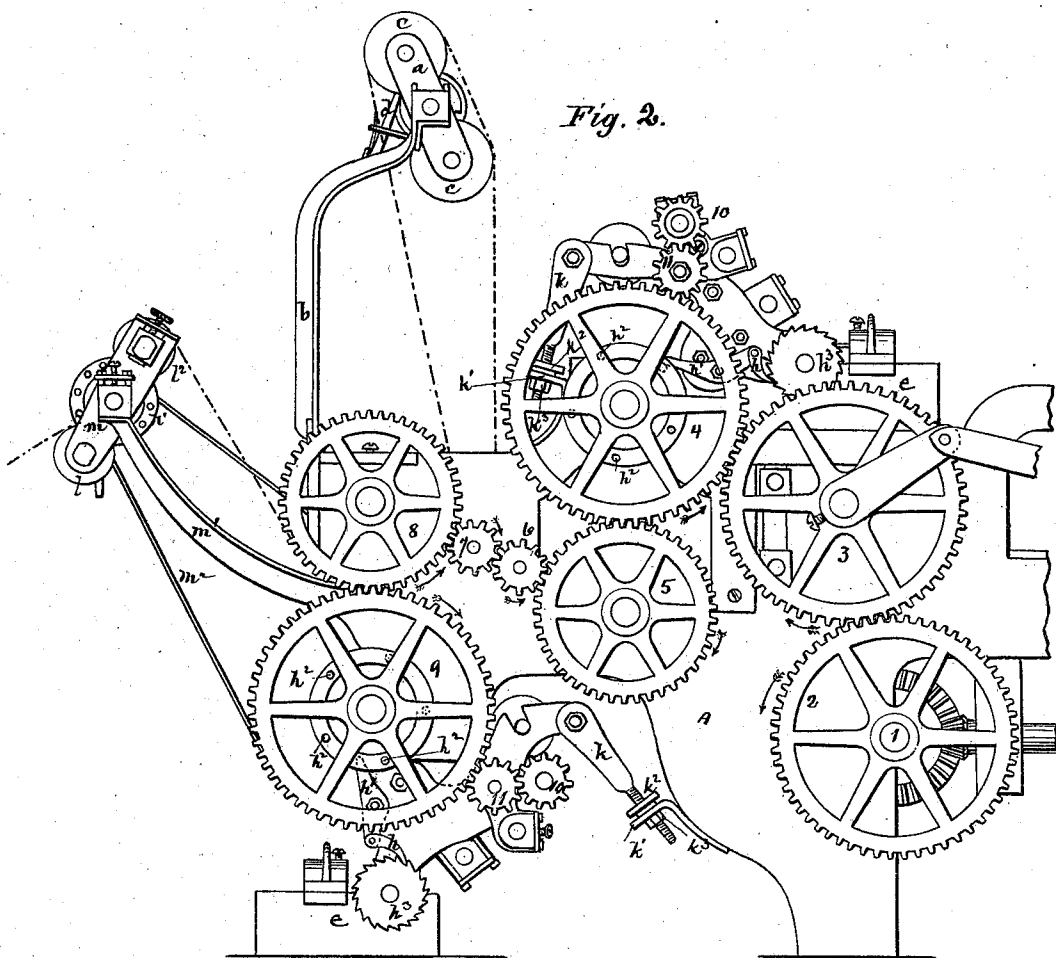
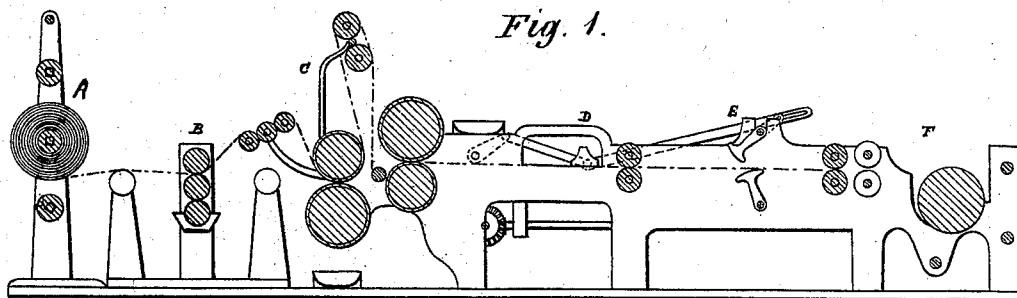


T. J. MAYALL.
Printing-Presses.

No. 150,593.

