(No Model.) 7 Sheets—Sheet 1.

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 533,117. Patented Jan. 29, 1895.

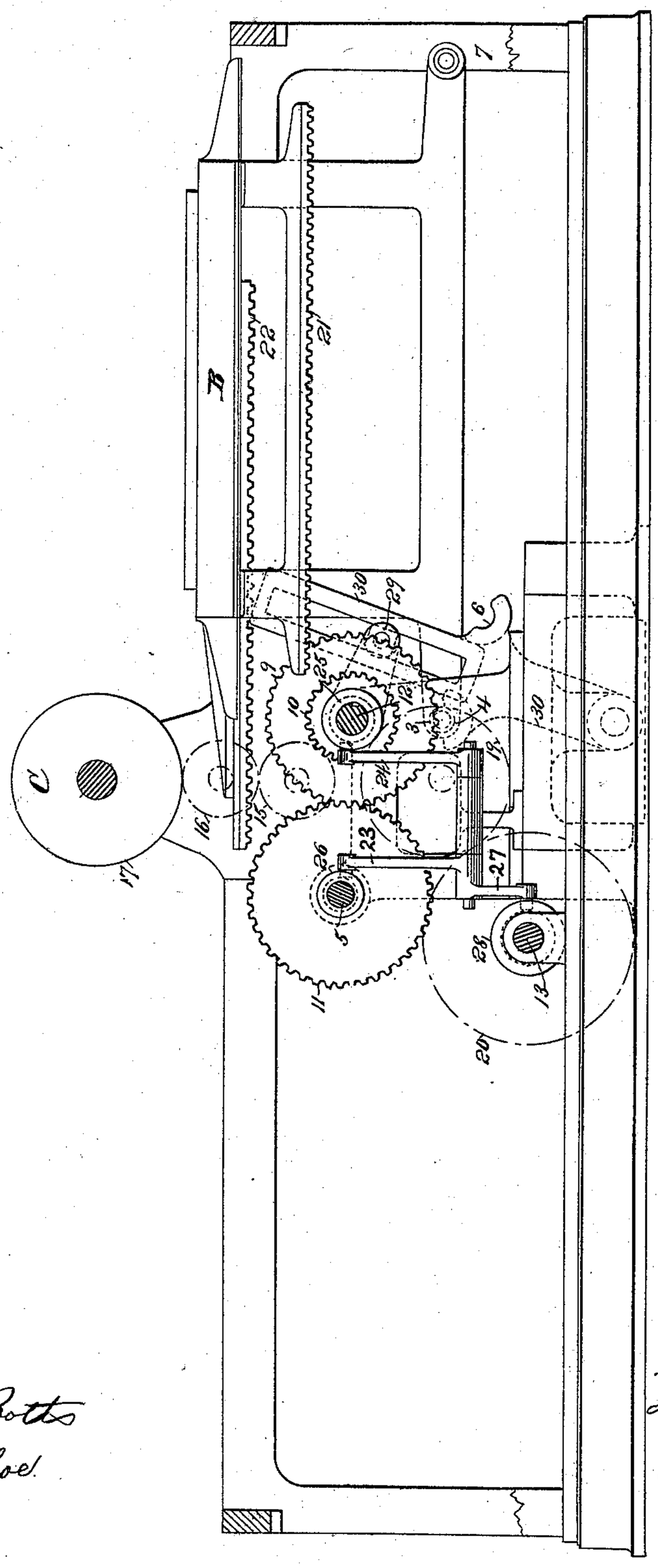

Fig. 1.

Attest;
Geo. H. Botts
J. F. Wehrel.

Inventor;
Luther C. Crowell
by
Philipp Munn & Sheeps

(No Model.) 7 Sheets—Sheet 2.

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 533,117. Patented Jan. 29, 1895.

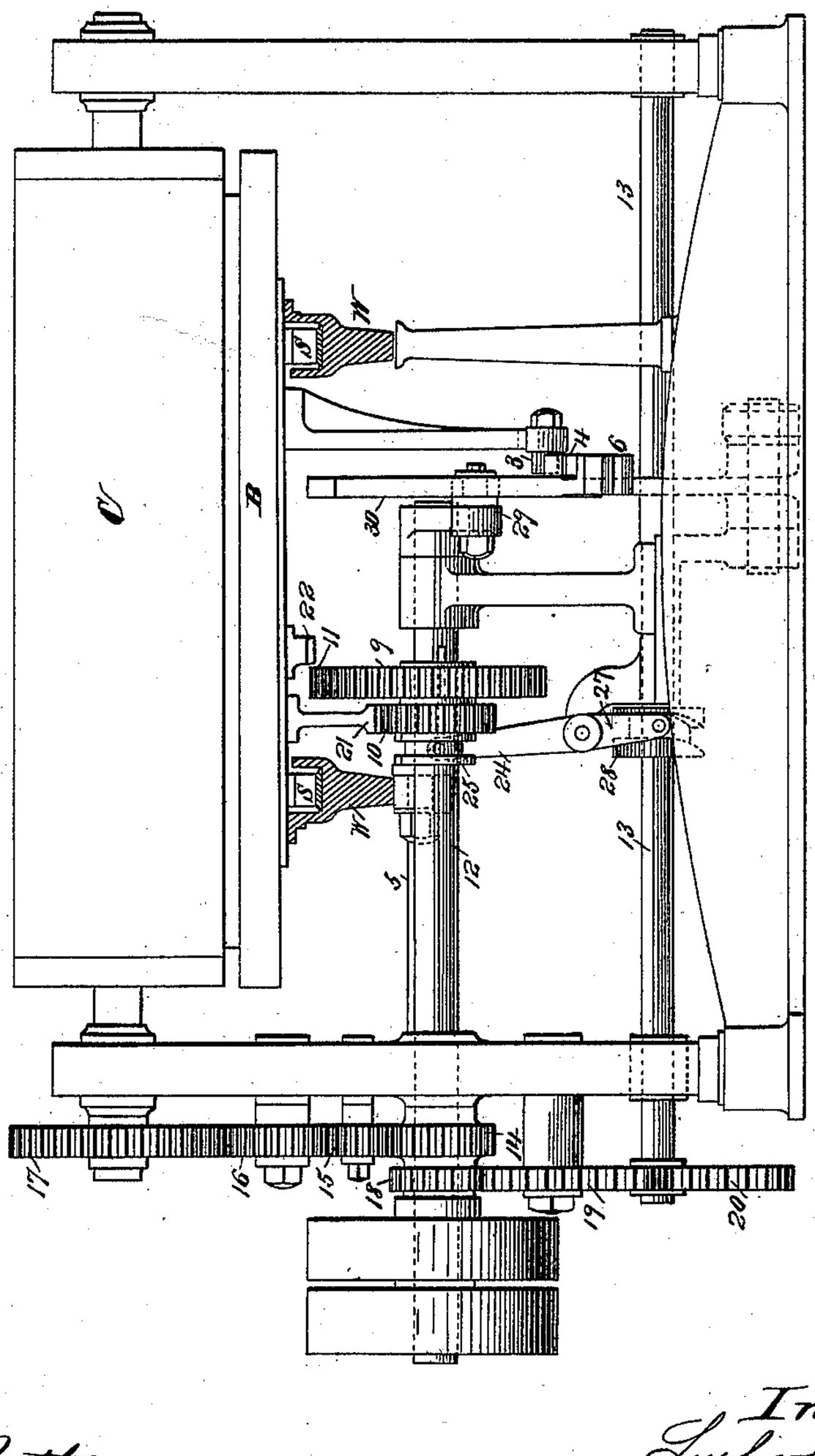

Fig. 2.

