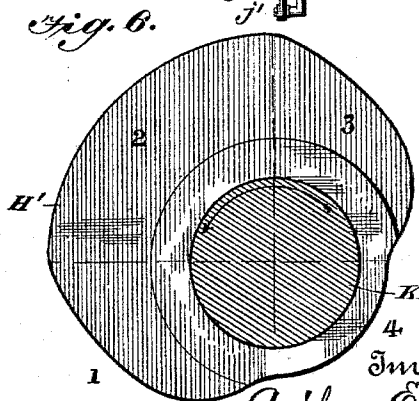
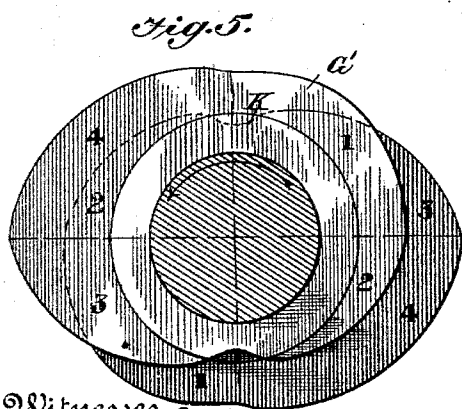
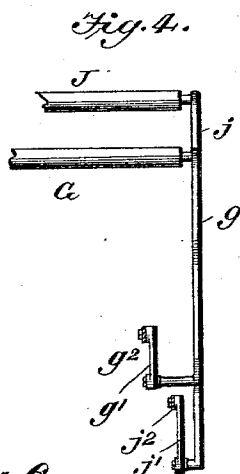
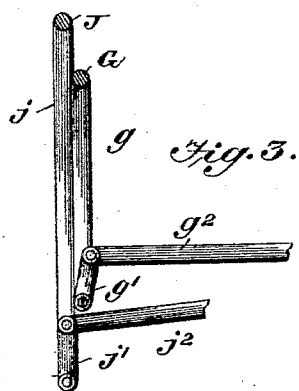
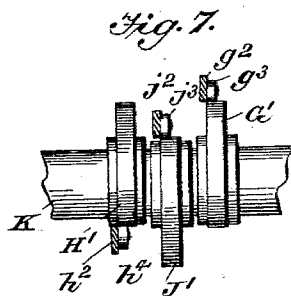
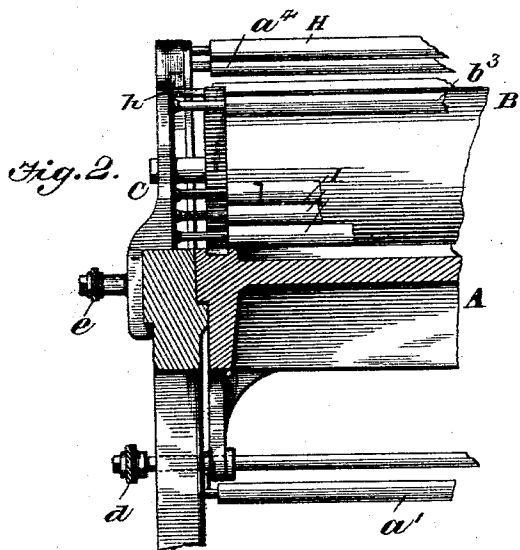




UNITED STATES PATENT OFFICE.

ARTHUR E. DOWELL, OF WASHINGTON, DISTRICT OF COLUMBIA.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 562,714, dated June 23, 1896.

Application filed April 29, 1895. Serial No. 547,531. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR E. DOWELL, of Washington, District of Columbia, have invented certain new and useful Improvements in Printing-Presses; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention is an improved printing-press embodying reciprocating beds and oppositely-reciprocating cylinders; and its object is to enable a perfected impression (such as a newspaper) to be produced at each stroke of the beds and cylinders, both forward and backward, and in this respect the invention is an improvement upon the press shown in my application for patent, Serial No. 545,081, filed April 9, 1895. In other words, my present invention is designed to double the capacity of said press by utilizing both strokes of the printing devices and doing away with the throw-off mechanism. In order to perfect the web by such a press, the web must be fed in unison with the movements of the beds during the printing operation, requiring either an irregular feed and delivery of the web, or some compensating devices for controlling the web intermediate the printing mechanisms and the feed and delivery, such as shown herein, and in addition, where the beds move together, (in same direction,) an intermediate web-compensating mechanism must be employed to take care of the web which at every other stroke of the press is accumulated between the printing mechanisms. Where the beds move oppositely this intermediate web-compensating mechanism will not be needed, and the other compensating devices can be operated in unison. This latter form of press forms the subject-matter of another application, and I consider it subsidiary to the present invention.