Patented May 5, 1874.



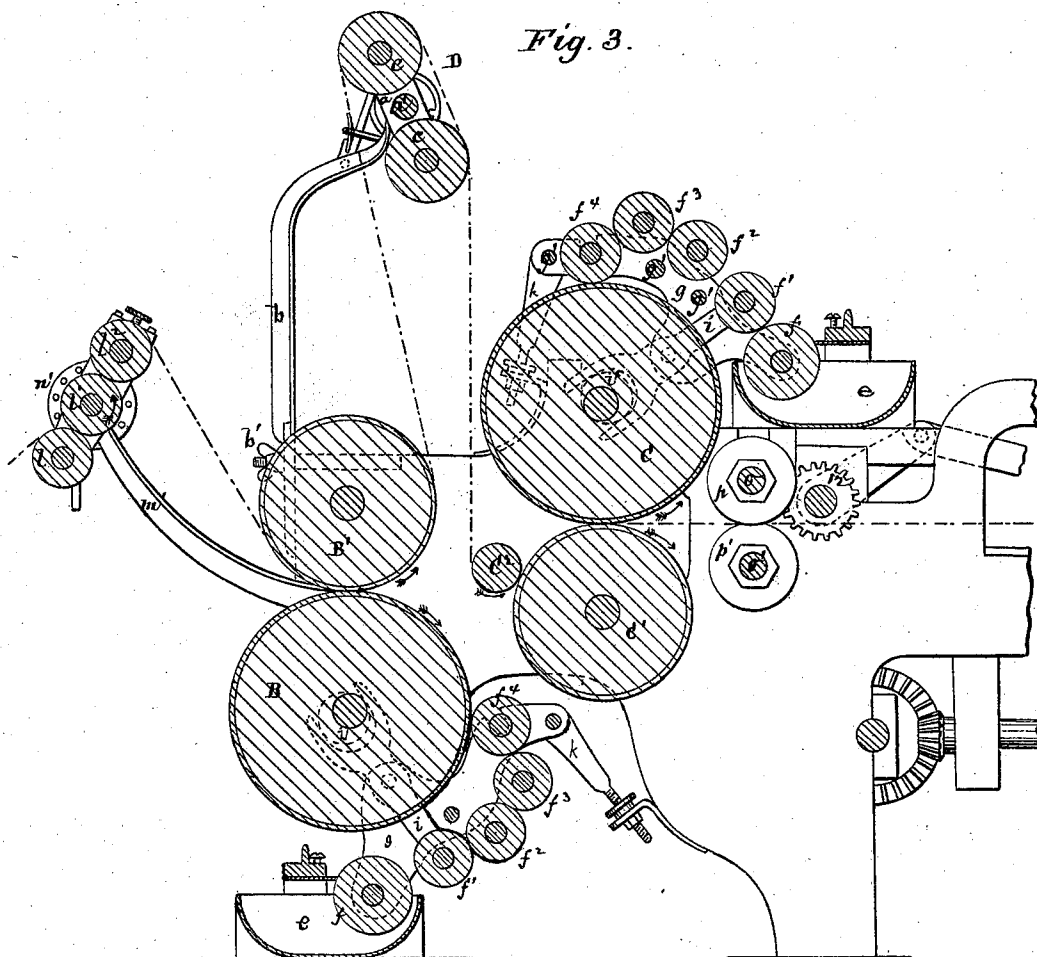
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Printing-Presses.

No. 150,593.

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Fig. 4.

