No. 621,749. Patented Mar. 21, 1899.

C. P. COTTRELL.

PRINTING MACHINE.

(Application filed Aug. 25, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

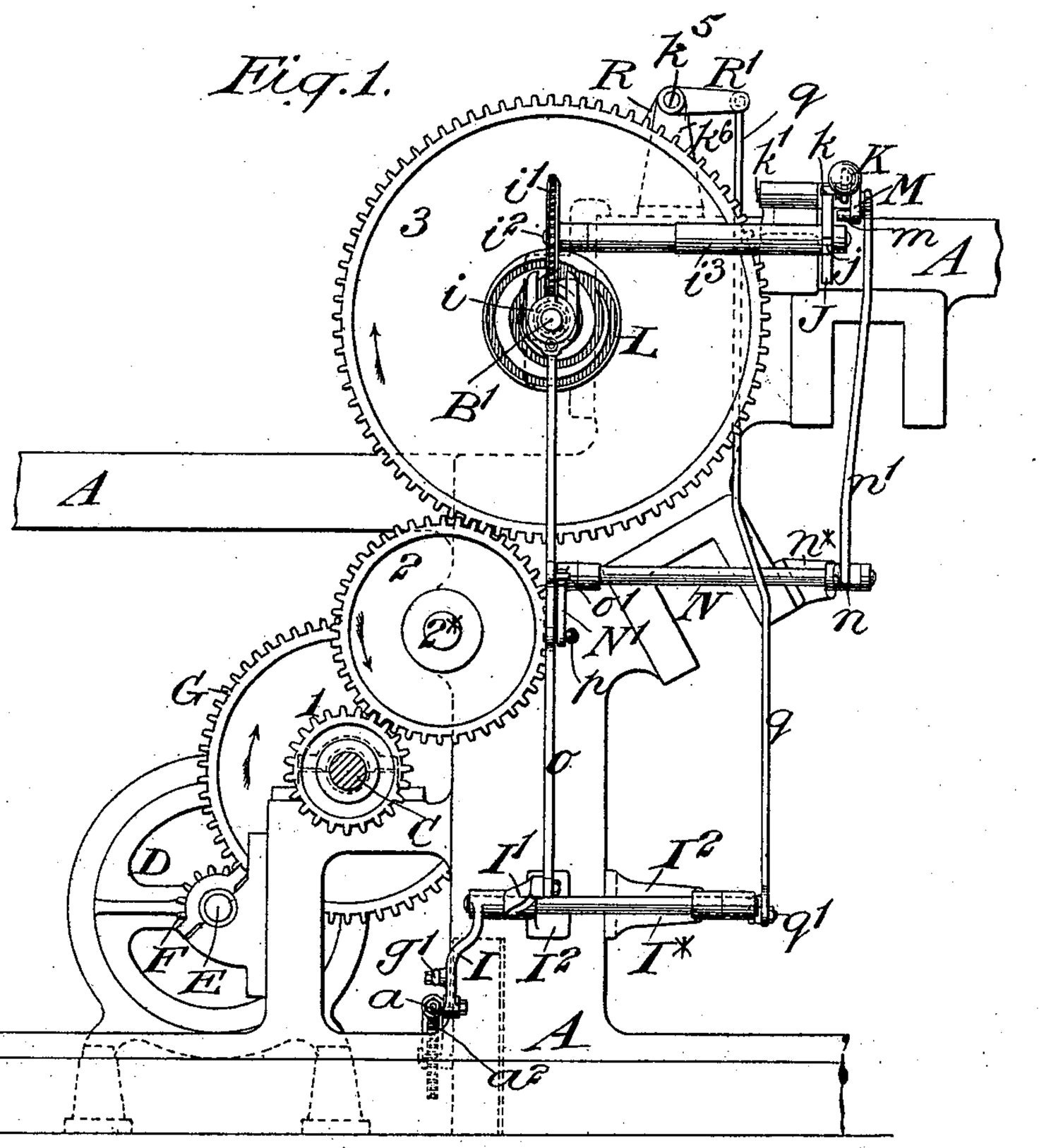
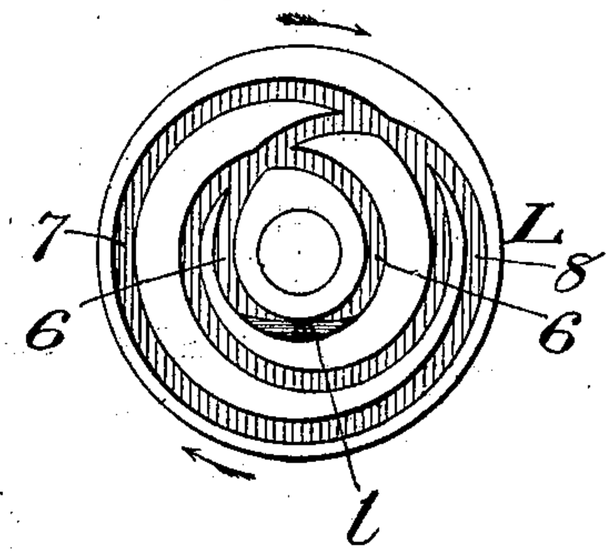


Fig. 4.



