(No Model.)

6 Sheets—Sheet 1.

E. A. BLAKE.

PRINTING PRESS.

No. 503,713. Patented Aug. 22, 1893.

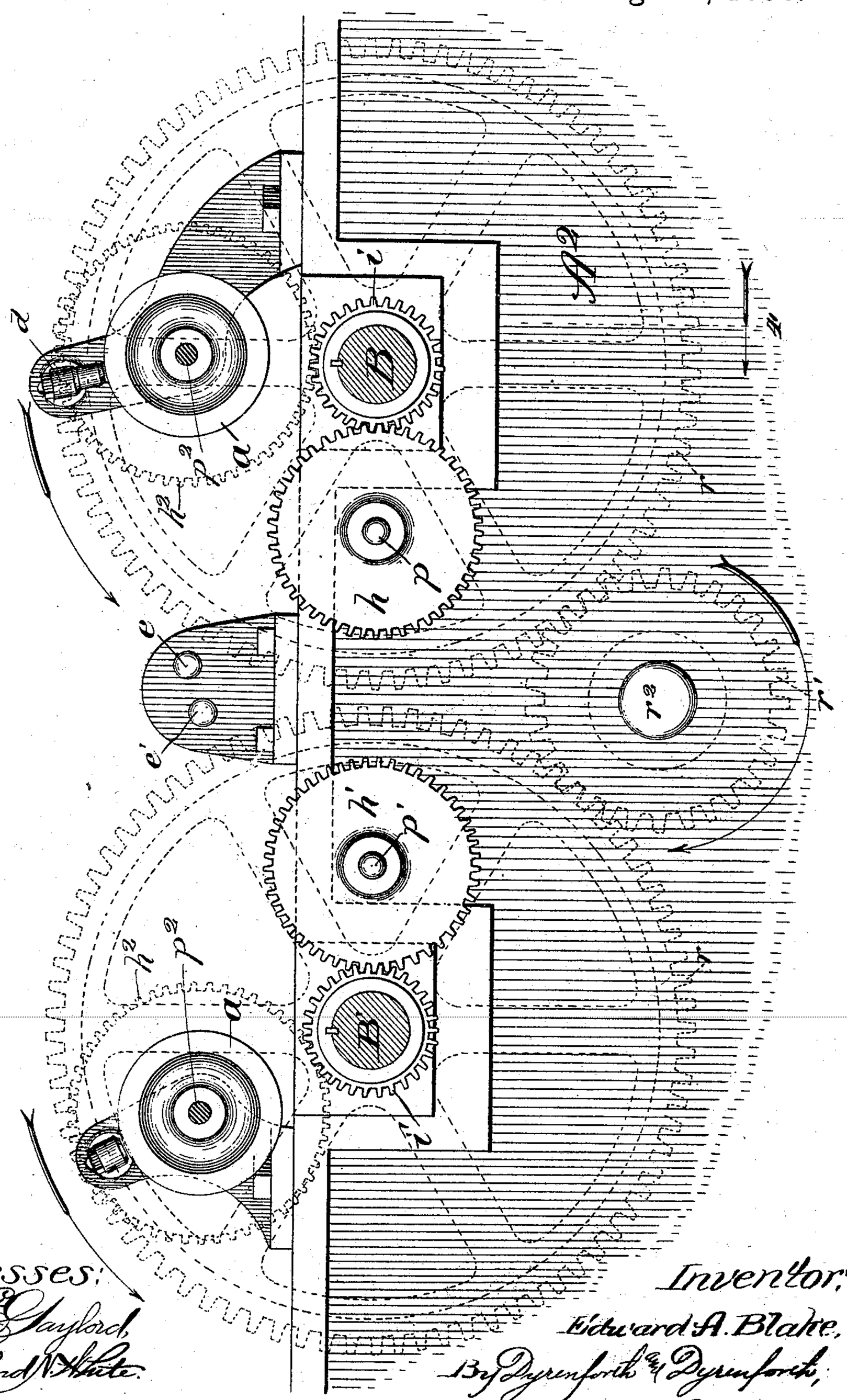

Fig. 1.

Witnesses:
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Inventor:
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By Dyrenforth & Dyrenforth,
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(No Model.) 6 Sheets—Sheet 2.

E. A. BLAKE.

PRINTING PRESS.

No. 503,713. Patented Aug. 22, 1893.

