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BED AND CYLINDER PRINTING MACHINE.

(Application filed July 15, 1898.)

(No Model.)

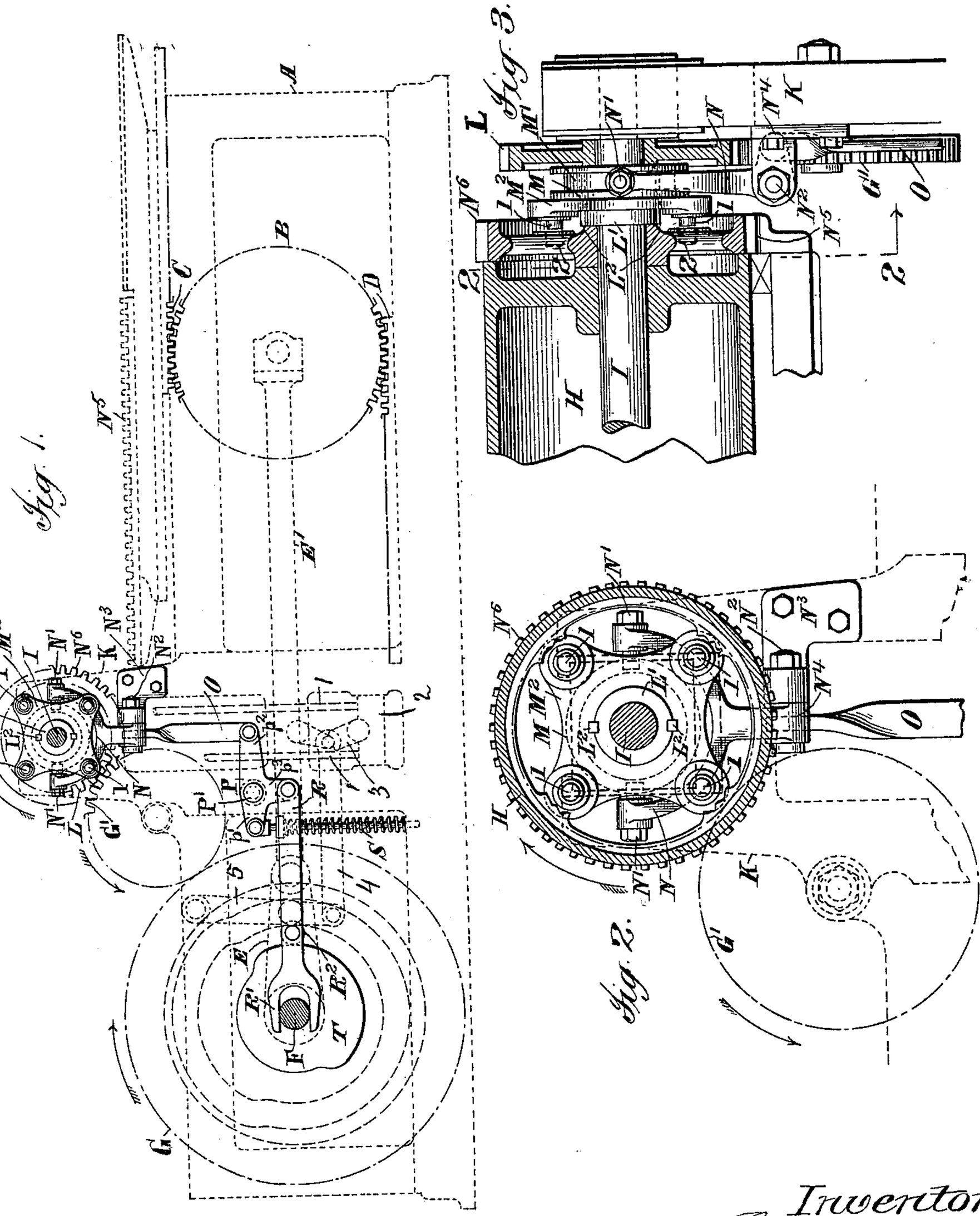

Fig. 1.

