(No Model.)

3 Sheets—Sheet 1.

C. B. COTTRELL.

PRINTING MACHINE.

No. 327,243.

Patented Sept. 29, 1885.

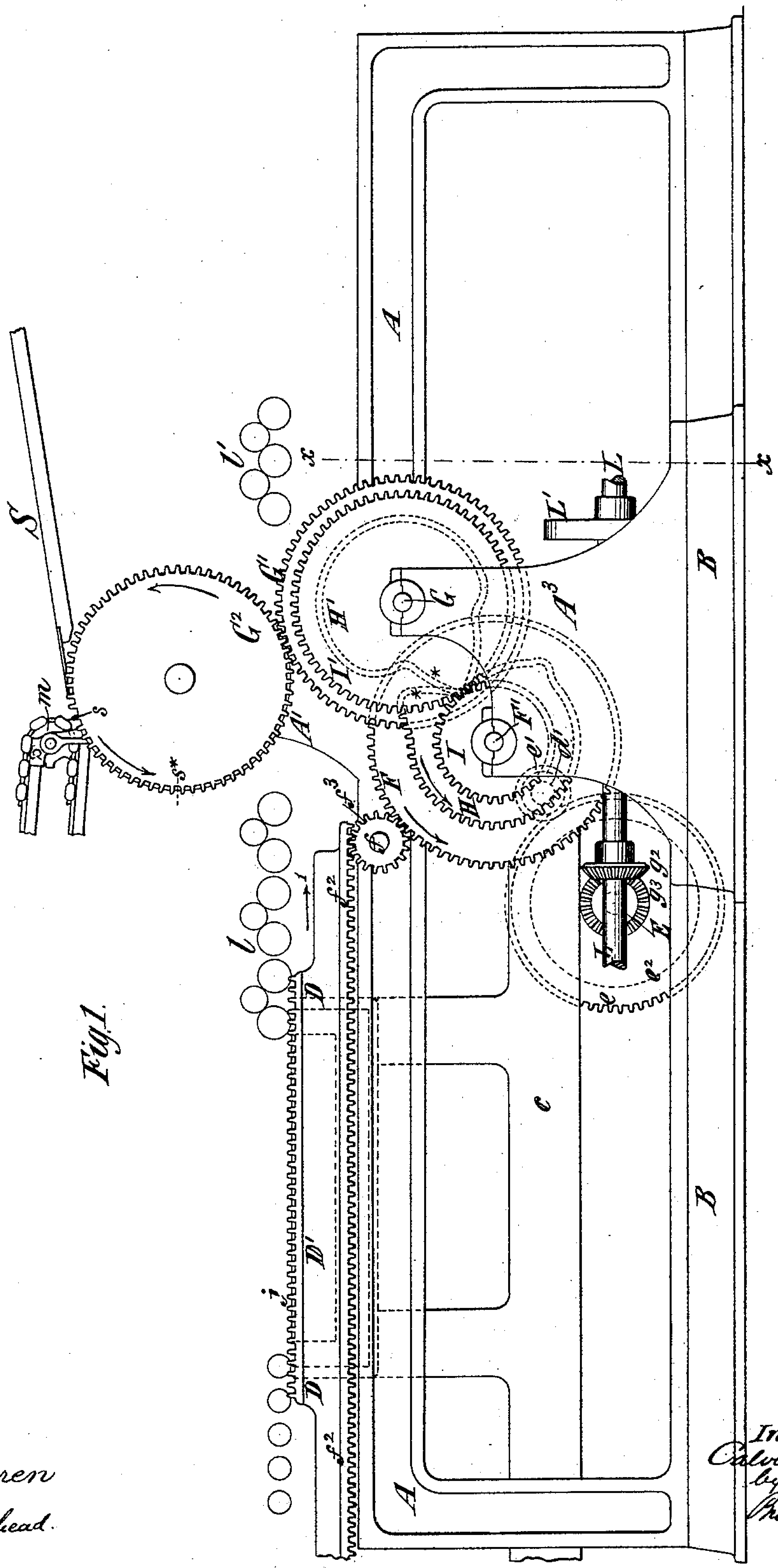

Fig. 1.

