

**No. 648,425.**

**Patented May 1, 1900.**

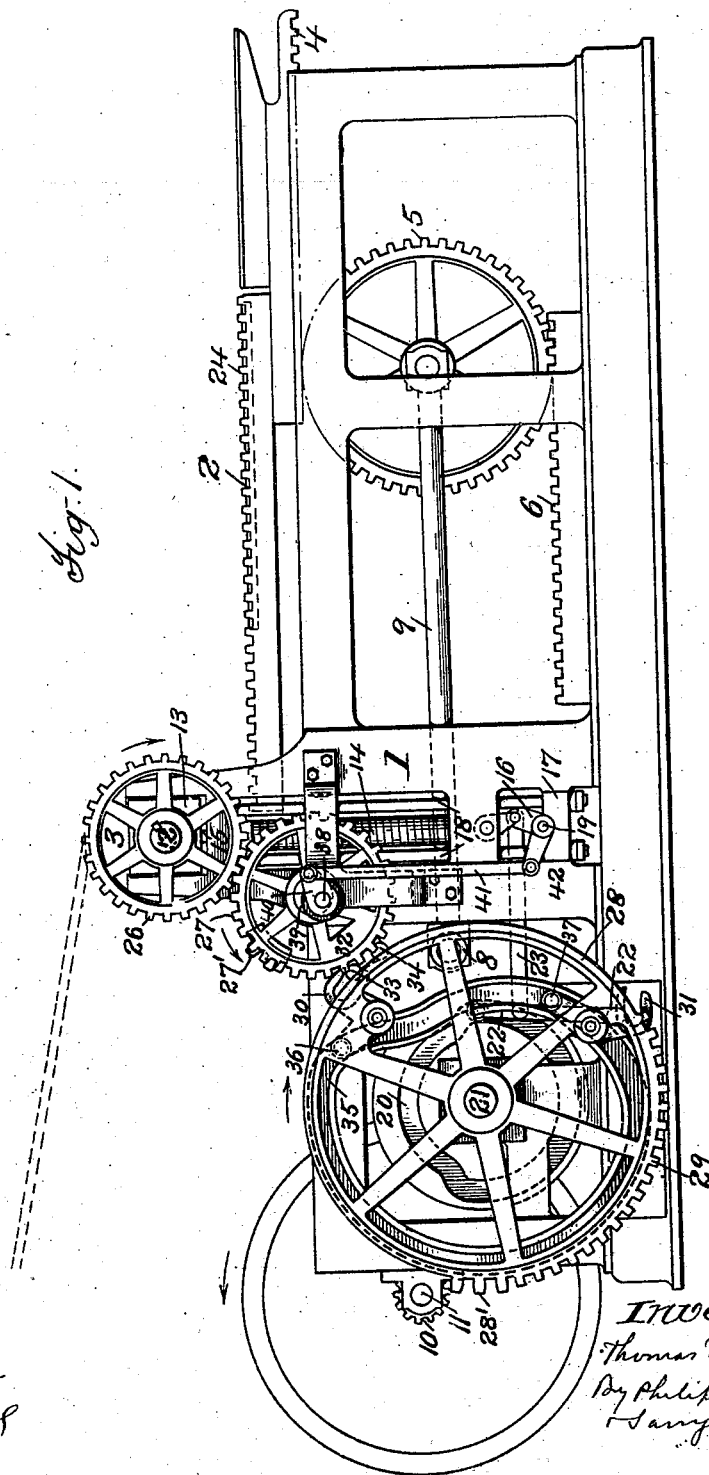
**T. M. NORTH.**

**CYLINDER CONTROLLING MECHANISM FOR MULTIREVOLUTION BED AND CYLINDER  
PRINTING MACHINES.**

(Application filed July 10, 1899.)

(No Model.)