Fig. 3.

Fig. 2.

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BED-AND-CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 622,126, dated March 28, 1899.

Application filed July 15, 1898. Serial No. 686,003. (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-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 printing-machines, and more particularly to that class of machines in which a reciprocating bed coöperates with a cylinder which revolves continuously in the same direction. In this class of machines it is necessary in order to effect registry and produce good results in printing that the cylinder and bed move in exact synchronism during that part of the stroke of the bed in which the printing is accomplished. It is usual, therefore, to drive the cylinder from the bed, as by a rack-and-gear connection, during a considerable part of the movement of the bed, which of course produces exact correspondence in movement between the cylinder and the bed, and to cause the printing to be done while the cylinder is so driven. When the cylinder is disengaged from the bed, which disengagement may be effected in various ways, it is driven by an auxiliary mechanism which takes the cylinder and revolves it continuously in the same direction until it is again taken by the bed. The disengagement of the cylinder and bed and their reëngagement may be effected in various ways, though in machines of the multi-revolution type it is usual to accomplish it by raising and lowering the cylinder at appropriate times.

In machines of the character under consideration the mechanism which drives the bed, in order to make a machine which is efficient so far as product is concerned, should be of such a character as to drive it at a high speed during so much of the stroke as is possible and yet act to slow it down, bring it to a full stop at the point of reverse, start it on its return stroke, and bring it again up to its full speed as expeditiously as possible.

The peculiar movements which the bed requires can be effectively given to it by means of a crank mechanism or by mechanisms operated by or producing a movement which is similar to that produced by a crank mechanism. The movement produced by a crank mechanism is, however, as is well known, at no time constant, and the movement of the bed produced by it is of course at no time constant. The bed constantly increases in speed from the point of reverse up to the middle of its stroke and then constantly decreases to the point of reverse at the other end of the stroke. If the cylinder and the bed remain in engagement during the entire or nearly the entire stroke of the bed and the crank-driving mechanism, therefore, be compelled to drive at varying speeds not only the heavy bed through its entire stroke, but has imposed upon it the additional task of driving a heavy cylinder, which also must move at varying speeds, since it is driven through the bed and corresponds thereto in its movement, the strain produced upon the driving mechanism is excessive and causes great wear and tear upon the machine. While, therefore, it is very desirable in order to produce the necessary exact register to drive the cylinder from the bed during the printing operation, it is also desirable to relieve the bed and the crank mechanism which drives it from the necessity of driving the cylinder except during the printing operation—that is, the cylinder should be disengaged from the bed as soon as possible after the completion of the printing operation and held out of engagement therewith until the printing operation is to again begin, when the bed and cylinder should again be brought into engagement. The crank driving mechanism is thus only required to drive the cylinder during a small part of the complete reciprocation of the bed and at the time when there is the least variation in movement due to the characteristics of the said crank mechanism. To produce an effective machine, however, it is necessary that the cylinder and bed be enabled to engage and disengage at high speeds and to accomplish this without shock or jar, which, especially in high-speed mechanisms, would be very injurious to the entire ma-

chine. To effect this result, it is of course obvious that the cylinder must be caused to move, when it reëngages the bed, at a rate of speed which corresponds exactly to that which the bed has at that time.

Heretofore it has been considered impractical to disengage a cylinder which revolves continuously in the same direction from the bed and cause it to reëngage with the bed at high speeds, because of the resulting shock or jar, which, as has been before said, is exceedingly injurious to the machine. It has been necessary, therefore, to maintain the cylinder in engagement with the bed during a much longer period of time than was necessary to accomplish the printing. In fact, the bed and cylinder in machines in which the cylinder revolves continuously in the same direction have remained in engagement until the bed was practically at the end of its stroke, at which time disengagement and reengagement presented little difficulty. This long engagement of the bed and cylinder has resulted in causing a great strain upon the driving mechanism, which is compelled not only to drive both the bed and cylinder during the printing operation, when the speed is more nearly constant than at other times, but also during the periods when the speed of these parts must be constantly increased and diminished, and has also resulted in limiting to a very considerable degree the speed at which the machine was run.

