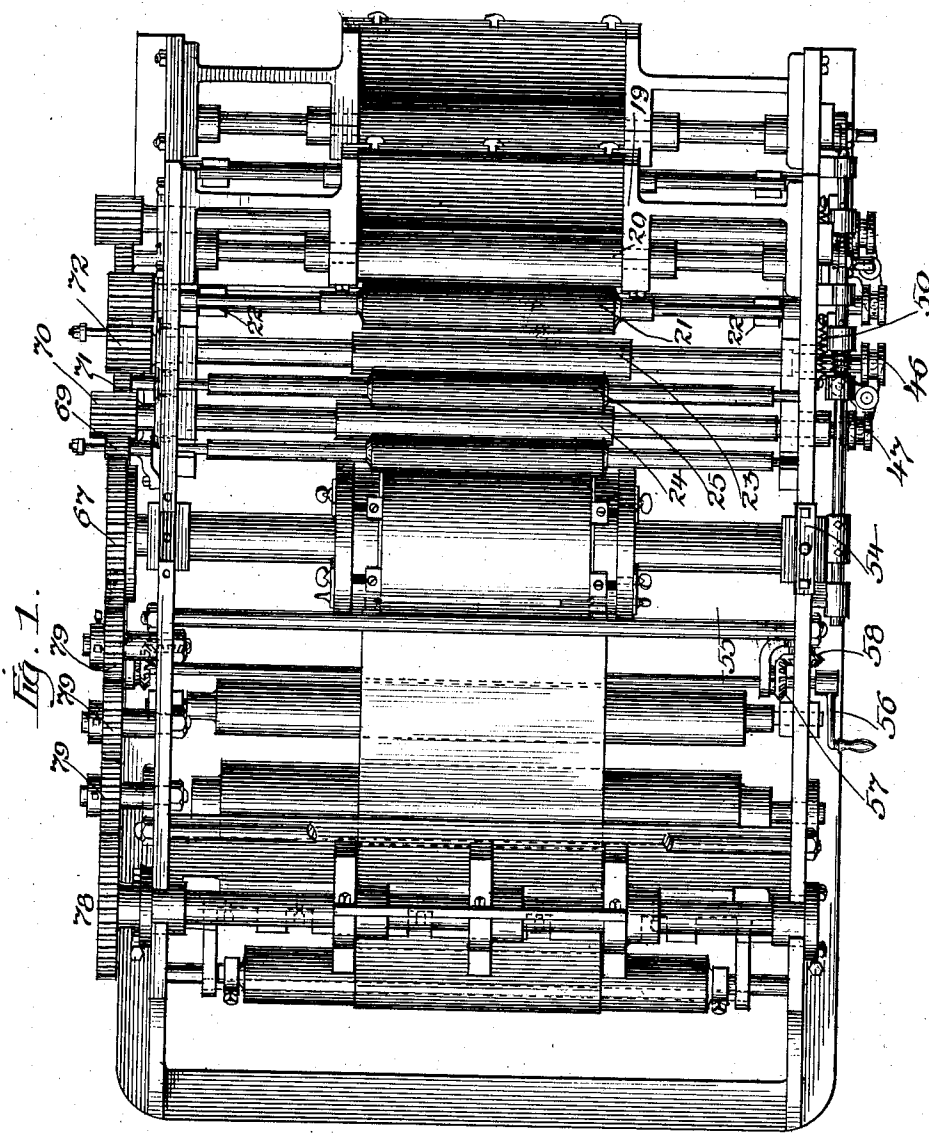


1,011,508.

C. N. SMITH.
ROTARY WEB PRINTING PRESS.
APPLICATION FILED APR. 21, 1908.

Patented Dec. 12, 1911.

6 SHEETS—SHEET 1.



Witnesses:

Frank B. Blanchard
P. H. Truman

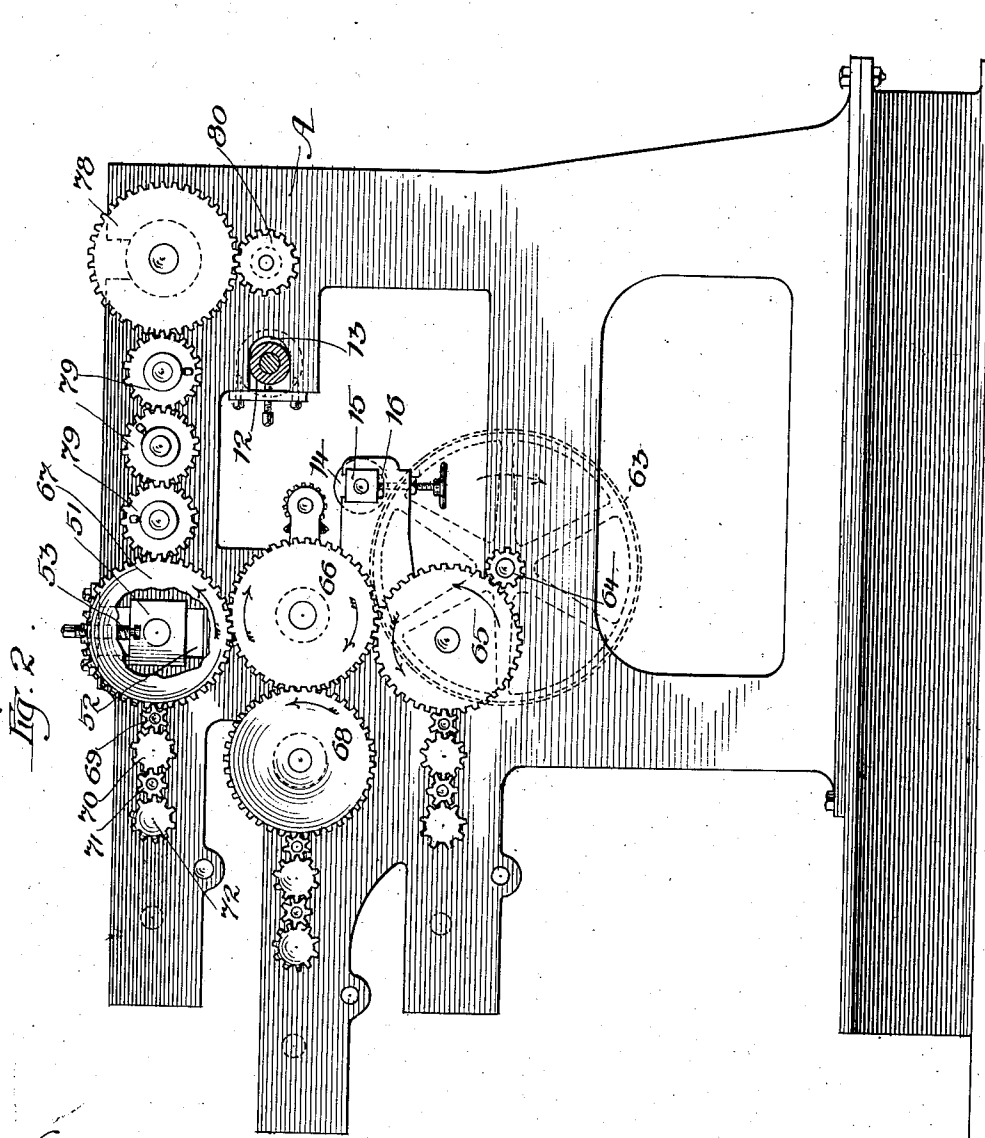
Inventor

Christian N. Smith
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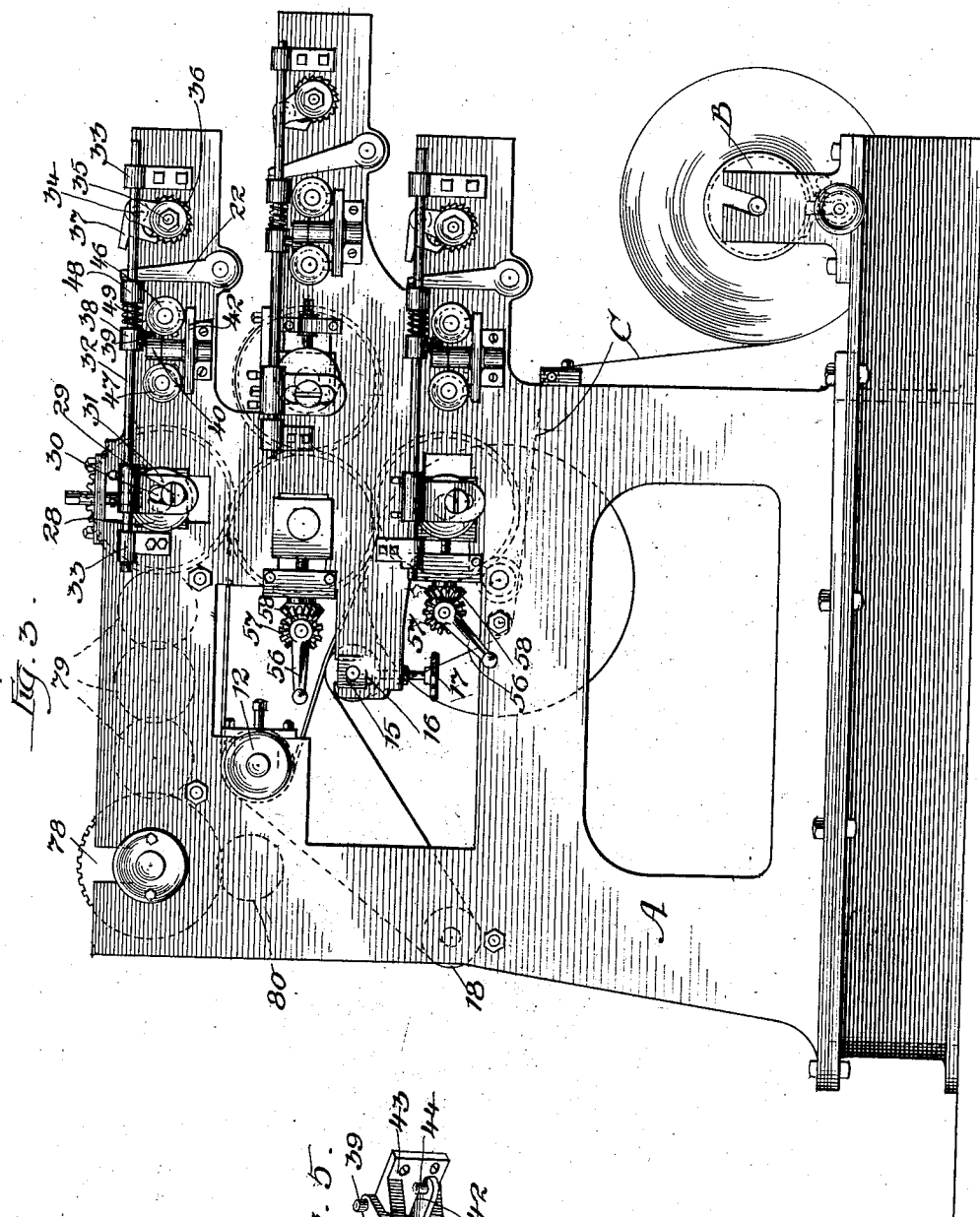
Witnesses:
 Francis Blanchard
 P. H. Trueman