Witnesses:—
George Barry Jr.
Edward Viesel

Inventor
Charles P. Cottrell
by attorneys
Brown & Seward

No. 621,749. Patented Mar. 21, 1899.

C. P. COTTRELL.

PRINTING MACHINE.

(Application filed Aug. 25, 1898.)

(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

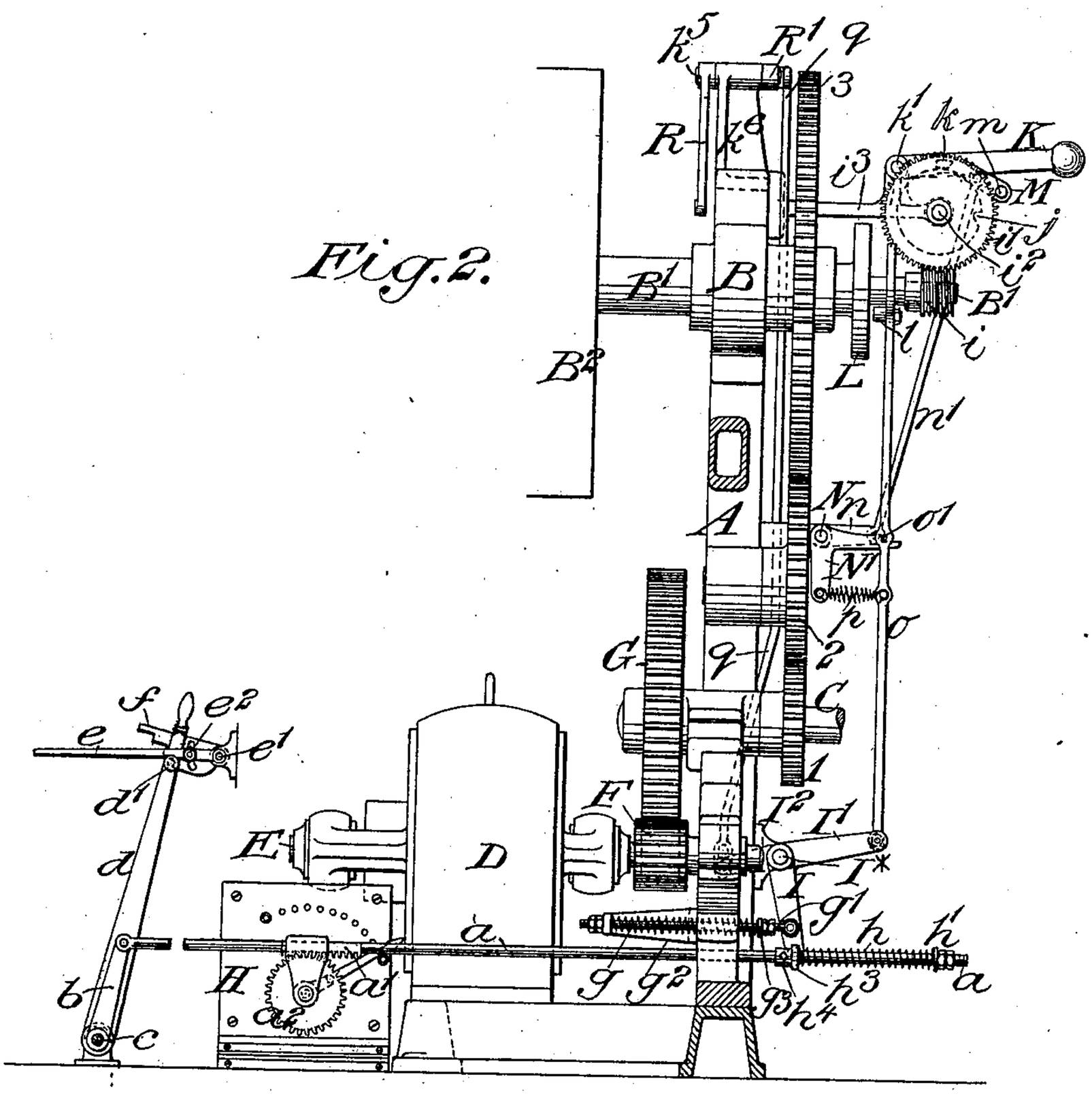
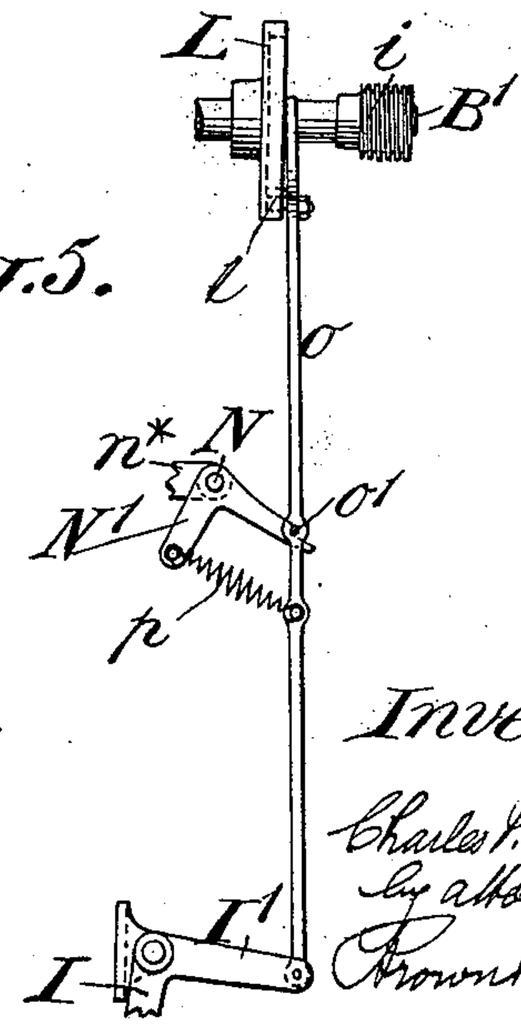