It is the object of this invention to produce a printing-machine embodying a cylinder continuously revolving in the same direction and a reciprocating bed in which the bed may be operated by a crank mechanism or other similar mechanism operating at varying speeds and in which the cylinder is driven in synchronism with the bed only during substantially the printing operation and thereafter by an auxiliary mechanism which maintains the cylinder after its disengagement from the bed at a constant speed which is equal to the speed it had when it was disengaged from the bed until it again reëngages with the bed and to accomplish this transfer from one driving mechanism to the other at high speeds and by means of intermediate devices which enable the transferring operation to be effected without shock or jar or any injurious strain upon the machine.

With these and other objects in view the invention consists in certain constructions, parts, improvements, and combinations, as will be hereinafter described and more fully pointed out in the claims hereunto appended.

In the accompanying drawings, which constitute a part of this specification and in which like letters and figures of reference indicate the same parts, Figure 1 represents in side elevation so much of one of the several types of bed-and-cylinder printing-machines embodying my invention as is necessary to enable the invention to be clearly understood. Figs. 2 and 3 are detail views illustrating the action of the intermediate devices by means of which the cylinder is secured to and released from the constant-speed mechanism.

In this embodiment of the invention the frame of the machine, which is marked A, is diagrammatically illustrated by dotted lines. The bed is preferably directly reciprocated by a mechanism ordinarily known in the art as a "railroad-gear," the said gear being marked B and engaging racks C and D, respectively, mounted on the bed and the frame of the machine. The said railroad-gear is operated by a crank-arm E, (shown in dotted lines in Fig. 1,) mounted on the shaft F. The crank-arm E and the railroad-gear before referred to are connected by means of the ordinary yoked connecting-rod, (herein shown in dotted lines and marked E'.) The shaft F also carries a power-wheel or large gear G, through which power is transmitted to the shaft in any usual manner. While this construction affords a convenient and effective means for reciprocating the bed, it is to be understood that the invention is not to be considered as in any way limited thereto, as many other forms of variable-speed mechanism might be used for this purpose.

The bed, which reciprocates in the usual ways, is provided with a rack N^5, which engages at suitable times with a cylinder N^6, suitably secured to the cylinder-shaft, the said shaft being marked I and the cylinder thereon being marked II.

In the type of machine shown the cylinder-shaft I is journaled in suitable sliding boxes of a usual construction, which are mounted in standards K on the frame of the machine. The cylinder-gear N^6 is engaged with and disengaged from the rack N^5 on the bed by means of suitable raising and lowering mechanism of an ordinary type. Such raising and lowering mechanism is in the interest of clearness indicated in dotted lines in Fig. 1. It consists of rods 1, connected to a cross-bar 2, said cross-bar 2 being lowered by toggles 3 and the cylinder and cross-bar being raised by the usual springs. (Not shown.) The toggles are made and broken by a link 4, which is operated from a pivoted lever 5, said lever being controlled in its movements by a cam on the shaft F.

The large gear or power wheel G, before referred to, engages with a suitably-mounted intermediate G', which in turn meshes with a gear L, loosely mounted on the cylinder-shaft I, before referred to. As the gear G runs at a constant speed, it will be understood that the train of gearing just referred to will also be continuously operating at a constant speed, which speed is less than the highest speed which the bed has under the influence of the crank mechanism and is of course greater than its lowest speed. While this train of gearing forms an efficient constant-speed mechanism, it is to be understood that any other mechanism which would form a constant-speed device might be used, as the in-

vention is by no means limited to any particular means for producing constant speed.

