

**No. 622,127.**

**Patented Mar. 28, 1899.**

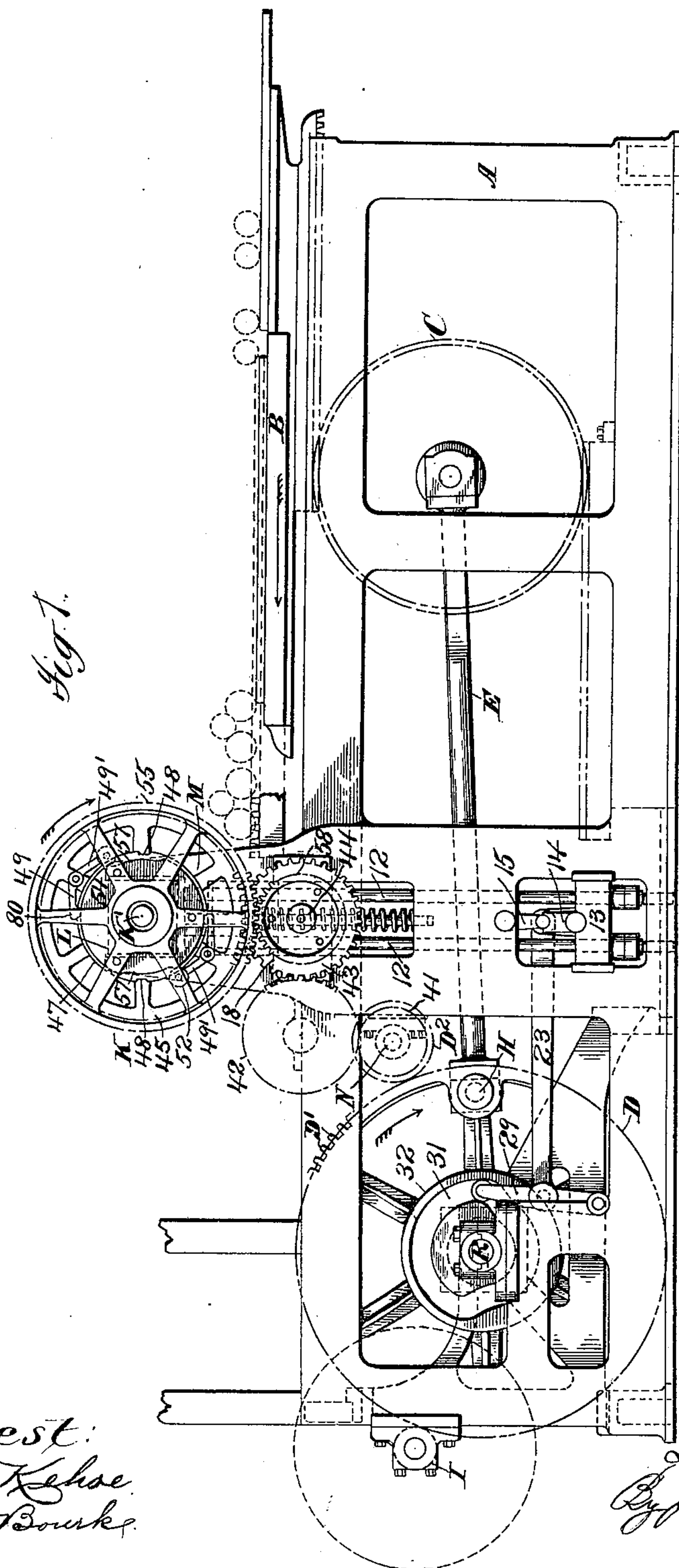
**L. C. CROWELL.**

## BED AND CYLINDER FRINTING MACHINE.

(Application filed July 15, 1898.)

(No Model.)

