(No Model.) 2 Sheets—Sheet 1.

# E. A. BLAKE.

## PRINTING PRESS.

No. 487,468. Patented Dec. 6, 1892.

Fig. 1.

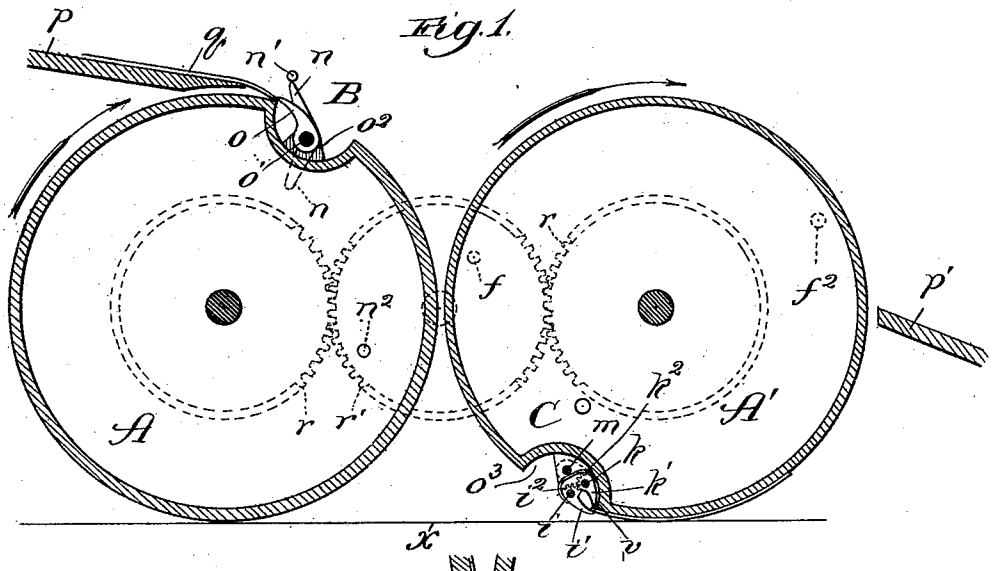



Fig. 2.

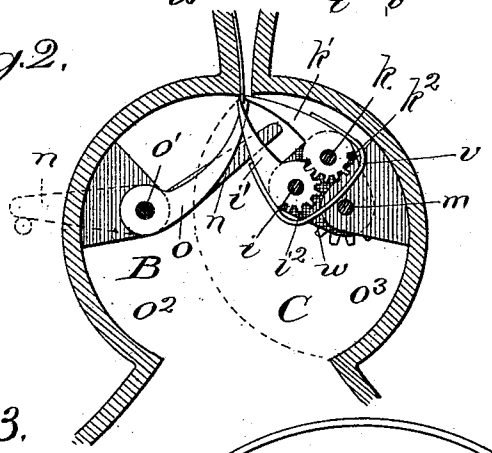
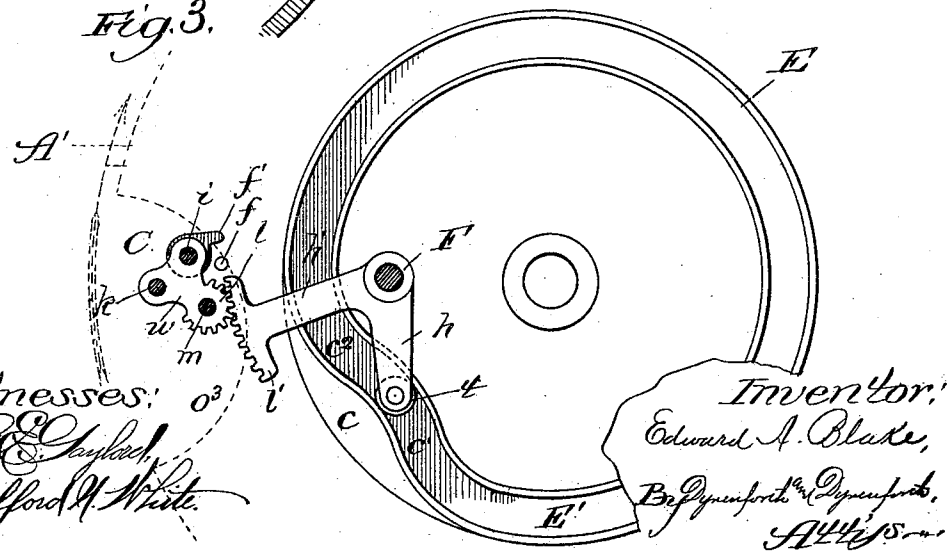



Fig. 3.