The gear L has a boss or hub L′ extending inwardly therefrom, which boss or hub is provided with a suitable feather or feathers L^2. Sliding on the hub or boss L′ and connected thereto by the feathers L^2, before referred to, is a member M of a sliding clutch which forms a part of an intermediate mechanism by which the cylinder when it is disconnected from the bed is connected to the constant-speed gearing before referred to. This member M is provided with a grooved collar M′, which is engaged by pins N′, mounted on the arms N of a yoke which constitutes one of the arms of a bell-crank lever. This bell-crank lever is preferably pivoted on a pivot N^2, supported in any suitable manner. It is herein shown as supported on a bracket N^3, mounted on the frame of the machine. The other arm, N^4, of the bell-crank lever (clearly shown in dotted lines in Fig. 3) is connected by a rod or bar O to one of the arms p^2 of a three-armed lever P, which is suitably mounted on the frame of the machine. The three-armed lever P is pivoted at P′ and has one of its arms, as p', bearing upon a suitable spring S, which is compressed by the movement of the lever, hereinafter to be described. The other arm, p^3, of the lever P is connected to a sliding bar R, which is preferably formed with a yoke R′, which yoke embraces the shaft F of the large gear G. The sliding bar carries a stud R^2, which stud bears upon and is operated by a suitable cam T and also mounted on the shaft F, before referred to. The cam and the connected devices automatically operate at the desired times to shift the clutch member M and lock the cylinder to and disengage it from the constant-speed mechanism, as will be described.

The clutch member M, before referred to, is provided with a plate M^2, which carries a series of pins 1. These pins are preferably four in number, although the number of pins may be varied as desired. The gear N^6 is provided with a series of sockets 2, corresponding in number to the number of the pins 1.

The construction being as above described, the operation is as follows, reference being had to Fig. 1: Power being applied to the gear or power wheel G in any suitable manner, as by a driving-pinion, (not shown,) it is caused to revolve. The crank E will be revolved and the bed will be reciprocated through the railroad-gear in an obvious manner. At the same time the intermediate G′ will be revolved, and as the clutch member M has been shifted so that the pins 1 are engaging the sockets or recesses 2 in the cylinder-gear N^6 the cylinder will be under the control of and be revolved by the constant-speed gearing. The speed of the bed under the influence of the crank driving mechanism will increase as the crank is moving from its position on the center, as shown in Fig. 1, toward the position in which it will stand in a vertical line passing through the axis of the shaft F, at which time its speed and the speed of the bed will have reached the maximum. When or shortly before the bed under the influence of the increasing speed of the crank attains the speed which the cylinder has under the control of the constant-speed mechanism or gearing (which will be at about the time the crank has completed, say, one-eighth of a revolution,) the raising and lowering mechanism will be operated to lower the cylinder and bring the gear N^6 into position to be engaged by the rack N^5. At about this time the low part of the cam T comes opposite the stud R^2, and the spring S will operate to throw the three-armed lever, rock the bell-crank N, and cause the clutch member M to slide on the hub L′ of the gear L, thereby withdrawing the pins 1 from the recesses 2, and thus disconnecting the cylinder from the constant-speed mechanism. The cylinder is now wholly under the control of and is operated by the bed, and exact synchronism of movement between the two being thus secured the printing operation takes place. After the crank passes the vertical line referred to in the preceding paragraph its speed and the speed of the bed will begin to decrease. When the speed of the bed and the cylinder (which is then, as has been before said, entirely under its control) has decreased under the influence of the crank mechanism until it again coincides with the speed of the constant-speed mechanism, which will be at about the time that the crank has moved one-eighth of a revolution from the vertical line referred to, by which time the printing operation has been concluded, the raising and lowering mechanism operates to raise the cylinder and disengage the gear N^6 from the rack N^5. At the same time the cam T operates upon the stud R^2 of the sliding bar R and rocks the three-armed lever P against the tension of the spring S. This movement of the three-armed lever through the connecting-rod O rocks the bell-crank N, causes the member M to slide upon the hub L′ of the gear L, and brings the pins 1 into engagement with the recesses 2, thereby locking the cylinder to the gear L, it being remembered that the member M is connected to the hub of the gear L by splines or feathers L^2. The cylinder is now locked to the constant-speed mechanism and will be continuously revolved by it at a constant speed. The bed, which is now disengaged from the cylinder, continues on with a constantly-decreasing speed to its point of reverse, reverses, makes its return stroke, and again reverses. As it reaches the point where its speed coincides with that of the constant-speed mechanism and the printing operation is to again take place the raising and lowering mechanism is operated to lower the cylinder, and the low part of the cam T, coming opposite the stud R^2, permits the spring S to rock the three-armed lever and disengage the pins 1 of the member M from the sockets 2 in the cylinder-gear. The cylinder is now