2 Sheets—Sheet 1.



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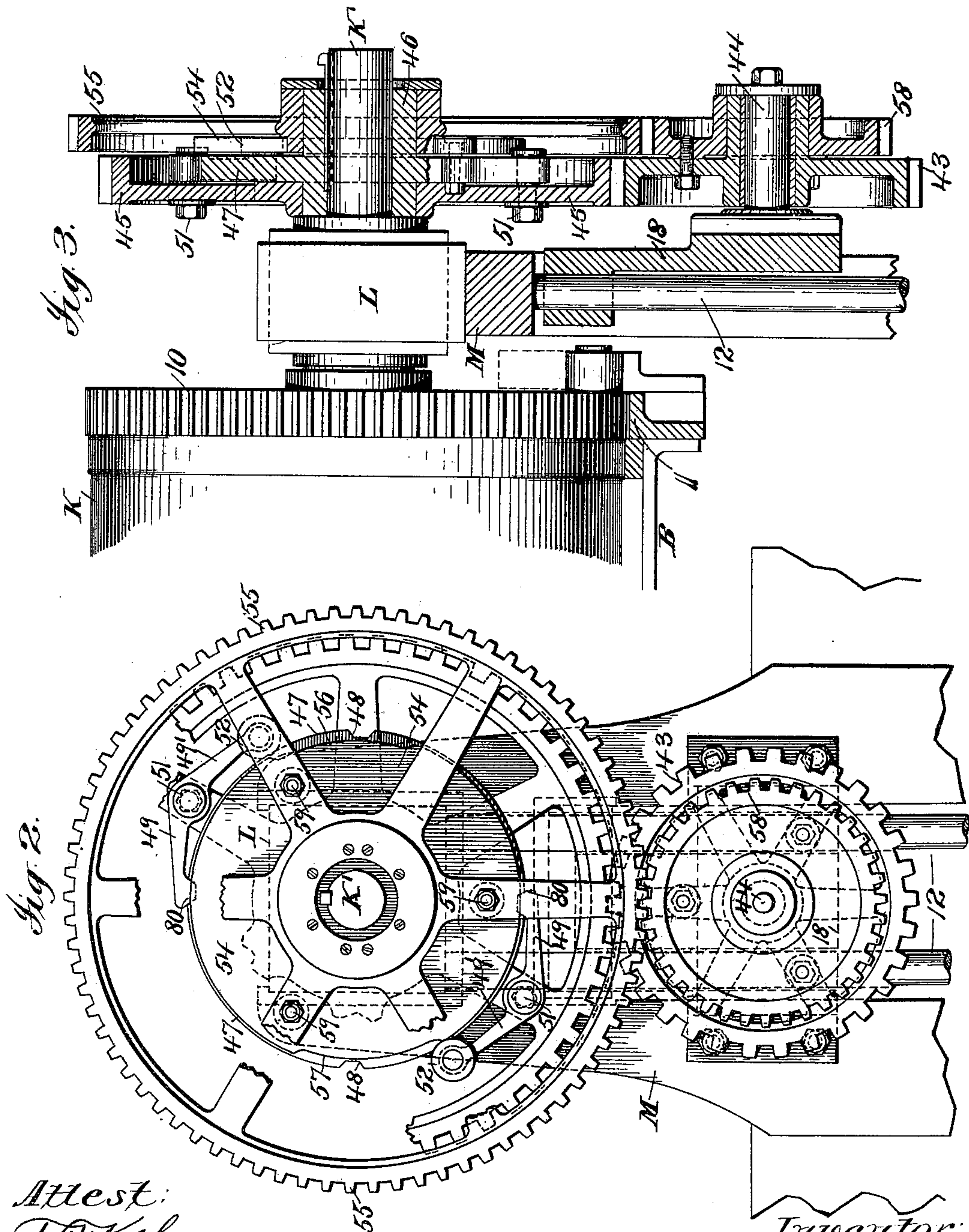
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2 Sheets—Sheet 2.



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# UNITED STATES PATENT OFFICE.

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## BED-AND-CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 622,127, dated March 28, 1899.

Application filed July 15, 1898. Serial No. 686,005. (No model.)

*To all whom it may concern:*

Be it known that I, LUTHER C. CROWELL, a citizen of the United States, residing at New York, county of Kings, and State of New York, have invented certain new and useful Improvements in Bed-Motions for Bed-and-Cylinder Printing-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in bed-and-cylinder machines, and more particularly to that class of machines in which the printing is effected by a continuously-rotating cylinder operating in connection with a reciprocating bed which is driven at varying speeds.

