(No Model.) 6 Sheets—Sheet 1.

S. J. MURRAY.

PRINTING PRESS.

No. 492,893. Patented Mar. 7, 1893.

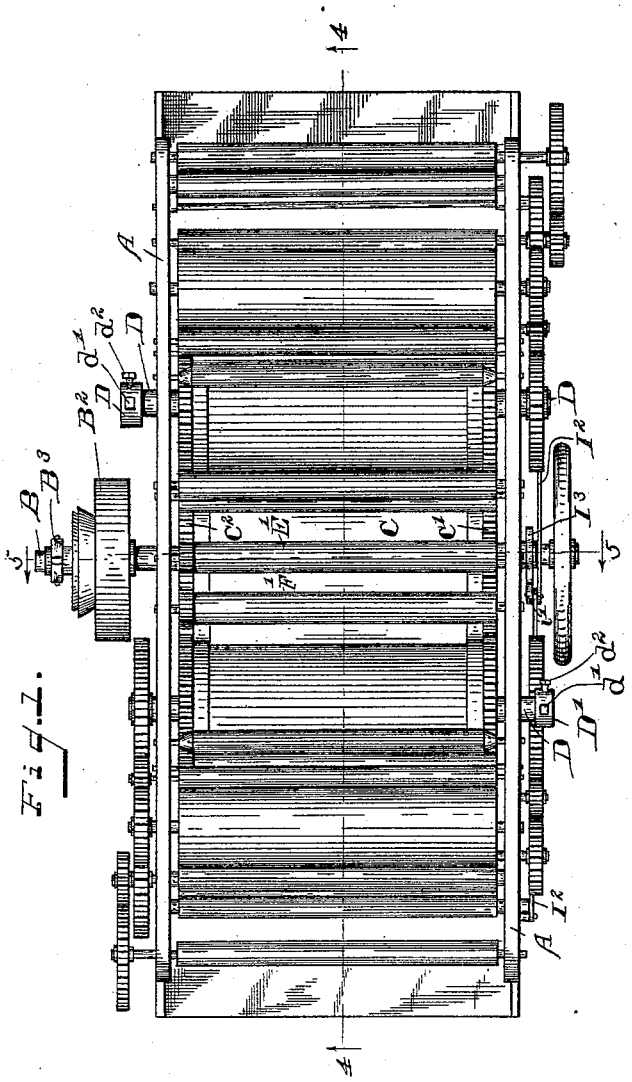

Fig. 1.

WITNESSES.

F. H. Warner.

J. A. Walsh.

INVENTOR.

Samuel J. Murray,

per C. A. & W. Bradford,

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6 Sheets—Sheet 2.