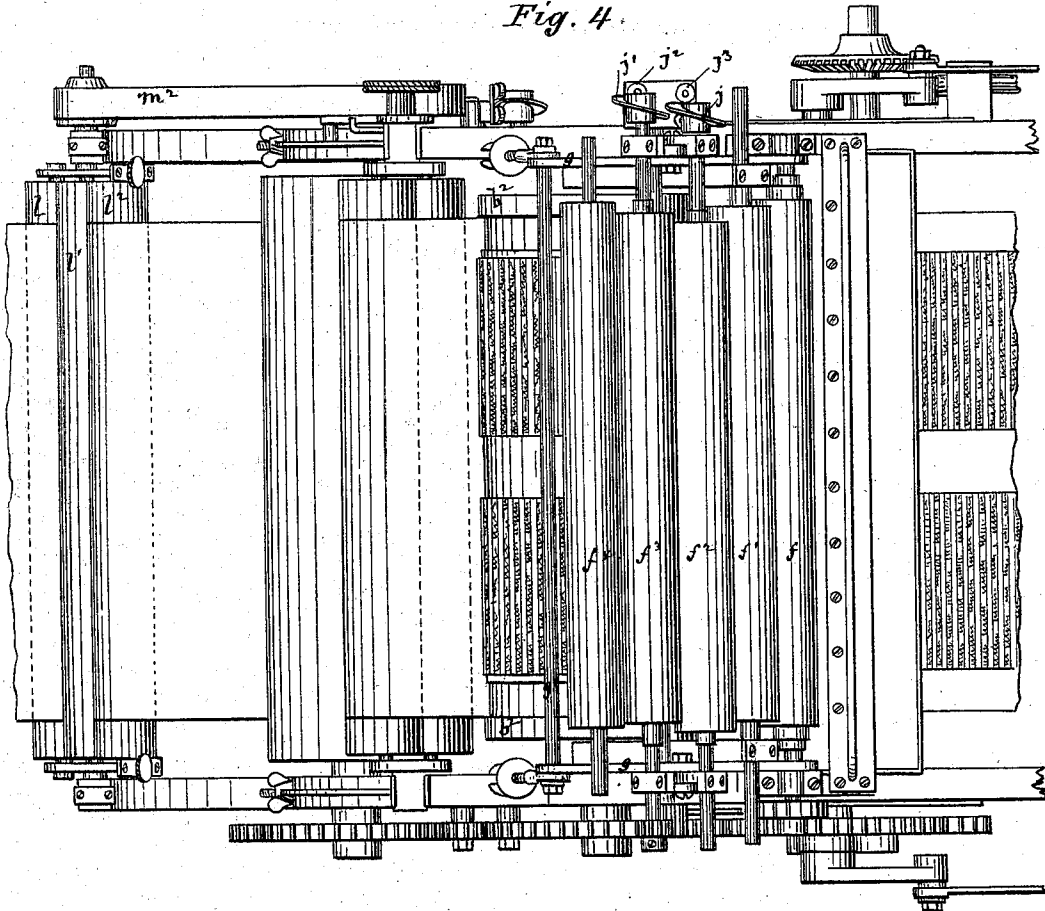


Fig. 5.

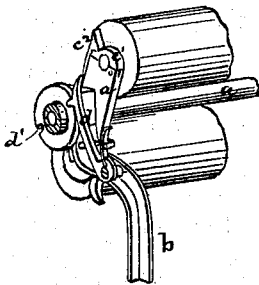
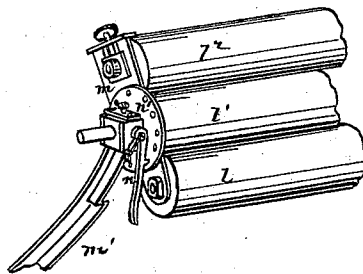


Fig. 6.



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UNITED STATES PATENT OFFICE.

THOMAS J. MAYALL, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN PRINTING-PRESSES.

Specification forming part of Letters Patent No. **150,593**, dated May 5, 1874; application filed July 20, 1873.

CASE B.