Attest;
Geo. H. Botts
T. F. Kehoe.

Inventor;
Lucius C. Crowell
by Philip Thomson & Sheep

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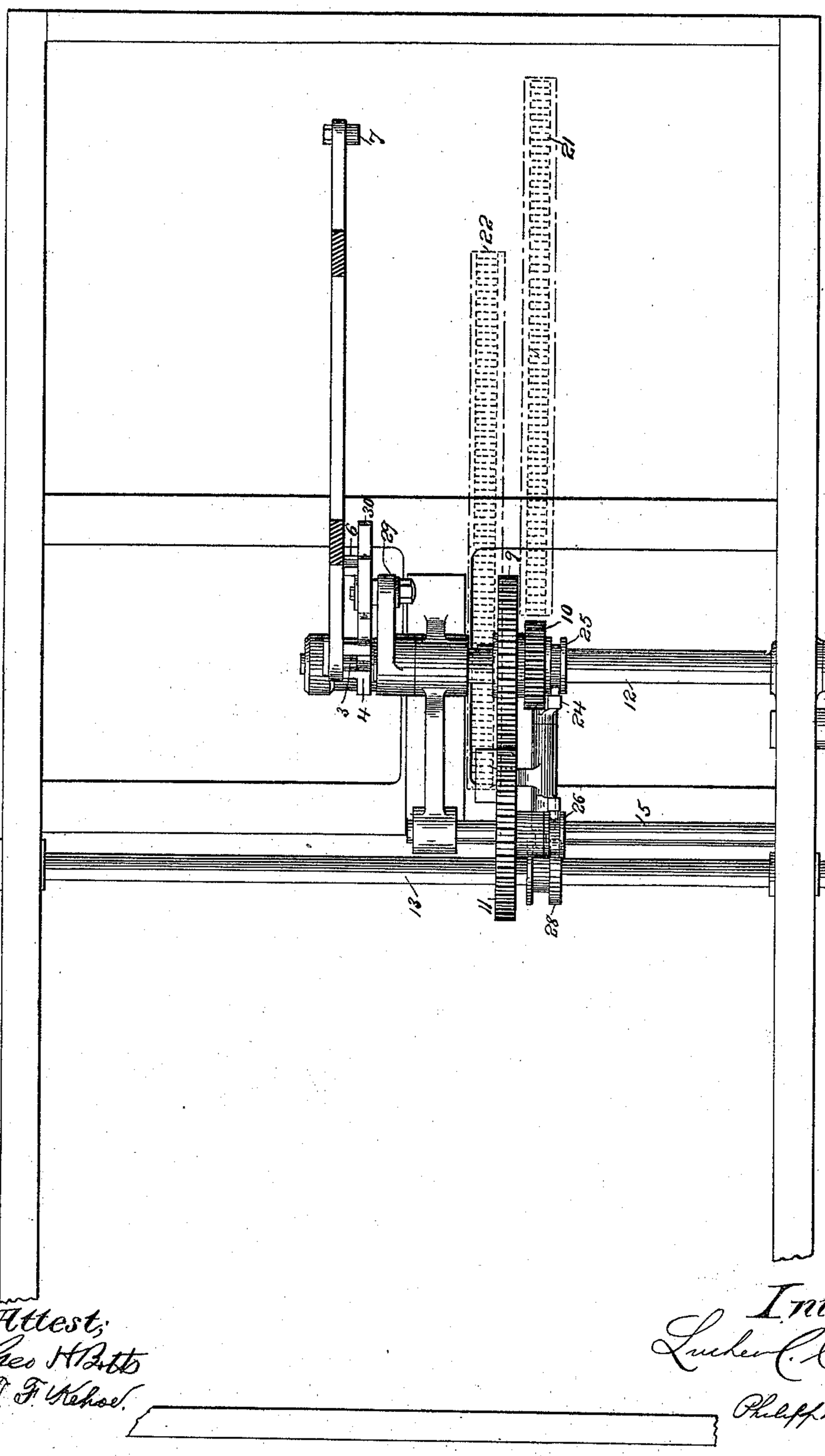
L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 533,117. Patented Jan. 29, 1895.



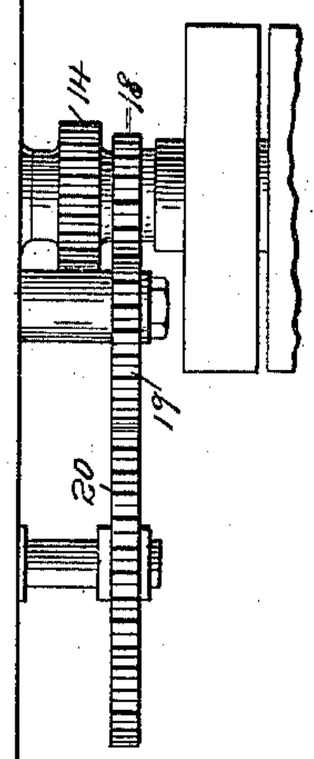


Fig. 3.

Attest;
Geo. H. Betts
T. F. Kehoe.

Inventor;
Lucien C. Crowell
by
Philipp Thomas Phelps

(No Model.) 7 Sheets—Sheet 4.

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 533,117. Patented Jan. 29, 1895.

Fig. 4.

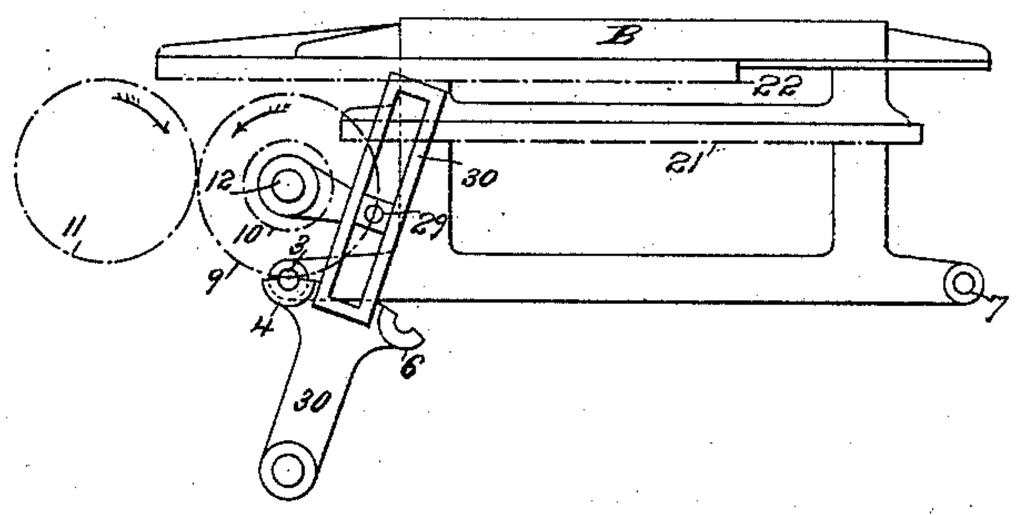


Fig. 5.