**4 Sheets—Sheet 1.**



Attest:  
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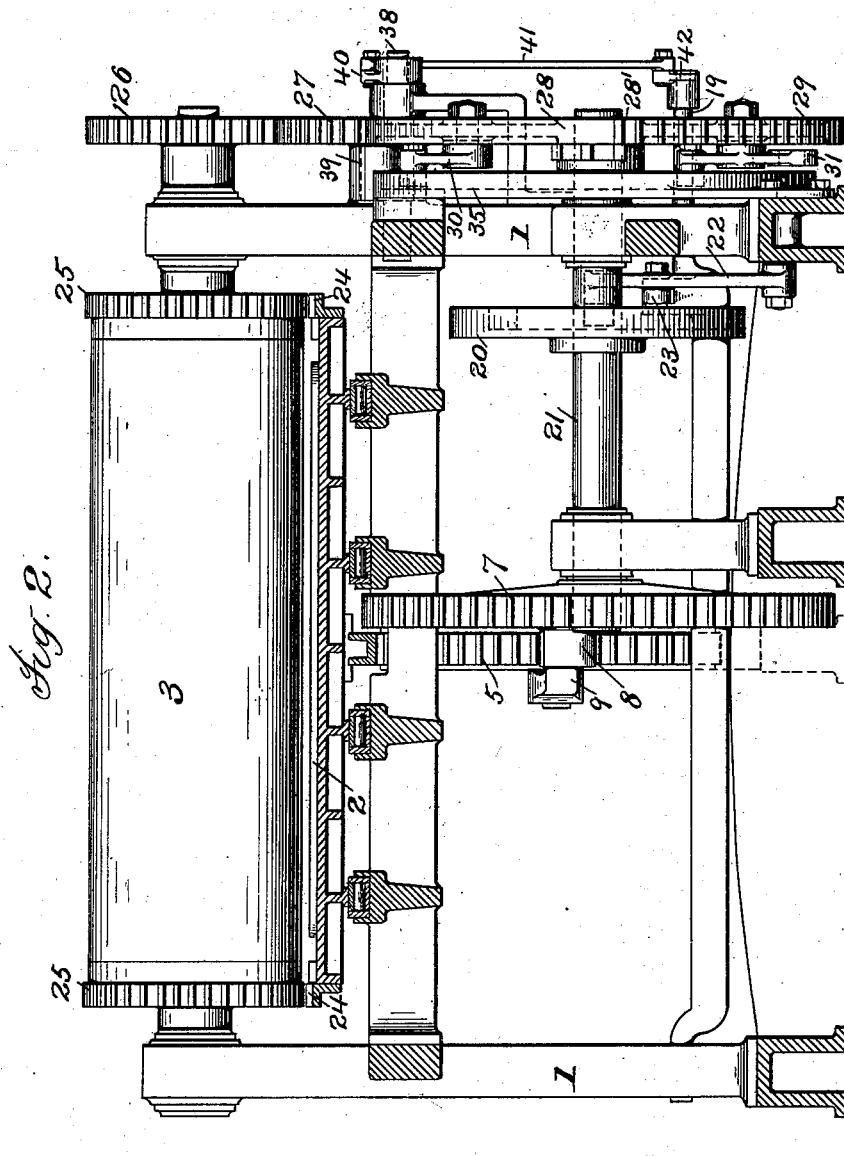
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CYLINDER CONTROLLING MECHANISM FOR MULTIREVOLUTION BED AND CYLINDER  
PRINTING MACHINES.

(No Model.)

(Application filed July 10, 1899.)