This invention therefore consists in the combinations and constructions of parts set forth in the claims, and the simplest form of press now known to me is constructed as follows:

Referring to the drawings, Figure 1 is a longitudinal vertical central section through the press. Fig. 2 is a detail vertical trans-

verse section through one side of press. Fig. 3 is a detail view of the end web looping or compensating devices. Fig. 4 is a detail side view thereof. Figs. 5 and 6 are detail views approximately illustrating the contour of the looping-roller-actuating cams. Fig. 7 is a detail edge view showing the arrangement of the cams on their shaft.

The type-beds A A' are rigidly connected together and move as one, being suitably mounted on and between the side frames of the press. The cylinders B B', respectively coöperating with said beds, are journaled in a carriage C, slidably mounted on the side frames. The beds are reciprocated by pitmen *d*, connected to crank-wheels D, and the cylinder-carriage is reciprocated simultaneously with, but contrary to, the beds by pitmen *e*, connected to crank-wheels E. The crank-wheels D E, or their shafts, are geared together so as to rotate simultaneously, as indicated in the drawings.

At each side of each cylinder are form-inking rollers I, which receive ink from fountains I', mounted on the main frame at each end of the stroke of each cylinder.

The web *w* is led in from a roll W at one end of the press through feed-rolls F, thence up over a looping-roller G, (mounted on vertically-reciprocating bars *g*,) down under a guide-roller *a*, forward under bed A to a guide-roller *a'*, then up between the beds to and over a guide-roller *a''*, then over a guide-roller *b*, at the inner side of cylinder B', down under said cylinder, up over a roller *b'*, at the outer side thereof, thence to and over a guide-roller *a'''*, back to and under a guide-roller *a''''*, up over a looping-roller H, (mounted on vertically-reciprocating bars *h*,) down under a roller *a'''''*, beside roller *a''''''*, then over a roller *b''*, at the inner side of cylinder B, under said cylinder, up over a guide-roller *b'''*, back to a guide *a''''''*, down under a looping-roller J, (mounted on reciprocating bars *j*,) and up to the delivery-rolls *f*, as shown in Fig. 1. Rollers *a*, *a'*, *a''*, *a'''*, *a''''*, and *a''''''* are mounted directly or indirectly on the main frame in stationary bearings, (except that roller *a'''* is preferably made adjustable for use as a registering-roll,) and rollers *b*, *b'*, *b''*, and *b'''* are mounted on and reciprocate with the carriage C.

The bars *g*, carrying rollers G, are connected

by links g' with the free ends of levers g^2 , pivoted at their other ends and lying athwart a shaft K, and having friction-rollers g^3 , engaging cams G' on said shaft. Bars j, carrying roller J, are likewise connected by links j' with the free ends of levers j^2 , pivoted at their other ends and lying athwart shaft K, and having friction-rollers j^3 , engaging cams J' on shaft K. The levers $g^2 j^2$ may be pivoted on studs k on the sides of the main frame, and for convenience the bars g, j may lie side by side and be guided through the same loops.

The cams G' J' are substantially identical in shape, but set on the shaft a half-turn or one hundred and eighty degrees apart. This fact would enable both levers $g^2 j^2$ to be worked off one cam by having one pass below the shaft; but I believe it desirable to use separate cams for each.

The bars h , carrying roller H, are connected by links h' to the ends of levers h^2 , which are suitably fulcrumed on the main frame at h^3 , and their rear ends are provided with friction-rollers h^4 , engaging cams H' on shaft K.

Springs g^4, j^4 , and h^4 may be arranged to prevent the levers jumping on the cams and to hold them steadily in contact therewith. Obviously, to a mechanic, the bars j, g , and h might be worked directly by the cams, but by using the levers the motion is amplified and size of cams reduced.