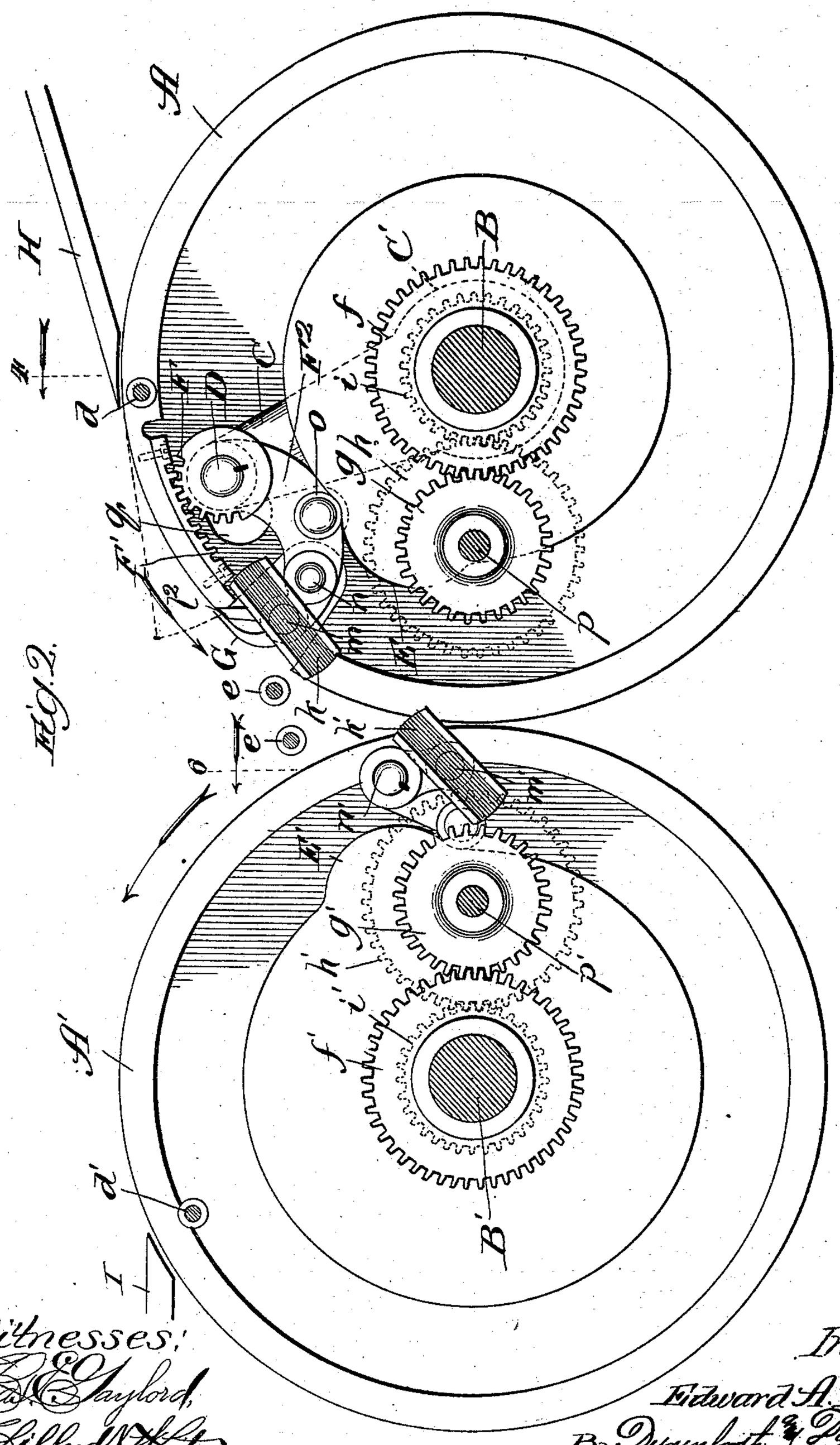

Fig. 2.

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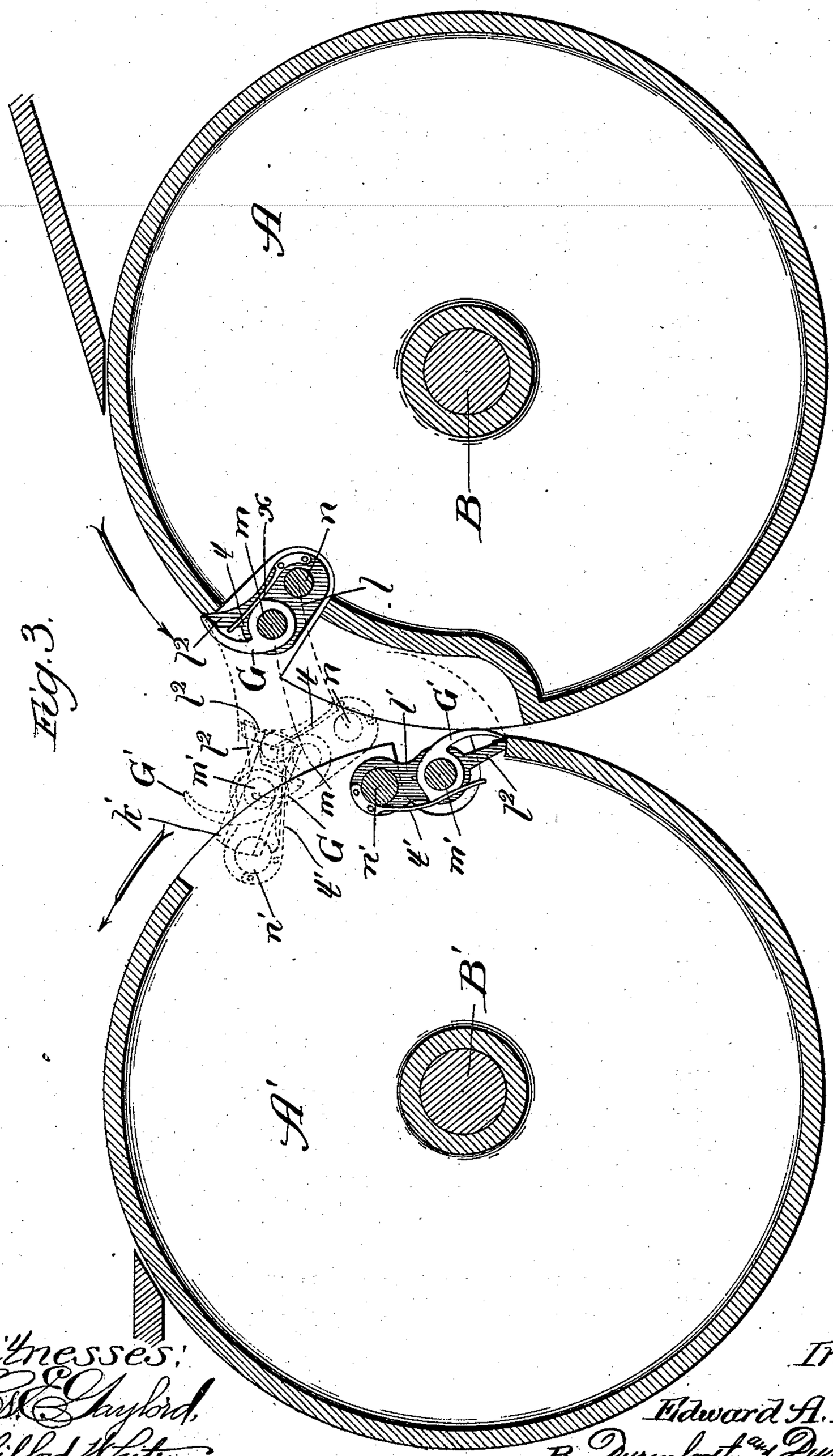
(No Model.) 6 Sheets—Sheet 3.