again disengaged from the constant-speed mechanism, is wholly under the control of the bed, and therefore is and will be operated exactly in synchronism with the bed, and this operation will continue until the printing operation is completed, at which time the engaging and disengaging operations are repeated.

For the sake of convenience in illustration the invention has been shown as embodied in a continuous-revolution press of the three-revolution type wherein the cylinder is connected with and disconnected from the bed by means of a raising and lowering mechanism. It is to be understood, however, that the invention is by no means limited to a machine of this description, but is applicable to and may be used with any type of bed-and-cylinder press employing a cylinder which rotates continuously in the same direction and operates in connection with a reciprocating bed, and this whether the cylinder and bed be connected or disconnected by means of a raising and lowering mechanism or any other device.

It is to be understood that while the clutch described is a convenient and effective form of intermediate connection by which the cylinder is connected to and disconnected from the constant-speed mechanism the invention is by no means limited to this or any particular form of clutch. Any device which is auxiliary to the constant-speed mechanism, which is intermediate the cylinder and the constant-speed mechanism, and which will operate to connect the cylinder to and disconnect it from the constant-speed mechanism falls within this invention.

In general it is to be understood that this invention is not limited in its scope or application to the specific details of construction which have been described in the foregoing specification. The construction described is an effective one for carrying out the desired operation; but many changes may be made therein and many other constructions substituted for those described without departing from the spirit or scope of the invention, which is generic in its nature.

What I claim is—

1. In a bed-and-cylinder printing-machine the combination with a reciprocating bed, of means for driving it at varying speeds, a cylinder continuously rotating in the same direction, means for driving the cylinder in synchronism with the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven in synchronism with the bed, auxiliary intermediate devices between the constant-speed mechanism and the cylinder, said devices being operable to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the two speeds coincide, substantially as described.

2. In a bed-and-cylinder printing-machine, the combination with a reciprocating bed and a constantly-rotating cylinder of means for driving the bed at varying speeds, means for driving the cylinder in synchronism with the bed during substantially the printing period, means for driving the cylinder during the non-printing period at a constant speed which is approximately equal to the printing speed, and auxiliary devices intermediate the cylinder and the constant-speed mechanism whereby the cylinder may be connected to and disconnected from said mechanism.

3. The combination with a reciprocating bed driven at varying speeds, of a cylinder continuously rotating in the same direction, said cylinder being driven by the bed during substantially the printing operation, said cylinder and bed being disconnected during substantially the non-printing period of the movement of the bed, mechanism for rotating the cylinder at a constant speed which is approximately equal to the speed given it by the bed at the beginning and end of the printing operation, and auxiliary devices acting at substantially the times when the two speeds coincide, for connecting the cylinder to one driving mechanism and disconnecting it from the other.

4. The combination with a reciprocating bed driven at varying speeds, of a cylinder continuously rotating in the same direction, said cylinder being driven by the bed during the printing operation and held by the bed against movement in either direction independently of the bed during said operation, mechanism for rotating the cylinder at a constant speed during the non-printing period and auxiliary means intermediate the cylinder and the constant-speed mechanism for connecting the cylinder to and disconnecting it from said mechanism, substantially as and for the purpose described.

5. The combination with a reciprocating bed, of a crank mechanism for driving the bed at varying speeds, a continuously-rotating cylinder driven from the bed during the printing operation and disconnected therefrom during the rest of its movements, said bed and cylinder being arranged with the printing operation occurring during that part of the movement of the bed in which the speed varies but slightly, a constant-speed mechanism for rotating the cylinder when disconnected from the bed, the cylinder being transferred from the bed to the constant-speed mechanism at substantially the times when the two speeds coincide, and raising and lowering devices.