In an application, Serial No. 679,088, filed April 28, 1898, there is disclosed, among other things, a printing-machine in which a reciprocating bed driven by a variable-speed mechanism is used in connection with a continuously-revolving cylinder which is driven during a part of its stroke in synchronism with the bed and during the remainder of its stroke by a constant-speed mechanism, the said machine also including a peculiar construction of clutch mechanism which acts at proper times to connect the cylinder to and disconnect it from the constant-speed mechanism. In the construction set forth in the said application the cylinder is driven in synchronism with the bed during that part of the stroke of the bed in which the printing usually takes place, whereby it is enabled to have that absolute correspondence in movement to the varying movements of the bed due to the variable-speed driving mechanism which is necessary to secure perfect register during the printing period. The cylinder is, however, released from the bed practically or immediately after the completion of the printing operation and while the bed is running at a high speed and is by the clutch mechanism referred to connected to the constant-speed mechanism. The cylinder being thus is revolved thereby at an unvarying rate of speed while the bed completes its stroke, reverses, makes its return stroke, and again reverses, these operations being conducted at

a speed, which constantly varies. The driving mechanism, however, is relieved from the task of driving the cylinder during these periods of wide variations in speed, so that it is not subjected to the undue strain which would otherwise result, and the machine is enabled to be operated at a very high rate of speed.

The present invention relates to the same type of machine as that which forms the subject of said former application and has in general the same objects in views, but concerns itself more particularly with certain modifications in the construction of the intermediate clutch devices, which operate at the proper times to connect the cylinder to and disconnect it from the constant-speed mechanism.

The invention consists in certain parts, improvements, and combinations which will be particularly described in the following specification, and the novel features of which will be pointed out in the claims hereunto appended.

In the accompanying drawings, which constitute a part of this specification, in which like references indicate the same parts, Figure 1 is a side view of a bed-and-cylinder machine embodying my invention. Fig. 2 is a detail front view illustrating, on an enlarged scale, the mechanism for connecting the cylinder to and disengaging it from a constant-speed mechanism. Fig. 3 is a section of the construction shown in Fig. 2 with the cylinder and its sliding journal-box in elevation.

In the machine shown in Fig. 1, which illustrates a practical form of my invention, A indicates the frame, and B the reciprocating bed. The bed is driven by a gear-wheel C, which engages upper and lower racks on the bed and frame, respectively, and is reciprocated by means of a yoked connecting-rod E, which is connected to a stud H, carried on the crank-wheel D. This construction forms the railroad-gear mechanism, which is well known in the art. The crank-wheel D is driven by a pinion I, the bent pulley for which is indicated by dotted lines in Fig. 1.

The printing-cylinder K is mounted in the usual boxes L and is provided with a gear 10, which engages a rack 11 on the bed. The boxes L are held to slide in standards M,



which rise from the frame A. Depending from the sliding boxes L are a pair of rods 12, which are connected by cross-bars 13, which slide in ways in the standards. These cross-bars receive the lower members 14 of a toggle, the upper members 15 of which are journaled in the standards. The toggles 14 and 15 are made and broken by a rod 23, which is connected to a rocking lever 29, which is pivoted in the frame of the machine. The upper end of the rocking lever carries a bowl or stud which engages a cam-groove 31 in a cam-wheel 32, which is mounted on a shaft R, which shaft also serves to carry the cam-wheel D.

The construction above described constitutes an ordinary form of raising and lowering mechanism, by which it is obvious that the cylinder will be raised and lowered once for each revolution of the gear D and therefore for each complete reciprocation of the bed.

Suitably mounted in the frame is a counter-shaft N. (Indicated in dotted lines in Fig. 1.) This counter-shaft has a pinion D<sup>2</sup> on its inner end which engages with a gear D' on the crank-wheel D. On its outer end this counter-shaft is provided with a pinion 41, this pinion being the first of an auxiliary train of gearing the purpose and function of which is to rotate the cylinder when it is not driven by the bed. The pinion 41 meshes with an intermediate 42, which in turn meshes with a gear 43, carried on a stud 44, which is supported on a slide 18, which slide is connected to the rods 12 of the raising and lowering mechanism. Since the gear 43 is directly connected through the train described with the gear D' on the crank-wheel D, it is obvious that it will revolve continuously and at a constant speed, since the crank-wheel of course is moving at a constant speed. The gear 43 is constantly in mesh with a gear 45, which is loosely mounted on a hub 46, which is connected to the cylinder-shaft K'. This hub 46 has connected to it a disk 47, this disk being herein shown as in one piece with the hub. The disk 47 is provided with a series of notches 48, located in its periphery, which in the machine shown are four in number. The gear 45 carries a series of two-armed levers 49 49', the said arms being pivoted to the gear in any suitable manner, as by bolts 51. The arms 49 of the two-armed levers carry bosses or projections 80, which at certain times engage the notches 48 in the disk 47, these parts thus constituting a clutch mechanism. The arms 49' preferably carry friction-wheels 52, which run on the periphery of a disk 54, which is provided with high and low cam parts 56 57. This disk 54 is secured, preferably by means of bolts 59, to the spokes of a gear 55, which is journaled and turns loosely on the hub 46, before referred to. The gear 45 is constantly in mesh with the gear 43, which has been heretofore described as mounted on the stud 44. Also mounted on the stud 44 is a gear 58, which is secured, as

by bolts, to the gear 43. It is obvious, therefore, that the gear 58 partakes of the movement of the gear 43.