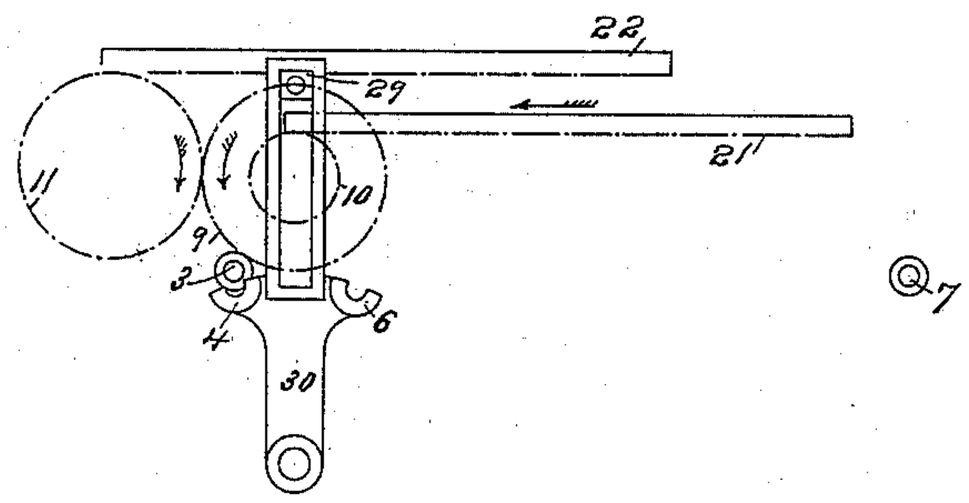


Fig. 6.

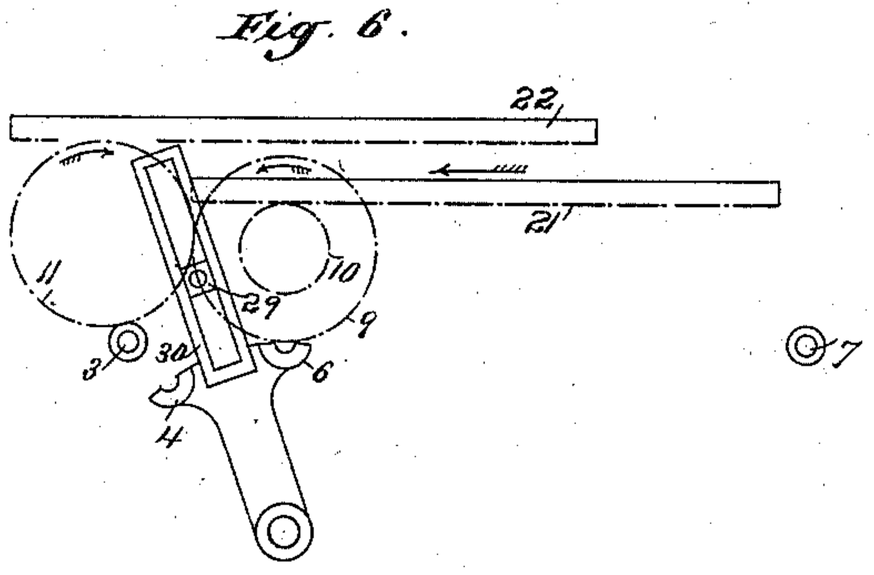
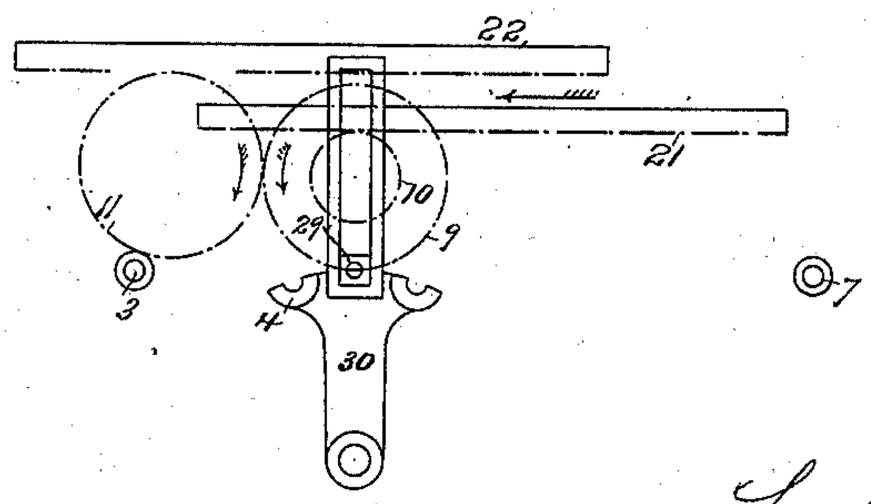


Fig. 7.



Attest:
Geo. H. Botts.
P. F. Kehoe.

Inventor
Luther C. Crowell
By
Philipp Brumm & Phelps
Attys

(No Model.) 7 Sheets—Sheet 5.

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 533,117. Patented Jan. 29, 1895.

Fig. 8.

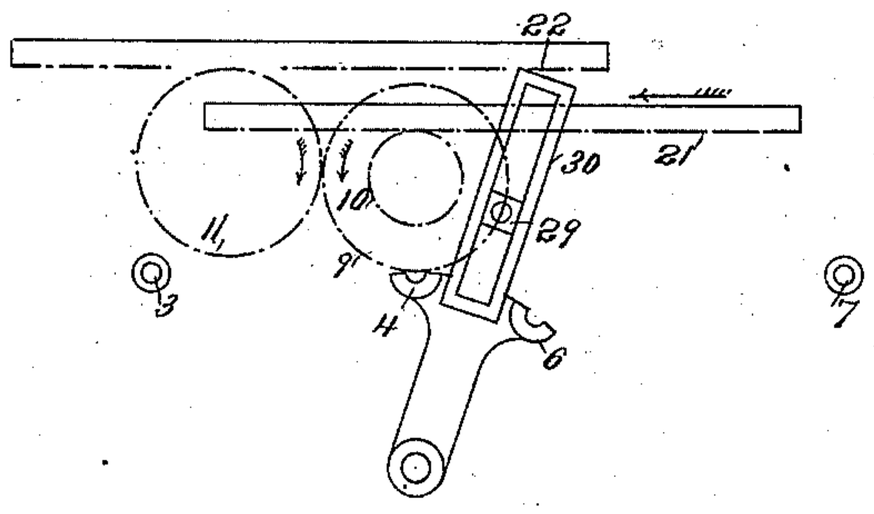


Fig. 9.