Witnesses:

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Louis M. F. Whitehead.

Inventor:

Calvert B. Cottrell

by his Attys

Brown & Hall

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 2.

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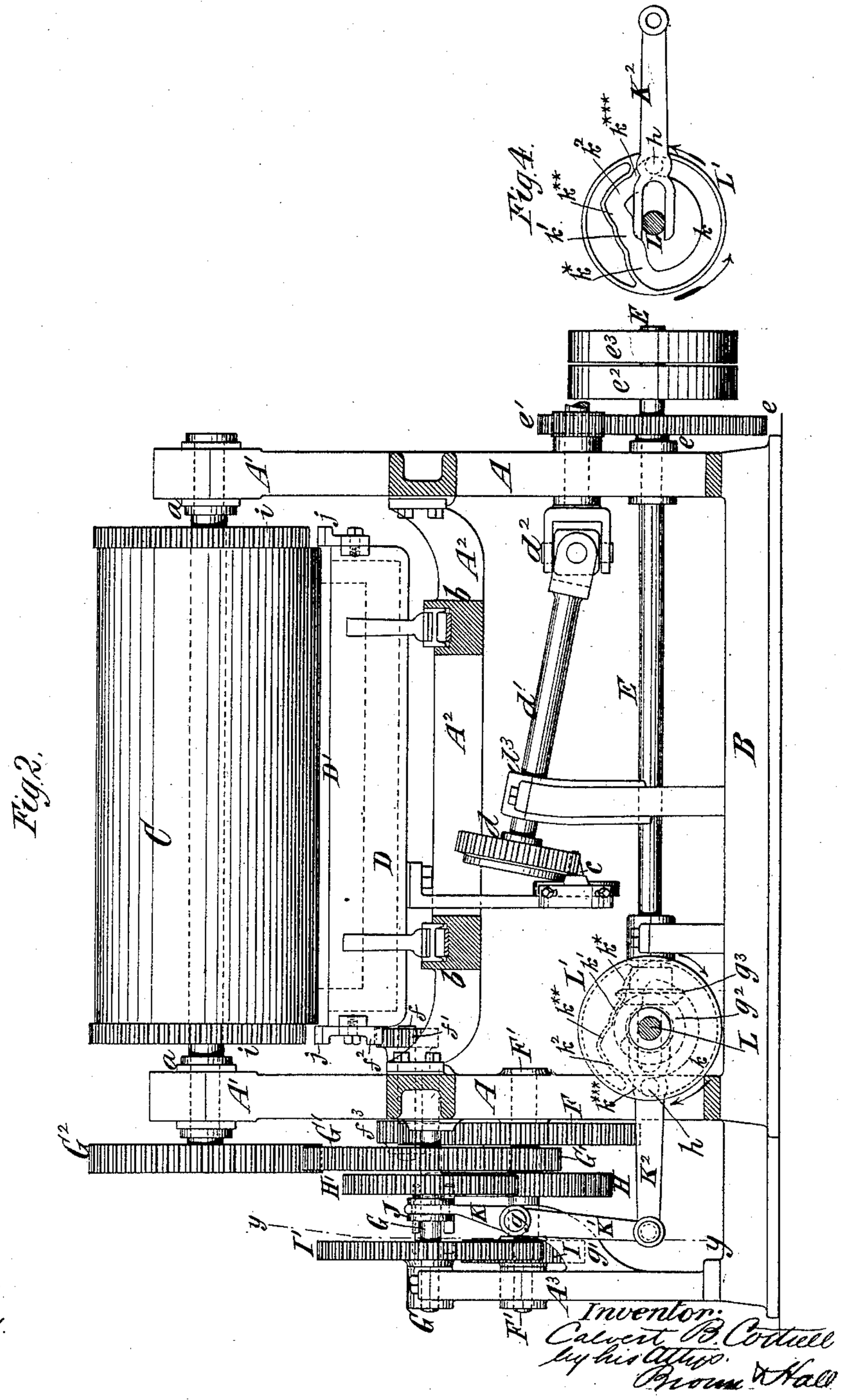