Witnesses:
Chas. E. Gaylord
Clifford H. White.

Inventor:
Edward A. Blake,
By Dyrenforth & Dyrenforth.
Att'ys.

(No Model.) 2 Sheets—Sheet 2.

# E. A. BLAKE.

## PRINTING PRESS.

No. 487,468. Patented Dec. 6, 1892.

Fig. 4.

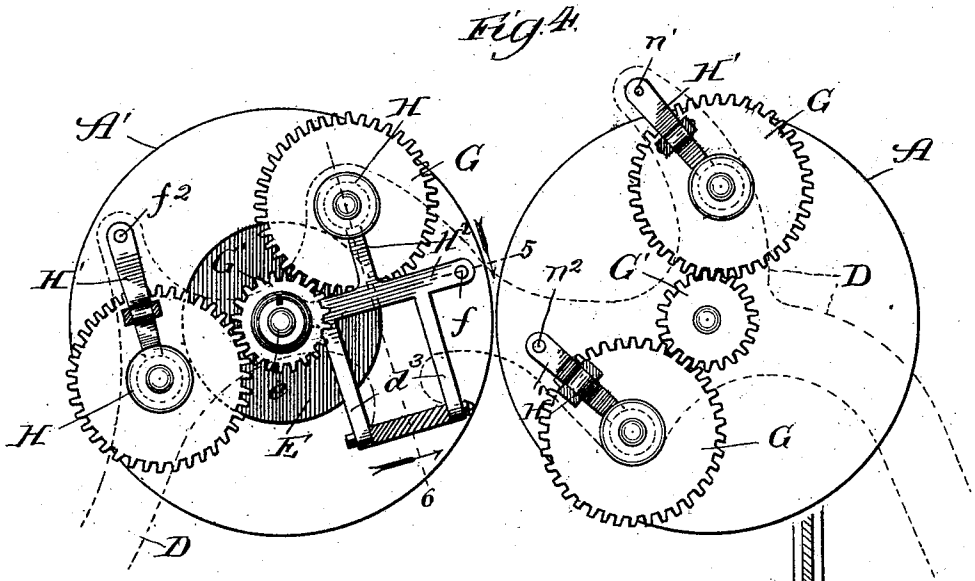
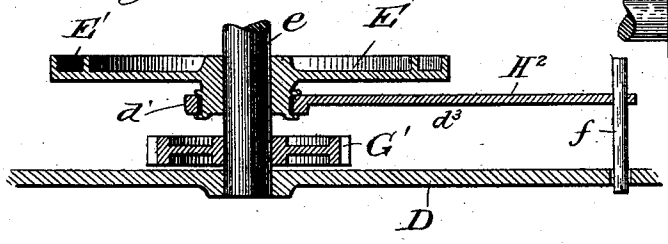



Fig. 5.



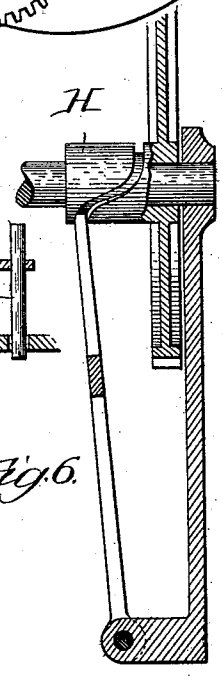




Fig. 6.

Witnesses:
Chas. E. Gaylord
Clifford A. White.

Inventor:
Edward A. Blake,
By Dyrenforth & Dyrenforth,
Attys

# UNITED STATES PATENT OFFICE.

EDWARD A. BLAKE, OF CHICAGO, ILLINOIS.

## PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 487,468, dated December 6, 1892.

Application filed February 20, 1892. Serial No. 422,214. (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 in which the impression-producing portion is essentially a rotary cylinder or more than one cylinder, whether the form-carrying portion be a reciprocating bed or one or more form-cylinders.