To all whom it may concern:

Be it known that I, THOMAS J. MAYALL, of Boston, Suffolk county, Massachusetts, have invented certain new and useful Improvements in Printing-Presses, of which the following is a specification:

This invention relates to that portion of a printing-press consisting of the printing apparatus proper. My improvements have been designed with special reference to their use in what is known as a "perfecting-press;" but in some respects they are applicable to cylinder-presses generally, whether double or single. The invention consists, first, in combining with the printing-cylinder or cylinders a combined tension-feeding and smoothing device, which regulates the delivery of the paper to the printing-cylinder, feeding it forward as fast as required, ironing and smoothing it out, and at the same time, if necessary, tightening the paper and taking up any slack due to stretching of the dampened material. Second, in combining with the two printing-cylinders and their pressure or blanket rolls a "set-off," interposed between the two sets of printing-cylinders and pressure-rolls, and adjustable at a greater or less height above them. The paper from the first cylinder passes up over this set-off, and thence down to the second cylinder, and by adjusting the set-off to the proper height the paper is spaced so that the second impression will be made exactly opposite to the first. Third, in combining the two sets of printing-cylinders, and blanket or pressure rolls and the inking apparatus, in the manner hereinafter shown and described.

The above are the more prominent features of my improvements. Other features will be developed in the course of the following description of the manner in which my invention is or may be carried into effect, which I shall now proceed to give by reference to the accompanying drawings.

Figure 1 is a diagram, partly in section and partly in elevation, indicating the position which the above-named printing devices occupy in a perfecting-press, for which, as before stated, they have been specially designed. The several portions of this press have been made by me the subject of separate applica-

tions for Letters Patent of even date herewith, and I need, therefore, say nothing further here concerning the general structure of the press than to state that A is the paper-rack for containing the roll or rolls of paper. B is the dampening apparatus; C, the printing devices hereinafter described; D, the perforator for perforating the paper in lines indicating the dividing-lines of the sheets; E, the nippers for tearing the paper into sheets following these lines of division; and F the delivery.

Fig. 2 is a side elevation of that portion of the press to which the herein-described improvements relate. Fig. 3 is a longitudinal vertical central section, and Fig. 4 is a plan of the same. Figs. 5 and 6 are views of detached parts hereinafter referred to.

The same letters of reference are employed in designating similar parts in Figs. 2, 3, 4, 5, and 6.

The various portions of the apparatus are supported in a frame, A, of suitable design and structure. The first printing-cylinder, B, is supported in boxes in the lower front part of the frame, and in such position that one-half, or somewhat more than one-half, of its periphery is accessible at all times, as seen in Fig. 3. Immediately above this printing-cylinder is located the pressure or blanket roll B', which runs in contact with the stereotype-plate or plates on the printing-cylinder. This roll may be covered with any suitable material, but I prefer for many reasons to coat it with vulcanized india-rubber, which is laid on the roll in the green or uncured state, and is there vulcanized, the surface of this vulcanized rubber blanket or sheet being afterward ground or turned perfectly smooth and true. In this way a most excellent surface is obtained for the pressure-rolls, inasmuch as it is durable, accurate, and admirably adapted in every way for the purpose for which it is designed. In rear of these two rolls is placed the second pressure or blanket roll, C', which is beneath instead of above its printing-cylinder, its axis being slightly below the level of the point of contact of the cylinder B and roll B'. The second printing-cylinder, C, is placed immediately above and in contact with its pressure or blanket roll C'. By this arrangement of

the rear or second printing-cylinder and its pressure-roll, the cylinder is brought above the first roll, *B'*, in such manner as to render at least one-half of its periphery accessible, so that, although the two sets of rolls and cylinders are set very near together, compactly and in comparatively small space, yet, owing to their relative arrangement, the cylinders are always sufficiently exposed to permit access to be had to them to readily take off and put on the stereotype-plates without necessitating either the removal of the cylinders or any other part of the press, or the disturbing or breaking of the paper.