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 6 SHEETS-SHEET 3.



Witnesses:
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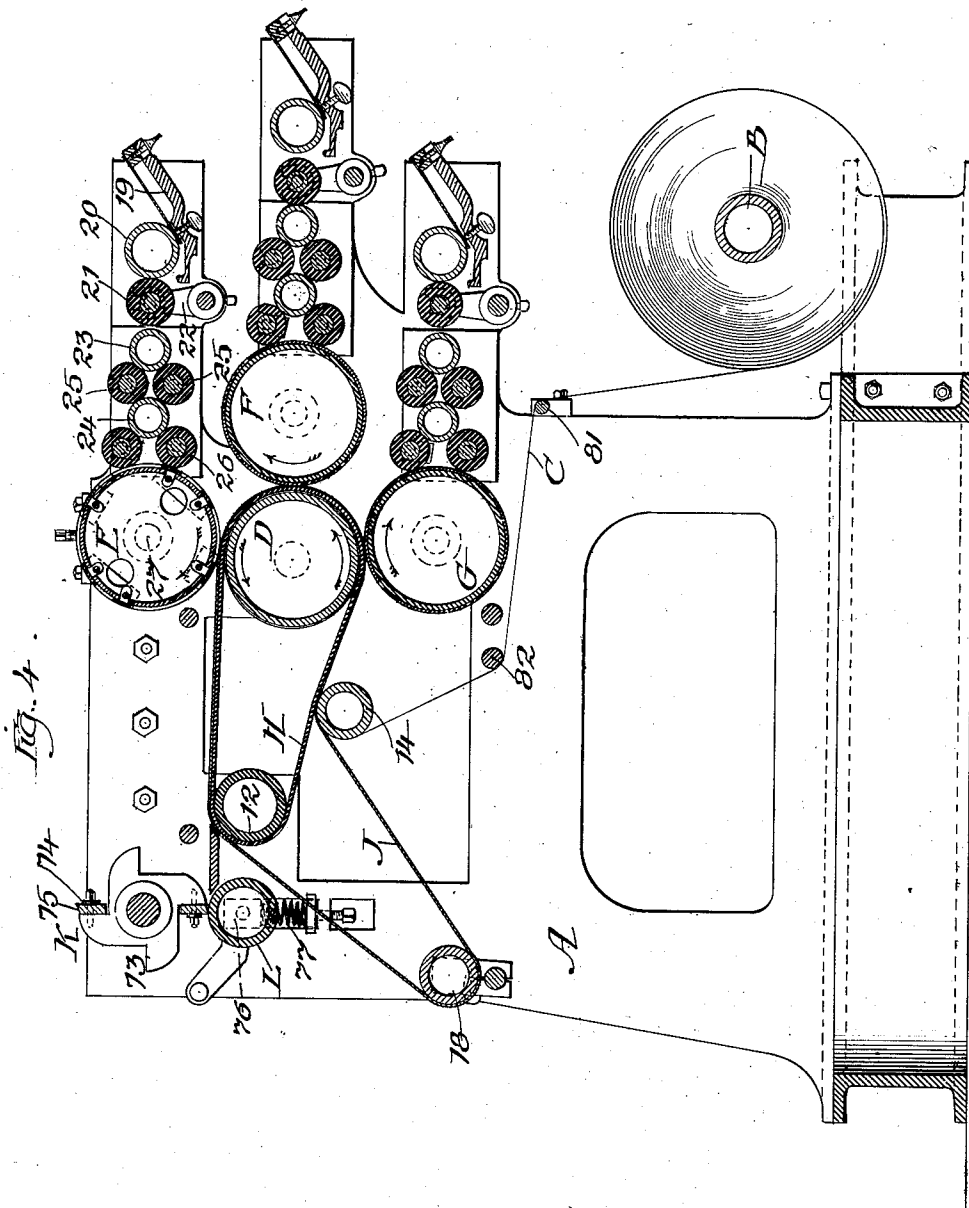
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6 SHEETS—SHEET 4.