E. A. BLAKE.

PRINTING PRESS.

No. 503,713. Patented Aug. 22, 1893.



Witnesses:
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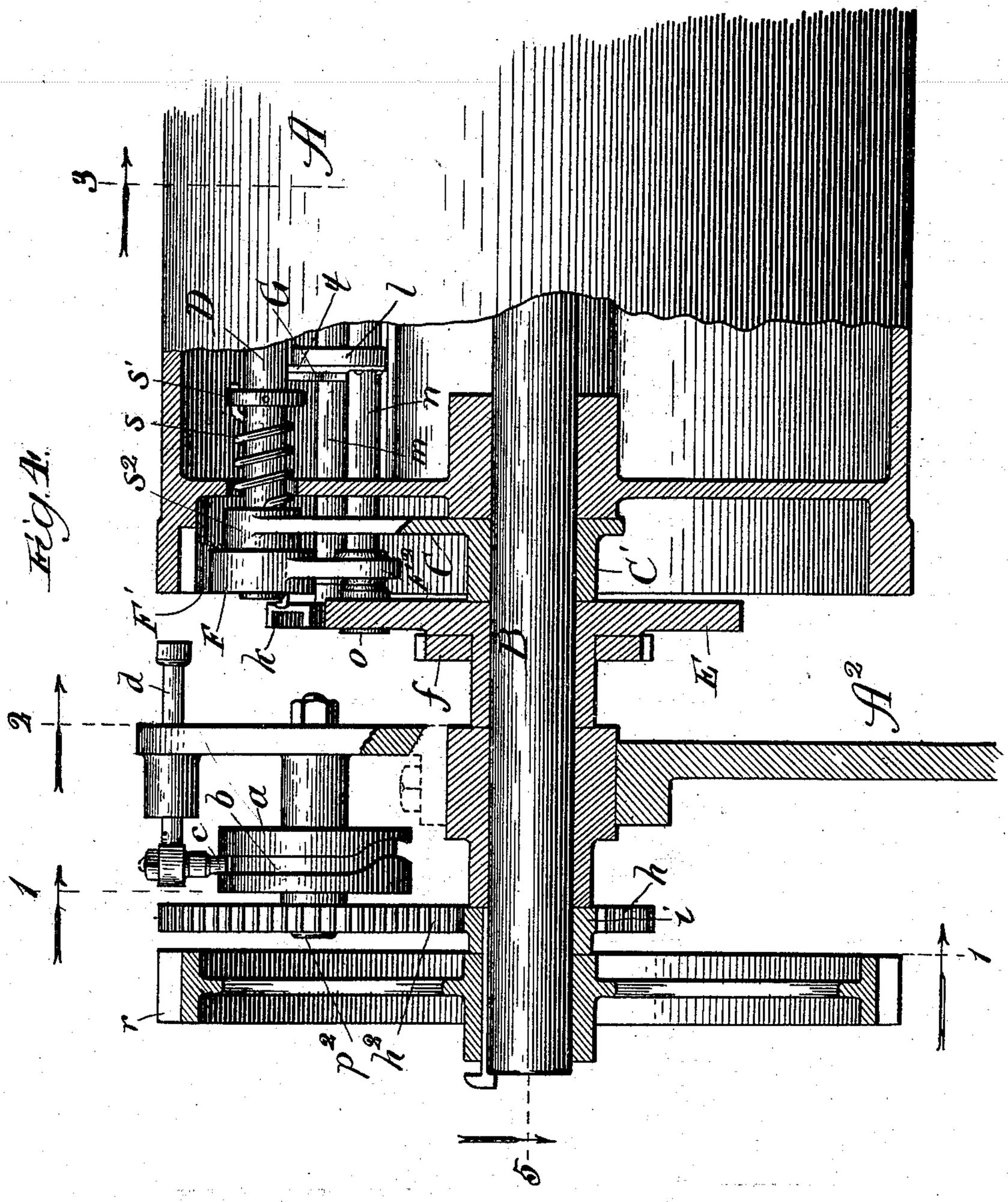
(No Model.) 6 Sheets—Sheet 4.

E. A. BLAKE.

PRINTING PRESS.

No. 503,713. Patented Aug. 22, 1893.



Witnesses:
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Inventor:
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(No Model.)