4 Sheets—Sheet 2.



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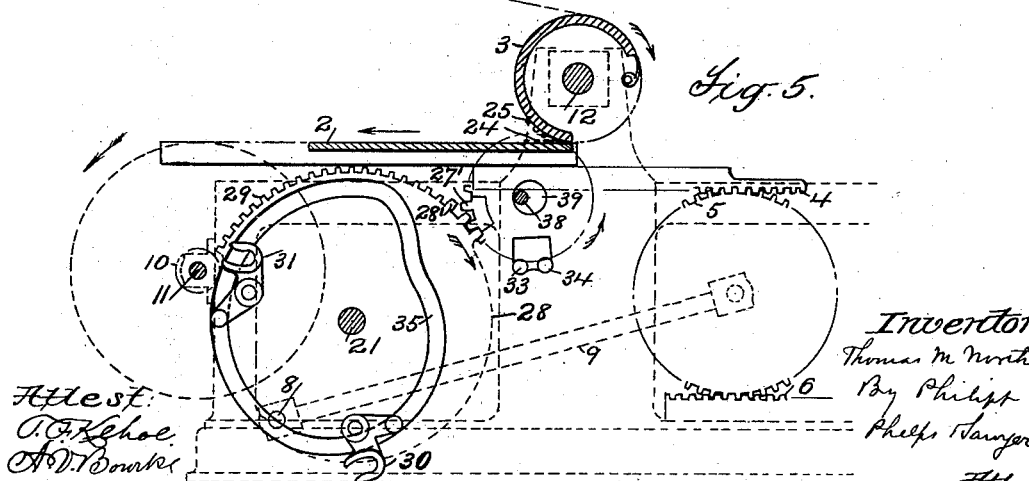
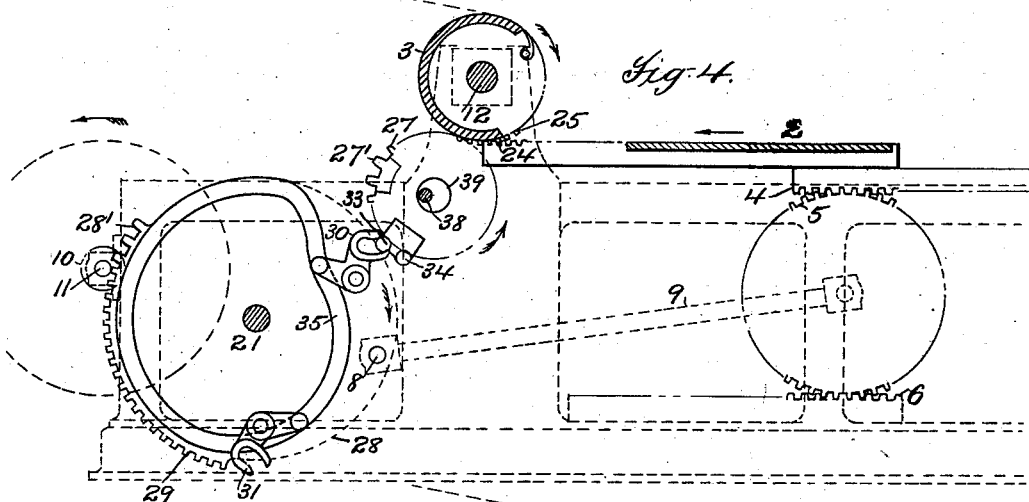
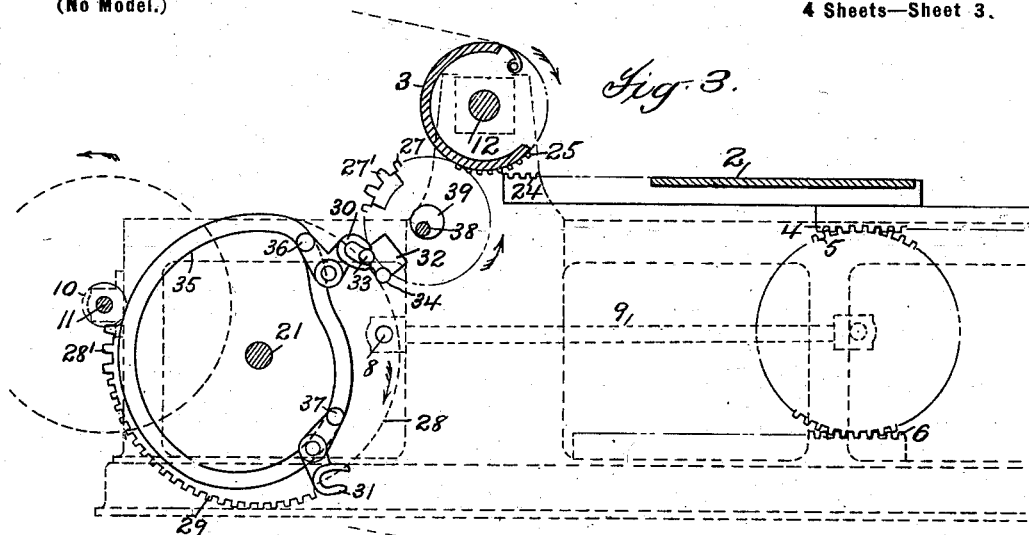
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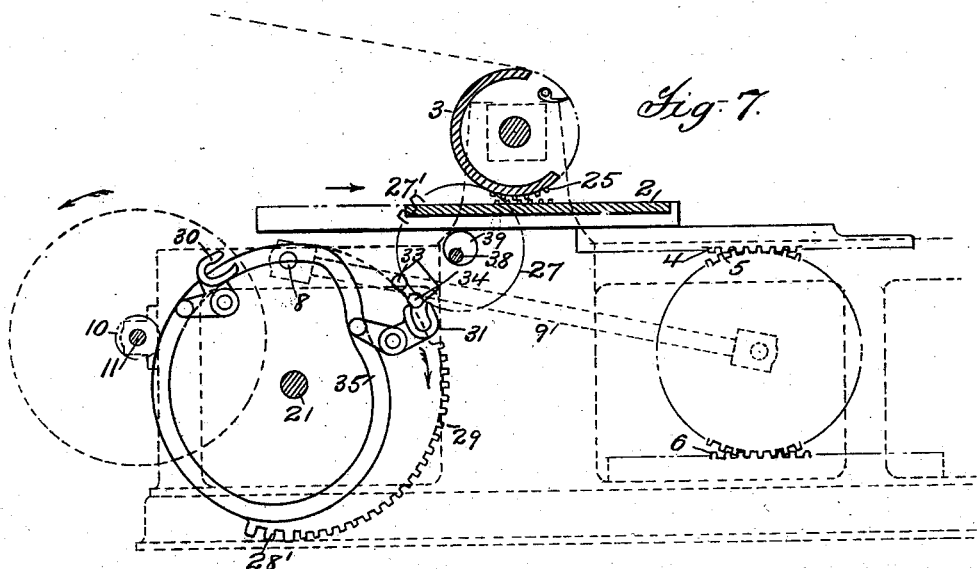
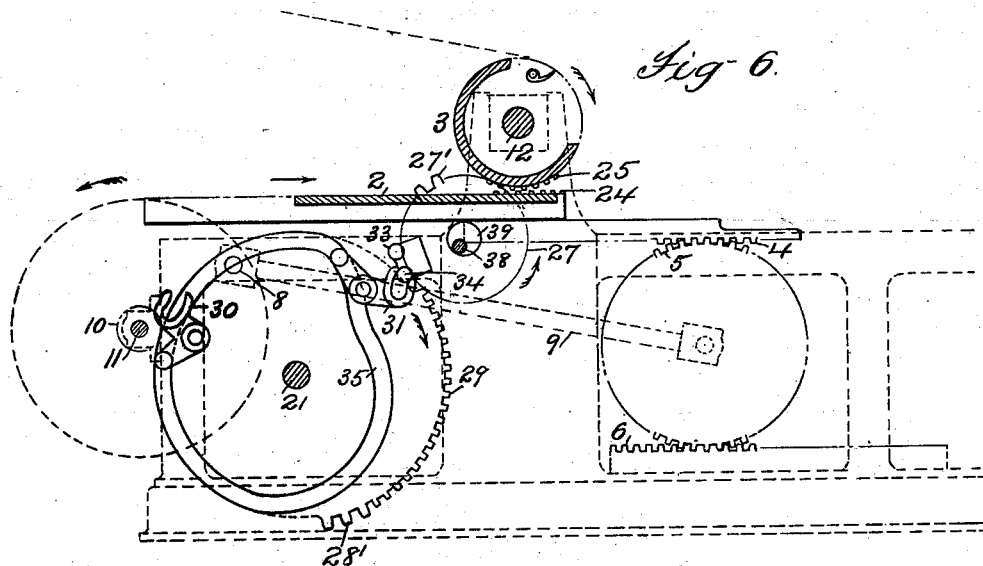
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PRINTING MACHINES.