Witnesses:
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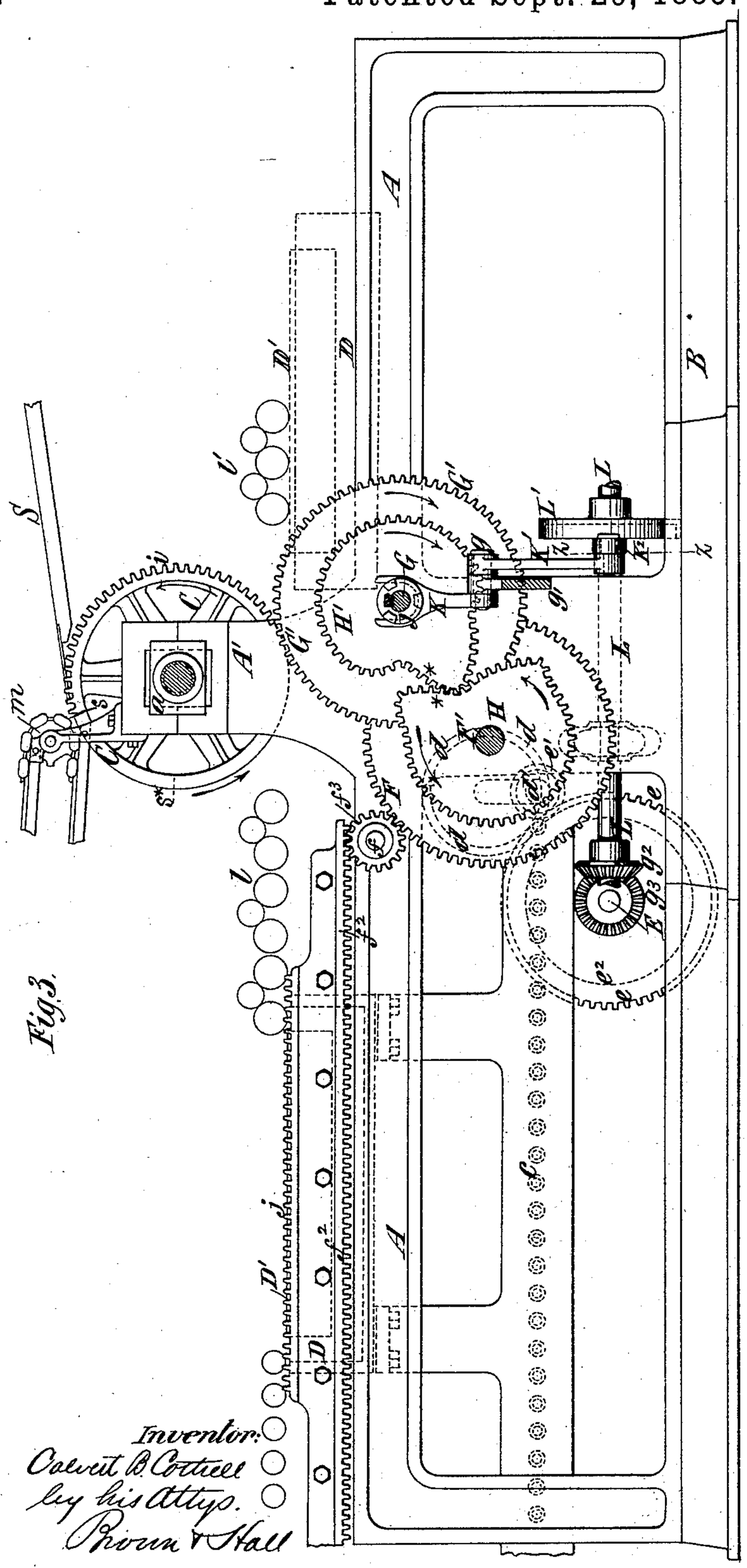

Fig. 3.

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UNITED STATES PATENT OFFICE.

CALVERT B. COTTRELL, OF STONINGTON, CONNECTICUT.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 327,243, dated September 29, 1885.

Application filed April 17, 1884. (No model.)

To all whom it may concern:

Be it known that I, CALVERT B. COTTRELL, 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.