Witnesses:
 Frank J. Blanchard
 H. H. Truman

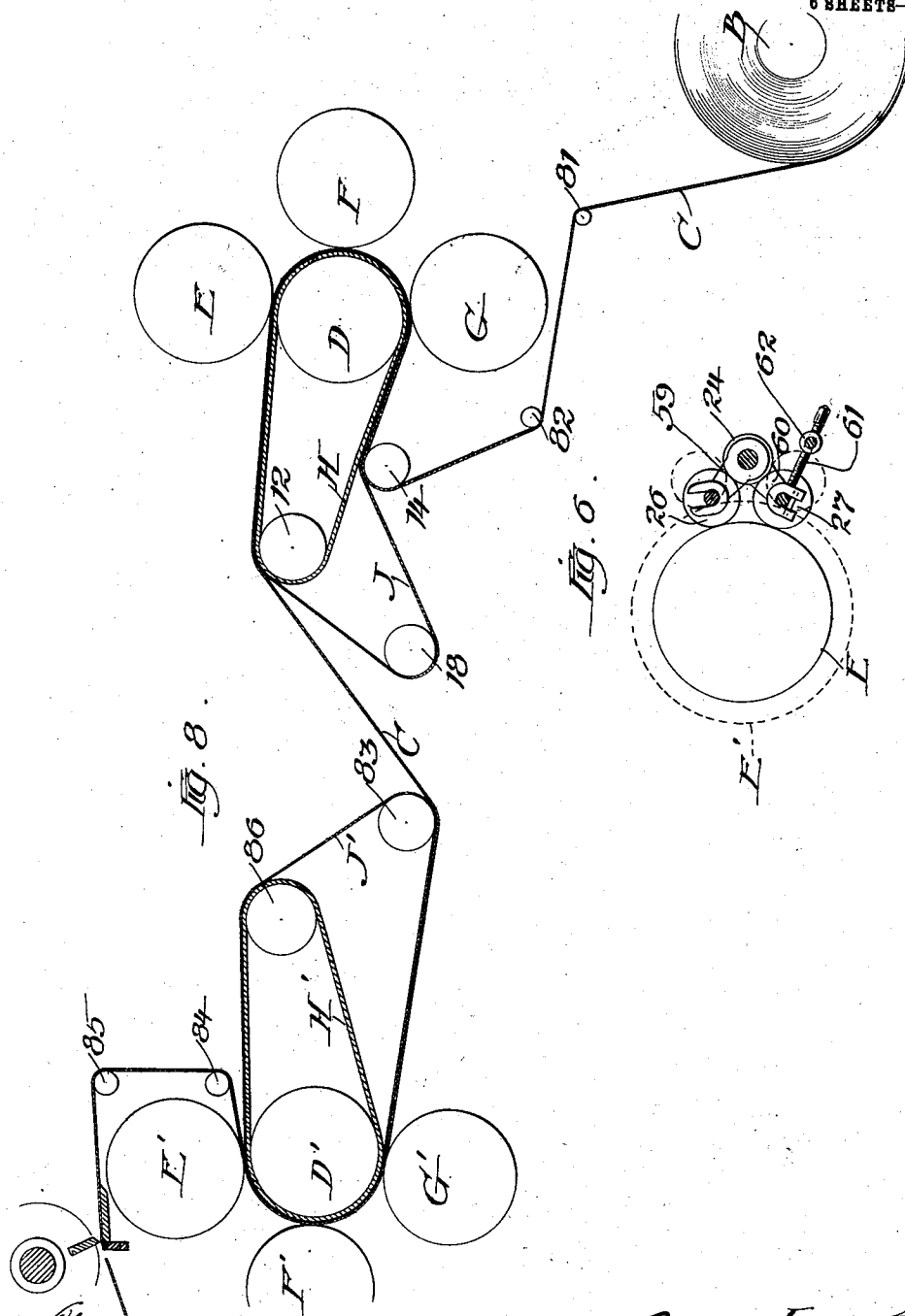
Inventor:
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6 SHEETS—SHEET 6.