Fig. 5.



Witnesses:-
George Barry Jr.
Edward Viesel

Inventor
Charles P. Cottrell
by attorneys
Brown & Seward

No. 621,749. Patented Mar. 21, 1899.

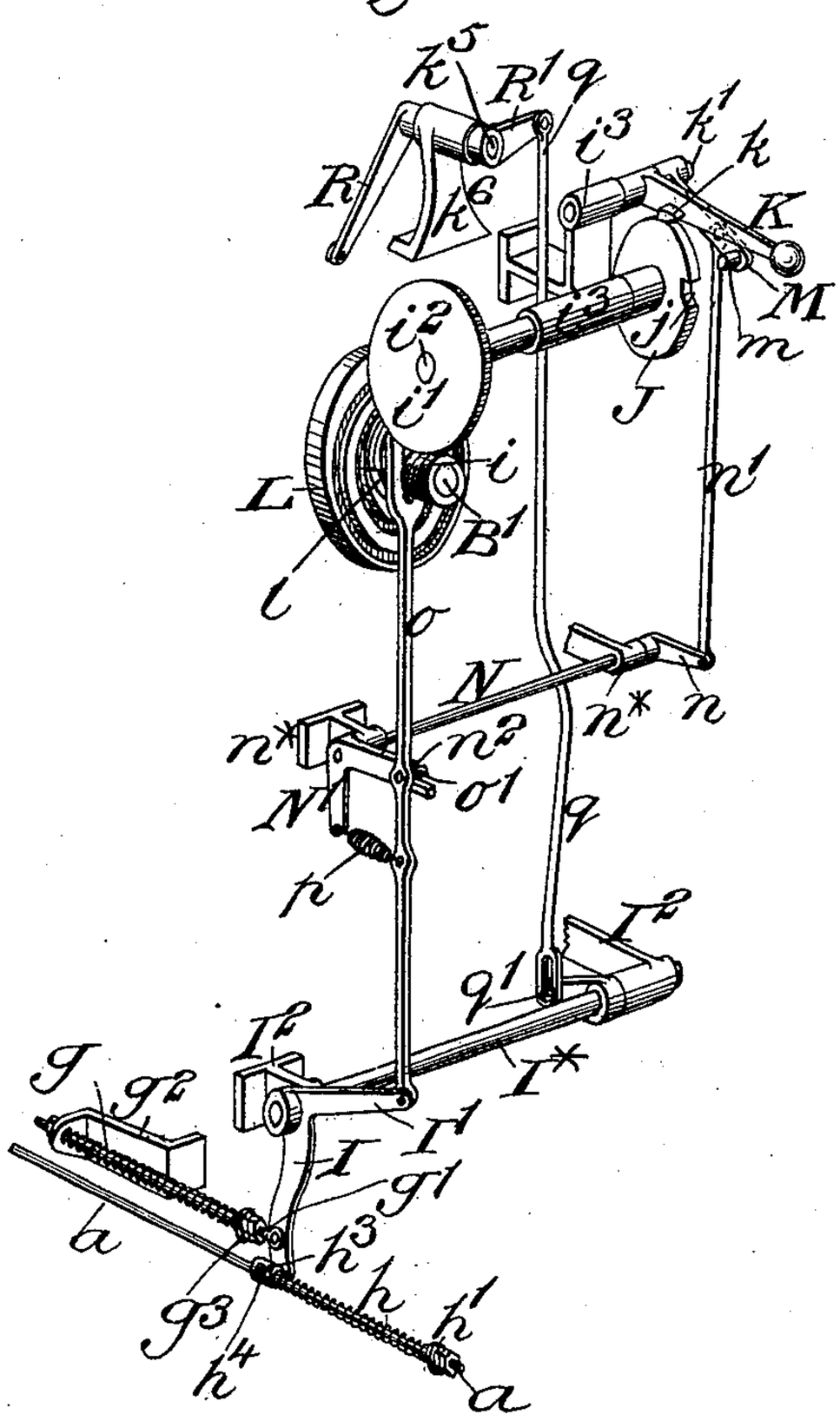
C. P. COTTRELL.