My invention is more particularly applicable to lithographic presses; and it relates to stop-cylinder presses in which the cylinder carries a segment-gear and the bed a rack, whereby the cylinder during printing is geared with the bed, but which permits the bed to move back or return after printing, leaving the cylinder stationary.

Owing to the difficulty of engaging the segment-gear of the cylinder with the bed-rack when the bed is moving at a high speed, and of stopping the cylinder if its segment runs out of the bed-rack when the bed is moving at a high speed, the beds of stop-cylinder presses have largely heretofore been driven by cranks, because the crank gives a gradually-decreasing and then a gradually-increasing speed to the bed at the end of its movement. These crank presses are, however, objectionable, because the method of operating the cylinder has necessitated a comparatively slow performance of work by the press, and in my Letters Patent No. 177,808, dated May 23, 1876, the stop-cylinder press was greatly improved by giving the bed a uniform speed of movement, and by attaching to the cylinder a short segment-gear independent of the segment with which the bed-rack engages, and employing in connection therewith a sector-gear, which by a suitable cam is brought into engagement with the sector-gear as the cylinder is disengaged from the bed, so as to gradually take up the momentum of the cylinder and bring it to a full stop, and which by another suitable cam is moved in an opposite direction to overcome the inertia of the cylinder and start it forward with such a gradually-accelerated movement that it and the bed shall have a common speed when its rack and the cylinder-segment are brought to their point of engagement.

In order to secure a proper action of the mechanism for stopping and starting the cylinder just described, a careful adjustment of the sector-gear whereby the cylinder is turned in stopping and starting, and of the cams whereby said sector is operated, was necessary, and even then there was liable, especially in running very fast, to be a thump or knock at the time the cylinder is let go by the bed and taken by the cam-actuated sector-gear, and vice versa.

An important object of my present invention is to obtain a still smoother operation of the cylinder, whereby the press may be safely run at a higher speed than has before been attainable in stop-cylinder presses, and, furthermore, to enable the cylinder, while receiving its entire movement from the bed, to be turned considerably more than a complete revolution during the forward movement of the bed, so that the printed sheet may be delivered from the front of the cylinder, the time taken by such rotation of the cylinder to deliver being utilized in a lithographic press to give the bed a longer movement, which will carry its form in the forward or printing stroke entirely beyond the cylinder and under the wetting-rollers, located at the opposite side of the cylinder from the color or inking rollers.

To these ends my invention consists in novel combinations of parts, which are hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of such parts of a press as are necessary to illustrate my invention, the parts being shown in the positions they occupy at the instant the bed commences its movement to print. Fig. 2 is a transverse vertical section of said parts on the dotted line *x x*, Fig. 1, looking toward the cylinder. Fig. 3 is a vertical section and side elevation of certain parts of the press on the dotted line *y y*, Fig. 2; and Fig. 4 is a sectional view on the plane of the dotted line *z z*, Fig. 3.

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

A A designate the side frames of the press, which are erected on the bed-plate B, and C designates the cylinder, which is journaled in suitable bearings, *a*, in the upper side frames or cylinder-frames, A′.

D designates the bed, which is capable of sliding on suitable bearers, *b*, secured upon cross pieces or stretchers A^2, connecting the

side frames, A A, and D′ designates the form, which in this example of my invention consists of a lithographic stone.

Attached to the under side of the bed D is a rack, *c*, with which engages a pinion or wheel, *d*. This pinion or wheel *d* is mounted on a shaft, *d′*, in which is a knuckle or universal joint or coupling, d^2, as best shown in Fig. 2, and which is supported at one end in a bearing in the side frame, A, and adjacent to the wheel *d* in a bearing, d^3, wherein it can rise and fall a sufficient distance to allow it to engage with the upper or lower side of the rack *c* on the lower side of the bed. The shaft *d′* receives a motion continuously in one direction through the wheel and pinion *e e′* from a shaft, E, on which are placed the driving-pulleys e^2 e^3. (Shown in Fig. 2.) This mechanism for driving the bed is shown in my aforesaid Letters Patent, and is a well-known movement for transforming uniform rotary motion into uniform reciprocating motion, the shaft engaging with the under or upper side of the rack *c* to move the bed in one or other direction at uniform or nearly uniform speed. The shaft E therefore constitutes the driving-shaft of the machine, and imparts the desired uniform motion to the bed, and the entire movement of the cylinder is produced by suitable gearing operated by the bed, and which I shall now describe.