The primary object of my invention is to provide for the direct transfer of the printed sheet (thus without any interposed intermediate transfer mechanism) from the initial or the impression cylinder to the next cylinder, or successively to each cylinder in the series, the final one of which, whether composed of two or more, may be, like the others, an impression-cylinder or a delivery-cylinder, the manner of transfer being such as to maintain with each transfer the same side of the sheet undermost or that bearing against the cylinder.

My invention is especially designed for use in any method of printing wherein registering is required of the matter imprinted on the sheet at one cylinder with the form cooperating with the next adjacent cylinder, as in printing in different colors, and it is also designed especially for the direct transfer of a printed sheet from an impression-cylinder to an adjacent cylinder arranged to operate as a delivery-cylinder. However, though the two purposes mentioned are those for accomplishing which my improvement is particularly designed, I do not wish to be understood as intending its use to be limited thereto, but, on the contrary, as protecting it for application to any purpose of immediate transfer of the sheet from one impression-cylinder to the next adjacent cylinder of a printing-press.

As applied to the purpose referred to of registering in color-printing, my invention is more particularly in the nature of an improvement on a form of printing-press known to me, in which a transfer-cylinder is interposed between two impression-cylinders, both rotating in the same direction, and operates to transfer the sheet from one, with the same side down, to the other. Among the objections to the construction of press thus outlined, and which are overcome by my invention, are the liability to defective operation, owing to lost motion and consequent inaccuracy in resistering, and the requirement therein of the extra roller, which not only produces complication of the mechanism of the press, but precludes the desirable compactness which my improvement, enabling an intermediate transfer-roller to be dispensed with, affords by materially reducing the size of the press, and consequently the room taken up by it.

The gist of my invention lies in providing the transfer-cylinder with means for transferring from the impression-cylinder preceding it, and while both cylinders are revolving in the same direction, the sheet, which means turn automatically on their own axes for the transferring operation, first in the direction of rotation of the cylinders till the leading end of the sheet is grasped, after which the transfer mechanism turns on its axis in the direction contrary to that of the rotation of the cylinders to lead the sheet with the same surface undermost against the second or transfer cylinder as was against the first cylinder.

A general statement of the operation of a printing-press provided with my improvement is the following, described more particularly with relation to a color-printing press having two rotary impression-cylinders geared to turn in the same direction and cooperating with a horizontally-reciprocating type-bed: The requirement is that the sheet to be printed shall be carried by the first cylinder to which it is fed, around past the reciprocating bed, which imprints it, to take-off mechanism on the second cylinder adjusted to engage the sheet when released by its holding means on the first cylinder, and then lead it with its initially-forward end foremost and the printed side up in the same direction around with the second cylinder as it was carried by the first past the imprinting-bed to the point of delivery. (As is the case in other printing-presses of the present class, each cylinder obviously is caused to make two revolutions for each imprinting operation, so that

the first shall be fed in each second revolution while the second is delivering.) To accomplish my object of directly transferring the printed sheet from the first to the second cylinder, the transfer mechanism is caused to turn prior to engaging the sheet upon its axis on the transfer-cylinder in the direction of rotation of the latter and of the first impression-cylinder until the sheet has been so engaged, whereupon the transfer mechanism is turned on its axis in the direction of rotation opposite that of the cylinders, thus to lead the sheet upon the second cylinder from the first with the printed surface uppermost.

My improvement is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of that portion of a printing-press constructed in accordance with my invention, the frame being omitted. Fig. 2 is a sectional end view in the nature of a diagram, enlarged over the scale in Fig. 1, and representing the gripper mechanism on the initial cylinder cooperating with the transfer mechanism on the second cylinder. Fig. 3 is a broken end view of a cam device on the end of the second or transfer cylinder for actuating the transfer mechanism thereon. Fig. 4 is a diagrammatic side view of the machine in which the frame is indicated by dotted lines. Figs. 5 and 6 are sections taken, respectively, at the lines 5 and 6 on Fig. 4 and viewed as indicated by the arrows.

In each of Figs. 1 to 3, inclusive, the view is regarded from the same side of the machine, being that at which the cylinders are geared together, while Fig. 4 is the opposite side view of the press.