At a point above and a little in front of the space intervening between the two sets of rolls and cylinders, I locate a set-off, *D*, over which the paper from the first cylinder passes before it reaches the second. This device is placed at such a point and such a distance above the two cylinders that the paper printed on one side by the first cylinder will reach the second cylinder at the proper time to cause the impression of the latter cylinder to be made on the other side of the paper directly opposite to the first impression. A convenient arrangement for this purpose is represented, the set-off being, by the path traveled by the paper, equidistant from the point where the paper leaves the first cylinder and the point where it reaches or comes in contact with the second cylinder; and each of these two equal portions of the path thus traveled by the paper, in length, is equal to one printed sheet, with allowance for margin, &c.; or it might be two sheets, three sheets, or more, in order to give the ink, on the first impression, time to set and partly dry, before carrying this impression between the second pressure-roll and its cylinder. The reason for thus regulating the distance of the set-off by lengths of sheet is, of course, that the impression from the second cylinder may be made on the reverse side of that part of the paper upon which the first impression was printed by the first cylinder. The set-off is made vertically adjustable, in order to accurately regulate and adjust it.

I prefer to construct it, and to effect its adjustment, as follows: The set-off is composed of a transverse frame, *a*, journaled in standards *b* attached to the main frame. This frame is capable of being revolved on its journal *a*¹ for the purposes hereinafter described. In the frame *a* are hung two rollers, *c c*, preferably of vulcanized india-rubber, each roller being supported in bearings in the frame, the bearings at one end being closed by hinged caps *c*¹, held down by spring-catches *c*². The drawing back of either of these spring-catches allows the cap with which that catch is combined to be lifted from the journal of the roller located in the bearing, and thus either of the rollers can be removed at any time. Either roller, at pleasure, is brought uppermost by rotating the frame *a* until that roller is on top, at which time a spring-catch, *d*, will drop into

a notch, *d*¹, on a disk encircling the one of the hubs or journals of the frame, as seen in Fig. 5.

The object of using two rollers, and of making them reversible and removable, is to permit the removal of either one, at any time, without interfering with the working of the apparatus. The removal of the rollers is necessary, inasmuch as the printed side of the paper runs in contact with them, and they consequently soon become soiled when in use, and require to be quite often cleaned.

The operation of removing the roll can be readily performed, as will be seen by reference to Fig. 2. Suppose the machine to be in motion, and the upper roller *c* requires cleaning, the attendant draws back catch *d*, and rotates the frame *a* to bring the lower roller on top; the soiled roller is now below, and inoperative, and it is at once removed by drawing back the spring-catch *c*², letting fall cap *c*¹, and taking out the journal of the rubber from the bearing thus uncovered.

The standards *b* are slotted at their lower ends, and are secured in place by set-screws *b*¹ passing through these slots into the frame, as indicated in Fig. 3. By this arrangement the standards can be adjusted up or down, at pleasure.

The path of the paper is indicated clearly in Fig. 3. After leaving the first cylinder it passes up over the set-off, thence down under a roller, *C*², designed to bind and hold the paper to the pressure-roll *C*¹, and thence between the latter roll and its type-cylinder.

In order that the pressure-rolls may not press unduly upon their cylinders, I provide each cylinder near each end with a band, *b*², (see Fig. 4,) of vulcanized india rubber, of the thickness of the stereotype-plate on the cylinder. The pressure-roll runs in contact with these end bands, and thus is prevented from pressing too hard against the type. The movements of the cylinders and rolls are in the direction of the several arrows in Figs. 2 and 3.

Motion is imparted and transmitted to the various parts from driving-shaft 1, through gears 2 3 4 5 6 7 8 9. Gears 4 and 9 are on the shafts of the type-cylinders, gears 5 and 8 on the axes of the pressure-rolls, and pinion 6 on the axis of the binding-roller *C*²; the other gears are merely wheels of transmission.

The pressure-rolls are but half the diameter of their printing-cylinders, this being to economize space, and to give increased facility for access to the type-cylinders. The driving-gears of these parts, as well as the gear of roller *C*², are, of course, of such size and so proportioned that they all have same peripheral speed, so that there shall be no dragging of one surface upon another.