6 Sheets—Sheet 5.

E. A. BLAKE.

PRINTING PRESS.

No. 503,713. Patented Aug. 22, 1893.

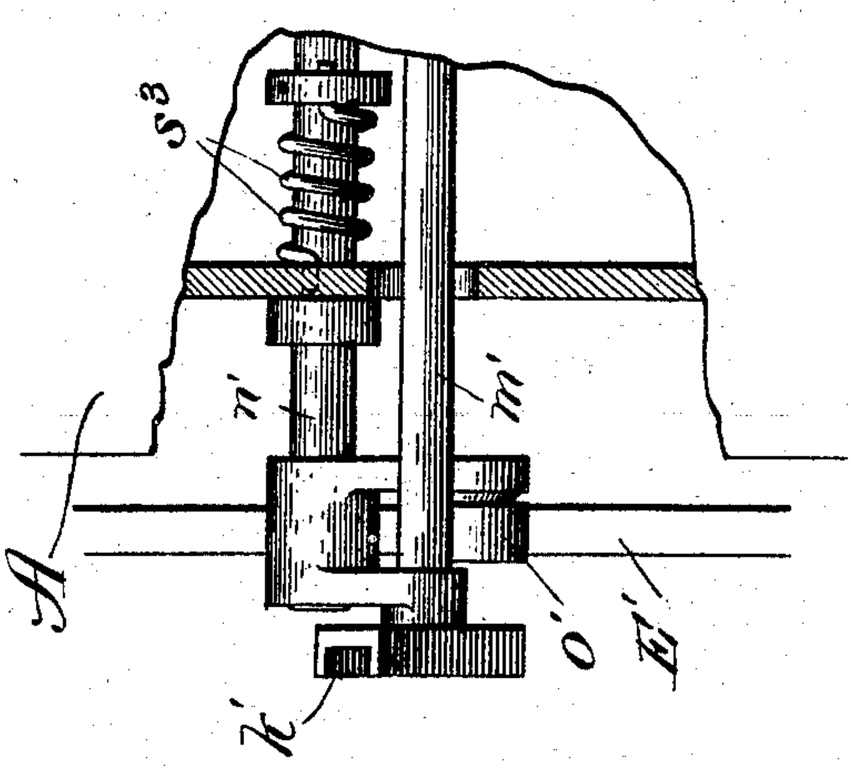

Fig. 6.

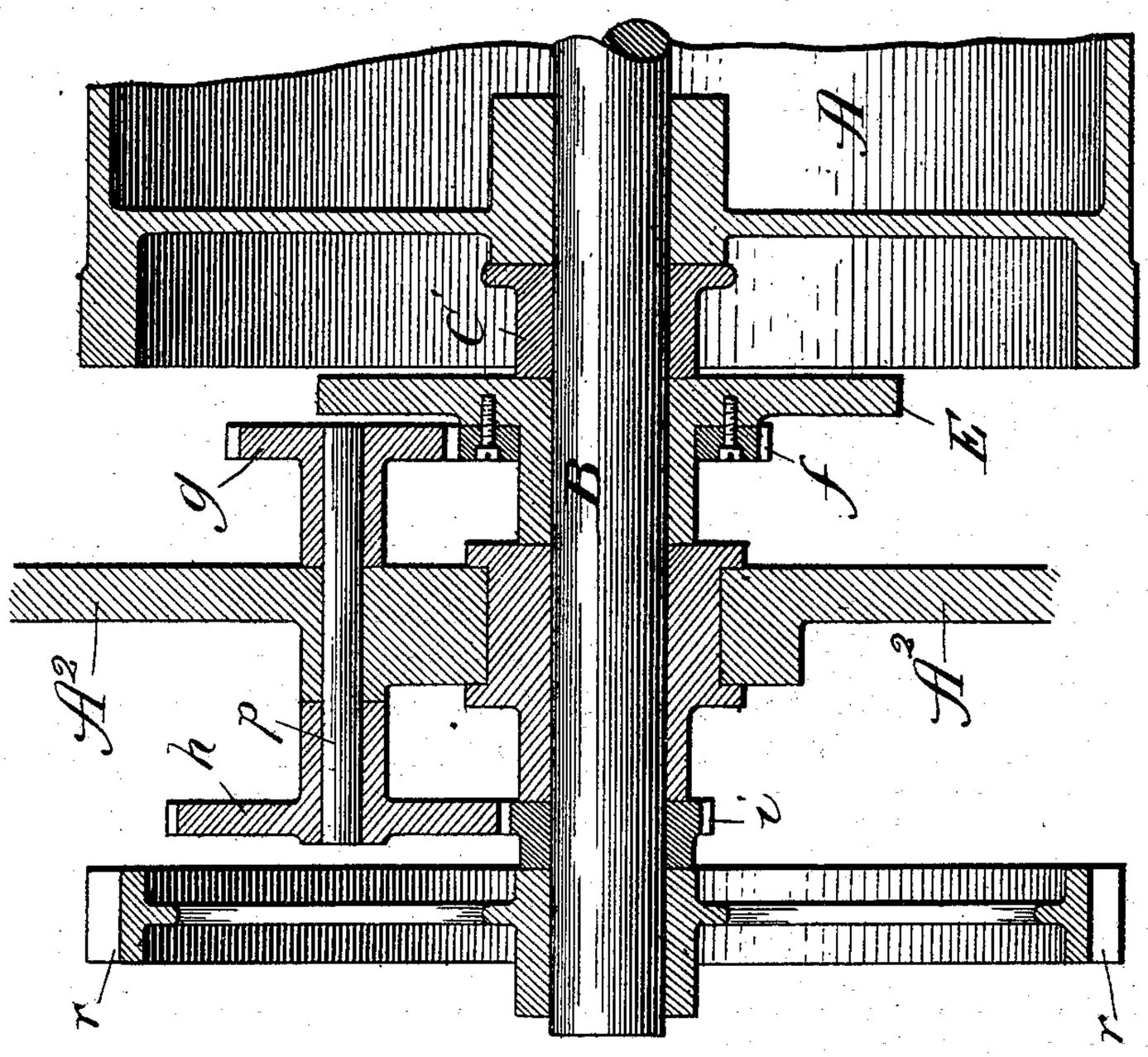

Fig. 5.