A and A′ are rotary impression-cylinders adapted to co-operate in a usual manner with a horizontally-reciprocating type-bed, which and the manner of and means for driving it and the cylinders are not shown, being old and well known, the plane of the upper surface of the type-bed being indicated at $x$ in Fig. 1. The cylinders A and A′ should be the same in diameter, and their rotation is the same as to speed and direction, and essentially the latter, by providing each at one end with a gear-wheel $r$, both meshing with an interposed gear-wheel $r'$. As represented, the cylinder A is the initial one or that to which the sheet $q$ or web of material to be imprinted is fed, as upon a table $p$, to holding means B, preferably in the form of a series of ordinary gripping-fingers $o$ on a rock-shaft $o'$, supported to extend in a suitable longitudinal recess $o^2$ in the periphery of the cylinder in bearings at opposite ends thereof, the shaft carrying at one end a trip-finger $n$ to engage a stop $n'$ on the frame in the course of rotation of the cylinder near the point of feed, thereby to close the grippers on the sheet $q$ and to engage another stop $n^2$ at the point of discharge (or delivery) in the said course, there to open the grippers and release the sheet.

The cylinder A′, hereinbefore referred to as a "transfer-cylinder" and which may be a second impression-cylinder, is provided lengthwise across its periphery with a recess $o^3$, like the recess $o^2$ in the cylinder A, in which recess $o^3$ is supported what has hereinbefore been termed "transfer mechanism" C. As illustrated, this transfer mechanism comprises a rock-shaft $m$, supported in bearings at the ends of the cylinder and carrying at each end a double bearing $w$ for rock-shafts $k$ and $i$, the double bearings being alike, except that where the shaft $m$ passes through the one presented in Fig. 3 its circular or peripheral portion is formed into a pinion $l$. At intervals along the shafts $k$ $i$ between their respective bearings they carry co-operating pairs of grippers $k'$ $i'$, the bases of which or hub portions through which the rock-shafts penetrate are formed into intermeshing mutilated pinions $k^2$ $i^2$. Each pair $k'$ $i'$ of the transfer-grippers should be spring-controlled to be normally closed. Accordingly I embrace the members of each pair by a spring $v$, producing the desired tendency. It should be stated that the transfer-grippers $k'$ $i'$ and feed-grippers $o$ do not mutually coincide on the two cylinders, but that the former should alternate with the latter.

From the foregoing it will be understood that turning the rock-shaft $m$ through the medium of the pinion $l$ effects turning with it of both rock-shafts $k$ and $i$; but that the latter may independently of the rock-shaft $m$ be turned in contrary directions by turning one or the other, owing to their intermeshing-pinion connections $k^2$ $i^2$, whereby the members of each pair of grippers $k'$ $i'$ may be separated or "opened" to be subsequently closed by their controlling-spring $v$.

On the side of the frame D, concentric with the adjacent end of the cylinder A′, is a non-rotary cam E, shown as formed of a disk provided upon its inner side with a cam-groove E′, circular throughout the greater portion of its extent, but deflected at $c$ inwardly from its circular course to afford the two inwardly-converging guide-groove portions $c'$ and $c^2$ of the cam-groove.

On the end of the cylinder A′, adjacent to the cam E, is fulcrumed at its angle and eccentrically of the cylinder a bell-crank F, one arm $h$ of which carries a thimble $t$, extending into the cam-groove E′, the other arm $h'$ terminating in a segmental rack $l'$, engaging with the pinion $l$ on the rock-shaft $m$ of the transfer mechanism C.

The operation is as follows: While both cylinders A and A′ are being revolved in the same direction, as indicated by arrows on Fig. 1, the sheet $q$ is fed to the grippers $o$ as they, then open by previous contact of an inner trip-finger $n$ (shown dotted in Fig. 1) with a stop $n^2$, (also shown dotted,) reach the proper position with relation to the table $p$. The sheet is then clamped by the closing of the grippers, owing to the outer finger $n$