Witnesses:
 Frank Blanchard
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C. N. SMITH.
ROTARY WEB PRINTING PRESS.
APPLICATION FILED APR. 21, 1908.

6 SHEETS—SHEET 6.



Inventor:
Christian A Smith
By ~~Otto R Barnett~~
Attorney.

UNITED STATES PATENT OFFICE.

CHRISTIAN N. SMITH, OF ELGIN, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, OF TWO-THIRDS TO JOHN A. HABEN AND CHARLES A. ARMBRUSTER.

ROTARY WEB-PRINTING PRESS.

1,011,508.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed April 21, 1908. Serial No. 428,313.

To all whom it may concern:

Be it known that I, CHRISTIAN N. SMITH, a citizen of the United States, residing at Elgin, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Rotary Web-Printing Presses, of which the following is a specification.

My invention relates to rotary web printing presses and particularly to presses for multi-color printing.

The object of the invention is to provide a simple, compact, durable printing press, particularly for multi-color work, which may be operated cheaply and requires but little attention, and which may be adjusted to print sheets of different widths.

The multi-color printing presses of the rotary type which are in use at the present time are composed of a number of printing couples, one for each color, through which the continuous web is passed successively. The couples consist, of course, of a type cylinder and an impression cylinder, the latter being provided with the ordinary blanket, which is wrapped around and its ends fastened to the cylinder. These presses take up a great deal of floor space, require a large number of attendants to operate and watch them, and do not always obtain as perfect a register of the successive impressions as could be desired. Moreover, they ordinarily cannot be adjusted to different kinds of work, for example, to printing sheets of different widths. If any such adjustment is made, both the printing and impression cylinders have to be changed, as the fastening of the blanket on the impression cylinder makes it possible to use it only with a type cylinder of the same diameter. Moreover, any such change of the cylinder would involve the practical reconstruction of the press. Therefore, it has been found necessary in practice to have different presses for different sizes of work.

The press of my invention employs, instead of a number of printing couples, a single impression cylinder which, instead of having the usual blanket, is provided with an endless blanket or tympan, preferably a belt running over an idler roller. The several printing cylinders are arranged circumferentially around this single impression cylinder. This construction makes the machine simpler, more compact and mate-

rially decreases the number of attendants necessary. It also allows, by making the inking devices of the printing cylinders adjustable, a substitution in the press of printing cylinders of different diameters without making any change in the impression cylinder.

It has been usual for some time to arrange a plurality of printing cylinders around a single impression cylinder over which travels an endless belt in calico printing; but, so far as I am aware, this arrangement has never been successfully applied to printing upon a paper or card-board web. In calico printing exactness of register is not very necessary nor is it commonly obtained.

The invention of this application has for its special object to provide a press for printing upon paper web which shall employ a single impression cylinder carrying an endless tympan, by means of which a perfect register of the successive impressions may be obtained.

The invention has for a further object to arrange the printing cylinder all on one side of the impression cylinder and within an arc of 180°, and to mount the impression cylinder movably, so that it may be quickly and easily moved out of contact with the printing cylinders. This is necessary under practical conditions, in order to avoid seams in the paper web, which are often so carelessly made as to injure or destroy parts of the press, if allowed to pass between the cylinders when at the normal distance apart.

A further object of the invention is to provide a press, of the multi-color type, in which the inking mechanisms are all arranged together upon one side of the press, so that they come under the eye of a single attendant, who may thus watch and adjust the application of the different inks to the paper.

The invention has for a further object to provide for the adjusting—or collapsing and expanding—of the mechanisms for inking the printing cylinders and to mount the printing cylinders, so that they may be removed and cylinders of different diameter substituted, thus accommodating the machine for work of different sizes.

The invention has for further objects such new and improved devices, arrangements and constructions in rotary web printing

presses as will be described in the following specification and set forth in the claim thereof.

While the press of my invention is particularly adapted for multi-color work, certain of the new and improved features might be employed in single impression printing.