In one of the side frames A is journaled a short shaft, *f*, having fixed on one end a pinion, *f′*, which engages with a rack, f^2, on the under side of the bed and receives a rotary motion alternately in opposite directions as the bed is reciprocated, and having fixed on the other or outer end a similar pinion, f^3, which gears into a large spur-wheel, F, fast on a shaft, F′. This shaft is journaled at one end in one of the side frames A, and at the other end in an outside or supplemental frame or standard, A^3, and the wheel F has such a circumference that it will make a complete turn at each forward or backward movement of the bed. Consequently the shaft F′ is not rotated continuously in one direction, but has imparted to it a reciprocating rotary motion, moving in each direction a complete or nearly complete turn.

G designates a second shaft, which is likewise journaled in the frames A A^3, and on which is fixed a spur-wheel, G′, gearing into a spur-wheel, G^2, on the shaft of the cylinder C. The wheel G^2 is fast on the cylinder-shaft, and consequently it will be understood that whenever the shaft G is turned the cylinder is also turned.

On the shaft F′ are two wheels, H I, which are both fast thereon, and which gear into two other wheels, H′ I′, on the shaft G. The wheels H′ I′ are loose on the shaft G, and are severally connected therewith or locked thereto at the desired times by a clutch-piece, J, capable of sliding on the shaft to cause it to engage with one or other of the said wheels, or to bring it to a position midway between them, in order to leave both wheels free. This clutch-piece is connected with the shaft G in a well-understood manner by a feather or spline, and is operated by a lever, K K′, fulcrumed at *g* to a bracket, *g′*, projecting from the outer frame or standard, A^2. The upper arm, K, of the said lever is forked to embrace the clutch-piece J, and the lower arm, K′, thereof is connected with a rod, K^2, as best shown in Fig. 2.

L designates a shaft which extends lengthwise of the press, and which is driven by bevel gears g^2 g^3 from the driving-shaft E.

Upon the shaft L is a cam, L′, the form and purpose of which will be hereinafter described, and the rod K^2 is forked to straddle the shaft, and carries a bowl or roller, *h*, which engages with a groove in said cam.

The wheels H H′ are cam-shaped spur-wheels, the forms of which are best shown in Fig. 3, and the wheels I I′ are not cam-shaped, but have a plane uniform periphery, the wheel I being smaller than the wheel I′.

During printing the cylinder C is geared with the bed D by spur-segments *i* on the cylinder engaging with racks *j* on the top of the bed, and, as shown in Fig. 2, one rack *j* is directly above and formed in the same piece with the rack f^2.

The form of the cam L′ is best shown in Fig. 4. In its side is a groove which comprises three concentric portions, *k k′* k^2, of different radii, and three offsets, *k* k** k****. The cam turns in the direction indicated by the arrows thereon in Figs. 2 and 4, and produces the following movements of the clutch-piece J: So long as the bowl or roller *h* is in the longer concentric groove portion *k* the clutch-piece is held in engagement with the wheel H′, as shown in the drawings; but by the rotation of the cam the offset *k** acts upon the said bowl or roller *h*, and directs it into the second concentric portion, *k′*, which is of shortest radius, and thereby throws the clutch-piece J out of engagement with the wheel H′ and across into the wheel I′, where it remains during the passage of the groove portion *k′* over the roller *h* and until the offset *k*** reaches the said roller. The offset *k***, acting on the roller *h*, draws the clutch-piece J out of the wheel I′ and into an intermediate position out of engagement with both wheels H′ I′, where it remains during the time the concentric groove portion k^2 traverses the roller *h*, and until the offset *k****, acting on the said roller *h*, throws the clutch-piece J again into engagement with the wheel H′, in which position it appears in the drawings.

In front of the cylinder C, I have represented in outline inking or color rollers *l*, and behind the cylinder are represented in a similar manner wetting-rollers *l′*, which would not be necessary in a type-press.