Witnesses:
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(No Model.)

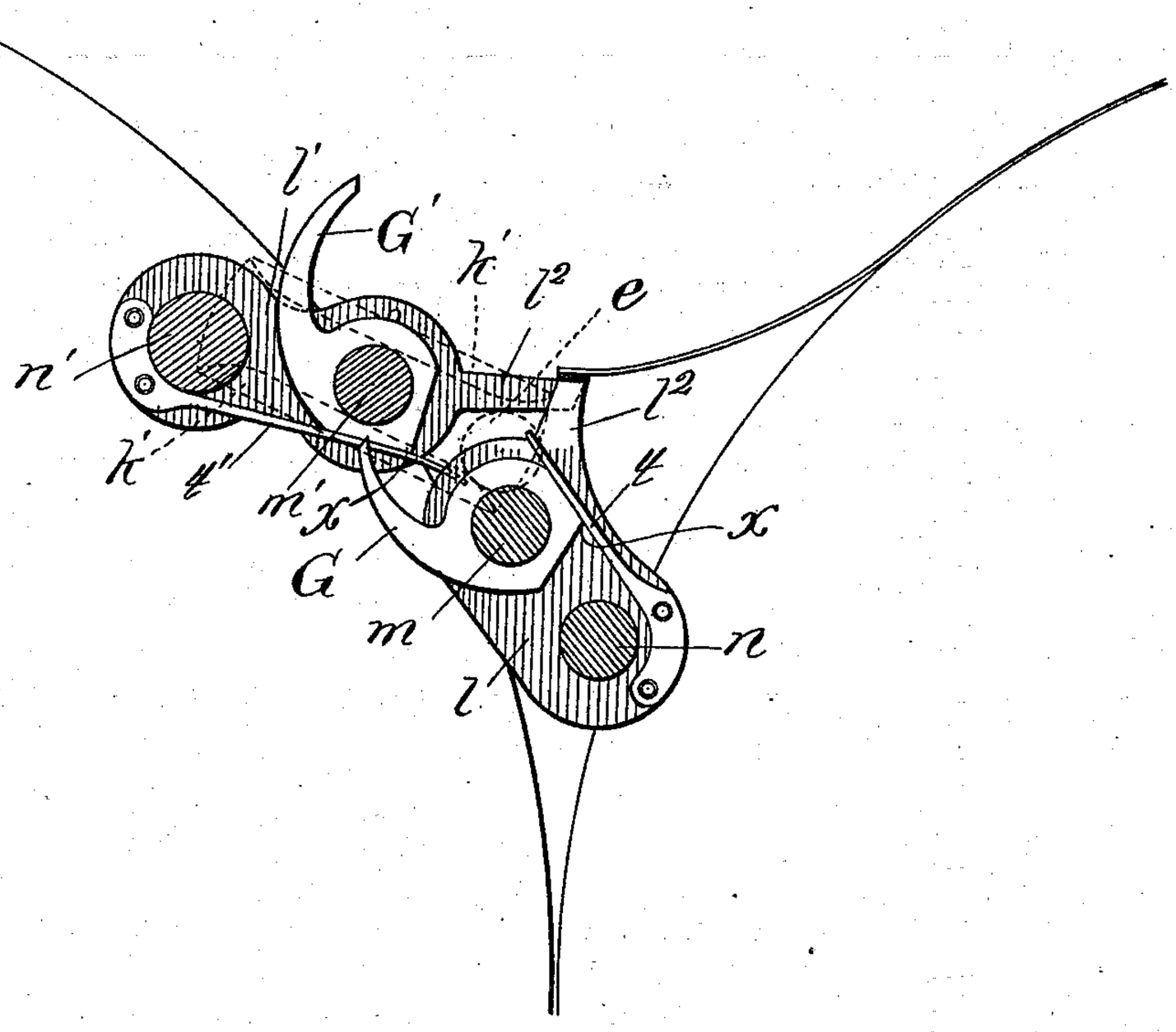
6 Sheets—Sheet 6.

E. A. BLAKE.

PRINTING PRESS.

No. 503,713. Patented Aug. 22, 1893.

Fig. 7.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

EDWARD A. BLAKE, OF CHICAGO, ILLINOIS.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 503,713, dated August 22, 1893.

Application filed February 7, 1893. Serial No. 461,332. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. BLAKE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Printing-Presses, of which the following is a specification.

My invention relates to an improvement in the class of printing presses represented by the invention for which Letters-Patent of the United States, No. 487,468, were granted to me on the 6th day of December, 1892, and the gist of which consists in mechanism operating to transfer, from one rotating cylinder immediately to an adjacent cylinder rotating correspondingly with the first, the sheet with the same surface thereof uppermost as was uppermost on the cylinder from which the transfer was made.