As will be seen from the drawings, the gear 58 is smaller in circumference than the gear 43. The gear with which it meshes—namely, the gear 55—is larger in circumference than the gear 45. It being remembered that the gear 43 is constantly revolving because of its connections through the train of gearing before referred to with the gear D' on the crank-wheel D, it will be understood that the gears 58 and 55 are also constantly rotating, and through them the cam-disk 54, before referred to, is also constantly rotated. Owing to the difference in size of the various gears, however, the cam-disk 54 rotates at a lower speed than the notched disk 47, and the gear 45, which carries the two-armed locking-levers before referred to, is also rotating at a lower speed than the said notched disk, but at a higher speed than the cam-disk. It being understood that the bed is being constantly reciprocated at varying speeds through the operation of the crank-stud and railroad-gear mechanism before described and that the printing-cylinder, through the operation of the raising and lowering mechanism, is at times in mesh therewith and driven thereby and at other times out of mesh therewith and being driven by the constant-speed mechanism, consisting of the train of gears before referred to, the operation of the various parts will be clear.

Supposing the cylinder to be in mesh with the bed and having completed the printing operation, the raising and lowering mechanism which is described in the preceding portion of this specification will be operated to raise the cylinder, so that its gear 10 will be disengaged from the rack 11 on the bed. The various parts are so timed that about the time this operation takes place the notched disk 47 will be in such a position that two of its notches 48 will be opposite the projections 80 on the arms 49 of the two-armed levers before referred to, which are mounted on the rotating carrier 45. When this occurs, the high parts 56 of the disk 54 will engage the friction-rollers 52 on the end of the arms 49' and rock the arms, thereby causing the projections 80 on the arms 49 to engage the notches 48. This movement locks the carrier 45, upon which the arms 49 are pivoted, and the disk 47 together, and these two parts will remain so locked as long as the friction-rollers 52, before referred to, remain on the high parts 56 of the cam. As the carrier or gear 45 is constantly in mesh with the constant-speed gearing heretofore referred to and the disk 47 is secured to the cylinder-shaft, it is obvious that the cylinder, which has been moved out of driving relation with the bed by the operation of the raising and lowering mechanism, will now be under the control of and will be driven by the constant-speed mechanism and at an unvarying rate of speed.



The bed having been released from the cylinder will continue on at a decreasing speed to its point of reverse, will reverse, make its return stroke, and again reverse, these operations being conducted at varying speeds by reason of the crank mechanism through which the bed is driven. The cylinder, however, will continue to move at a constant speed under the influence of the constant-speed gearing described. When the bed has completed its return stroke, has reversed, and is again nearing the point when the printing operation is to commence, the raising and lowering mechanism will be operated to lower the cylinder, so that its gear 10 will be in position to be engaged by the rack 11 on the bed. The gear 45, carrying the two-armed levers 49, before referred to, owing to its greater speed has by this time gained sufficiently on the gear 48, carrying the cam-disk 54, so that the friction-roller carried by the arm 49' will pass off from the high part 56 of the cam onto the low part 57, so that the two-armed levers are free to be disengaged from the notches in the disk 47. As soon as the gear on the cylinder has engaged the rack on the bed the speed of the cylinder will increase, since the speed of the bed, as will be understood, is constantly increasing because of the action of the crank driving mechanism. This will cause the speed of the notched disk 47 to increase, and the notches 48 will ride out from under the projections 80 on the arms 49. The cylinder is now entirely disengaged from the constant-speed gearing and is free to be driven by and partake of the varying motions of the bed and to attain that synchronism of movement that is required of the cylinder and bed in order to insure perfect printing. The cylinder continues to be driven by the bed until the printing operation is completed, at which time the various parts will be in position so that as the cylinder is disengaged from the bed it will be engaged with the constant-speed mechanism, as before described.