The inking-rolls for each cylinder are represented at *f f*¹ *f*² *f*³ *f*⁴. The two groups of rolls are the same in construction and mode of operation. The fountain-roll *f* is supported in boxes on top of the main frame, and runs in the ink fount or tank *e* in the usual way. Upon the shaft of this roll are mounted arms

or brackets g , one at each end of the shaft, capable of vibrating upon the shaft as an axis, and connected by cross rods or ties g^1 , so as to constitute a frame in which all the remaining inking-rolls have their bearings, as shown. The fountain-roll gets its intermittent rotary movement from a pawl, h , hung on a lever, h^1 , which is intermittently vibrated by pins h^2 on the rotating gear 4, which strike and raise the rear end of the lever, and thus force downward the pawl at the other end. The latter engages a ratchet, h^3 , on the fountain-roll shaft, which thus derives through these instrumentalities, an intermittent rotary movement. The ink taken up by the fountain-roll is delivered to the second roll, f^1 , which is hung or has its bearings in lever-arms i , one on each side of the machine, pivoted to the inking-roll frame, and having their lower arms or ends forked to straddle cams i^1 on the shaft of the second type-cylinder, as indicated by dotted lines in Fig. 3. By this means the roll f^1 has a vibratory movement, and is brought alternately in contact with roll f and roll f^2 , taking the ink from the former and delivering it to the latter. Roll f^2 runs in contact with roll f^3 , and each of these rolls has a longitudinal reciprocating movement on the other, which is induced by an inclined flange, j j^1 , on the roll-shaft running between a pair of friction-rollers, j^2 j^3 , on the machine-frame. The object of this rubbing movement of the one on the other, while they at the same time revolve together, is to evenly spread the ink, so that it may be in proper condition to be taken by the delivery-roll f^4 , which alone, of all the inking-rolls, runs in contact with the printing-cylinder. Power is applied to either of the rolls f^2 f^3 . In the present instance, roll f^3 of the upper group is provided with a pinion, 10, meshing into an intermediate pinion, 11, which engages wheel 4. Roll f^3 of the lower group is actuated in a similar way from wheel 9. Each inking-roll frame is supported by hinged arms k , one at each end of the frame, the outer or free ends of which pass through slotted supports k^1 fixed to the main frame. The free end of each arm is screw-threaded, and provided with clamping-nuts k^2 k^3 , between which the support k^1 is taken hold of. By means of these arms, nuts, and supports, the inking-frames can be adjusted to any required position with respect to the printing-cylinders, and by loosening the hold of the nuts on the supports the hinged arms can be removed from the latter, and the frames can be swung back so as to remove the rolls entirely away from the type-cylinders, and either set of rolls can be entirely removed by lifting out from its bearings the fountain-roll, on the axis of which, as before said, the inking-roll frames are hung. The inking-rolls and their frames, which belong to the second type-cylinder, are arranged above and somewhat to the rear of said cylinder. The inking-rolls and frame of the first cylinder are arranged below, and somewhat in the rear of that cylinder. This arrangement econo-

mizes space, and leaves the cylinders unobstructed. I prefer, on the whole, to hang the inking-roll frame on the axis of the fountain-roll, but it will be understood that said frame may be pivoted or hinged to other parts of the frame without departure from my invention.

It is necessary, especially when running a continuous band of paper from the paper-rack and through dampening-rolls, as indicated in Fig. 1, to provide means for smoothing or ironing the paper, feeding it, and regulating its tension after it leaves the dampening apparatus, and before reaching the printing apparatus proper.

The means I employ for this purpose are plainly represented in the drawing. In front of the press or printing apparatus proper, and somewhat higher than the first pressure-roll, are located three horizontal rollers, l l^1 l^2 , preferably made of soft vulcanized rubber, hung side by side in arms m , which are pivoted to brackets or standards m^1 , the pivots being the ends of the shaft of the central roll, which are arranged to revolve in suitable boxes in the upper ends of the standards m^1 . The center roll is revolved by power taken from a suitable source; in this instance, by means of a belt, m^2 , passing around a pulley on the axis of the first type-cylinder, and a pulley on the shaft of roller l^1 . The roller l^2 has its journal in boxes which can be pressed down by set-screws, so as to force the roller with any required pressure on roller l^1 . The other roller is mounted in non-adjustable bearings, and is designed to touch very lightly, if at all, the roller l^1 . It is, on the whole, better that it should not be in contact with the middle roller. The arms or frames m , with their two rollers, l l^2 , can revolve about the roller l^1 , and said frame is held in any desired position by means of a spring latch or stud, n , on one of the standards m^1 , which catches in one of the series of holes formed in a disk, n^1 , fixed on one side of the frame, as shown plainly in Fig. 6.