One embodiment of my invention, together with a diagrammatic illustration of a modified arrangement, is illustrated in the accompanying drawings, wherein—

Figure 1 is a plan view of the press. Fig. 2 is an elevation of one side thereof. Fig. 3 is an elevation of the other side. Fig. 4 is a longitudinal, vertical section. Fig. 5 is a detail illustrating the movement of the vibrators. Fig. 6 is a detail illustrating a preferred means of mounting the composition rollers. Fig. 7 is a view of the tympan or make-ready belt showing my preferred form of construction. Fig. 8 is a diagrammatic view of two presses, such as are shown in the preceding figures, coupled together so as to perfect or print on both sides of the paper; and Fig. 9 is a similar diagrammatic view in which the press is provided with four instead of three type cylinders.

Like characters of reference indicate like parts in the several figures of the drawings.

Referring to Figs. 1 to 8 inclusive, A represents the frame work of the press, B a roll from which the web C is unwound, D the impression cylinder, and E, F and G type cylinders of any ordinary sort.

H is a belt, which is preferably composed of a relatively soft backing 10 which may be of rubber covered with a harder surface 11, and which extends around the impression cylinder D and around an idler 12, which is adjustably mounted in slot 13 in the frame of the press (Fig. 2). Preferably, however, I provide a tension roller 14 mounted in boxes 15, which are guided in the slots 16, so as to be adjustable by means of the adjusting device 17 (Fig. 3). In order to protect belt H from becoming worn or soiled, I preferably, though not in all cases necessarily, cover the same with a second belt J of tougher, cheaper material. Belt J is preferably made of canvas web. In the arrangement shown, belt J is larger than belt H and extends around an idler 18. If the belt H be elastic, by adjustment of the rolls in contact with which it runs, it can be stretched so as to become thinner or thicker, harder or softer, according to the paper used. To a certain extent this adjustment can be made by adjusting tension roller 14, although the non-elasticity of web J, in the particular arrangement shown, would hinder it. This feature is not claimed herein, as it is claimed in a co-pending application Serial No. 458,008, filed October 16, 1908.

The type cylinders E, F and G are pref-

erably arranged, respectively, above, back of and below the impression cylinder D, contacting therewith within an arc of less than 180°. Means is provided, as will be later described, for shifting the impression cylinder laterally out of contact with the type cylinders. Each type cylinder is provided with its inking mechanisms, these being preferably arranged as shown, that is, extending horizontally back from the type cylinders, so that the several sets are one above the other and all under the eye of an attendant, who may stand back of the machine. When the inking devices are arranged on different sides of the machine, as is the customary way, more than one attendant is required to watch the ink fountains or else the single attendant must be continuously running around the press. The inking devices are the same for each cylinder. One set alone will be described in detail. For example, type cylinder E is provided with an ink fountain 19, of ordinary construction, comprising the fountain roller 20. As is customary in presses of this character, the ink is conveyed from the fountain roller 20 to the type cylinder by a collector 21, mounted in a rocking frame 22, so as to oscillate between roller 20 and the first of a pair of vibrators 23, 24, between which are the pair of composition rollers 25, 24 and between the second of which vibrators and the type cylinder are the pair of composition rollers 26, 26. All of the inking devices of each cylinder are driven from that cylinder. The fountain roller, collector and vibrators receive their movements from a single actuating member. The shaft 27 of type cylinder E (Figs. 1 and 3) is provided with a crank disk 28, having a pin 29 extending into a slot 30 in a plate 31 on a rod 32 slidably mounted in guides 33, 33 on the frame work of the press. To the outer end of rod 32 is loosely pinned the upper end of a pawl carrier 34, which rocks on the journal 35 of fountain roller 20 and rigidly mounted upon which is a ratchet 36, a pawl 37 being pivoted to the pawl carrier. Intermittent rotation will be given to the fountain roller as rod 32 is reciprocated. On the rod 32 is a collar 38 having a slot in the under side thereof into which extends the pin 39 (Figs. 3 and 5), on a lever 40 which is connected by a pin 41 with a rock arm 42, the whole being mounted in a bracket 43 on the frame of the press, the rock arm having pins 44, 45 which extend into perforations in the under side of bosses 46, 47 on the shafts of vibrators 22 and 25, respectively. The movement of reciprocation of rod 32 will oscillate rock arm 42 and thereby give the usual, longitudinal, vibratory movements to the vibrators.

The frame 22 of the collector 21 is mounted on the frame of the press, so as to have

rocking movement. It is rocked outwardly, so as to bring roller 21 into contact with roller 20 by means of a sleeve 48 loose on rod 32 and elastically held against the frame 22 by a spring 49 which abuts collar 38 and, in the other direction, by a spring 50 (Fig. 1).