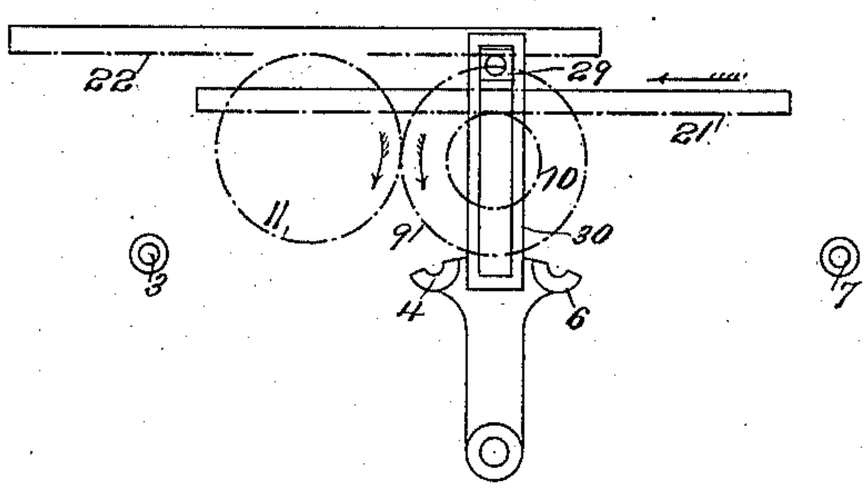


Fig. 10.

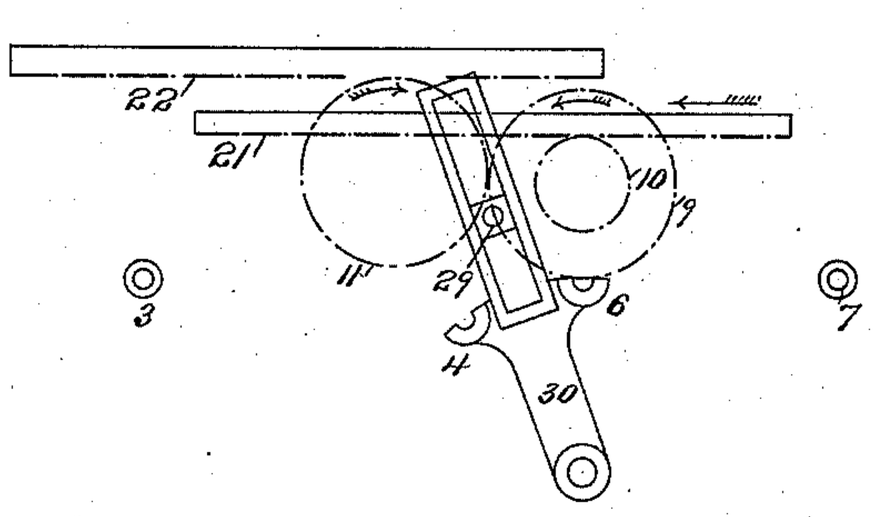
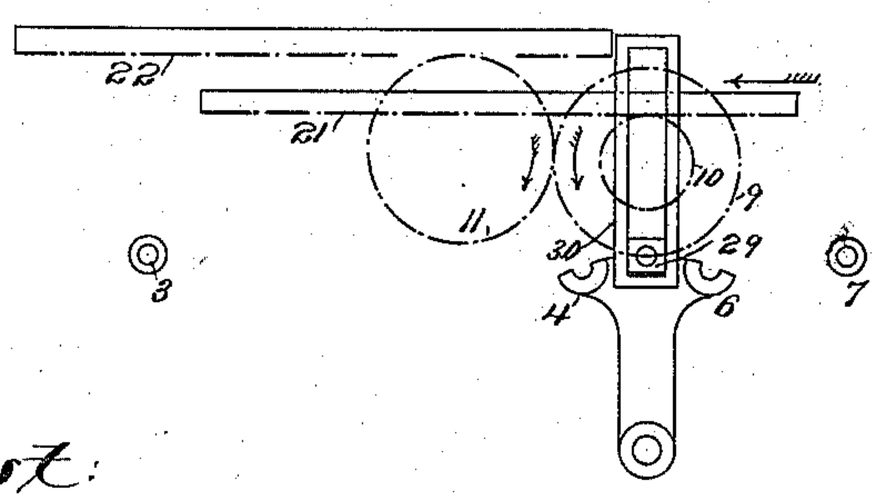


Fig. 11.



Attest:
Geo. H. Botts.
J. F. Kehoe.

Inventor:
Lucien C. Crowell
by
Philipp Munson & Sheip
Attys

(No Model.) 7 Sheets—Sheet 6.

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 533,117. Patented Jan. 29, 1895.

Fig. 12.

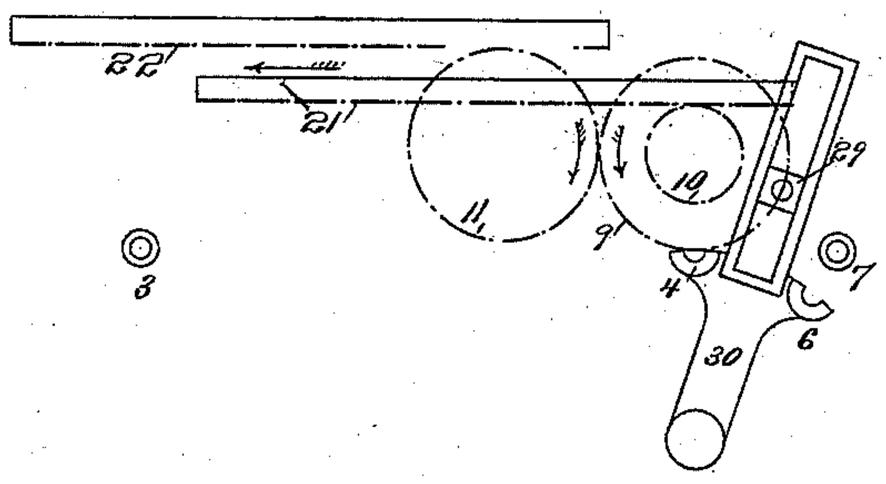


Fig. 13.

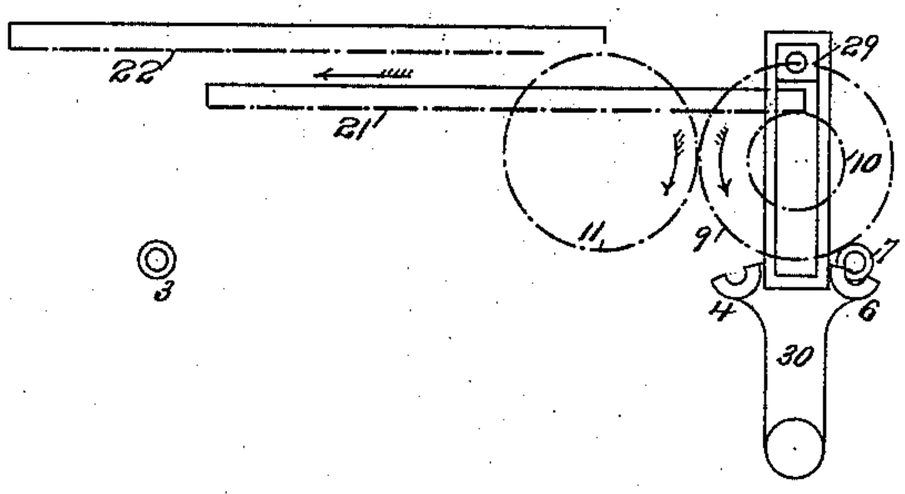


Fig. 14.