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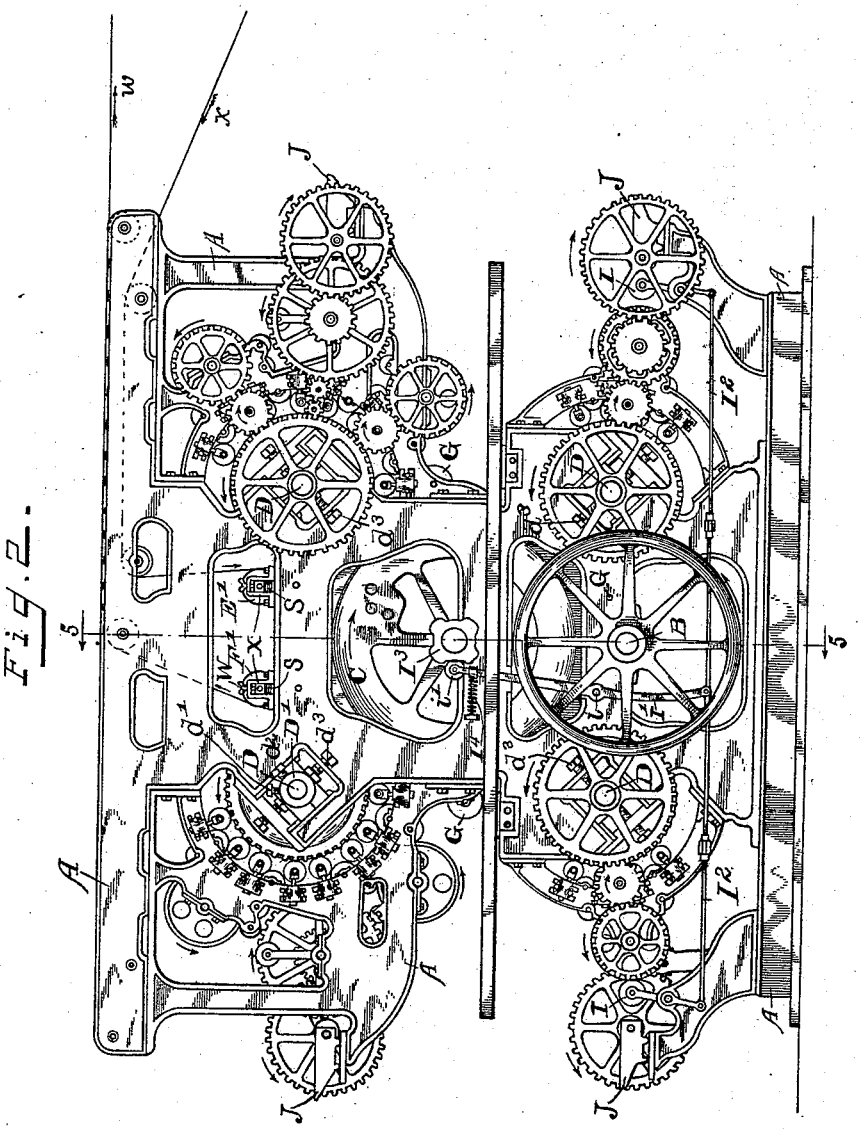
Fig. 2.



WITNESSES.

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6 Sheets—Sheet 3.

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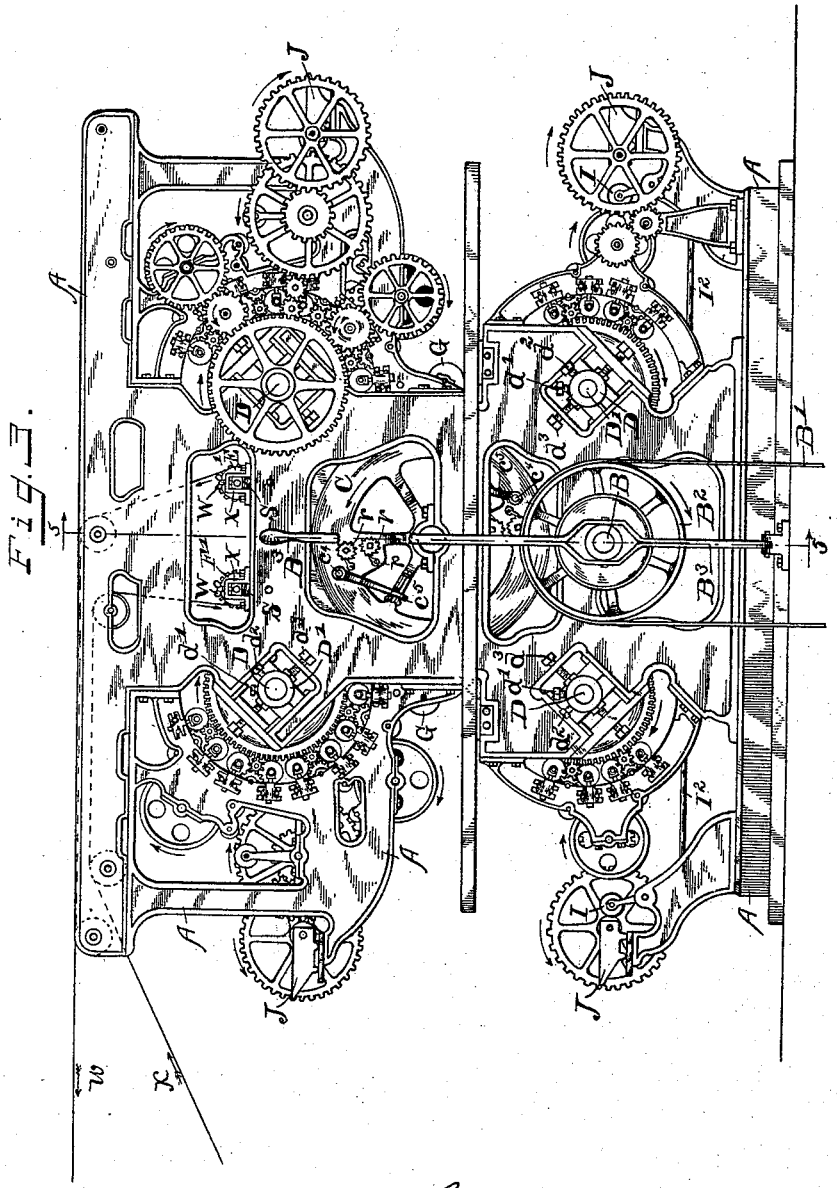
Fig. 3.