My said patent sets forth, for accomplishing the object of the invention, particular means as representing a species of the genus covered by the patent.

My present object is, primarily, to provide, in the nature of an improvement in my aforesaid invention, another species of mechanism for effecting, according to it, the peculiar transfer of the sheet, which improvement shall afford, so far as I am at present aware, the best means for the purpose; and this new species I desire to claim broadly or generically and also in detail-combinations.

In the accompanying drawings—Figure 1 is a view in sectional side elevation, partly in dotted representation, showing the two cylinders of a printing press and details of my improved transfer-mechanism thereon, the section being taken at the line 1—1 on Fig. 4, and viewed in the direction of the arrows. Fig. 2 is a view of the same in sectional side elevation, the section being taken at the line 2 on Fig. 4, and viewed in the direction of the arrow. Fig. 3 is a sectional view, diagrammatic in its nature, the section being taken through the cylinders at the line 3 on Fig. 4, and viewed in the direction of the arrow. Fig. 4 is a vertical longitudinal sectional view of the first or initial cylinder, the section being taken at the line 4 on Fig. 2 and viewed in the direction of the arrow. Fig. 5 is a horizontal section of the same, taken at the line 5 on Fig. 4 and viewed in the direction of the arrow. Fig. 6 is a broken sectional view, showing a detail, the section being taken at the line 6 on Fig. 2, viewed in the direction of the arrow, and enlarged. Fig. 7 is a sectional view showing the co-operating gripper-mechanism on a larger scale than the dotted representation thereof in Fig. 3.

A and A′ are two cylinders of a printing-press, which may be designed for co-operation with a reciprocating type-bed, or with other, impression, cylinders. The cylinder A is shown as the initial cylinder, or that to which the material (paper) to be printed is fed; while the cylinder A′ is shown as the delivery cylinder, to which the sheet is transferred from the cylinder A, and from which it is finally delivered, as to a third cylinder or to any suitable delivery mechanism. The cylinders are driven to rotate in the same direction, as indicated by arrows on Figs. 1, 2 and 3, each being shown as carrying at one end, for the purpose, a gear r, meshing with an interposed pinion r' (Fig. 1), which may be the driving medium for both cylinders, when its supporting shaft r^2 would be the driving shaft. However, the pinion r' may be a mere transmitter between the gears r, when one of the cylinders could be the initially driven one.

On the shaft B of cylinder A, which shaft is journaled in the frame A^2 of the machine, and near each of the two opposite ends thereof, is an arm C on a hub C′ loosely surrounding the shaft, and rotating with the cylinder, the said arms and other parts of the transferring mechanism being preferably within annular extensions of the cylinder, as represented. Only one of these arms is presented to view, owing to the nature of the illustration selected. The arms C afford bearings at their outer ends for a rock-shaft D, extending longitudinally through the cylinder and through laterally elongated openings q (Fig. 2) in the opposite ends or heads thereof; and I surround the shaft, toward each end, with a spiral spring s, fastened at one of its ends to a collar s' in the shaft, and at its opposite end to the bearing or head s^2 on the arm C, whereby a tendency is afforded the arms to bear in a direction which will cause a cam-roller carried by

the shaft to maintain contact with a cam disk E, hereinafter described, throughout its rotation.

On the inner side of the extreme end of each annular extension of the cylinder A is provided a rack F′ in the form of a quadrant, with which meshes a pinion F, (shown as a mutilated gear) keyed to the shaft D, and having extended from it an arm F^2, which should be curved, as shown, and which carries near the base of its curve an anti-friction roller *o*. In the arms F^2, near their outer ends, are fastened a non-rotary shaft *n*, and in the same, farther toward their outer ends, is journaled a rock-shaft *m*. A desired number of gripper-pad blocks *l*, having the finger-extensions or "pads" l^2 affording bearings for the grippers, as shown, are provided, at suitable intervals, on the two shafts *n* and *m*, which thus pass through the said blocks, in which the shaft *m* is free to rock. The gripper G for each pad l^2, is journaled on the shaft *m* and controlled by a spring *t* (Fig. 3) fastened to the pad-block to bear toward its free end against the hub of the gripper on which a projection *x* is provided, whereby when the spring bears against the hub at one side of its projection, the gripper will be forced into the position in which it is represented in Fig. 2, whereas when it bears against the hub at the opposite side of the projection, the gripper will be forced into and held by the spring in the position of extending in a backward direction from that so shown. On the shaft, moreover, is secured, to rock with it, a so-called tumbler *k*.

On the cylinder-shaft B, near one end, is the cam E comprising a cam-disk having a peripheral cam-projection, which cam-disk is not secured to the shaft to rotate with it, but has an independent rotary motion corresponding with but at a slower speed than, and preferably half the speed of the cylinder. This half-speed cam-rotation is provided for because the cylinder is designed to make two revolutions for each transfer of the sheet, and is produced by a gear *i* fastened to the shaft B and meshing with a gear *h* on one end of a shaft *p* (see Fig. 5) journaled in the frame and carrying at its opposite end a gear *g* meshing with a gear *f*, the same size as the gear *h* and fast on the outer face of the cam-disk. The relative sizes of the aforesaid gears should be such as are required to produce the desired one to two motion, and to that end, may be measured off and proportioned according to requirement in any particular machine, as is well understood by those skilled in the art.