striking a stop $n'$ and carried around the mechanisms B and C, passing each other once without being actuated, owing to the provision of preventing mechanism to that end which may be old and well known for the purpose, though it is hereinafter more particularly described. Thus the sheet is carried past the reciprocating bed $x$, which imprints it in the usual manner, whence the continued rotation of the cylinders brings the recesses $o^2$ and $o^3$ again coincident. At this time the inner trip-finger $n$ will be about to be tripped by contact with the stop $n^2$ to open the grippers $o$ and release the sheet $q$. Meantime the thimble $t$ on the bell-crank F will have reached the part $c'$ of the deflected portion $c$ of the cam-groove E', wherein obviously it will be guided in a direction to effect depression of the rack-arm $h'$, thereby by the time the thimble reaches the apex portion of the part $c$ producing such turning of the rock-shaft $m$ as will have extended the pairs of grippers $k'$ $i'$ from the position they are shown to occupy in Fig. 1 to that in which they are shown in Fig. 2. In the last-named position of the grippers $k'$ $i'$ the points of the members $i'$ will extend across those of the gripper-fingers $o$ underneath the leading gripped end of the sheet $q$ on the cylinder A, and just before and when the inner trip-finger $n$ strikes the stop $n^2$, thus releasing the sheet from the gripper mechanism B. A stop $f$ in the path of the trip-finger $f'$ (see Fig. 3) on the shaft $i$ is engaged by the last-named trip-finger, thereby rocking that shaft and the shaft $k$, through the medium of the pinions $k^2$ $i^2$, in opposite directions to open the pairs of grippers against their controlling-springs $v$. Thus the leading end of the sheet enters between the spring-jaws of the grippers of the transfer mechanism and is immediately thereafter clamped between them by the recoil of their controlling-springs after the stop $f$ has been cleared. The continued rotation of the cylinders brings the thimble $t$ on the bell-crank into the part $c^2$ of the deflected portion $c$ of the cam-groove E', causing the rack end of the bell-crank F to turn in the opposite (upward) direction, which effects reversal of the direction of rotation of the rock-shaft $m$, and obviously returns the grippers $k'$ $i'$ to the positions or direction of pointing illustrated in Fig. 1. As will thus be seen, the transfer mechanism C by first turning to point its grippers toward the direction of rotation of the cylinders to take hold of the sheet on the cylinder A would, if continued in so pointing, transfer the sheet to the cylinder A' from the cylinder A by bringing the surface thereof which was uppermost on the latter (the printed side) also uppermost on the former; but the sheet would then lie across the recess $o^3$. The reversal of the gripper mechanism C, however, after it has taken hold of the sheet necessarily also effects the transfer of the sheet to the cylinder A' with the same side (printed) uppermost as was uppermost on the cylinder A, but causes the sheet to lie upon the impression-surface without crossing the recess $o^3$. When by the continued rotation of the cylinder A' the sheet $q$ reaches the point whence it is to be discharged or delivered, the trip-finger $f'$ for the shaft $i$ strikes a stop $f^2$, which opens the gripper pairs $k'$ $i'$ of the transfer mechanism and permits the sheet to shunt, still printed side up, upon a table $p'$, or, if the cylinder A' be a delivery-cylinder, upon traveling tapes or the like. (Not shown.)

As in the printing-press referred to as being particularly improved upon by my present invention, both cylinders may be required to make two revolutions for each feed and discharge of a sheet $q$, though it were possible to adapt my improvement to printing-presses in which one or more sheets could be operated on in each revolution of the cylinders A A'. To effect the feed and discharge of a sheet in each second revolution of the cylinders, the tripping mechanism of the several grippers must operate only with the alternate revolutions of each cylinder. I may accomplish this purpose by the same means employed in the aforesaid old printing-press, and involving cog-wheels G, journaled on studs at the adjacent ends of the two cylinders, each carrying a central cam H, and all on each cylinder meshing with a pinion G' one-half its diameter, whereby it requires two revolutions of a cylinder and a pinion G' to revolve each gear-wheel G and cam H once. At the end of each revolution of a gear-wheel G the cam H it carries engages one end of a hinged finger H' in a manner to turn on the hinge in an outward direction the opposite end of the finger connected with the respective stop, which is supported in its bearing on the frame, to be moved lengthwise out and in, thus out of and into the path of its trip. I utilize the same principle of means for disengaging the thimble $t$ of the bell-crank F from the part $c$ of the cam E each alternate time it reaches and passes the latter. Thus the cam is shown to be supported on the shaft $e$ of the cylinder A' in a manner to be movable back and forth on the latter, though it is stationary in the sense of not revolving therewith. To effect its back-and-forth movement, I provide its hub portion $d$ with a collar $d'$ at one corner of a hinged frame $d^3$, from the opposite corner of which may extend, as shown, an arm $H^2$ to engage an adjacent stop $f'$, while another arm H' may extend from its upper end into engagement with a cam H.