6. In a bed-and-cylinder printing-machine, the combination with a reciprocating bed, of means for driving it at varying speeds, a cylinder continuously rotating in the same direction, means for driving the cylinder in synchronism with the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven in synchronism with the bed, auxiliary intermediate devices between the constant-speed mechanism and the cylinder, and mechanism for operating the intermediate devices to con-

nect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the two speeds coincide, substantially as described.

7. In a bed-and-cylinder printing-machine the combination with a reciprocating bed, of means for driving it at varying speeds, a cylinder continuously rotating in the same direction, means for driving the cylinder from the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, auxiliary intermediate devices between the constant-speed mechanism and the cylinder, said devices being operable to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the two speeds coincide, substantially as described.

8. In a bed-and-cylinder printing-machine, the combination with a reciprocating bed, of means for driving it at varying speeds, a cylinder continuously rotating in the same direction, means for driving the cylinder from the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, auxiliary intermediate devices between the constant-speed mechanism and the cylinder, and mechanism for operating the intermediate devices to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the two speeds coincide, substantially as described.

9. In a bed-and-cylinder printing-machine, the combination with a reciprocating bed, of means for driving it at varying speeds, a cylinder continuously rotating in the same direction, means for driving the cylinder from the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, raising and lowering mechanism for connecting the cylinder to and disconnecting it from the bed, intermediate devices between the constant-speed mechanism and the cylinder, and automatic mechanism for operating the intermediate devices to connect the cylinder to and disconnect it from the constant-speed mechanism while the bed is running at a considerable speed and before it reaches the end of its stroke, substantially as described.

10. In a bed-and-cylinder printing-machine, means whereby the bed is driven at varying speeds, means whereby the cylinder is driven in synchronism with the bed during a part of one stroke, mechanism for driving the cylinder at constant speed when it is not driven in synchronism with the bed, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and constant-speed mechanism coincide, substantially as described.

11. In a bed-and-cylinder printing-machine, means whereby the bed is driven at varying speeds, means whereby the cylinder is driven in synchronism with the bed during a part of one stroke, mechanism for driving the cylinder at a constant speed which is substantially equal to the printing speed when it is not driven in synchronism with the bed, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and constant-speed mechanism coincide, substantially as described.

12. 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, means whereby the cylinder is driven in synchronism with the bed during a part of its stroke, mechanism operated from the power-wheel for driving the cylinder at a constant speed, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and the constant-speed mechanism coincide.

13. 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, means whereby the cylinder is driven in synchronism with the bed during a part of its stroke, mechanism operated from the power-wheel for driving the cylinder at a constant speed, which is substantially equal to the printing speed, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and the constant-speed mechanism coincide.

14. In a bed-and-cylinder machine, mechanism whereby the bed is driven at varying speeds, means whereby the cylinder is driven by the bed during a part of its stroke, mechanism for driving the cylinder at a constant speed when it is not driven by the bed, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and the constant-speed mechanism coincide.

15. In a bed-and-cylinder machine, mechanism whereby the bed is driven at varying speeds, means whereby the cylinder is driven by the bed during a part of its stroke, mechanism for driving the cylinder at a constant speed which is substantially equal to the printing speed, when it is not driven by the bed, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and the constant-speed mechanism coincide.

16. In a bed-and-cylinder machine, mechanism whereby the bed is driven at varying speeds, means whereby the cylinder is driven by the bed during a part of its stroke, a constant-speed mechanism for driving the cylin-

der when it is not driven by the bed, a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and of the constant-speed mechanism coincide, and raising and lowering devices for connecting the cylinder to and disconnecting it from the bed, substantially as described.

17. The combination with the reciprocating bed driven at varying speeds and carrying a rack, of a cylinder continuously rotating in the same direction and carrying a gear engaging said rack during a part of the movement of the bed, mechanism for rotating the cylinder independently of the bed and at a constant speed when the gear is out of engagement with the rack, and auxiliary devices intermediate the cylinder and the constant-speed mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and constant-speed mechanism coincide.