By drawing back the latch, the frame and its rollers can be revolved to any extent desired. The paper can be passed around and between these rollers in any convenient way. One way of carrying the paper between them is seen in Fig. 3, where the paper first passes forward between the rollers l l^1 , thence back around l^1 , and between the latter and l^2 ; thence over l^2 , and forward to the printing-cylinder s . By rotating the roller-frame, any required degree of tension can be attained.

The dragging of the paper on the rubber surface of the loose roll l^1 , which, as above stated, is so arranged that it need not be revolved by the center roller, has the effect of retarding the drawing forward of the paper, and, by turning or revolving the frame, so as to wrap the paper more or less around the rollers, any desired resistance can be offered to the feed, which takes place between the two rollers l^1 l^2 , so that these rollers will, to a certain extent, slip on the paper without car-

rying it forward. The passage of the paper between these rollers will cause it to be ironed out and smoothed; and the slip of the two rollers U^1 U^2 on the paper will assist in the smoothing process.

The direction in which the center roller is revolved by the belt m^2 is indicated by the arrow in Fig. 3.

The above-described device is simple, and operates very effectively, being a perfect regulator of the tension, while, at the same time it supplies the paper as fast as it is required for the printing, smoothing it, and taking out all wrinkles or puckers.

The stereotype-plates on the cylinders are put on in sections, and between the sections there is often considerable space. The pressure-rolls, the boxes of which are provided with set-screws and springs to force the rollers against the cylinders, are prevented from dropping into these spaces by the raised rubber bands on the ends of the cylinders before described.

The inking-rolls are mounted in boxes, which are removable from the inking-roller frame, so that any roll can be removed separately from its frame, when desired.

A little beyond the point where the paper passes from the second type-cylinder, I provide boxes to receive shafts o o' , placed vertically one over the other, and provided with cutting-disks p p' , which work against one another to divide the paper band longitudinally into halves, should this be desired. These cutter-shafts can be put in place by taking off the upper ink-fount, to open the ways in which the boxes are located. The shaft of gear 3 has a pinion, 12, fixed on it, which is designed to engage a pinion on shaft o . The latter shaft is also provided with a gear meshing into a like gear on the lower shaft o' . In this way the cutters, when in use, are revolved, and will, consequently, cut the paper as it passes from the printing-rolls.

In practice I prefer to form and secure the rubber surface to the pressure or blanket rolls in the manner described in Letters Patent No. 125,593, granted to me April 9, 1872.

Having now described my invention, and the manner in which the same is or may be carried into effect, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The combined tension, feed, and smoothing mechanism, consisting of three rollers parallel with one another and in the same plane, and supported in a frame capable of rotating upon an axis coincident with the axis of the middle roller, and of being locked in any desired position, the said mechanism being located in advance of the printing cylinder or cylinders to regulate the delivery of the paper thereto, substantially as shown and set forth.

2. The set-off herein described, consisting of two parallel rollers carried in a rotary reversible frame mounted in standards adjustable up and down on the press-frame, the said rollers being removable from their frame at pleasure, and the frame being provided with devices for locking it in position to hold one or the other of rollers uppermost, substantially as and for the purposes set forth.

3. The combination with the two sets of printing-cylinders and pressure or blanket rolls, arranged with relation to each other, as described, of the set-off rollers, their reversible frame and adjustable standards, and the binding-roller intermediate between the set-off and the second pressure-roll, under the arrangement and for the operation as shown and set forth.

4. The combination, with the two sets of printing-cylinders and blanket-rolls, located, with relation to each other, as shown and described, of the two sets of inking-rollers, each mounted in a pivoted or hinged and adjustable frame, the one below and to the rear of the foremost printing-cylinder, and the other above and to the rear of the hindmost printing-cylinder, all as herein shown and set forth.

In testimony whereof I have signed my name in the presence of two subscribing witnesses.

THOS. J. MAYALL.

Witnesses:

JOHN BULKLEY,
JAS. CROSBY.