WITNESSES.

F. W. Hanner

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Chas. A. Bradford,

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(No Model.)

6 Sheets—Sheet 4.

S. J. MURRAY.

PRINTING PRESS.

No. 492,893. Patented Mar. 7, 1893.

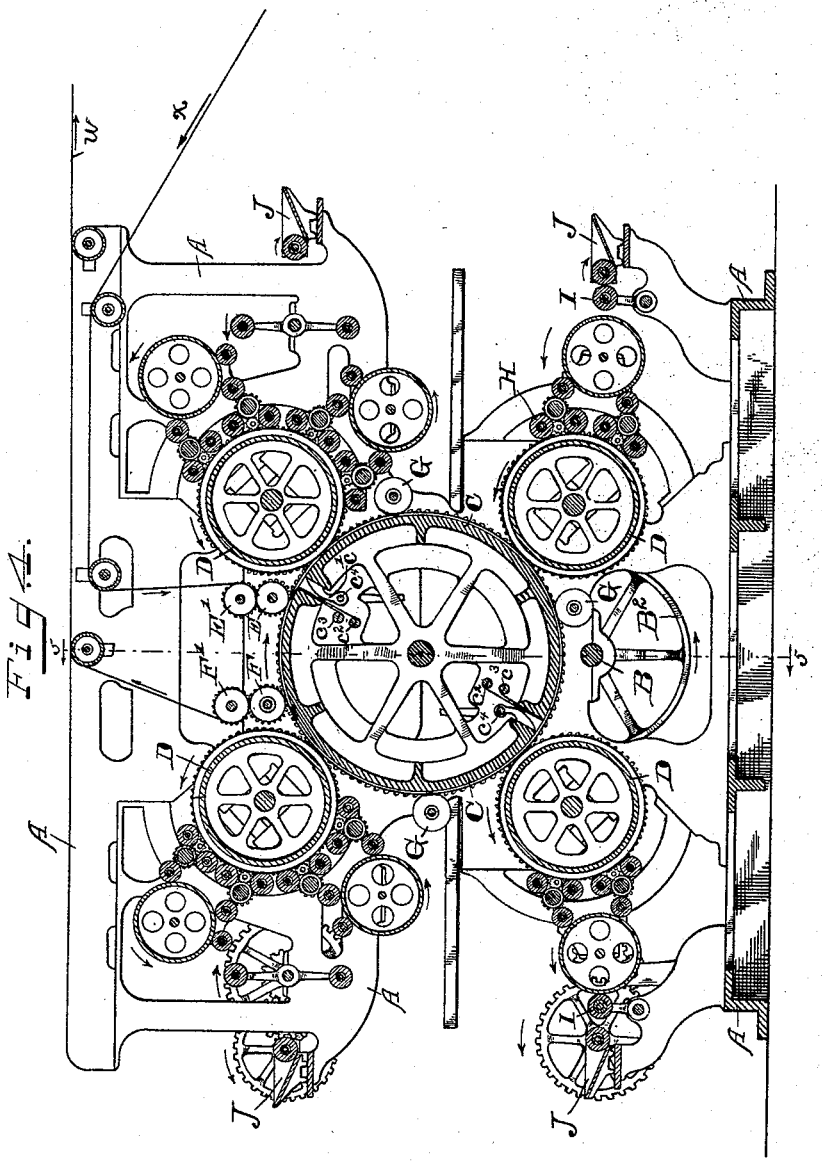

Fig 4.

WITNESSES.