A stationary trip *e* is provided to extend, adjacent to the cylinder A, in the path of the tumbler *k*; and *d* is a trip extending toward the end of the cylinder at which the cam E is provided and which is automatically actuated to be withdrawn out of the path of the aforesaid tumbler in alternate revolutions of the cylinder to prevent opening action of the gripper-mechanism in each such revolution of the cylinder that a sheet thereon is being imprinted. The automatic mechanism for withdrawing and advancing the trip *d*, respectively in alternate revolutions of the cylinder, may comprise, as well-known details for the purpose, a stud *c* on the rear end of the trip, extending into the groove *b* of a cam *a* fastened on a shaft p^2 carrying a gear-wheel h^2 meshing with the gear-wheel *i*.

On the cylinder A′ are cam and gripper mechanisms which may be counterparts of the corresponding details of the same on the cylinder A to co-operate therewith in transferring the sheet: E′ is a cam on a cam-disk supported on the cylinder-shaft B′ and driven preferably at half the speed of the cylinder by the gears *i*′, *h*′, *g*′ (the two latter being on a shaft *p*′) and *f*′. Shafts *n*′ and *m*′ (the former forming a fulcrum in the present instance) on the cylinder carry the gripper-pad blocks *l*′, the grippers G′ for which are carried by the rock-shaft *m*′, on which is the tumbler *k*′ adapted to engage with a stationary trip *e*′ in its path, the grippers being controlled by springs *t*′, which, however, tend only to maintain the grippers G′ closed, whereby, when they are opened, on being released, they immediately spring back to their closed condition. An anti-friction roller *o*′ engages with the cam E′ as the medium through which to transmit the cam-action to rock the grippers; and, as shown in Fig. 6, like the cam-roller *o*, the roller *o*′ should be maintained in frictional engagement with the cam by confined spiral spring s^3 operating like the the spring *s*. A self-acting trip *d*′ on the cylinder A′ operates in all respects like the trip *d* on the cylinder A.

Reference to my aforesaid former patent will show that the transfer of the sheet from the cylinder A to the cylinder A′ takes place so near the horizontal centers of the cylinders that, as a result, the sheet is buckled or doubled between the cylinders in its transfer, which is not desirable. By my present improved mechanism the transfer is made quite far above the horizontal centers of the cylinders, without buckling (and without pulling, which were even more objectionable), and the sheet, while describing a slight downward curve in being led from the cylinder A to the cylinder A′, is thus led over nearly in a straight line or through a nearly horizontal plane, the effect on, or course of, the sheet being practically the same as though it were a stiff piece of pasteboard on the cylinder A, raised by hand therefrom at its leading end and directed to the cylinder A′.

Following is a description of the operation of my improved transfer-mechanism: For the purpose of the explanation, it may be supposed that the cylinders have been started to rotate in the same direction; that a sheet has been fed, by way of the feed-table H, to the cylinder A; that it has been taken by the grippers G; and that the cylinders have completed

one revolution and passed to where the grippers G and G′ and their actuating parts are in the relative positions at which they are illustrated in Fig. 2, and by the full lines in Fig. 3. Then, as the continued rotation of the cylinder A proceeds, the cam E, which rotates only one-half as fast as the cylinder and is, therefore, in a sense overtaken by it, is engaged by the roll *o*, and gradually raises or rocks outward the arms F^2 on their center D whereby the pinions F will engage the rack-quadrants F′, and by thus causing the outer ends of the arms C to advance in the slots *q*, continuously change, or shift, the position of the center D. If, as will be understood, the center D were permanent with relation to the cylinder A, the arms F^2 would merely describe the arc of a circle, and, in raising the leading end of the sheet off the cylinder as the rotation of the latter proceeded, would tend somewhat to buckle the sheet backward. This is prevented by the shifting function of the center D in its forward progress, whereby the sheet is caused to describe toward its leading end a series of parabolic curves, as it were, till the progress of the cylinder shall have brought the grippers G to the position they are shown to occupy by the dotted representation in Fig. 3. Then the tumbler *k* will have been extended out into a position to have passed by or about the left-hand side of the stationary trip *e*, in clearing which, however, the lower right-hand corner of the tumbler will have engaged the trip, with the obvious effect of opening the grippers G against their springs *t* far enough to cause the springs to bear against the gripper-hubs at the opposite sides of the projections *x* thereon from which they are shown as bearing in Fig. 3, whereby the grippers are thrown wide open and are so held till again closed in the manner hereinafter described. While, by the rotation of the cylinder A, the grippers G are being actuated and are reaching the position as described, the rotation of the cylinder A′ is advancing the grippers G′ to meet them, and the rotating cam E′ is turning the shaft *n*′ to point the grippers G′ and their pads l^2 outward. The tumbler *k*′ slides over the stationary trip *e*′, and in clearing the latter it trips the tumbler, suddenly opening the grippers against their springs *t*′ immediately after the grippers G have been opened to release the sheet, whereupon, after the clearance of the trip *e*′ by the tumbler *k*′, the gripper-springs *t*′ snap their grippers back upon the leading freed end of the sheet, under which the pads l^2 of the blocks *l*′ have meantime reached; and the continued rotation of the cylinder A′ carries the sheet around with it, with the same surface uppermost as was uppermost on the preceding cylinder, to the delivery I, where its delivery is effected, if the second cylinder be merely a delivery cylinder, as it may be, though the intention is rather to utilize the cylinder A′ as a second form-cylinder with a delivery, when the trip *d*′ will be withdrawn during the one revolution of the cylinder, a result which may be accomplished by the same mechanism as is employed for the purpose on the cylinder A, and of which the following is a description of the operation: Continued rotation of the cylinder A brings the roller *o* past the projection on the cam-disk upon the circular periphery thereof, thus returning the gripper-mechanism to its normal position; and, toward the end of the revolution of the cylinder, the tumbler *k* engages with the trip *d*, extending into its path, which turns the grippers G back just as they reach the end of the feed H, whereby they are caused to grip the leading end of another sheet. This sheet passes around with the cylinder through one revolution, and is printed, without being disturbed by any action of the gripper-mechanism, till, at the beginning of the next revolution, the roll *o* will be caused to overtake the cam-projection, when the transfer of the sheet will be produced in the manner already described. In the same way that the sheet is carried once around by the cylinder A, the cam-arrangement E′ on the cylinder A′, when the sheet has been transferred, as described, to that cylinder, prevents the gripper-mechanism G′ from being disturbed during one revolution of the cylinder, till the second revolution brings it into engagement with the trip *d*′, then extending into its path, the same as the trip *d* is caused to extend into the path of the gripper-mechanism G in alternate revolutions of the cylinder A.