18. In a bed-and-cylinder machine, the combination with mechanism whereby the bed is driven at varying speeds, of a rack on the bed meshing with a gear on the cylinder for driving the cylinder during a part of one stroke of the bed, gearing rotating at constant speed for driving the cylinder when it is not driven by the bed, devices for raising and lowering the cylinder to move its gear into and out of mesh with the rack on the bed, and a suitable clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and constant-speed mechanism coincide.

19. In a bed-and-cylinder machine, the combination with a power-wheel, of a crank mechanism operated by the wheel for driving the bed mechanism whereby the cylinder is driven by 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, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed gearing at substantially the times when the speeds of the bed and said gearing coincide.

20. The combination with a reciprocating bed, of means for driving it at varying speeds, a cylinder continuously rotating in the same direction, means whereby the cylinder is driven in synchronism with the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven in synchronism with the bed, a clutch mechanism between the constant-speed mechanism and the cylinder, said clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism while the bed is running at a considerable speed and before it reaches the end of its stroke, substantially as described.

21. The combination with a reciprocating bed, of means for driving it at varying speeds, a cylinder continuously rotating in the same direction, means whereby the cylinder is driven in synchronism with the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven in synchronism with the bed, a clutch mechanism, automatic devices operating to actuate the clutch mechanism to connect the cylinder to and disconnect it from the constant-speed mechanism while the bed is running at a considerable speed and before it reaches the end of its stroke, substantially as described.

22. In a bed-and-cylinder machine, the combination with a reciprocating bed, of a power-wheel rotating at a constant speed, mechanism whereby the bed is driven from said wheel at varying speeds, a cylinder continuously rotating in the same direction, means whereby the cylinder is driven in synchronism with the bed during a part of one stroke, a constant-speed mechanism operated from the power-wheel for driving the cylinder when it is not driven in synchronism with the bed, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and constant-speed mechanism coincide, substantially as described.

23. In a bed-and-cylinder machine, the combination with a reciprocating bed, of mechanism whereby the bed is driven at varying speeds, a cylinder continuously rotating in the same direction, means whereby the cylinder is driven by the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, and a clutch mechanism acting to connect the cylinder to and disconnect it from the constant-speed mechanism at substantially the times when the speeds of the bed and constant-speed mechanism coincide, substantially as described.

24. In a bed-and-cylinder machine, mechanism whereby the bed is driven at varying speeds, means whereby the cylinder is driven by the bed during a part of one stroke, a constant-speed mechanism for driving the cylinder when it is not driven by the bed, a clutch mechanism for connecting the cylinder to and disconnecting it from the constant-speed mechanism while the bed is running at considerable speed and before it reaches the end of its stroke, and raising and lowering devices for connecting the cylinder to and disconnecting it from the bed, substantially as described.

25. In a bed-and-cylinder machine, the combination with a reciprocating bed, of a power-wheel running at a constant speed, mechanism whereby the bed is driven from said wheel at varying speeds, a cylinder continuously rotating in the same direction, means whereby the cylinder is driven by the bed during a part of one stroke, mechanism operated from the power-wheel for driving the cylinder at

a constant speed when it is not driven by the bed, and devices including a clutch acting at substantially the times when the speeds of the bed and the constant-speed mechanism coincide for connecting the cylinder to and disconnecting it from the constant-speed mechanism, substantially as described.

26. In a bed-and-cylinder machine, the combination with mechanism whereby the bed is driven at varying speeds, of a rack on the bed meshing with a gear on the cylinder for driving the cylinder during a part of one stroke of the bed, gearing rotating at a constant speed for driving the cylinder when it is not driven by the bed, devices for raising and lowering the cylinder to move its gear into and out of mesh with the rack on the bed, and a suitable clutch mechanism for connecting the cylinder to the constant-speed gearing while the bed is running at considerable speed and before it reaches the end of its stroke, substantially as described.