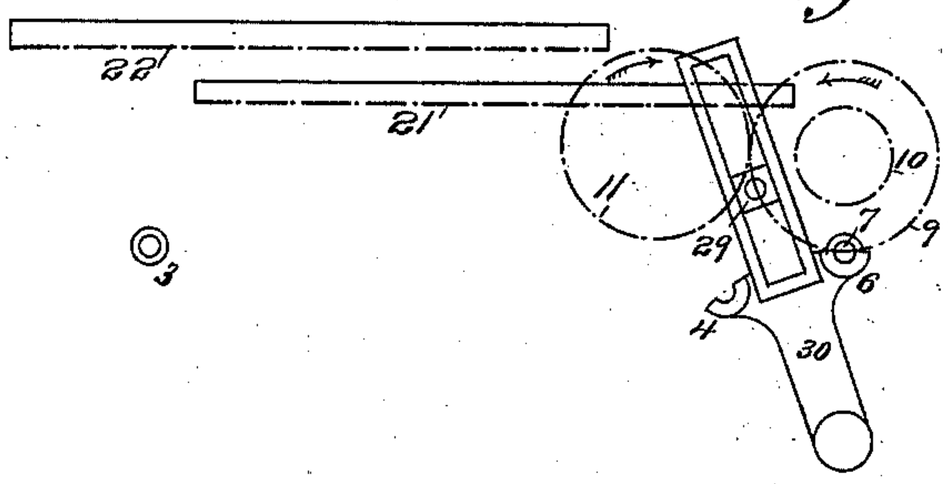
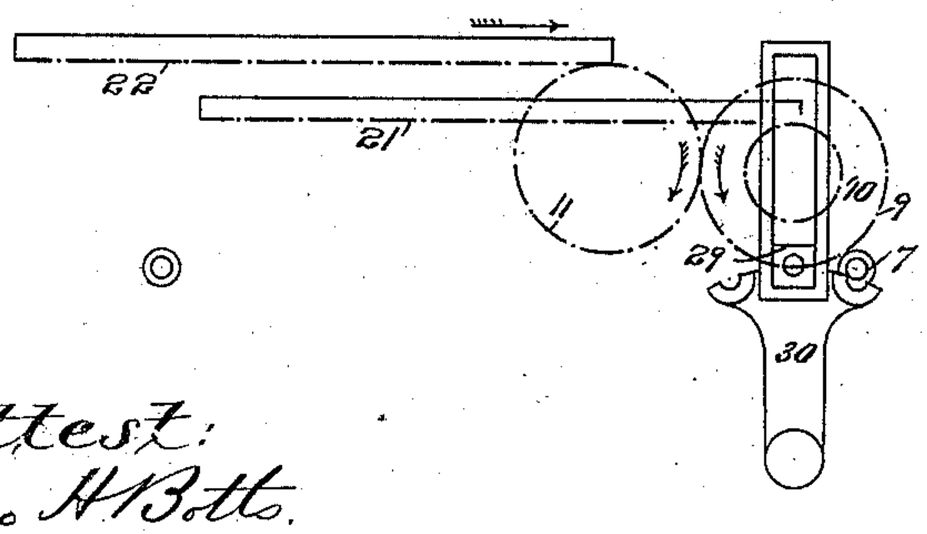


Fig. 15.



Attest:
Geo. H. Botts.
J. F. Kehoe.

Inventor
Luther C. Crowell
by
Philipp Munson & Sheffs
Attys

(No Model.) 7 Sheets—Sheet 7.

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 533,117. Patented Jan. 29, 1895.

Fig. 16.

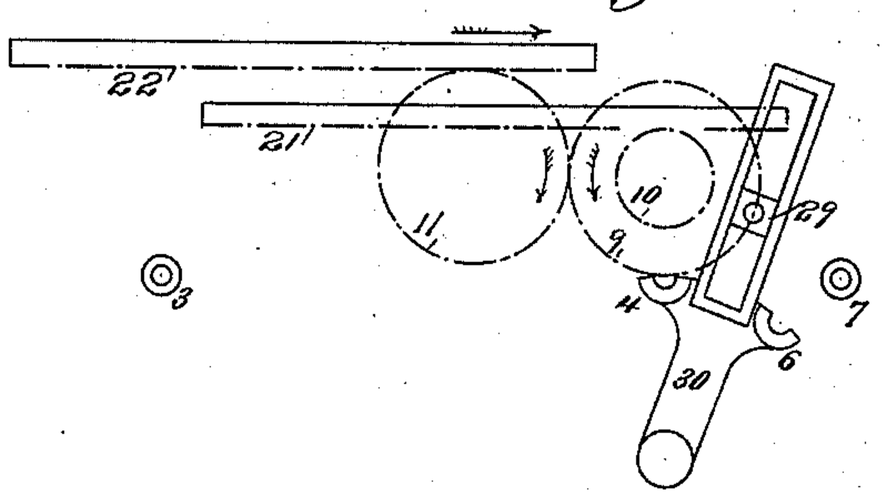


Fig. 17.