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(No Model.) 6 Sheets—Sheet 5.

S. J. MURRAY.

PRINTING PRESS.

No. 492,893. Patented Mar. 7, 1893.

Fig. 5.

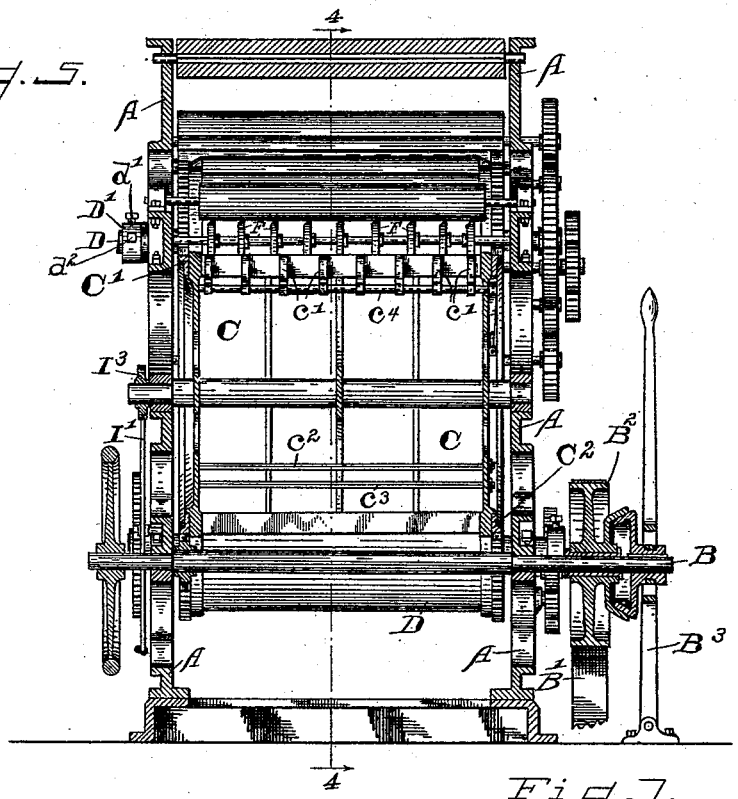


Fig. 6.

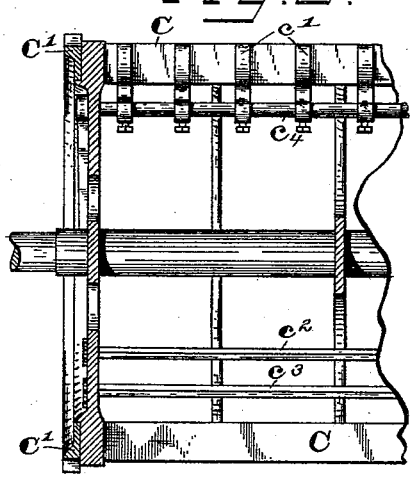
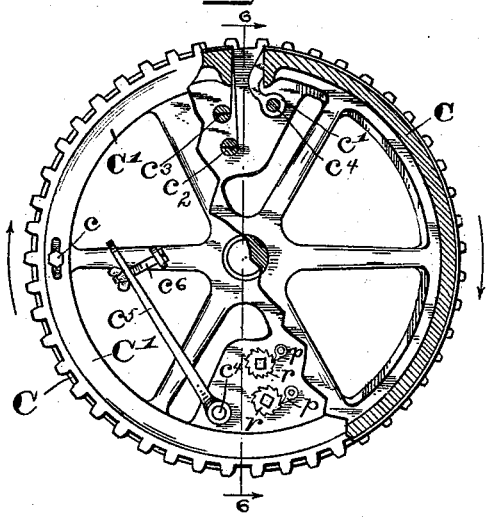


Fig. 7.