The impression cylinder, and preferably also the type cylinders, are so mounted that they may be shifted out of their operative positions or may be removed entirely. In case of the impression cylinder, the shifting may be done while the press is in operation and without throwing the machine out of gear. It is often necessary to either stop the machine or else separate the impression and printing cylinders, as, for example, when there is a thick or bulky joint in the continuous web of paper. It seldom happens that these joints are properly made and, if a thick joint is allowed to run in against the plates on the printing cylinders, it would be sure to injure or destroy them. The mechanism shown for moving the cylinders is substantially the same for all of them. I will describe the mounting of the type cylinder E. This cylinder is mounted in boxes 51 which slide in slots 52 in the press frame, the box at one or both ends of the cylinder shaft being engaged by set screw 53 which extends through a block 54 extending across the top of the slot and is provided with a squared end for a wrench. I have shown cylinder F having the same sort of adjusting means. Cylinders D and G are similarly mounted, but the apparatus shown for their adjustment consists of rods 55 operated by cranks 56 and carrying bevel pinions 57 meshing with similar pinions 58 at each end of the cylinders.

In order to accommodate the press for different sizes of type cylinder, and thus for printing different sized sheets, the inking mechanisms are made adjustable. This may be done by mounting the inner composition rollers 26, 27 so that they may be brought nearer together or spread, according to the size of the cylinder. In Fig. 6 I have shown an arrangement to accomplish this. E represents a type cylinder, of the size shown in the other figures, and the dotted lines E' a larger cylinder. The composition rollers 26, 27 are mounted on rock arms 59 and 60, respectively, which pivot on the journals of vibrator 24. The composition rollers may be held in different positions by a set screw 61, which extends through a rotatably mounted pin 62 on the frame of the press. The drawing shows the pin associated with roller 27. A similar pin may be used in connection with roller 26. The use of the traveling tympan belt, instead of the ordinary blanket with its ends fastened to the impression cylinder, makes it possible to accommodate the press for sheets of different

size, whether in single or multi-color work, by merely putting in different printing cylinders and adjusting the inking mechanisms in conformity to the diameters of the cylinders used. Such an arrangement is impossible with the ordinary blanket, because, on account of the attachment of the ends of the blanket, the printing and impression cylinders have to be the same diameter.

Figs. 1 and 2 show the gearing by which the several cylinders and rollers are driven. 63 is a belt pulley on the journal of which is a pinion 64 meshing with a gear 65 on type cylinder G, which meshes with a gear 66 on impression cylinder D, which, in turn, meshes with gears 67 and 68 on cylinders E and F, respectively. Gear 67 meshes with gear 69, which is mounted on the frame work of the press, and this gear meshes with a gear 70 having greater length, which is on the end of vibrator 24. Another gear 71 is interposed between gear 70 and gear 72 on the end of vibrator 23. There are similar trains of gears driving the vibrators associated with the other type cylinders. The gears 70 and 72 are long, so as to accommodate the longitudinal movement of the vibrators.

I may associate with the above described printing mechanisms a cutting device which will sever the sheets from the web as the web comes from the press. This cutting device is shown as consisting of a rotary cutter head K having a plurality, here shown as four, of faces 73 on substantially radial lines, to which are adjustably attached knives having beveled edges 75. By varying the number of knives used, the size of the sheets may be varied. The knives work against a hard cylinder L which is journaled in boxes 76, which are supported by springs 77. Cutter head K is provided with a gear 78 which is connected with gear 67 by a train of gears 79. Cylinder L has a gear 80 which meshes with gear 78. The cutter head and the roller are preferably rotated at different speeds. According to the arrangement here shown, the roller L is rotated at the higher speed. By this arrangement a shearing cut is given to the paper. The knives, it will be seen, because of the position they take when coming into contact with the roller, are kept sharp thereby. This apparatus for severing the sheets works continuously without interfering with the continuous movement of the web out of the press. Instead of employing two opposed cutters, which have to be kept in accurate register, as, for instance, when the knives of the cutter are made to cooperate with slots in the roller, my apparatus consists of a cutter, which is self sharpening, and a perfectly smooth roller. No claim is made herein to the combination of the printing and cutting mechanisms, as that is made

the subject of the application above mentioned.