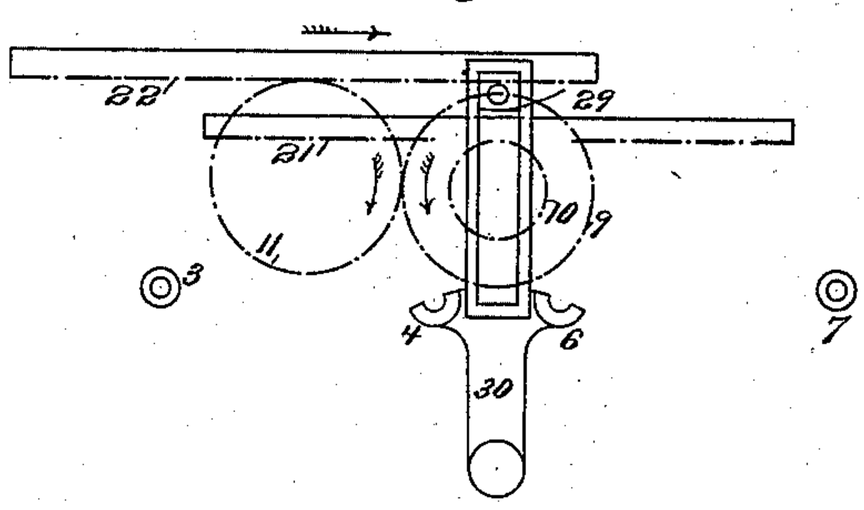


Fig. 18

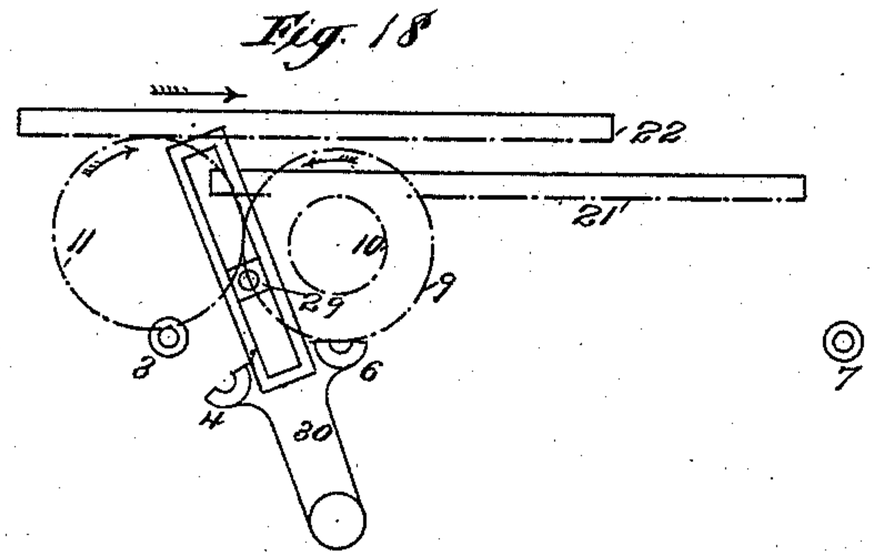
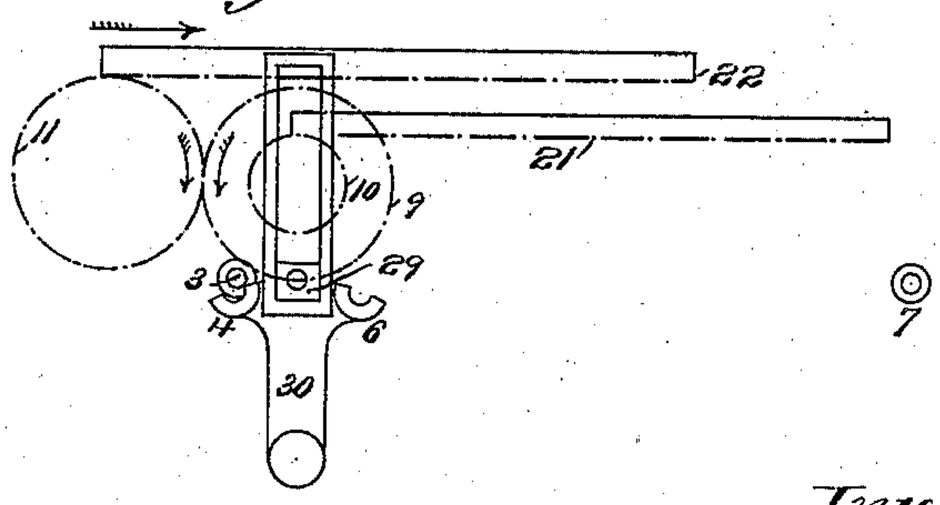


Fig. 19.



Attest:
Geo. H. Botts.
J. F. Kehoe.

Inventor:
Lucher C. Crowell
by
Philip Dennis & Phelps.
Attys

UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO ROBERT HOE, THEODORE H. MEAD, AND CHARLES W. CARPENTER, OF NEW YORK, N. Y.

BED-MOTION FOR CYLINDER PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 533,117, dated January 29, 1895.

Application filed May 7, 1892. Serial No. 432,144. (No model.)

To all whom it may concern:

Be it known that I, LUTHER C. CROWELL, a citizen of the United States, residing at the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Bed-Motions for 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 printing machines which have reciprocating type beds that cooperate with rotating cylinders in making the impression, and which machines may have one, two or more impression cylinders co-operating with as many forms carried by the type bed. Of these machines, one type has its cylinder driven from a top rack on the type bed and rotated first in one direction and then in the other. In one class the cylinder prints a sheet while running one way, is then raised for, and runs idly, during the return of the bed. In another class the cylinder does not rise and fall, but prints while running both ways and perfects a sheet. In another class the cylinder has two feeds and without rising and falling prints one side of two sheets. Another type of such machines has the impression cylinders continuously revolved. Of those having one impression cylinder one class makes one revolution, another two, and another three revolutions during each reciprocation of the type bed; in the first form a depressed part of the cylinder allowing the returning form to pass without contact with it; in the second form the cylinder being raised during the second revolution while the bed is returning, and, in the third form the cylinder is printing during one revolution, is being raised during the next half revolution, stands raised during the next revolution and is being lowered during the next half revolution. In each of these classes the impression cylinder is of a different size relative to the length of the run of the bed. In the double cylinder type, two impression cylinders continuously revolve in opposite directions, each one printing during its second revolution and so rising and falling that while one cylinder is down in printing position, the companion is up out of printing relation to the passing bed. Sheets may be fed to each cylinder and delivered printed upon one side only, or a sheet may be fed to one cylinder and once printed be transferred to the other cylinder and be delivered printed upon both sides. In another type the two impression cylinders continuously revolving in opposite directions have depressed portions for the non-printing passage of the bed and are connected by two transferring cylinders, so that a sheet printed by one cylinder, is transferred to and printed by the other cylinder and delivered. There is another type in which the cylinder driven during the printing operation by a top rack on the bed, always turns in one direction but is stopped while the bed in making its return runs past a flat portion of the cylinder. Many of these various constructions have been the outcome of attempts to secure speed of production, and a considerable number of bed driving mechanisms have been devised with the same end in view.

One object of the present invention is the providing of a mechanism for retarding and stopping the movement of the bed in one direction and starting and accelerating it in the reverse direction at each end of its run, which shall perform those operations so quickly as to minimize the time for their accomplishment and thus enable the highest rate of speed of the machine to be utilized without undue modification in making such reversing movements of the bed.

Another object of the invention is the accomplishment of the return or non printing movement of the bed at a higher rate of speed than that which it has when the impression is made, whereby the general speed of the machine is increased.

The invention embodies, in the accomplishment of the first object named, a single vibrating crank actuated lever which is coupled with one or the other of engaging lugs, carried at opposite ends of the bed, while the receiving socket of the lever is moving with the same surface speed as the bed is impelled by its main driving mechanism, which lever thereafter controls the movement of the bed during the reversing operation, by progress-

ively slowing it down to a state of rest and then starting it carries it in the opposite direction with an accelerated speed, and when the reversing is complete is disengaged from the bed while moving at the same surface speed therewith, as the main driving mechanism again becomes the driver.

The invention embraces, for the carrying into effect the second object stated, a main bed driving mechanism consisting of two pinions one running at the greatest surface speed which may be practically used while it drives the bed and the impression is being made, and the other running at a considerably higher rate of speed and driving the bed when it is making its non printing movement, these two speeds being preferably attained by pinions of two sizes respectively gearing with separate racks carried by the type bed.

These improvements are applicable to all forms of printing machines having reciprocating beds and to many other machines having like moving members. The first stated invention may be used in connection with any of the forms of bed driving mechanism described in my application, Serial No. 421,914, filed February 18, 1892, as well as with any that are shown herein or with any equivalent bed movements. The second branch of the invention is also applicable in combination with many other forms of bed retarding, stopping, starting and accelerating mechanisms, and its fast running pinion may be used without the slower running bed driving pinion, in cases where the impression cylinder is driven by direct gearing from a driving shaft and is also geared to the type bed during the time of impression by an upper bed rack then meshing with a toothed wheel on the cylinder shaft.