At the top of the cylinder is the feed-board S, and at the front of the cylinder, opposite the feed-board, are chain-wheels *m*, over which pass endless chains, carrying delivery-grippers.

I have not here shown these chains fully nor the delivery-grippers, as they form no part of my present invention; but in my two applications for Letters Patent, filed, respectively, November 26, 1883, and January 28, 1884, and numbered, respectively, 112,916 and 118,908, are shown and described front delivery apparatus, in which are employed endless chains and gripper-bars and rods extending between them.

As before stated, the position of parts shown is that which exists just as the bed D commences its forward movement in the direction of the arrow 1, Fig. 1, and at this time the receiving-edge *s* of the cylinder is in the position shown in Fig. 1 by a full line. As the bed moves its rack f^2, acting upon the pinion f' and through the shaft *f*, pinion f^3, wheel F, and shaft F′, turns the cam-shaped gear H in the direction indicated by the arrows thereon in Figs. 1 and 3, and inasmuch as the fellow cam-wheel H′ is now locked by the clutch J to its shaft G said shaft will also be turned, and through the wheels G′ G^2 will turn the cylinder forward in the direction of the arrows, Figs. 1 and 3. At the initial movement of the wheel H the portion * is coming into engagement and meshes into the corresponding portion * of the fellow wheel H′, and consequently the inertia of the cylinder will be overcome very gradually, and the cylinder gradually increased in speed until at the time the bed-racks *j* come to the cylinder they mesh into the segments *i* without shock or jar, and continue in gear therewith until printing is completed.

In the press here shown the travel of the bed is sufficient to carry it entirely beyond the cylinder and into the position shown in dotted lines at the right of the cylinder in Fig. 3. This carries the stone or form D′ under the wetting-rollers, and during the whole forward movement of the bed the concentric groove portion *k* of the cam L′ has held the roller *h*, and therefore kept the clutch-piece J in constant engagement with the wheel H′.

As before stated, the circumference of the wheel F is equal to the travel of the bed D, and the wheel H, being upon the same shaft, also makes a single revolution at each movement of the bed, and by the time the bed has reached the end of its movement the wheels H H′ are again in the position shown in Fig. 1, and have brought the cylinder to a stand-still without shock or jar.

In a front-delivery press as here shown the gearing should be so proportioned as to give the cylinder more than a complete revolution, and therefore the gearing shown is arranged to carry the receiving-edge *s* of the cylinder beyond the position shown in Fig. 1 to the position indicated by the dotted line *s**, or thereabout, and as the cylinder, after a complete turn, moves from *s* to *s** the sheet is delivered and the cylinder brought to a stand-still at *s** at the time the bed terminates its movement.

As the bed completes its movement and just before it begins its return the cam L′ by its rotation brings the offset *k** against the roller *h*, and by acting thereon moves the clutch-piece J out of engagement with the wheel H′ and into engagement with the wheel I′, at which time the said roller is in the concentric portion *k*′ of smallest radius; but as soon as the clutch-piece J is unlocked from the wheel H′ the bed D commences its return movement, thereby turning the shaft F′ and its wheels H I in the opposite direction. The instant that the clutch-piece J engages with the wheel I′ the cylinder is turned back at a slow speed, because of the comparatively small size of the wheel I and the larger size of the wheel I′, and until the receiving-edge of the cylinder is brought back to the position indicated by *s* in Figs. 1 and 3. The offset *k*** of the cam L′ now acts on the roller *h* and draws the clutch-piece J out of engagement with the wheel I′ and into an intermediate position, where it remains while the concentric groove portion k^2 of the cam L′ traverses the roller *h*, the cylinder being left stationary to properly register the sheet upon it. As the bed completes its return movement the offset *k**** meets the roller *h*, and thereby throws the clutch-piece J again into engagement with the wheel H′ to move the cylinder forward with its sheet, and, as before described, the portions * * of the wheels H H′ coming into gear effects the starting of the cylinder very slowly and accelerates its speed until at the time of the coming together of the bed-racks *j* and cylinder-segments *i* the bed and cylinder have a uniform movement.

If found necessary or desirable on high-speed presses, I may employ means to clamp the cylinder at the time of reversing the bed, and also at the time of unlocking the cylinder when it is brought to a position to receive the fresh sheet from the feed-board.