(Application filed July 10, 1899.)

(No Model.)

4 Sheets—Sheet 4.



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# UNITED STATES PATENT OFFICE.

THOMAS M. NORTH, OF NEW YORK, N. Y., ASSIGNOR TO ROBERT HOE,  
THEODORE H. MEAD, AND CHARLES W. CARPENTER, OF SAME PLACE.

CYLINDER-CONTROLLING MECHANISM FOR MULTIREVOLUTION BED-AND-CYLINDER PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 648,425, dated May 1, 1900.

Application filed July 10, 1899. Serial No. 723,312. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS M. NORTH, a subject of the Queen of Great Britain and Ireland, residing at New York city, county of Kings, and State of New York, have invented certain new and useful Improvements in Cylinder-Controlling Mechanism for Multirevolution 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 cylinder-controlling mechanism, said mechanism being more particularly intended for use in connection with machines in which the cylinder makes a plurality of revolutions during a complete reciprocation of the bed, such machines being ordinarily known in the art as "multirevolution" machines.

In multirevolution printing-machines, as is well known, the cylinder is driven in synchronism with the bed and usually by the bed during the printing operation. After the printing operation is completed the cylinder continues its revolution while the bed is reversing, returning, and again reversing, the cylinder and the bed being separated during the return of the bed usually by lifting the cylinder by means of any of the well-known mechanisms for this purpose.