An explanation of the manner in which these improvements are or may be carried into effect, will now be given aided by reference to the accompanying drawings which illustrate embodiments thereof, as follows:

Figure 1 shows by a side elevation a cylinder printing machine provided with one form of the present improvements. Fig. 2, is an end elevation thereof. Fig. 3, is a plan view of the same, and Figs. 4 to 19 inclusive, are diagrams illustrating the positions of the principal parts during each quarter revolution of the main driving pinion performed during one reciprocation of the type bed.

As a preliminary to a specific description of the various mechanisms, the machine will be generally described. It comprises the usual impression cylinder C mounted to turn in suitable journals supported by the frames, which cylinder co-operates with a reciprocating type bed B that moves on slides S running in longitudinal ways W rigidly secured to the framework. The cylinder C is rotated by a train outside of the frame consisting of wheel 17, and intermediates 16, 15 from a wheel 14 fast on the shaft 12, and there is a train outside of the frame consisting of a pinion 18 fast on shaft 12, an intermediate 19, and wheel 20, that drives various parts including the shaft 13 to which the wheel 20 is fixed. The shaft 12 carries what is denominated the main driving pinion 9 for the reason that it determines the movements of the actual bed driving pinions 10, 11. This pinion 9 has such relation to the bed driving mechanism that it makes three revolutions to each reciprocation of the bed, and though this has advantages such relative movement may be changed without affecting the present invention, as may the construction and arrangement of the rack and pinion mechanism. The bed driving pinion 10 which is carried by the shaft 12 is of half the size of pinion 9 and hence though it makes the same number of turns its surface speed is but one-half that of said pinion 9. The bed driving pinion 11 which is mounted to turn freely upon a short shaft 5 is of equal size and is geared with the pinion 9 and hence makes turn for turn with it and runs at a like surface speed. The pinions 9 and 10 are mounted fast upon a common sleeve that may move on a spline and the pinion 11 is likewise mounted upon a sleeve so as to move freely upon the shaft 5 all of said pinions 9, 10, 11 being thus capable of moving laterally to such slight extent as will bring the pinions 10, 11 alternately into gear with the bed racks 21, 22 which are fixed to the bed and depend therefrom in different vertical and horizontal planes, being arranged horizontally so that the pitch line of the lowermost one 21 will agree with the pitch line of the upper part of the pinion 10, and so that the pitch line of the uppermost one 22 will agree with the pitch line of the upper part of the pinion 11; and these racks are arranged horizontally so that when the pinion 10 is geared with and driving the bed through the rack 21, while the impression is being made, the pinion 11 will be out of the plane of travel of the rack 22, and vice versa, and as the pinions 9 and 11 move laterally together they will remain geared together during their lateral movements to carry the pinion 11 into and out of driving position with respect to the rack 22. The lateral movements of these pinions may be accomplished in various ways. As here shown the means are levers 23, 24, one 24 entering a collar 25 on the sleeve which carries the pinions 9, 10 and the other, 23, entering a collar 26 on the sleeve which carries the pinion 11, both of which levers are fast on a shaft that is oscillated by a rock arm 27 that is vibrated by means of a cam 28 on the shaft 13.

Although the pinions 10 and 11 are the means in co-action with the racks 21, 22, that cause the bed to make the principal or main portions of its reciprocating movements, it will be observed that since these racks are less in extent than the run of the bed they will leave said pinions before the movement of the bed is completed in either direction.

The finishing of the movement of the bed in

one direction and the beginning of its movement in the other direction, at each end of its run, is accomplished by the retarding, stopping, starting and accelerating mechanism constituting one of the main features of the invention. This consists of a vibrating lever 30 which has receiving sockets 4, 6 and the bed B carries at each end lugs 3, 7 suitable to be engaged by said sockets. This lever 30 is actuated by a crank 29 whose pin plays in an elongated slot in said lever, which crank 29 is fast upon the shaft 12 and therefore makes turn for turn with the pinions 9, 11, and in consequence of the pin of the crank 29 working in the slot of the lever, which thus practically becomes a rocking yoke, the reciprocating movements imparted to the lever by the crank become differential, that is, when the crank is making its lower sweep or moving below the shaft 12 through about a third revolution, the movement of the lever from its left hand position of rest (Fig. 18) is begun and accelerated until its socket 4 attains the surface speed of the pinion 11, as the crank passes its lowest point (Fig. 19); and, as the crank moves to its position in Fig. 4, the lever is progressively slowed down until it comes to a state of rest as it reaches the limit of its movement to the right, as in Fig. 4. When the crank is making its upper sweep or moving above the shaft 12 through about a two third revolution, the movement of the lever from its right hand position of rest, as in Fig. 4 is begun and accelerated until its socket 4 attains the surface speed of the pinion 10. As the crank passes its highest point (Fig. 5) the lever is progressively slowed down until it comes to a state of rest as it reaches the limit of its movement to the left as in Fig. 6. Thus the maximum speed of movement of the socket 4 of the lever, performed when the crank is making its lower sweep, equals that of the fast moving pinion 11 and enables said socket 4 to receive the lug 3 and the rack 22 to leave the pinion 11 while those parts are moving at the same surface speed, and then, through said lug, to slow down and stop the bed and since the maximum speed of movement of the socket 4 of the lever, performed when the crank is making its upper sweep, equals that of the slow moving pinion 10 it enables the socket 4 through the lug 3 to start the bed and accelerate its movement until that maximum speed is attained when the rack 21 will gear with the pinion 10 and the lug 3 disengage the socket 4, while said rack, pinion, lug and socket are moving with like surface speed.

The movements of the parts with respect to the socket 6 and lug 7, in the reversing operation at the other end of the run of the bed are substantially the same as those just described, as will be clearly understood, when the action of the mechanism is considered in connection with the diagrams Figs. 4 to 19, wherein various portions of the parts during their operation are illustrated as each quarter revolution of the crank is made. In these diagrams such parts as would obscure others, then active, are either broken away or shown in dotted lines.

Assuming the machine to have been in operation, an impression to have been made, the type bed to have made its return movement driven by the pinion 11 and the rack 22, and said bed to have been arrested in the position of Fig. 4 by the action of the socket 4 of the lever 30 then coupled to the lug 3 of the bed, at which time the lever 30 is in its extreme right hand position, the rack 22 has left the pinion 11 and the pinion 10 has moved or is being moved into the path of travel of the rack 21. The next or printing run of the bed is now to be made in the direction of the arrow in Fig. 5. As the crank moves from the point at which it stands in Fig. 4 to its highest position shown in Fig. 5, it will rock the lever 30 so as to start the bed through the lug 3 and socket 4, and so accelerate its motion that when the crank has reached its highest position the bed and hence the rack 21, lug 3 and socket 4 will all be moving with a surface speed equal to that of the pinion 10, and therefore the rack 21 will engage the pinion 10 and the lug 3 simultaneously disengage the socket 4, which engaging and disengaging of the parts will be accomplished smoothly and simultaneously. The bed will then be driven solely by the pinion 10, the lug 3 will move away from the lever 30 and the lever will vibrate idly, as in Figs. 6 to 12, while said pinion is making two revolutions which cause the bed to perform the major part of its printing run. When, however, the rack 21 is about to run free from the pinion 10, as in Fig. 12, the lever 30 will be so rocked while the crank is repeating its upper sweep, that as the crank approaches and passes its highest point, as in Fig. 13, the rack 21 will leave the pinion 10 and the socket 6 of the lever 30 will simultaneously receive the lug 7 while the said parts are moving in harmony at the surface speed of the pinion 10. Now while the crank is making its throw which brings the lever 30 to its extreme left hand position, the crank will so move the socket 6 as to gradually slow down and finally arrest the bed in the extreme position of its printing run, as in Fig. 14, at which time the pinion 11 has moved or is being moved into the path of travel of the rack 22. As the crank then moves to its position shown in Fig. 15, it will cause the lever through the socket 6 and lug 7 to start the bed in the opposite direction and accelerate its movement until it attains that of the pinion 11, when, as the crank approaches and passes its lowest point, at which time the rack 22, pinion 11, socket 6 and lug 7 are all moving with like surface speed, the rack 22 engages the pinion 11, while the lug 7 simultaneously disengages from the socket 6. The bed will then be driven solely by the pinion 11, the lug 7 will move away from the lever 30 and the lever will vi-