The operation of the press is as follows: The paper is drawn from the roller B over the idlers 81 and 82, around roller 14, and then passes around the impression cylinder D, upon belt J, and held against the belt by roller 14 which belt J lies over belt H so that the web is printed upon in succession by the printing cylinders G, F and E. It will be seen that a perfect register may thus be obtained. Instead of being printed successively between a series of pairs of impression and type cylinders, where slight shifting or looseness of the web is likely to occur and throw the successive impressions out of register, the web is all the time held firmly on the belts which pass over the single impression cylinder D. The web of paper, continuing its travel, is carried forward by the belt and severed into sheets between the knives of the cutter head K and the cylinder L. If the printing is to be done in only two colors, any one of the three type cylinders may be thrown out of action in the manner described. The movement of a fraction of an inch will be sufficient to prevent the plate on such cylinder from coming in contact with the paper. The gearing is preferably cut deep enough so that this slight movement will not throw the gears out of mesh. However, if desired, any one of the type cylinders may be removed entirely.

If it is desired to print a sheet which shall be longer or shorter than that which has been turned out formerly, the type cylinders may be removed and new cylinders of greater or less diameter substituted. In this way, the same machine may be used for printing different sizes of work. Ordinarily it has been necessary to have a different press for each size of sheet printed. To accommodate cylinders of different diameter, the inner pair of composition rollers may be shifted, as is illustrated in Fig. 6.

Each type cylinder is inked by its own movement. I preferably utilize the ordinary collectors, vibrators and inking rollers used at the present time, but my invention provides for a simplified method of operating these different devices from a single actuating rod, which may be reciprocated by connection with the type cylinder.

The arrangement of the inking mechanisms all on one side of the press enables them to be watched and adjusted by a single attendant. The arrangement of the type cylinders within an arc of less than 180° of the circumference of the impression cylinder allows the latter to be quickly and easily moved out of contact with the former without stopping the machine. The capacity of the inking mechanisms to be collapsed or expanded, taken together with the

use of an endless tympan on the impression cylinder, permits the machine to be accommodated to different sizes of work by merely substituting printing cylinders of different size and re-adjusting the inking devices without making any other change in the press.

It will be understood, of course, that where the paper is to be printed on both sides, two presses such as are shown in Figs. 1 to 7 inclusive will be coupled up together, only one of them being provided with a cutting device.

The arrangement of the printing cylinders on one side of the impression cylinder and within an arc of less than 180°, and the mechanism for shifting the impression cylinder toward the roller 12 makes it possible when a joint in the paper web is reached, or some other imperfection in the web, which, if allowed to pass between the cylinders would injure the same, to move the impression cylinder away from the printing cylinders without altogether stopping the travel of belt H, the tension of which is ordinarily sufficient to make it travel even when the cylinder D is a slight distance from the printing cylinders. Thus the paper web will continue to travel until the seam or joint has passed by the printing cylinders, when the impression cylinder may be shifted back to its normal position.

In Fig. 8 I have shown diagrammatically the arrangement of two presses constituting together a perfecting press. On the right are the impression cylinder D and the printing cylinders E, F and G, the paper passing from roll B over idlers 81 and 82, over tension roller 14 around cylinder D, over belts J and H, over idler 12, then over idlers 83 of the apparatus on the left, corresponding to idler 18 on the right, and following belts J' and H' around impression cylinder D', so as to be printed upon by type cylinders G', F' and E' successively, whence it passes to the cutting apparatus over idlers 84 and 85. Belts H' and J' extend around roller 86 corresponding to the roller 12 on the other side of the press. In Fig. 9 I have shown diagrammatically a similar arrangement for printing four colors, involving the addition of the type cylinders M, M' and some rearrangements of the belt which will be obvious from inspection of the drawing. The arrangement shown sacrifices the advantages arising from placing all the type cylinders on one side of an impression cylinder.

I do not desire to limit myself to the exact devices, constructions and arrangements here shown, as obvious modifications will occur to those skilled in the art which would not involve departure from my invention. The improvements above described have special relation to each other and are designed to cooperate as set forth in the

specification. However, some of the described features might be omitted or other equivalent devices substituted therefor; and certain of the features might be employed separately upon presses differing from the one described; my invention, the various features of which are particularly specified in the claim, contemplates all these different uses and modifications.

10 I claim:

15 In a rotary printing press for printing upon a paper web, the combination of an impression cylinder, a plurality of printing cylinders arranged on one side of the impression cylinder and within an arc of less than 180°, said printing cylinders being removably mounted in the press, a traveling tympan belt on said impression cylinder, a roller which carries the tympan belt ar-

ranged on the other side of the impression cylinder from the printing cylinders, a second roller which bears against the outside of said belt between the first named roller and the impression cylinder, over which runs the paper web, means for shifting the impression cylinder so as to carry the paper web out of operative contact with the printing cylinders, an ink fountain for each of said printing cylinders, and inking devices between each ink fountain and its printing cylinder which inking devices are adjustable, so as to permit the use of printing cylinders of different diameters in connection with the same impression roller.

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