Owing to the fact that the foregoing mechanism for working the stops and cam E in the manner explained presents no novelty in principle, it is not deemed necessary to prolong this description to set it forth more minutely.

I wish to be understood as intending to claim as my invention, broadly, transfer mechanism on one or two correspondingly-rotating cylinders of a printing-press operating to turn

toward the direction of rotation of the cylinder carrying it to engage the sheet held on the other cylinder, and then to turn in the opposite direction and transfer the sheet to the cylinder carrying the transfer mechanism with the same side down (or up) as was down (or up) on the preceding cylinder. I do not, therefore, intend to limit my improvement to mere details of construction or particular combinations of parts, since these may be variously altered without thereby departing from the spirit of my invention. Thus, by way of example, it would be quite feasible to adapt my invention, as hereinbefore suggested, to the purpose of delivering from the impression-cylinder A, the cylinder A′ then being a delivery-cylinder, when of course it would not co-operate with a reciprocating type-bed. Furthermore, the form-carrying medium could be a cylinder or cylinders instead of a reciprocating type-bed. It would also be quite feasible to actuate the transfer mechanism C otherwise than by the particular mechanism shown and described for the purpose, and other means to that end will readily suggest themselves to those skilled in the art to which my invention relates, and the particular construction of grippers for the transfer mechanism is not necessarily the only one that would serve my purpose. The plan also suggests itself to me of increasing the number of cylinders A A′ as for the purpose of augmenting accordingly the number of colors in which to print.

It may be suggested that should the centrifugal action of the cylinders, particularly during the transfer from one cylinder to the other of the sheet, tend to blow the latter away from the cylinder-surface, means—such as an air-blast—may be provided for holding it down.

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

1. In a printing-press having the two correspondingly-rotated cylinders and means for holding and releasing the sheet on one cylinder, transfer mechanism on the other cylinder operating immediately therefrom to engage the sheet on the preceding cylinder in the rotation of the cylinders and transfer it to the said other cylinder with the same surface uppermost thereon as was uppermost on the said preceding cylinder, substantially as described.

2. In a printing-press having the two correspondingly-rotating cylinders and means for holding and releasing the sheet on one cylinder, rocking transfer mechanism on the other cylinder, and means, substantially as described, operating in the rotation of the cylinders to turn said transfer mechanism toward the direction of rotation of the cylinder carrying it directly to engage the sheet on the preceding cylinder and then to turn it in the opposite direction and transfer the sheet immediately to the cylinder carrying said transfer mechanism with the same surface uppermost as was uppermost on the preceding cylinder, substantially as described.

3. In a printing-press having correspondingly-rotating cylinders A and A′ and gripping means for the sheet on the cylinder A, transfer mechanism on the cylinder A′, comprising a rock-shaft carrying grippers and actuating means therefor, a reciprocable cam, and means, substantially as described, for engaging the cam with the rock-shaft in the alternate revolutions of the cylinders to turn the rock-shaft and actuate the grippers thereon to engage directly a sheet on the cylinder A and then reverse and transfer the sheet immediately with its printed side uppermost to the cylinder A′, substantially as described.

4. In a printing-press having correspondingly-rotating cylinders A and A′ and gripping means for the sheet on the cylinder A, a cam E at one end of the cylinder A′, and a bell-crank F thereon to engage at one arm the cam and having a rack on the other arm, and transfer mechanism on the cylinder A′, comprising a rock-shaft *m*, carrying gripping means and provided with a pinion *l* to be engaged by the said rack, the whole being constructed and arranged to operate substantially as described.

5. In a printing-press having correspondingly-rotating cylinders A and A′ and gripping means B for the sheet on the cylinder A, a cam E at one end of the cylinder A and a bell-crank F thereon to engage at one arm the cam and having a rack on the other arm, and transfer mechanism on the cylinder A′, comprising a rock-shaft *m*, carrying bearings supporting rock-shafts *k* and *i*, carrying spring-controlled gripping-fingers *k′* and *i′*, geared together to co-operate in pairs, and a pinion *l* on the rock-shaft *m* to be engaged by the said rack, the whole being constructed and arranged to operate substantially as described.

EDWARD A. BLAKE.

In presence of—
M. J. FROST,
BRUCE S. ELLIOTT.