27. In a bed-and-cylinder machine, the combination with a reciprocating bed, of a power-wheel, crank mechanism operated by the wheel for driving the bed, a cylinder continuously rotating in the same direction, mechanism whereby the cylinder is driven by the bed during a part of one stroke, gearing operated from the power-wheel at a constant speed for driving the cylinder when it is not driven by the bed, and a clutch mechanism acting at substantially the times when the speeds of the bed and constant-speed mechanism coincide for connecting the cylinder to and disconnecting it from said gearing, substantially as described.

28. In a bed-and-cylinder machine, the combination with a gear-wheel, of a crank-stud mounted on the wheel and suitable connections whereby the crank-stud is caused to drive the bed, means whereby the cylinder is driven by the bed during a part of one stroke, a suitable mechanism for raising and lowering the cylinder, a train of gearing connected with the above-named gear, and a suitable clutch mechanism for connecting the cylinder to the gearing when it is disconnected from the bed while the bed is running at considerable speed and before it reaches the end of its stroke, substantially as described.

29. The combination with a bed, of a crank mechanism for driving it, a cylinder, means whereby the cylinder is driven from the bed during a part of one stroke, a constant-speed mechanism having a speed which is considerably greater than the least speed of the bed and less than its greatest speed, a sliding clutch intermediate the cylinder and the constant-speed mechanism, and means for operating the said clutch to connect the cylinder to and disconnect it from the constant-speed mechanism, substantially as described.

30. The combination with a bed, of a crank mechanism for driving it, a cylinder, means whereby the cylinder is driven from the bed during a part of one stroke, a constant-speed mechanism having a speed which is considerably greater than the least speed of the bed and less than its greatest speed, a sliding clutch intermediate the cylinder and the constant-speed mechanism, and automatic means for operating the said clutch to connect the cylinder to and disconnect it from the constant-speed mechanism when the speed of the cylinder under the influence of the bed is equal to that of the constant-speed mechanism, substantially as described.

31. The combination with a reciprocating bed, of a crank mechanism for driving it, a cylinder continuously rotating in the same direction, means for driving the cylinder from the bed during a part of one stroke, raising and lowering devices operating to connect the cylinder with and disconnect it from the bed, a constant-speed mechanism having a speed which is considerably greater than the least speed of the bed and less than its greatest speed, a sliding clutch, and means for operating the clutch to connect the cylinder to and disconnect it from the constant-speed mechanism when the speed of the cylinder under the influence of the bed is equal to the speed of the constant-speed mechanism, substantially as described.

32. The combination with a reciprocating bed, of a crank mechanism for driving it, a cylinder, means for driving the cylinder from the bed during a part of one stroke, a constant-speed mechanism, a sliding clutch intermediate the cylinder and the constant-speed mechanism, a bell-crank for operating the clutch, a cam, and devices intermediate the cam and the bell-crank whereby the cam is caused to operate the bell-crank and slide the clutch, substantially as described.

33. The combination with a bed, of a crank mechanism for driving it, a cylinder, means for driving it from the bed during a part of one stroke, a constantly-running gear mounted on the cylinder-shaft, a clutch member slidingly mounted on and connected to the hub of the gear, cylinder-engaging devices carried by the clutch member, and suitable means for operating the clutch, substantially as described.

34. The combination with a bed, of a crank mechanism for driving it, a cylinder, means whereby the cylinder is driven from the bed during a part of one stroke, raising and lowering devices operating to connect the cylinder to and disconnect it from the bed, a constantly-running gear mounted on the cylinder-shaft, a clutch member slidingly mounted on and connected to the hub of the gear, cylinder-engaging devices carried by the clutch member, and suitable means for operating the clutch, substantially as described.

35. The combination with a bed, of a crank mechanism for driving it, a cylinder, means for driving the cylinder from the bed during a part of one stroke, a constantly-running gear, a clutch member having a sliding connection

with the hub of the gear, a series of pins on the clutch member, a series of recesses in the cylinder, and devices operating to slide the clutch to cause its pins to engage the recesses in the cylinder when the cylinder is disengaged from the bed, 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.