PRINTING MACHINE.

(Application filed Aug. 25, 1898.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



Witnesses:-

George Barry Jr.

Edward Vieser

Inventor:

Charles P. Cottrell

by Attorneys

Brown & Seward

No. 621,749. Patented Mar. 21, 1899.

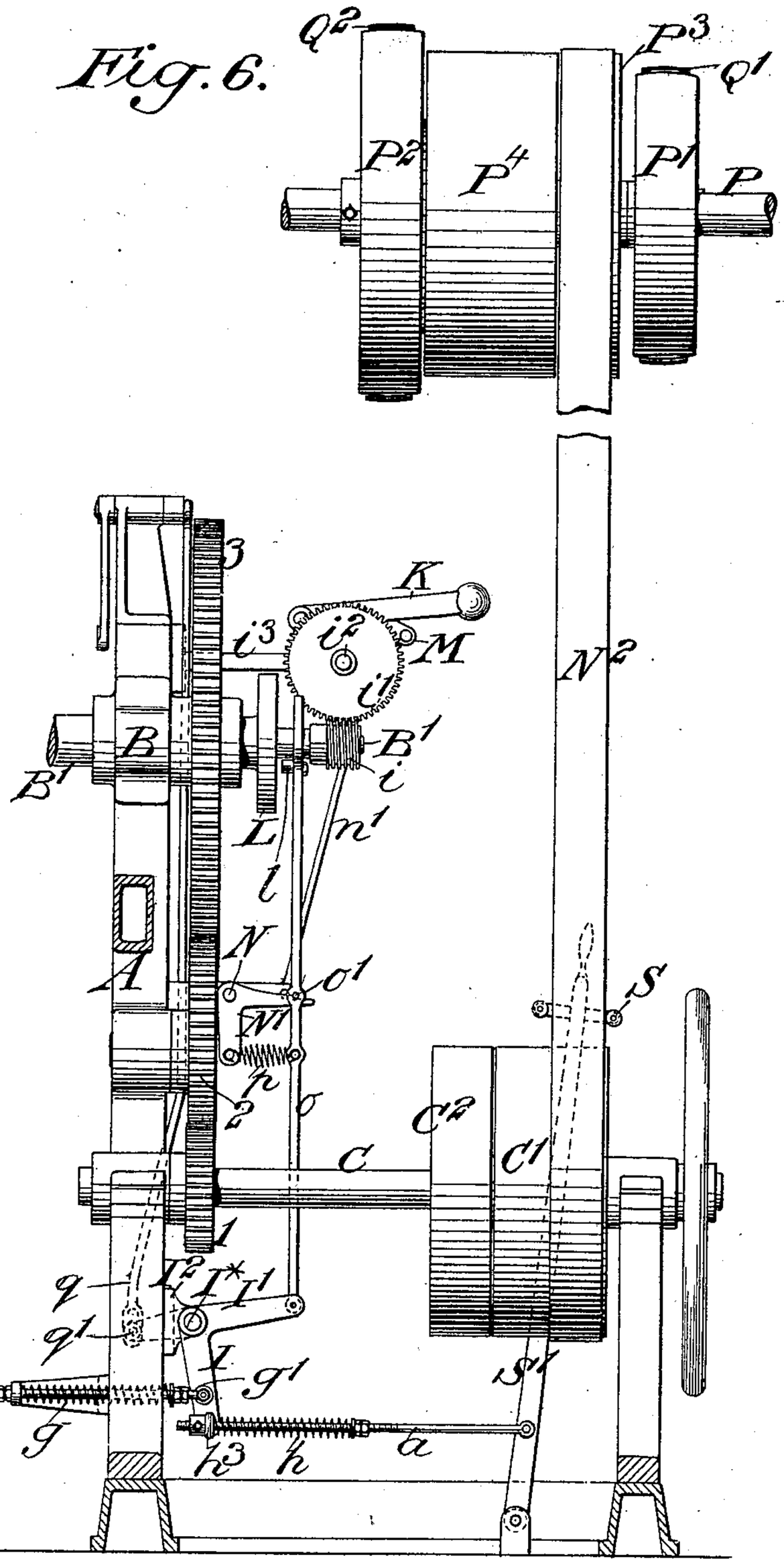
C. P. COTTRELL.

PRINTING MACHINE.

(Application filed Aug. 25, 1898.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 6.



Witnesses:—
George Barry Jr.
Edward Vilser.

Inventor
Charles P. Cottrell
by attorneys
Brown & Seward

UNITED STATES PATENT OFFICE.