The invention is well adapted for use in connection with machines of the two-revolution type and in which during the printing stroke the cylinder is driven from the bed by a rack on the bed intermeshing with a gear on the cylinder, and the engagement of the cylinder and bed is effected by raising and lowering the cylinder. The invention is, however, applicable to all machines in which a continuously-rotating cylinder coöperates with a reciprocating bed. So, also, while the clutch mechanism and the constant-speed mechanism are most efficiently arranged when they are timed so as to take the cylinder immediately after the completion of the printing operation or as soon thereafter as is possible, yet it is to be understood that the invention is not limited to a machine in which they are so timed, as it is obvious that the clutch and constant-speed mechanism might be arranged to take the cylinder at any time

during the reciprocation of the bed after the completion of one printing operation, provided the cylinder be kept continuously revolving in the same direction.

What I claim is—

1. The combination with a reciprocating bed, of a variable-speed mechanism for driving it, a continuously-revolving cylinder, means for driving it in synchronism with the bed during a part of its stroke, a constant-speed mechanism for driving the cylinder when it is not driven in synchronism with the bed, and a clutch embodying rigid arms and suitable coöperating devices for connecting the cylinder to and disconnecting it from the constant-speed mechanism at substantially the points where the speeds of the bed and constant-speed mechanism coincide, substantially as described.

2. The combination with a reciprocating bed, of a variable-speed mechanism for driving it, a continuously-revolving cylinder, means for driving it in synchronism with the bed during a part of its stroke, a constant-speed mechanism, a clutch between the cylinder and the constant-speed mechanism, said clutch embodying rigid arms and suitable coöperating devices and being constructed to be released by the increased speed of the cylinder when it is driven in synchronism with the bed and to be reengaged when the speeds of the bed and constant-speed mechanism become equal, substantially as described.

3. In a bed-and-cylinder machine, a power-wheel rotating at a constant speed, mechanism whereby the bed is driven from said wheel at varying speeds, a continuously-revolving cylinder, means whereby the cylinder is driven in synchronism with the bed during a part of its stroke, a constant-speed mechanism operated from the power-wheel for driving the cylinder when it is not driven in synchronism with the bed, a clutch embodying rigid arms and suitable coöperating devices for connecting the cylinder to and disconnecting it from the constant-speed mechanism, said clutch being constructed to be released by the increased speed of the cylinder when it is driven in synchronism with the bed and to be reengaged when the speeds of the bed and the constant-speed mechanism become equal, substantially as described.

4. In a bed-and-cylinder machine, mechanism whereby the bed is driven at varying speeds, a continuously-revolving cylinder, means whereby the cylinder is driven by the bed during a part of its stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, a clutch for connecting the cylinder to and disconnecting it from the constant-speed mechanism, said clutch embodying rigid arms and suitable coöperating devices and operating at substantially the points where the speeds of the bed and the constant-speed mechanism coincide, substantially as described.



5. In a bed-and-cylinder machine, mechanism whereby the bed is driven at varying speeds, a continuously-revolving cylinder, means whereby the cylinder is driven by the bed during a part of its stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, a clutch for connecting the cylinder to and disconnecting it from the constant-speed mechanism, said clutch embodying rigid arms and suitable cooperating devices and being constructed to be released by the increased speed of the cylinder when it is not driven by the bed and to be reengaged when the speeds of the bed and the constant-speed mechanism become equal, substantially as described.

6. The combination with a bed, of means for driving it at varying speeds, a continuously-revolving cylinder, means whereby the cylinder is driven by the bed during a part of its stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, raising and lowering devices for connecting the cylinder to and disconnecting it from the bed, a clutch for connecting the cylinder to and disconnecting it from the constant-speed mechanism, said clutch embodying rigid arms and suitable cooperating devices and operating at substantially the points where the speeds of the bed and the constant-speed mechanism coincide, substantially as described.

7. The combination with a bed, of a power-wheel running at a constant speed, mechanism whereby the bed is driven from said wheel at varying speeds, a continuously-revolving cylinder, means whereby the cylinder is driven by the bed during a part of its stroke, a constant-speed mechanism operated from the power-wheel for driving the cylinder when it is not driven by the bed, a clutch for connecting the cylinder to and disconnecting it from the constant-speed mechanism, said clutch embodying rigid arms and suitable cooperating devices and operating at substantially the points where the speeds of the bed and the constant-speed mechanism coincide, and raising and lowering devices whereby the cylinder is connected to and disconnected from the bed, substantially as described.