While multirevolution printing-machines have certain advantages as compared with printing-machines of the ordinary stop-cylinder type, among which may be mentioned speed in operation and the possibility of using what is ordinarily known as a "front delivery" therewith, it is necessary, of course, in feeding such machines to present the sheets to the cylinder while the cylinder is in motion, and there is liability that the sheet will not be truly fed, resulting, of course, in loss of register. Printing-machine constructions have heretofore been suggested and are known in the art in which the cylinder, though making a plurality of revolutions during each complete reciprocation of the bed, is brought to a stop in order that the sheet may be fed thereto, these constructions being intended to obtain the advantages incident to both the multirevolution and stop-cylinder types of printing-machines. The constructions now

generally known in the art, however, depend largely upon the use either of reciprocating parts or eccentric gears and are expensive, complicated, and not always certain in operation.

The object of the present invention is to produce a printing-machine of the multirevolution class in which the cylinder shall rotate in synchronism with the bed during the printing operation and shall continue its rotation while the bed is reversing, returning, and again reversing, and at the same time shall have its speed of rotation varied, preferably by being brought to a stop, to receive the sheet during the period when it is not being driven in synchronism with the bed, thereby attaining the advantages of both the multirevolution and stop-cylinder types of printing-machines, and to do this by a simple, cheap, compact mechanism which is open to none of the disadvantages that are characteristic of the constructions now known in the art.

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

In the accompanying drawings, which form a part of this specification and in which like characters of reference indicate the same parts, Figure 1 is a side view of one form of a bed-and-cylinder printing-machine embodying the invention. Fig. 2 is a sectional end elevation of the construction shown in Fig. 1. Figs. 3, 4, 5, 6, and 7 are diagrammatic views illustrating various positions of the cylinder and bed during a complete reciprocation of the bed and also illustrating the operation of the cylinder-controlling mechanism by which the requisite movements of the cylinder are produced.

Referring to the drawings, 1 is a frame of a printing-machine of any ordinary construction. 2 indicates the bed, which may be provided with any of the usual forms of printing-surfaces, and 3 indicates the cylinder. The bed may be driven by any of the usual forms of bed-driving mechanism. Inasmuch, however, as certain advantages accrue from the use of a crank mechanism of the railroad-gear

type, this form of driving mechanism will preferably be used. In the machine shown the bed is provided with a rack 4, with which meshes a railroad-gear 5, said gear running on a stationary rack 6. The gear 5 is driven from a main driving-gear 7, mounted on a shaft 21, suitably supported in the frames, said gear carrying a crank-pin 8, which is connected to the axle of the gear 5 by a connecting-rod 9. The main driving-gear may be driven in any suitable manner and is shown as driven from a pinion 10, mounted on a shaft 11, suitably journaled in the frame of the machine and driven from any suitable source of power. The cylinder-shaft 12 is mounted in boxes 13, which are supported, as usual, in the upper ends of standards on the frame.

As is well known, it is necessary in this type of machine that the cylinder and bed be separated during the return of the bed. While this separation may be effected in any known or desired way, it is preferably effected by raising and lowering the cylinder. The raising and lowering mechanism for the cylinder may be of any desired type. In the machine shown, however, the cylinder is raised by springs 14, operating on plunger-rods 15 in the usual manner, and is lowered by means of pairs of toggles 16, the lower toggle of each pair being mounted on cross-bars 17. The bars 17 are connected to rods 18, which are in turn connected to the cylinder-boxes. The toggles are operated from a rock-shaft 19, the said shaft being given its movement from a cam 20, mounted on the shaft 21, the said cam operating the shaft 19 through the medium of a pivoted lever 22 and a connecting-rod 23. The mechanism just described is an ordinary type of raising and lowering mechanism and is well known in the art. Any other form of mechanism may, however, be substituted for it if desired.

The cylinder may be driven in synchronism with the bed in any desired manner—as, for instance, by an independent driving mechanism. Preferably, however, the cylinder will be driven during the time when it moves in synchronism with the bed by the bed itself, as exact correspondence of movement is thus attained. To this end, therefore, the bed is provided with the usual register-racks 24, which racks engage with gears 25, fast on the cylinder, this engagement taking place when the cylinder is in its lowered position.