CHARLES P. COTTRELL, OF STONINGTON, CONNECTICUT, ASSIGNOR TO THE C. B. COTTRELL & SONS COMPANY, OF SAME PLACE AND NEW YORK, N. Y.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 621,749, dated March 21, 1899.

Application filed August 25, 1898. Serial No. 689,450. (No model.)

To all whom it may concern:

Be it known that I, CHARLES P. COTTRELL, a citizen of the United States, and a resident of Stonington, in the county of New London and State of Connecticut, have invented a new and useful Improvement in Printing-Machines, of which the following is a specification.

This invention relates to printing-machines in which an impression-cylinder is furnished with a movable tympan and means for automatically shifting said tympan while the cylinder continues in motion between two successive printings. In high-speed machines it has been found very desirable that the speed of the machine should be temporarily reduced below the normal printing speed before and during the operation of shifting the tympan.

This invention consists in certain novel means, hereinafter described and claimed, whereby such temporary reduction of speed and the subsequent acceleration to the normal printing speed are automatically and gradually effected.

The invention is applicable with especial advantage to a printing-machine driven by an electric motor, but is also applicable to a machine driven by a belt.

In the accompanying drawings, Figure 1 represents a side elevation of a portion of the framing of a perfecting printing-machine, the second impression-cylinder, an electric motor, driving-gearing between said motor and cylinder, and means for changing the speed of said cylinder preparatory to and after the shifting of the tympan; Fig. 2, a transverse sectional elevation corresponding with Fig. 1; Fig. 3, a perspective view of the principal parts of the speed-changing mechanism. Fig. 4 is a face view of a cam which constitutes an important part of said mechanism. Fig. 5 is a detail view which will be hereinafter explained. Fig. 6 is a view illustrating the changes necessary to adapt the speed-changing mechanism to a machine driven by belting.

Similar letters and numerals of reference designate corresponding parts in all the figures.

A is one of the side frames of the printing-machine; B, one of the journal-boxes in which is supported the shaft B′ of the second impression-cylinder B^2 of the machine, to which cylinder my invention is applied.

C is a driving-shaft, which corresponds with the driving-shaft of other perfecting printing-machines and is supported in bearings in the framing A and geared with the cylinder B^2 for driving the same by gears 1 2 3, the gear 1 being fast on said shaft C and meshing with and driving the gear 2, which is fitted to turn freely on a fixed stud 2^*, secured in the framing A, the said gear 2 meshing with and driving the gear 3, which is fast on the cylinder-shaft B′.

D, Figs. 1 and 2, is the electric motor, the shaft E of which carries a gear F, which meshes with a gear G on the shaft C for driving the same.

H is a speed-controller, which may be and is represented as what is commonly known as a "rheostat," applied to said motor for controlling the speed thereof, said rheostat being operated through a rod *a*, on which is a toothed rack *a′*, engaging with a pinion a^2 on the rheostat-spindle. This rod *a* is connected with the arm *b* of a rock-shaft *c*, which works in fixed bearings and is furnished with a hand-lever *d*, the movement of which in one or the other direction, operating through the rod *a*, accelerates or retards the motor. As represented, the movement of the rod to the right effects the acceleration and that to the left the retardation. In the hand-lever *d* there is secured a stud *d′*, over which lies a latch-bar *e*, which is pivoted at a fixed point *e′* and to which is secured by a screw e^2 an adjustable latch-piece *f*, in which are several notches, either of which may be so set to the lower edge of the bar *e* as to act as a stop to limit the movement of the lever *d* and rod *a* to the right for the purpose of limiting the maximum normal speed of the motor to correspond with the speed at which the cylinder is to run for printing. To hold the rod *a* in the position for this normal speed until the retardation is required, there are applied to the said rod, as shown in Figs. 2 and 4, two thrust-springs *g h*, which act in connection with the lower arm of a bell-crank lever I I′. The spring *g* is coiled upon a rod *g′*, connected with said lever and passing through a bracket g^2, affixed to the fram-