brate idly as in Figs. 15 to 18, while said pinion 11 is making one complete revolution which causes the bed to make the major part of its non-printing run at twice the speed at which it was moved by the pinion 10 in making its printing run. When, however, the rack is about leaving the pinion 11 as in Fig. 19, the crank will again be making its lower sweep and as it approaches and passes its lowest point, it will through the lever 30 again bring the socket 4 into engagement with lug 3 simultaneously with the disengaging of the rack 22 from the pinion 11, at which time the said rack 22, pinion 11, socket 4 and lug 3 are moving concertedly at the same surface speed; and as said crank moves from its lowest point to the position it has in Fig. 4 it controls the further movement of the bed, and operates to progressively slow it down and finally bring it to a state of rest, as in Fig. 4, which is the position from which this description of the operation of the parts was begun.

It is to be observed that the principal portion of the reciprocating movement of the bed is made in each direction by the rack and pinion mechanism independently of the reversing mechanism which latter periodically engages with the bed and operates only at the end of the run in both directions. The bed may therefore be driven by the rack and pinion mechanism to any extent desired before the reversing mechanism is brought into action, the two bed moving mechanisms being thus independent except as they are brought into co-action when the driving action is transmitted from one to the other of such mechanisms. The lugs on the bed and sockets in the lever might exchange position without changing their mode of operation or their co-operative relation, and in either case have substituted for them racks or segment racks. The point of coupling of the lever and bed may be such that an equal movement may be given to the bed in both directions during the reversing operations at the end of the run of the bed in both directions and thus enable the use of a pinion or pinions running at the same surface speed in producing both movements of reciprocation of the bed, and therefore this is to be regarded as within the scope of the present invention.

What therefore is claimed is—

1. The combination of a moving member, a pivoted lever provided with a yoke, a rotating crank traveling in said yoke to vibrate the same, and means for coupling the lever with and uncoupling it from said member, whereby movement of said member in one direction is retarded and stopped, and its movement in the opposite direction is started and accelerated, substantially as described.

2. The combination with a reciprocating member, of a pivoted lever provided with a yoke, a rotating crank traveling in said yoke to vibrate the same, and means for coupling the said lever with and uncoupling it from said member, whereby the movement of said member in one direction is reversed by being retarded and stopped, and then started and accelerated in the opposite direction, at each end of its run, substantially as described.

3. The combination with the moving bed and a rack and pinion mechanism operating to drive the same during the principal part of its run in either direction, of a pivoted lever provided with a yoke, a rotating crank traveling in said yoke to vibrate the same, and means for coupling and uncoupling the lever and bed, whereby movement of the bed in one direction is retarded and stopped and its movement in the opposite direction is started and accelerated, substantially as described.

4. The combination with the reciprocating bed and a rack and pinion mechanism operating to drive the same during the principal part of its run in both directions, of a pivoted lever provided with a yoke, a rotating crank traveling in said yoke to vibrate the same, and means for coupling and uncoupling the lever and bed, whereby the movement of the bed in one direction is reversed by being retarded and stopped and then started and accelerated in the opposite direction, at each end of its run, substantially as described.

5. The combination with the moving bed and means for moving the same throughout the principal part of its run in either direction, of a pivotal lever provided with a yoke, a rotating crank traveling in said yoke to vibrate the same, and means for coupling and uncoupling the lever and bed, whereby movement of the bed in one direction is retarded and stopped and its movement in the opposite direction is started and accelerated, substantially as described.

6. The combination with the reciprocating bed and means for moving the same throughout the principal part of its run in both directions, of a pivoted lever provided with a yoke a rotating crank traveling in said yoke to vibrate the same, and means for coupling and uncoupling the lever and bed, whereby the movement of the bed in one direction is reversed by being retarded and stopped and then started and accelerated in the opposite direction, at each end of its run, substantialy as described.

7. A mechanism for reversing a moving member, consisting of the combination with a pivoted lever provided with a yoke and having means for alternately coupling it to and uncoupling it from said moving member, of a rotating crank traveling in said yoke and operating to vibrate said lever differentially so that it will engage the moving member at one speed, retard and arrest it, and then start and accelerate it to another speed as it is disengaged therefrom, substantially as described.

8. A mechanism for reversing a reciprocating member, consisting of the combination with a pivoted lever provided with a yoke and having means for alternately coupling it

with and uncoupling it from said member, of a rotating crank traveling in said yoke and operating to vibrate said lever differentially so that it will engage the moving member at one speed, retard and arrest the same, then start and accelerate said member to another speed as it is disengaged therefrom at each end of its movement, substantially as described.

9. The combination with the driving pinions 10, 11, and means for shifting the same laterally, of a bedrack composed of two downwardly facing racks arranged in such planes as to be alternately engaged by said pinions, substantially as described.

10. The combination with the moving bed and its engaging lugs 3, 7, of a single pivoted lever having receiving sockets 4, 6, and provided with means for vibrating the same, substantially as described.

11. The combination with the bed, its engaging lugs 3, 7, and a rack and pinion mechanism for producing the principal part of its run in either direction, of a single pivoted lever having receiving sockets 4, 6, and provided with means for vibrating the same, substantially as described.

12. The combination of the bed, its engaging lugs 3, 7, a rack and pinion mechanism for producing the principal part of its reciprocating movement, a single pivoted lever provided with a yoke and having receiving sockets 4, 6, and a rotating crank for vibrating said lever, substantially as described.

13. The combination with the bed, its double rack 21, 22 and pinions 10, 11 having different surface speeds, of the single pivoted lever provided with a yoke, and an actuating crank for vibrating said lever differentially for co-operating with said pinions, substantially as described.

14. The combination with the bed, its engaging lugs 3, 7, the double rack 21, 22 and pinions 10, 11, having different surface speeds, of the single pivoted lever provided with receiving sockets 4, 6, and a yoke, and a rotating crank operation to vibrate said lever differentially, substantially as described.

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

LUTHER C. CROWELL.

Witnesses:
H. T. MUNSON,
THOMAS F. KEHOE.