WITNESSES.

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(No Model.) 6 Sheets—Sheet 6.

S. J. MURRAY.

PRINTING PRESS.

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Fig. 8.

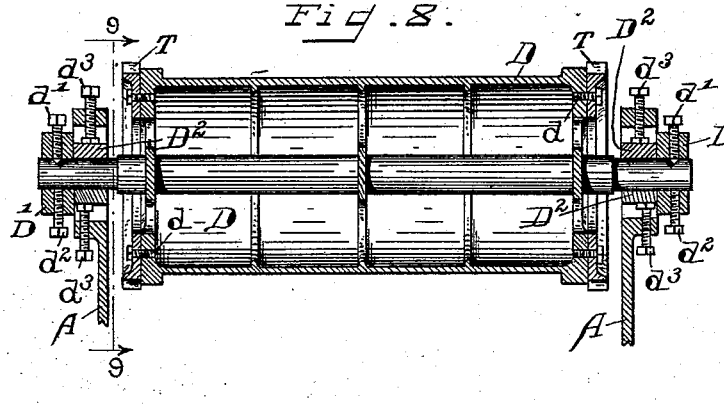


Fig. 9.

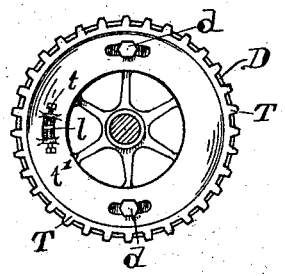


Fig. 10.

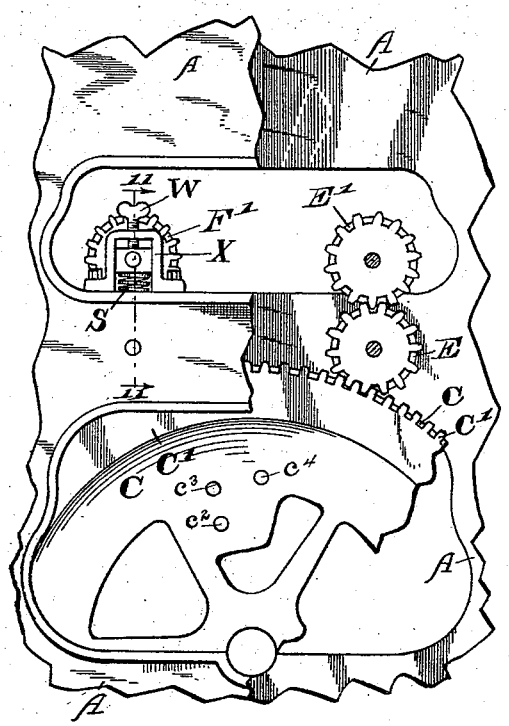


Fig. 11.

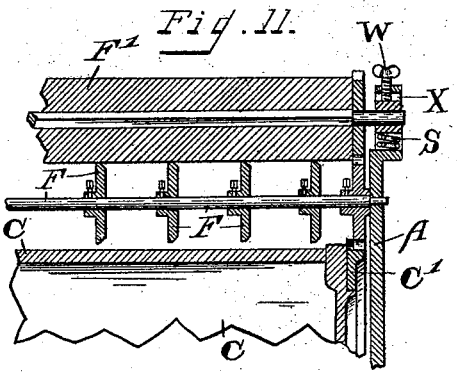
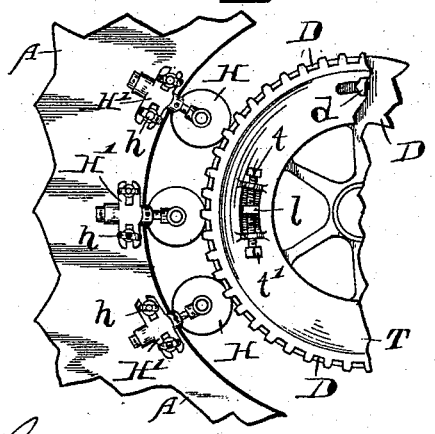


Fig. 12.