ing A, and it takes its thrust between a shoulder on said bracket and an adjustable collar g^3 on the said rod. The spring h is coiled upon the rod a and takes its thrust between an adjustable shoulder h' on the said rod and a swivel-eye h^3, secured in the lower arm of the lever. A collar h^4 is provided on the said rod on the opposite side of the swivel-eye h^3 to be acted upon by the bell-crank, as hereinafter described, for moving the said rod to the left to produce the retardation. The spring h is weaker than that g, so that it will permit the movement of the rod a by the hand-lever without disturbing the mechanism, of which the bell-crank lever I I′ forms part, through which the cylinder B^2 itself automatically produces its slowing down and speeding up. This mechanism will now be described in detail. On a prolongation of the cylinder-shaft B′ there is an endless screw i, which gears with a worm-gear i' on a small shaft i^2, arranged transversely to the cylinder-shaft in a bracket-bearing i^3, secured to the main framing, the said worm-gear having a number of teeth corresponding with the number of revolutions which the cylinder is to make between the successive shiftings of the tympan. For example, if the shifting is to commence at every sixtieth revolution the worm-gear has sixty teeth. The time occupied by the retardation and subsequent restoration of the normal speed may correspond with one or more revolutions, that being determined by a cam L on the cylinder-shaft. On the shaft i^2 of the worm-gear there is what I term a "tripping-disk" J, the periphery of which is concentric with the shaft except in one place where there is a notch j for the reception of a lug k on a lever K, which is pivoted at k' to a projection on the bracket i^3 and which, being loaded at the end, holds down the said lug upon the edge of the disk. On the same pivot k' with the lever K there is independently pivoted a lever M, from which a lug m projects laterally under the lever K. This lever M is connected by a rod n' with the arm n of a rock-shaft N, working in bracket-bearings n^*, secured to the framing A, the rock-shaft carrying also an elbow-lever N′, which may be termed the "locking-lever," its upper arm being notched at n^2 (see Fig. 3) to receive a lug o', projecting from a rod o, the lower end of which is connected with the arm I′ of the bell-crank lever I I′. The upper part of this rod o is forked to receive the prolongation of the cylinder-shaft and has pivoted to it a crescent-shaped runner l, which runs in a groove in the outer face of the cam L. The said rod is connected with the lower arm of the locking-lever N′ by a spring p, which tends to pull the rod o inward toward the cam for the purpose of throwing the cam-runner l toward and into engagement with the cam when the said rod is not locked with the runner clear of the cam, as shown in Figs. 2 and 3, by the engagement of its lug o' in the notch n^2 of the locking-lever N′.

I have hereinbefore mentioned that the retardation of the speed of the cylinder and its subsequent restoration to the normal may take place during one or more revolutions of the cylinder; but in order to effect it without shock or jar three revolutions will be ample, and the cam J on the cylinder-shaft, which I have herein represented as an example, is organized to so effect it. This cam consists of a disk having in its face, as shown in Fig. 4, a groove which, commencing with a small radius as near as practicable to the shaft, is concentric for a short distance, as shown at 6 6, and from this concentric portion 6 6 it runs in opposite directions in volute form to a concentric portion 7 8 of larger radius, so that the runner l, entering the portion 6 6 of the groove, will be moved outward radially to the shaft in a downward direction and so produce a downward movement of the rod o, which, through the bell-crank lever I I′, will move the rod a in the direction to slow down the motor. After the point 7 of the cam has passed the runner l the continued revolution holds the runner stationary and so keeps the motor slowed down until the point 8 reaches the runner, when the further continued revolution permits the runner to return toward the shaft and so permits the spring g, by its action on the lever I I′, to raise the rod o and to draw back the rod a, and the motor is thereby caused to be speeded up again. It will be observed on reference to Fig. 4 that the evolution of the cam-groove from the part 6 6 to the point 7 corresponds with more than one and a half revolutions, and the involution from the point 8 to the part 6 6 corresponds with less than one revolution, and that consequently it takes more than one and a half revolutions of the cylinder to produce the retardation, but less than one to speed up again. The reason for slowing down more gradually than for speeding up is that in slowing down the momentum of the machine has to be overcome. It is obvious, however, that the cam might be constituted to slow down and speed up by the same amount of turn of the cylinder.

Having now described the several details of the mechanism, I will briefly describe one operation of slowing down and speeding up. Until the time arrives for slowing down the lug k of the lever K remains upon the true circular portion of the tripping-disk J, and the cam-runner l is locked out of engagement with the cam L by the engagement of the lug o' of the rod o in the notch of the locking-lever N′; but when it is time to slow down the notch j of the tripping-disk arrives at the lug k of the lever K, and the said lever, dropping upon the lug m of the lever M, knocks down the said lever, which, by the action of the rod n' on the arm n of the rock-shaft N, causes the locking-lever N′ to withdraw its notch n^2 from the lug o' of the cam-rod o. The spring p then pulls in the cam-rod toward the cam L, and the part 6 6 of

the cam-groove then coming opposite the runner *l* the latter enters into engagement with the cam. The continued rotation of the cam, acting through the rod *o* on the bell-crank, causes the latter to overcome the pressure of the spring *g* and to act upon the rheostat-rod *a* first to produce the gradual retardation of the motor and slowing down of the cylinder; then to so hold the said rod *a* as to maintain for a time the reduced speed until the point 8 of the cam passes the runner *l*, when all the cam has to do is to control the upward movement of the rod *o* and the return of the rheostat-rod *a* for the gradual speeding up. Just as the speeding up is completed the tripping-disk J, by the action of the inclined side of its notch *j* on the lug *k*, lifts the lever K, so that during the continued revolution of the said disk the said lug runs on the periphery of said disk until the time arrives for again slowing down. In the above-described operation before the said rod *o* reaches its lowest position the locking-lever N′, swinging inward toward the frame, with the lug *o′* resting upon it back of the notch n^2, will have carried the shoulder of the notch back of the lug *o′*, so that said lug may drop back into the notch. Then as the rod rises and the locking-lever swings forward the said shoulder acts upon the lug *o′* to push out the rod and so withdraw the runner from the cam-groove. This action of the locking-lever on the lug *o′* may be understood by reference to Fig. 5, in which the cam-rod *o* is shown in its lowest position with the runner *l* in engagement with the cam and the locking-lever just coming into engagement with the lug *o′*.