8. The combination with a bed, of mechanism whereby it is driven at varying speeds, a continuously-revolving cylinder, a gear on the cylinder, a rack on the bed, raising and lowering devices whereby the cylinder and bed are connected and disconnected at suitable times, a constant-speed mechanism, and a suitable clutch mechanism for connecting the cylinder to and disconnecting it from the constant-speed mechanism, said clutch mechanism embodying rigid arms and suitable cooperating devices and operating at substantially the points where the speeds of the bed and the constant-speed mechanism coincide, substantially as described.

9. The combination with a bed, of a power-

wheel rotating at a constant speed, a crank mechanism operated from the wheel for driving the bed, a continuously-revolving cylinder, mechanism whereby the cylinder is driven from the bed during a part of its stroke, gearing operated from the power-wheel at a constant speed for driving the cylinder when it is not driven by the bed, a clutch mechanism embodying rigid arms and suitable cooperating devices for connecting the cylinder to and disconnecting it from said gearing and operating at substantially the points where the speeds of the bed and the gearing coincide, substantially as described.

10. The combination with a continuously-rotating cylinder running at varying speeds, of a constant-speed mechanism, and a clutch mechanism embodying a disk having a plurality of notches and rigid cooperating arms between the cylinder and the constant-speed mechanism for connecting the cylinder to and disconnecting it from the constant-speed mechanism, substantially as described.

11. The combination with a continuously-rotating cylinder running at varying speeds, of a constant-speed mechanism, and a clutch mechanism embodying a notched disk and rigid cooperating arms between the cylinder and the constant-speed mechanism, and a cam-disk for operating the rigid arms located alongside the notched disk, substantially as described.

12. The combination with a bed, of means for reciprocating it at varying speeds, a continuously-revolving cylinder, means whereby the cylinder is driven by the bed during a part of its stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, a notched disk and rigid arms cooperating therewith, one of these elements being connected to the constant-speed mechanism and the other to the cylinder, and means whereby said rigid arms are connected to and disconnected from the notched disk, substantially as described.

13. The combination with a bed, of means for reciprocating it at varying speeds, a continuously-revolving cylinder, means for driving it from the bed during a part of its stroke, a constant-speed mechanism, a clutch mechanism between the constant-speed mechanism and the cylinder consisting of a notched disk and cooperating rigid arms, and means operated from the constant-speed mechanism to cause the arms to be connected to and permit them to be disengaged from the notched disk, substantially as described.

14. The combination with a bed, of means for reciprocating it at varying speeds, a continuously-rotating cylinder, means for driving it from the bed during a part of its stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, a notched disk and rigid cooperating arms, one of these parts being connected to the cylinder and the other to the constant-speed mechanism, substantially as described.



ism, and a cam-operating disk located alongside the notched disk, substantially as described.

15. The combination with a shaft, of a cylinder carried thereby, means for rotating the cylinder at times at varying speeds, a constant-speed mechanism for rotating the cylinder when it is not under the control of the varying-speed mechanism, a clutch mechanism embodying rigid arms with suitable cooperating devices supported on the shaft, a cam-disk supported on the shaft and operating to connect the rigid arms to hold them in engagement with, and permit them to be disengaged from the cooperating devices, substantially as described.

16. The combination with a shaft, a cylinder mounted thereon, means for driving it at times at varying speeds, a notched disk rigidly connected to the cylinder-shaft, a rotating carrier, a series of pivoted two-armed levers supported on the carrier, one of the arms of each of said levers being constructed to at times engage the notched disk, a cam-disk located alongside the notched disk and engaging one of the arms of the two-armed levers, means for continuously rotating the carrier and the cam-disk at different speeds,

whereby the two-armed levers are at times caused to engage with the notched disk and at other times are permitted to be disengaged therefrom, substantially as described.

17. The combination with a reciprocating bed carrying a rack, of a variable-speed mechanism for driving it, a cylinder having a gear thereon, raising and lowering mechanism whereby the gear on the cylinder is caused to engage with and be disengaged from the rack, a notched disk on the shaft of the cylinder, a carrier located alongside the notched disk, a series of two-armed levers pivoted to the carrier, one of the arms of each of said levers being constructed to engage at times the notched disk, a cam-disk located alongside the notched side and operating upon the other arms of the pivoted levers, and means for rotating the carrier and the cam-disk at different speeds, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LUTHER C. CROWELL.

Witnesses:

JAMES Q. RICE,  
T. F. KEHOE.