WITNESSES.

F. H. Warner.

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UNITED STATES PATENT OFFICE.

SAMUEL J. MURRAY, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO THE NATIONAL CARD COMPANY, OF SAME PLACE.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 492,893, dated March 7, 1893.

Application filed January 7, 1892. Serial No. 417,261. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL J. MURRAY, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Printing-Presses, of which the following is a specification.

It is of great importance in the printing of articles requiring a number of colors, or a number of impressions to make up the complete design, that all the printing plates that embody the various features of the design, and which are arranged to impress their respective features successively upon the paper, should register exactly, so that the design when completed may be perfect. It is also of much importance, where large quantities of work are to be executed, that the printing shall be done from rolls of paper, rather than from sheets, this being a measure of great economy both in the amount of labor and care necessary to properly manipulate the press, and in the comparative quantity of work which may be accomplished.

Heretofore in the printing of such work, it has been found impracticable to embody the required accuracy of register in a continuous feed cylinder printing press adapted to use roll paper, owing, to some extent, to the difficulties of adjustment, and, to some extent to the fact that roll paper, as commonly made, is always somewhat longer upon one edge than the other, thus rendering it difficult to hold it accurately and tightly over the whole surface of the tympan on the impression cylinder of the press.

The object of my said invention is to produce a press which will do the work above described, and avoid the difficulties pointed out.

It consists in many features of construction, and arrangements of parts, whereby the required results are achieved, as will be hereinafter more particularly described and claimed. It may be briefly designated as a "multi-color" printing press.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a top or plan view of the general or major parts of a printing press embodying my said invention; Fig. 2 an elevation of the right-hand side, (the end to which the work is delivered being considered the rear;) Fig. 3 an elevation of the left-hand side; Fig. 4 a longitudinal central sectional view on the dotted line 4 4; Fig. 5 a transverse sectional view on the dotted line 5 5; Fig. 6 a longitudinal sectional view of the impression cylinder; Fig. 7 a view partly in section and partly in end elevation of said cylinder; Fig. 8 a longitudinal section of one of the printing cylinders; Fig. 9 an end elevation of the same as seen from the dotted line 9 9; Fig. 10 an end elevation of a fragment of the platen cylinder, and of adjacent tension rolls for the paper, on an enlarged scale; Fig. 11 a detail section on the dotted line 11 11 in Fig. 10, and Fig. 12 an end elevation of a fragment of one of the printing cylinders, in connection with a portion of one of the sets of inking rolls, on an enlarged scale.

In said drawings the portions marked A represent the frame of the press; B the main driving shaft; C the impression cylinder; D the printing cylinders; E E′ a pair of friction rolls through which the paper passes on its way to be printed; F F′ a set of friction rolls between which the paper passes after it is printed; G rolls intermediate the printing cylinders for holding the paper against the impression cylinder or tympan; H ink rolls; I vibrating ink rolls for conveying the ink from the reservoirs to the train of distributing rolls, and J said ink reservoirs.

The frame-work A is preferably of the form shown, and has the necessary bearings for the rolls, shafts, and other mechanism, as is usual in printing presses. So far as it is peculiar, it will be described in connection with the other mechanism.

The driving shaft B is preferably located in the lower part of the frame-work, and is geared to drive the impression cylinder. It is driven commonly by a belt B′ and pulley B^2, and is thrown into and out of gear by a common clutch by means of the handle or clutch-lever B^3.