The mechanism by which the cylinder is driven when it is not moving in synchronism with the bed and by which it is controlled, so as to have its movement varied, preferably by stopping and starting, with relation to the movement of the bed in order that a sheet may be fed thereto, may be constructed within the limits of the invention in various ways. In the preferred form of this construction, however, the cylinder-shaft is provided with a gear 26, which gear meshes with an intermediate 27, mounted on the frame in a man-

ner to be hereinafter described. The gear 26 and the intermediate 27 are preferably continuously in mesh, and it is obvious, therefore, that when the cylinder is being driven by the bed the gear 26 will drive the intermediate 27, which at this time moves idly. In the machine shown the shaft 21 is provided with a wheel 28, said wheel having on its surface a segment 29, which meshes with the gear 27. In order that the gear and segment may run easily and surely into engagement without danger of crushing the engaging teeth, the gear is preferably provided with a short segment 27', having enlarged teeth, and a short segment 28', having similarly enlarged teeth, is attached to the wheel 28 alongside the end of the segment 29. These enlarged teeth may, however, be omitted, if desired. The wheel 28 also carries a pair of pivoted coupling-levers 30 31. The intermediate 27 carries a block 32, which is provided with studs 33 and 34, which studs are engaged at proper times by the pivoted coupling-levers 30 and 31. The pivoted coupling-levers 30 31, being secured to the wheel 28, have of course a continuous rotating or traveling movement. They are furthermore given an additional movement, said movement being produced by a path-cam 35. The coupling-lever 30 carries a stud or roller 36, which engages with the groove of the cam 35, and the lever 31 carries a similar stud or roller 37, which also engages the groove of the cam.

In Patent No. 629,087, granted July 18, 1899, there is shown and described a set of coupling-levers similar to those herein shown and described, the coupling-levers being used in the said patent to stop and start the impression-cylinder of a rotary printing-machine having a sheet-receiving impression-cylinder which is brought to a stop to receive the sheet. The coupling-levers 30 and 31 operate in the present machine in the same manner as do the coupling-levers of the said patent. Reference is therefore made to this patent for a full and precise description of the exact operation of these levers. For the purpose of this application it is sufficient to say that the coupling-lever 30 engages the stud 33 at the proper times and through it starts the intermediate 27 with an easy and gradually-accelerating motion, this motion being effected not only by the forward movement of the wheel 28, which carries the said coupling-lever, but also being due to the fact that through the path-cam 35 the coupling-lever 30 is caused to change its angle of inclination with reference to the path in which it rotates. The movement of the intermediate 27 is of course transmitted to the cylinder through the gear 26. In the same way the coupling-lever 31 engages the stud 34 at the proper time and brings the intermediate 27 to an easy and gradual stop, the motion of the intermediate being of course transmitted to the cylinder through the gear 26.

While the intermediate 27 might be con-

structed so as to remain constantly in mesh with the gear 26 without being raised and lowered, this intermediate will preferably be mounted on a shaft or stud 38, having an eccentric portion 39, on which the gear runs. The shaft 38 carries a crank-arm 40, said arm being connected by a connecting-rod 41 to a crank-arm 42, mounted on the shaft 19. By this construction the toggles and the shaft 38 are connected, so as to operate simultaneously. When, therefore, the toggles are straightening, so as to bring down the cylinder, the eccentric on the shaft 38 is being shifted so as to cause the intermediate 27 to move down with the gear 26, and when the toggles are broken, so as to permit the spring to raise the cylinder, the intermediate 27 is moved upward.

The operation of the construction will be clear from what has already been said, taken in connection with the brief description of the diagram Figs. 3 to 7. In the diagram illustrated in Fig. 3 the cylinder is shown at its point of rest, the grippers having closed upon the sheet. The coupling-lever 30 is just engaging the stud 33, and its further compound movement produced by the advancing movement of the wheel 28 and the movement on its pivot due to the cam 35 will cause the intermediate 27 to be started from its position of rest with an easy and gradual movement, this movement of course being transmitted to the cylinder 3 through the medium of the gear 26. When the cylinder under the influence of the coupling-lever 30 and the intermediate 27 has been brought up to the speed of the bed, the toggles are operated to force the cylinder down, so that its gears 25 will engage register-racks 24. At about the time this occurs the coupling-lever 30 is caused to become disengaged from the stud 33, this position of the parts being indicated in Fig. 4. The cylinder is now wholly under the control of the bed and moves in exact synchronism therewith during the printing operation. After the printing operation is finished and at about the time the racks 24 run out of engagement with the gears 25 the segment 29 on the wheel 28 runs into engagement with the enlarged teeth on the intermediate 27, and when the segment 29 and the intermediate 27 are fairly in mesh the cylinder-lifting devices are operated to raise the cylinder. Fig. 5 shows the parts in the position they occupy just as the segment is running into mesh with the intermediate 27 and just before the cylinder-lifting devices have operated. The cylinder now is under the control of the segment 29 and is rotated by this segment until the coupling-lever 31 comes into position to engage the stud 34, this position of the parts being shown in Fig. 6. As the lever 31 engages the stud 34 the segment 29 runs out of mesh with the intermediate 27. The lever 31 operates through a compound movement which is the reverse of that before described in connection with the

lever 30 to bring the cylinder to an easy and gradual stop. When the cylinder has been brought to a stop, the lever 31 passes out of engagement with the stud 34 and the cylinder remains quiescent and in raised position while a sheet is being fed thereto. The lever 30 then comes into position to engage the stud 33, and the cycle of operations just described is repeated.