Shaft K is geared to the shaft D' of crank-wheel D, so as to revolve synchronously therewith, and the feed-rolls F are intergeared and driven by gearing from the shaft of either crank-wheel, and the delivering-rolls ff are intergeared and driven by suitable gearing from one of the crank-wheel shafts or from the feed-rolls, so as to revolve synchronously therewith.

Operation: For brevity and clearness I will describe, substantially, the relative operations of the parts in printing eighteen-inch impressions on sheets twenty (20) inches long. In this case the rolls F and f would be so geared that they would respectively feed in and feed out forty (40) inches of web for each revolution of the crank-wheels or complete reciprocation of beds, that is, enough for two sheets, or two impressions and margins. As the beds and cylinders both reciprocate, it will be remembered that their strokes will be considerably shortened, for to make a twenty-inch impression the bed can move ten inches one way, the cylinder move ten inches the other way, and thus the complete twenty inches of impression produced, with a short stroke of the working parts. In practice the cylinders may be given a slightly-greater travel than the beds to facilitate the inking.

For further simplification of description I will assume that the crank-wheels are of such size that one-quarter of a revolution is sufficient to move the beds and cylinders the length of impression. Thus during the first quarter of a revolution of the crank-wheels the beds and cylinders move in one direction and the

printing takes place, ten inches of web being fed in and delivered from the press during such operation by the rolls F f . During the second quarter of a revolution, while the beds and cylinders are reversing, no printing takes place; but ten inches of web is fed in and out by rolls F f . During the third quarter of a revolution, during the return strokes of the beds and cylinders, another impression is made, and ten inches of web fed in and out by the rolls F f , and during the last quarter of a revolution while the beds and cylinders are reversing no printing takes place, but ten inches of web is fed in and out. The parts being in the position shown in Fig. 1, the beds ready to make their forward stroke, and the cylinders the back stroke, the machine is started. At the moment of starting roller G stands about midway of its travel and rollers J and H at the lowest points of their travels. During the forward stroke of the beds, as indicated by arrows in Fig. 1, the bed A' requires that ten inches of web be moved with it toward roll a^3 , and this ten inches of web is fed in by rolls F; but as the movement of bed A' is irregular as compared with the feed of the rolls F the first quarter of cam G' is so formed that roller G is caused to compensate for the varying feed of bed A', and the web is fed properly and regularly thereto. Bed A', during this stroke, therefore feeds in ten inches of web to roller H, which is taken up by the ascent of said roller. During this same stroke of bed A' bed A requires that ten inches of web be fed back with it, and rolls f demand ten inches of web for the folder. This is supplied by the loop of web around roller J, which roller is raised ten inches by its cam at such speed as to supply the demands of rolls f and bed A. Bed A therefore during this stroke also feeds in ten inches of web to roller H, which makes twenty inches of web that must be taken up by said roller, and cam H' is so shaped that during the forward stroke of the beds it does take up all the web fed in by both beds A A'.

When the impressions on the forward stroke are completed, and while the beds and cylinders are reversing, roller G is lowered five inches, roller H remains still, and roller J is dropped five inches. Therefore the loopers shift ten inches of web in addition to the ten inches fed in and out by rolls F f , so that twenty inches of web passes through the press between rollers $a a^6$ during this interval, and the web is brought into proper position to be printed on the return strokes of beds and cylinders. Upon such stroke bed A' pulls back ten inches of web from roller H, and bed A pulls forward ten inches of web from said roller, so during this return stroke roller H is lowered ten inches according to the demands of the beds. Roller G, however, has to rise ten inches in order to take up the web fed in by rolls F, and to draw back the web slacked off roll H, while roller J simply dances to compensate the irregular feed of web by bed A

to rolls *f*. Upon the completion of the return impressions and while the beds and cylinders are reversing, roller *G* drops five inches, roller *J* drops five inches, and rollers *H* stand still. Thus rollers *G* *J* and rolls *F* *f* cause twenty inches more of web to pass through the press from roller *a* to *a'*.

