprocable bed carrying a plurality of opposed racks, an impression cylinder having a gear, a reversing shaft located below said racks and having a gear directly meshing with the cylinder gear; an odd number of bed tracks, two of which are substantially beneath the extreme edges of the bed, another of which is substantially central with respect to the bed, and one of which is between said central bed track and that bed track nearest the cylinder gear, a stud shaft carried by said last enumerated bed track and having gearing thereon to engage said racks, and a primary reversing element carried by said reversing shaft and between said central bed track and the bed track most remote from the cylinder gears.

12. A printing press comprising in combination a reciprocable bed carrying a plurality of opposed racks, an impression cylinder having a gear, a reversing shaft, a gear 4 thereon directly meshing with said cylinder gear, a driving shaft 20 having a pinion 19 thereon directly meshing with said gear 4, a primary reversing element integral with said reversing shaft, a single bed reciprocating gear 17 upon the reversing shaft, a stud shaft 29, gearing thereon adapted to mesh with said bed reciprocating gear and alternately to mesh with said op-

posed racks, a cam shaft 24, and means operated from said cam shaft for sliding said gearing.

13. A printing press comprising in combination a reciprocable bed carrying a plurality of opposed racks, an impression cylinder having a gear, a reversing shaft located below said racks, a gear 4 upon said reversing shaft, a driving shaft 20 having a pinion 19 thereon directly meshing with said gear 4, a primary reversing element integral with said reversing shaft, a single bed reciprocating gear 17 upon the reversing shaft, an odd number of bed tracks of which one is substantially central with respect to the bed, two of which are substantially vertically beneath the extreme edges of the bed and one of which is between said central bed track and the bed track nearest the cylinder gear, a stud shaft 29 carried by said central bed track, gearing thereon adapted to engage said racks and said bed reciprocating gear 17, and a plurality of bearings for said reversing shaft, all of the bearings for the reversing shaft being upon the same side of the primary reversing element.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIS K. HODGMAN.

Witnesses:

MAY H. LOWRY,

ROBERT H. KAMMLER.