In a stop-cylinder press in which it is not important to run the cylinder over to facilitate the delivery of the printed sheet the bed will "run by" the cylinder only about four to six inches, and in this time the cylinder will run down to slow and stop, which will just place the receiving-edge of the cylinder in the proper position for feeding the fresh sheet, and by unlocking the cylinder at the point of reversal of the bed, or just before, the cylinder will not be disturbed. In this case the two concentric spur-wheels I I′ would not be required, and the clutch-piece J would simply be actuated to lock into and unlock from the wheel H′.

By my invention I operate the cylinder by gears which are always in mesh, and am thus enabled to run very rapidly and to effect the engagement of the bed and cylinder for printing without shock or jar, and also to stop and start the cylinder very gradually. I am also enabled to run the cylinder ahead after

printing to facilitate the delivery of the printed sheet, and then return it to a receiving position while the bed is returning and before it comples its return movement, thus giving ample time for registering the sheet on the cylinder.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a stop-cylinder printing-press, the combination, with a bed, of a cylinder geared directly to the bed during printing, and gearing and intermediate mechanism connecting the bed and cylinder, substantially as described, whereby the cylinder is carried past the point of taking a sheet during the forward movement of the bed, in order to deliver the printed sheet at the front of the cylinder, and is then returned to the point of taking the sheet and there allowed to dwell until the next forward movement of the bed, substantially as and for the purpose herein described.

2. In a stop-cylinder printing-press, the combination, with a bed, of a cylinder which is geared directly with the bed during printing, and cam-shaped gear-wheels deriving motion from the bed and serving to start the cylinder gradually and accelerate its speed, so that it and the bed will have a uniform motion at the time of coming into gear, and also serving to bring the cylinder gradually to a stop, substantially as and for the purpose herein described.

3. In a stop-cylinder printing-press, the combination, with a bed, of a cylinder geared directly with the bed during printing, a shaft gearing with the bed and receiving a reciprocating rotary motion therefrom, an intermediate shaft geared with the cylinder, cam-shaped gear-wheels connecting said shafts, the wheel upon the intermediate shaft being loose, and a cam-actuated clutch-piece whereby said loose wheel may be locked to its shaft during the forward movement of the bed and left unlocked during the return movement of the bed, substantially as and for the purpose herein described.

4. In a stop-cylinder printing-press, the combination, with a bed, of a cylinder having a gear-segment and a rack on the bed whereby the cylinder is geared directly with the bed during printing, and cam-shaped gear wheels serving to start the cylinder gradually and accelerate its speed, so that the bed and cylinder will have a uniform speed at the time of the rack on the bed coming into gear with the segment on the cylinder, and also serving to gradually stop the cylinder after the bed-rack has run out of gear with the cylinder-segment, substantially as and for the purpose herein described.

5. In a stop-cylinder printing-press, the combination, with a bed and a cylinder, of cam-shaped gear-wheels, whereby the cylinder is started gradually at the commencement of its movement and carried past a position to take the sheet and there stopped, other gear-wheels, whereby the cylinder is reversed and moved back to a position to take the sheet, and a cam-actuated clutch-piece, whereby said cylinder may be alternately connected with the cam-shaped gears and the reversing-gears, substantially as and for the purpose herein described.

6. The combination, with the bed D and cylinder C, provided with the rack and segment *j i*, for engagement during printing, of the shaft G, geared with the cylinder, the shaft F′, geared with the bed and having a reciprocating rotary motion, the cam-shaped wheel H on shaft F′, the cam-shaped wheel H′ loose on the shaft G, the clutch-piece J, and the cam L′ and connections, substantially such as described, for controlling the clutch-piece J, substantially as set forth.

7. The combination, with the bed D and cylinder C, provided with the rack and segment *j i*, for engagement during printing, of the shaft G, geared with the cylinder, and the wheels H′ I′, loose thereon, the shaft F′, geared with the bed and having a reciprocating rotary motion, the wheels H I, fast on the shaft F′, the clutch-piece J, and the cam L′, and connections, substantially such as described, for controlling said clutch-piece, substantially as set forth.

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