The automatic tympan-shifting mechanism to be employed with my mechanism for slowing down and speeding up the cylinder, which is the subject of the present invention, may be of any known or suitable kind—for instance, such as is illustrated and described in United States Patent No. 541,266—and my said mechanism serves besides the purpose of slowing down and speeding up the purpose of throwing the tympan-shifting mechanism into action. For illustration of the adaptation of my said mechanism I have not thought it necessary in this case to represent the shifting mechanism, but have thought it quite sufficient to show the lever R R′ of that mechanism, which corresponds with the tripping-lever shown in the above-mentioned patent and to show the connection of the present invention with that lever. The said lever (shown in Figs. 1 and 2) has for its fulcrum a rock-shaft k^5, which works in a bearing in a small stand k^6 on the top of the framing A. The arm R of said lever corresponds exactly with the arm R of the corresponding lever in said patent and is to be connected in the same manner and for the same purposes with the shifting mechanism by a rod 21. The other arm R′ of said lever is connected by a rod *q* with the mechanism by which the slowing down and speeding up are effected, and for this purpose the bell-crank I I′ is affixed to a rock-shaft I*, which works in bearings in brackets I^2, secured to the framing A, and the said rock-shaft is provided with an arm to which the said rod *q* is connected by a pin *q′* in said arm working in a slot in said rod in such manner that when the bell-crank I I′ is moved to shift the rheostat-rod *a* for slowing down the pin *q′*, striking the bottom of the slot, operates the trip-lever to trip the tympan-shifting mechanism, and that when the bell-crank is returned to produce the speeding up the said pin, striking the top of the slot, throws back the trip-lever to throw the said mechanism out of operation.

Referring now to Fig. 6, I will briefly describe what is necessary to adapt the mechanism, including the cam L, the endless screw *i*, and worm-gear *i′*, the bell-crank I I′, and all the intermediate devices to a printing-machine driven by a belt. The only change necessary in all this mechanism is to provide or connect the lower arm of the bell-crank I with the lever S of a belt-shipper S′ for shifting a driving-belt N^2, running on a pulley C′ on the shaft C, the said belt having provided for driving it two driving mechanisms running at different speeds. Such faster and slower driving mechanisms are fully described in Patent No. 541,266, hereinbefore mentioned, and therefore I will only here describe them as far as is necessary to explain the application of the present invention to changing the speed by shifting a belt.

The pulley C′, which is fast on the shaft C, is twice the width of the belt N^2 to provide for the shifting of the belt to and fro between a quick-running driving-pulley P^3, which is keyed fast upon a counter-shaft P and a slow-running driving-pulley P^4, which is loose on said shaft. There are also on said shaft P a smaller pulley P′, which receives a quick-running driving-belt Q′ and a larger pulley p^2, which receives a slow-running driving-belt Q^2, the said pulley P′ being keyed fast to the said shaft and the said pulley P^2 being loose upon the said shaft. When the belt N^2 is on the pulley P^3, it is driven by the quicker belt Q′ on the pulley P′; but when the said belt N^2 is on the pulley P^4 it is driven by the slower belt Q^2 on the pulley P^2, which is connected with and drives the said pulley P^4. This connection between the pulleys P^2 and P^4 is made by means of a ratchet and pawl, as described in Patent No. 541,266, but not herein shown, whereby the pulley P^4 is permitted to temporarily run ahead of P^3 during the shifting of the belt N^2 between the pulleys P^3 and P^4. The shaft C is furnished with a loose pulley C^2, and the pulley P^4 is wide enough to receive the belt N^2 while running either on said loose pulley C^2 or on the fast pulley C′. The shipper-lever S′ is represented as connected with the bell-crank I I′ by a rod *a*, which occupies the place occupied by the rheostat-rod *a* of the electric motor and performs a similar duty—viz., that of oper-

ating a speed-controller which in the electrically-driven machine is the rheostat and in the case of the belt-driven machine is the belt-shipper. The shipper-lever S′ is capable of a sufficient movement to carry the belt N^2 beyond the pulley C^2 to a loose pulley on the shaft C, which is permitted without disturbing the bell-crank and cam connections by the spring *h* on the rod *a* in the same way as the corresponding spring *h*, weaker than *g*, applied to the rheostat-rod *a* of the electrically-driven machine permits the movement of said rod to stop the electric motor.