Any suitable or well-known means may be employed to prevent separation of the sheet from the cylinder-surface by the centrifugal action of the cylinders, such as a guide-roller for the sheet (not shown) located between the cylinders above their horizontal centers, an air-blast, or the like.

From the foregoing, it will be apparent that I have provided on the one cylinder a sheet-transferring gripper-mechanism on a laterally shifting rocking center, and means for actuating the gripper-mechanism in the rotation of the cylinder to transfer the sheet, and, on the other cylinder, rocking gripper-mechanism to co-operate with that on the first-named cylinder in turning toward it, in the rotation of the cylinders, and engaging the leading end of the sheet as it is presented by the gripper-mechanism on the first cylinder and then turning in the opposite direction to complete the transfer upon the second cylinder, with the same side of the sheet down (or up) as was down (or up) on the first cylinder. Thus, as will be seen, at the point where the transfer of the sheet is made by the co-operation of the gripper-mechanism on the two cylinders, the transfer-mechanism, and also the sheet, are practically, or rather relatively, at a stand-still, whereby all strain on and buckling of the sheet are avoided.

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

1. In a printing press having the two rotating cylinders, rotating in the same direction transferring gripper-mechanism on a laterally shifting rocking center on one cylinder, means for actuating the said gripper-mechanism in the rotation of the cylinder, and rocking gripper-mechanism on the other cylinder provided with means for actuating it to turn toward and grip the sheet from the gripper mechanism on the preceding cylinder and then to turn in the opposite direction and complete the transfer, substantially as described.

2. In a printing press having the two rotating cylinders, rotating in the same direction transferring gripper-mechanism on a laterally shifting rocking center on one cylinder, means operating to actuate the said gripper-mechanism in alternate revolutions of the cylinder and in a plane above its horizontal center, and rocking gripper-mechanism on the other cylinder, provided with means for actuating it, co operatively with the gripper-mechanism on the preceding cylinder, to turn toward and grip the sheet from the gripper-mechanism on the said preceding cylinder and then to turn in the opposite direction and complete the transfer, substantially as described.

3. In a printing press having the two rotating cylinders, rotating in the same direction transferring gripper-mechanism on one cylinder, having rocking arms C carrying the shaft D having secured to it the pinion and gripper-carrying arm mechanism, rack-teeth F′ on the cylinder for engaging the pinion to shift the center D, a rotary cam E provided with driving-means for rotating it correspondingly with but independently of and at slower speed than the cylinder, and trips *d* and *e*, and rocking transfer-grippers on the cylinder A′ having a rotary cam E′ provided with driving means for actuating it correspondingly with the said cam E to rock the said transfer-grippers and produce their cooperation with the gripper-mechanism on the cylinder A, and trips *d′* and *e′*, the whole being constructed and arranged to operate substantially as described.

4. In a printing press having the two rotating cylinders A and A′, rotating in the same direction transferring gripper-mechanism on a laterally shifting rocking center on the cylinder A, means operating to actuate the said gripper-mechanism in alternate revolutions of the cylinder, and gripper-mechanism on the cylinder A′, comprising the grippers G′ and their pads journaled to rock on the cylinder, and a rotary cam E′ operating to rock the grippers in alternate revolutions of the cylinder and produce their described co-operation with the gripper-mechanism on the cylinder A, and driving means on the cylinder A′ for rotating the cam correspondingly therewith but at a slower speed, substantially as and for the purpose set forth.

5. In a printing press having the two rotating cylinders A and A′, rotating in the same direction transferring gripper-mechanism on the cylinder A, comprising rocking arms C carrying the shaft D, pinions F on the shaft to engage racks F′ on the cylinder and arms F^2 on the shaft carrying the shafts *n* and *m*, the grippers G and their pads and the tumbler *k*, a stationary trip *e* and a movable trip *d* in the path of the tumbler, and a cam E loosely supported on the cylinder-shaft to engage an arm F^2 and provided with means for driving it correspondingly with the cylinder but at a lower speed, and rocking gripper-mechanism on the cylinder A′, comprising the grippers G′ and their pads on shafts *n′* and *m′* journaled on the cylinder, and a tumbler *k′* on the shaft *m′*, a stationary trip *e′* and a movable trip *d′* in the path of the tumbler and a cam E′ loosely supported on the cylinder-shaft to engage the rocking gripper-support and provided with means for driving it correspondingly with the cylinder but at lower speed, the whole being constructed and arranged to operate substantially as described.

EDWARD A. BLAKE.

In presence of—
J. N. HANSON,
W. N. WILLIAMS.