The cams *G'* and *J'* (shown in Fig. 5) approximate the correct shape where the impression is effected during a quarter-revolution of the crank-wheels. They are indicated as divided into four segments 1 2 3 4, and rotated in the direction of the arrow. At the start of the press (on the forward stroke of the beds) roller *g*³ would traverse the first quarter of the cam, while roller *j*³ would traverse the third quarter while the impression was being taken. Between the end of the forward impression and beginning of the back impression roller *g*³ would traverse the second quarter and roller *j*³ the fourth quarter. During the return stroke impression-roller *g*³ would traverse the third quarter, and roller *j*³ the fourth quarter, and between the end of the return impression and beginning of the next forward impression roller *g*³ would traverse the fourth quarter, and roller *j*³ the second quarter.

From the foregoing a press-builder and draftsman can readily calculate the relative movement of the parts according to the number of degrees rotated through during an impression.

As shown in Fig. 6, the cam *H'* is also quartered, and roller *h'*⁴ successively traverses quarters 1 2 3 4 during a complete reciprocation of the beds and cylinders, as above described. I do not show these cams as accurate, but as approximating the correct shape of cams for a press feeding in the quantities and times above suggested.

It may be found in practice unnecessary to employ positive means for reciprocating the intermediate looping-roller *H*, and that it can lie idly in a loop of the web and be actuated by the web in one direction and by gravity in the other. While I consider the arrangement of beds and cylinders herein preferable, I do not think my invention restricted thereto, neither to the particular construction of web manipulating or compensating devices herein described. The web-looping system is also applicable to presses wherein only the beds reciprocate.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. In a printing-press, the combination of a pair of reciprocating beds, and cylinders cooperating with said beds; and web feeding and delivery mechanism; with a web-compensating device between the feed and first printing mechanism, a second web-compensating device separate from but between and independent of the printing mechanisms, and a third web-compensating device between the

second printing mechanism and the delivery and means for operating the compensating devices, substantially as and for the purpose specified.

2. In a printing-press the combination of a pair of reciprocating beds, and reciprocating cylinders cooperating with said beds; and mechanism for continuously feeding a web to and from the press; with a web-looping roller between the feed and first bed and cylinder, a web-looping roller between but entirely independent of the pairs of beds and cylinders, and a web-looping roller between the delivery and second bed and cylinder and means for operating said looping-roller independently of the beds and cylinders, whereby impressions are made on the web during the forward and backward strokes of both beds and cylinders, all substantially as and for the purpose described.

3. In a printing-press the combination of a pair of connected similarly-reciprocating beds, a pair of connected reciprocating cylinders, cooperating with said beds and reciprocating oppositely thereto; a continuous web-feed, and continuous web-delivery; with a looping-roller between the feed and printing mechanisms; a looping-roller intermediate the two printing mechanisms but independent thereof; and a third looping-roller intermediate the printing mechanisms and the delivery; and means for positively actuating all said looping-rollers, substantially as and for the purpose specified.

4. In a printing-press the combination of a pair of connected similarly-reciprocating beds, a pair of connected reciprocating cylinders, cooperating with said beds and reciprocating oppositely thereto; a continuous web-feed, and continuous web-delivery; with a looping-roller between the feed and printing mechanisms; a looping-roller intermediate the two printing mechanisms; and a third looping-roller intermediate the printing mechanisms and the delivery, with a cam-shaft carrying cams, and the independent levers operated by said cams, and respectively connected to and operating the said looping-rollers, for the purpose and substantially as described.

5. The combination of a pair of reciprocating beds arranged end to end in substantially the same plane, and mounted between the main frames; a reciprocating carriage; the cylinders mounted on said carriage and respectively adapted to coact with one of the beds; a pair of ink-fountains mounted on the main frame above the beds and between the cylinders; and inking-rollers at the inner side of each impression-cylinder adapted to receive ink from said fountains substantially as described.

6. The combination of a pair of reciprocating beds arranged end to end in substantially the same plane, and a reciprocating carriage; the cylinders mounted on said carriage and

respectively adapted to coact with one of the
beds; a pair of ink-fountains mounted on the
main frame between the cylinders; and ink-
ing-rollers at the inner side of each impres-
5 sion-cylinder, adapted to receive ink from
said fountains; with means for leading a web
of paper first between one cylinder and bed
and then between the other cylinder and bed;
and means for feeding the web through the

press during and after impressions, substan-
tially as specified.

In testimony that I claim the foregoing as
my own I affix my signature in presence of
two witnesses.

ARTHUR E. DOWELL.

Witnesses:

T. H. ALEXANDER,

JAMES R. MANSFIELD.