What I claim as my invention is—

1. The combination with the impression-cylinder of a printing-machine, means for driving the same at faster and slower speeds in the same direction, and a speed-controller, of a cam deriving constant rotary motion from the printing-machine, mechanism normally out of range of said cam to be actuated by said cam for producing the operation of said speed-controller, and automatic mechanism for periodically engaging the first-mentioned mechanism with the said cam and disengaging it therefrom for the purpose of slowing down and speeding up the cylinder, substantially as herein described.

2. The combination with the impression-cylinder of a printing-machine and means for driving the same at faster and slower speeds in the same direction and a speed-controller, of a cam fast on the cylinder-shaft and rotating therewith, mechanism normally inoperative by said cam for transmitting motion from said cam to the speed-controller, and mechanism deriving motion from the cylinder for engaging said first-mentioned mechanism with and disengaging the same from the said cam, substantially as and for the purpose herein described.

3. The combination with the impression-cylinder of a printing-machine, means for driving the same at faster and slower speeds and a speed-controller, of a cam deriving motion from the printing-machine, mechanism actuated by said cam for producing the operation of said speed-controller, the said cam being constructed to first operate the speed-controller slowly for slowing down, then to hold it temporarily stationary and afterward to operate it more rapidly for speeding up, substantially as herein described.

4. The combination with the impression-cylinder of a printing-machine and an electric motor for driving the same at different speeds in one direction, of a speed-controller for said motor and automatic mechanism deriving motion from said machine for periodically operating said speed-controller for the purpose of slowing it down and speeding it up again, substantially as herein described.

5. The combination with the impression-cylinder of a printing-machine and an electric motor for driving the same at different speeds in one direction, of a speed-controller for said motor, a cam deriving constant rotary motion from the printing-machine, a device actuated by said cam for producing the operation of said speed-controller and automatic mechanism for periodically engaging said device with the cam and disengaging it therefrom for the purpose of temporarily slowing down the cylinder and afterward speeding it up again, substantially as herein described.

6. The combination with the impression-cylinder of a printing-machine and an electric motor for driving the same, of a speed-controller for said motor, a rod connected with said speed-controller, a cam-actuated device and a cam therefor deriving motion from the printing-machine, automatic mechanism for periodically engaging said device with said rod for moving it and the speed-controller in a direction to reduce the speed of the motor, a stronger spring applied to said rod for moving it and the speed-controller in a direction to speed up the motor, a hand-lever connected with said rod, and a weaker spring applied to said rod and operating normally to move it in the same direction as the stronger spring but capable of yielding to permit the operation of the rod by the hand-lever independently of the stronger spring, substantially as herein described.

7. The combination with the impression-cylinder of a printing-machine and means for driving the same at faster and slower speeds and a speed-controller, of a cam on the cylinder-shaft and devices normally disengaged from said cam for transmitting motion therefrom when engaged therewith to the speed-controller, an endless screw on the cylinder-shaft, a shaft having on it both a worm-gear meshing with said endless screw and a tripping-disk, a trip-lever running on said disk, and mechanism actuated by said tripping-lever for producing the engagement of said device with the said cam, substantially as and for the purpose herein described.

8. In a rotary cylinder printing-machine the impression-cylinder of which is provided with a movable tympan and with devices for automatically shifting said tympan as the cylinder rotates, the combination with said cylinder, of a tripping device for starting the tympan-shifting devices, means for driving said cylinder in the same direction at faster and slower speeds, a speed-controller, a cam deriving constant rotary motion from the printing-machine, mechanisms to be actuated by said cam for producing the operation of said speed-controller and said tripping device, and mechanism for periodically engaging the first-mentioned mechanisms with said cam for the purpose of both slowing down the cylinder and shifting the tympan, substantially as herein described.

9. The combination with the impression-cylinder of a printing-machine and means for driving the same at faster and slower speeds and a speed-controller, of a cam deriving constant rotary motion from the printing-machine, a cam-rod and a connection between

said rod and the speed-controller, a locking device for holding said rod out of engagement with the cam, a spring for throwing said rod into engagement with the cam, and a tripping device deriving motion from the cylinder for actuating the locking device to liberate said rod, substantially as herein described.

10. The combination with the impression-cylinder and means for driving the same at faster and slower speeds and a speed-controller, of the bell-crank I for operating said controller, the cam L on the cylinder-shaft, the cam-rod *o* connected with the bell-crank and capable of engagement with and disengagement from said cam, the rock-shaft N, the locking-lever N′ on said rock-shaft, the spring *p* connecting said lever with the cam-rod, the tripping-disk *j* and its shaft i^2, the worm-gear i' on said shaft i^2, the endless screw on the cylinder-shaft for engaging with said worm-gear for driving the tripping-disk, the tripping-lever K controlled by said disk, the lever M actuated by the tripping-lever and the rod n' connecting said lever M with the rock-shaft N, all substantially as and for the purpose herein described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 12th day of July, 1898.

CHARLES P. COTTRELL.

Witnesses:
A. R. STILLMAN,
B. F. LAKE.