It will be seen that the cylinder is stopped and started through the mechanism before described in an easy and gradual manner, which obviates any sudden strains on the driving mechanism, and that this result is accomplished by exceedingly simple and effective devices, which consist in the main of many engaging surfaces which are inclined to their path of movement.

While the specific form of mechanism which has been described is considered a preferable one, it is to be understood that this mechanism may be varied within wide limits without departing from the invention. The invention is not, therefore, to be limited to the construction which has been described and illustrated.

What is claimed is—

1. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, and a controlling mechanism for varying the speed of the cylinder with relation to the bed when it is not driven in synchronism with the bed, said controlling mechanism including traveling engaging surfaces, one of which is movable, and means for giving said surface a movement with relation to its path of travel, substantially as described.

2. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, and a rotating controlling mechanism for varying the speed of the cylinder with relation to the bed when it is not driven in synchronism with the bed, said controlling mechanism including engaging surfaces, one of which is movable, and means for giving it a movement with relation to its path of rotation, substantially as described.

3. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, and a controlling mechanism for stopping and starting the cylinder when it is not driven in synchronism with the bed, said controlling mechanism including traveling engaging surfaces, one of which is movable, and means for giving said surface a movement with relation to its path of travel, substantially as described.

4. In a multirevolution bed-and-cylinder

printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, and a rotating controlling mechanism for stopping and starting the cylinder when it is not driven in synchronism with the bed, said controlling mechanism including engaging surfaces, one of which is movable, and means for giving said surface a movement with relation to its path of rotation, substantially as described.

5. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a controlling mechanism for varying the speed of the cylinder with relation to the bed when it is not driven in synchronism with the bed, said controlling mechanism including engaging surfaces, one of which is inclined to its path of movement, and means for varying the inclination of said surfaces, substantially as described.

6. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a controlling mechanism for stopping and starting the cylinder, said controlling mechanism including engaging surfaces, one of which is inclined to its path of movement, and means for varying the inclination of the surfaces, substantially as described.

7. In a multirevolution bed-and-cylinder printing-machine, the combination with a cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, and a controlling mechanism for varying the speed of the cylinder with relation to the bed when it is not driven in synchronism with the bed, said mechanism including two pairs of engaging surfaces, one surface of each pair being inclined to its path of movement, substantially as described.

8. In a multirevolution bed-and-cylinder printing-machine, the combination with a stop-cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, and a controlling mechanism for stopping and starting the cylinder, said mechanism including two pairs of traveling engaging surfaces, one surface of each pair being movable, and means for giving it a movement with relation to its path of travel, substantially as described.

9. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, and a rotating controlling mechanism for varying the speed of the cylinder with relation to the bed when it is not driven in synchronism with the bed, said mechanism including two pairs of engaging surfaces, one surface of each pair be-

ing inclined to its path of movement, substantially as described.

10. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, and a rotating controlling mechanism for stopping and starting the cylinder, said mechanism including two pairs of engaging surfaces, one surface of each pair being inclined to its path of movement, substantially as described.

11. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a controlling mechanism for varying the speed of the cylinder with relation to the bed when it is not driven in synchronism with the bed, said mechanism including two pairs of engaging surfaces, one surface of each pair being inclined to its path of movement, and means for varying the inclination of said surface, substantially as described.

12. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a controlling mechanism for stopping and starting the cylinder, said mechanism including two pairs of engaging surfaces, one surface of each pair being inclined to its path of movement, and means for varying the inclination of said surfaces, substantially as described.

13. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a rotating mechanism for varying the speed of the cylinder with relation to the bed when it is not driven in synchronism with the bed, said mechanism including two pairs of engaging surfaces, one surface of each pair being inclined to its path of movement, and means for varying the inclination of said surfaces, substantially as described.

14. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a rotating controlling mechanism for stopping and starting the cylinder, said mechanism including two pairs of engaging surfaces, one surface of each pair being inclined to its path of movement, and means for varying the inclination of said surfaces, substantially as described.

15. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of a rotating member carrying a pair of engaging surfaces, a second rotating member carrying a pair of engaging surfaces, and means whereby one surface of each pair is brought into engagement to stop the cyl-



inder and the other surface of each pair is brought into engagement to start the cylinder, substantially as described.

16. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of a rotating member carrying a pair of engaging surfaces, means for giving the surfaces a movement in addition to the rotating movement, a second member carrying a pair of engaging surfaces, and means whereby the engagement of two surfaces of each pair is caused to stop the cylinder and the engagement of the other two surfaces of each pair is caused to start the cylinder, substantially as described.

17. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of a rotating member carrying a pair of pivoted engaging surfaces, a second rotating member carrying a pair of engaging surfaces, means for turning the pivoted surfaces about their pivots, and means whereby the engagement of a surface of each pair is caused to stop the cylinder and the engagement of the other surfaces of each pair is caused to start the cylinder, substantially as described.

18. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of a rotating member carrying a pair of pivoted levers, of a second rotating member carrying a pair of studs which are engaged by the levers, and means for turning the levers about their pivots, substantially as described.

19. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of a rotating member carrying a pair of pivoted levers, of a second rotating member carrying a pair of studs with which the levers engage, and a cam for turning the levers about their pivots, substantially as described.

20. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of a gear on the cylinder-shaft, a second gear in mesh therewith, a pair of studs carried by the gear, a rotating member carrying a pair of pivoted levers, and a cam for turning the levers about their pivots, substantially as described.

21. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a gear and segment, means whereby these parts are caused to drive the cylinder when it is not driven in synchronism with the bed, and means for varying the speed of the cylinder with relation to the bed by varying the speed of one of these parts with relation to the other, said means consisting of engaging surfaces carried by the parts, substantially as described.

22. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchro-

nism with the bed during a part of a complete reciprocation of the bed, a gear and segment, means whereby these parts are caused to drive the cylinder when it is not driven in synchronism with the bed, means for varying the speed of the cylinder with relation to the bed by varying the speed of one of these parts with relation to the other, said means including a pair of engaging surfaces carried by the parts, one of said surfaces being inclined to its path of movement, and means for varying the inclination of said surface, substantially as described.

23. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a gear and segment, means whereby these parts are caused to drive the cylinder when it is not driven in synchronism with the bed, and means for stopping and starting the cylinder, said means including engaging surfaces carried by the gear and segment, said surfaces being brought into operation when the gear and segment are out of mesh, substantially as described.

24. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a gear and segment, means whereby the gear and segment are caused to drive the cylinder when it is not driven in synchronism with the bed, and means for stopping and starting the cylinder, said means including two pairs of engaging surfaces, one surface of each pair being pivoted, and means for moving the pivoted surfaces about their pivots, whereby the surfaces are given a compound movement, substantially as described.

25. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a gear and segment, means whereby the gear and segment are caused to drive the cylinder when it is not driven in synchronism with the bed, and means for stopping and starting the cylinder, said means including a pair of pivoted coupling-levers, and a pair of studs with which the levers engage, said studs and levers being carried by the gear and segment, and means for turning the coupling-levers about their pivots while they are in engagement with the studs, substantially as described.

26. In a multirevolution bed-and-cylinder printing-machine, the combination with the cylinder, of means for driving it in synchronism with the bed during a part of a complete reciprocation of the bed, a gear on the cylinder-shaft, a second gear in mesh with the first-mentioned gear, a segment for driving the second gear, a pair of pivoted coupling-levers, a pair of studs with which the levers engage, said coupling-levers and studs

being carried by the gear and segment, and means for turning the coupling-levers about their pivots, substantially as described.

27. In a multirevolution bed-and-cylinder  
5 printing-machine, the combination with the  
cylinder, of gears carried thereby, racks carried by the bed with which said gears engage,  
raising and lowering devices for the cylinder,  
a gear on the shaft of the cylinder, a second  
10 gear meshing therewith, means for giving the  
second gear movements corresponding to  
those given the cylinder by the raising and  
lowering devices, a segment for driving this

second gear, a pair of pivoted coupling-levers, studs with which they engage, said le- 15  
vers and studs being carried by the gear and  
segment, and means for moving the coupling-levers about their pivots, substantially  
as described.

In testimony whereof I have hereunto set 20  
my hand in the presence of two subscribing  
witnesses.

THOMAS M. NORTH.

Witnesses:

F. W. H. CRANE,  
L. ROEHM.