The impression cylinder C is located centrally of the machine. It is driven, as just described, from the main shaft, and is arranged to drive the printing cylinders which surround it. The driving is effected by means of toothed rims C′ and C^2 secured to the ends

of said cylinder by bolts *c* which pass through slots in said rims, as will be shown most plainly in Fig. 7. These toothed rims are preferably held in place, radially, by shoulders turned on the ends of the cylinder, as shown most plainly in Fig. 6. The rims are adapted to be adjusted circumferentially by means of slots through which the bolts *c* pass, and the peripheral relation of the surface of the impression cylinder to the printing cylinders thus determined. Accurate adjustment, as hereinbefore stated, is very important in a machine of this class and character. The tympans are secured on this impression cylinder at their rear ends by means of the usual gripping jaws *c'*, instead of at the front end as usual, and at the front ends pass around shafts c^2 c^3, on the outer ends of which are ratchets *r*, and pawls *p*, as shown, the ends of the shafts which pass through them being squared or flattened for the application of a crank or wrench. By means of these small shafts and the appropriate crank or wrench the tympans may be tightened up when desired, and, being tightened toward the front, instead of toward the rear as has heretofore been common, they are restored to their original position instead of sliding along somewhat and taking a somewhat different position. I have found this of considerable value in the making of accurate adjustments such as are necessary for the class of work which it is contemplated shall be done by my improved press. The gripping jaws *c'* are mounted on the usual shaft c^4, which is provided upon one end with an arm c^5, which is capable of adjustment, by means of a bolt c^6, to operate the shaft and gripping fingers in an ordinary and well known manner.

The printing cylinders D, in the construction of press shown, are four in number, and are disposed at equal distances apart around the impression cylinder. Each of these printing cylinders in the press which I have built, carries two sets of printing plates (not shown), and its diameter is one-half that of the impression cylinder. I have contemplated increasing the size of these cylinders and attaching three or more sets of printing plates, and regard such a construction as within the scope of my invention, but I will describe in this specification the press which I have actually constructed, wherein two sets of printing plates are attached to each cylinder. In such a press, when the press is used for printing playing cards, which is the special work in which it has been employed, each revolution of the printing cylinders prints two complete packs of cards, or four to each revolution of the impression cylinder, which, as before stated, is double the diameter of the printing cylinders. By the use of large printing cylinders whereon two or more sets of plates may be secured, the character of the plates is materially modified from that of those used upon a press where but one set can be attached to the printing cylinder. The surfaces can be made much more nearly flat, and better engraving can therefore be done on the plates, and the printing, as the work more nearly approaches a flat surface, is of a superior and more satisfactory character. The printing cylinders being equally disposed around the impression cylinder bear equally upon it from all sides, and sidewise strain and wear, which are common to other machines, are thus avoided, in addition to the other advantages attained thereby. When it is remembered that the slightest displacement of any part of a machine of this character results in a faulty registry of some one or more of several parts of the design, a construction which renders this substantially impossible will be seen to be of the highest importance. It must also be borne in mind that the paper, before being printed, is dampened somewhat, and while it is the intention to dampen it always the same, precise uniformity is manifestly impossible, and consequently the paper will be subject to greater expansion or stretching when it is dampened more than it will when dampened less. An exactly equal disposition of the printing cylinders around the impression cylinder is therefore of great importance, so that the stretching between the cylinders will be uniform, irrespective of whether it is much or little. An equal disposition of these printing cylinders also gives the several portions of the design an equal time to set before being subject to the action of the succeeding cylinder.

The advantages of the large sized printing cylinders have already been set out. I am aware that these features in detail have been embodied in other printing presses, but I am not aware that they have all been combined in one press, and the accurate and highly superior results of my improved press thus attained. This accuracy, and a high rate of production (as before stated, four complete packs of cards to each revolution of the impression cylinder) as well as a high grade of work is the result of my invention, as has been demonstrated by long continued practical test. These printing cylinders are also capable of very accurate adjustment both circumferentially and longitudinally. The circumferential adjustment is effected in the same manner that the corresponding adjustment of the impression cylinder is, by means of bolts *d* extending through slots in the toothed rims T which are attached to the ends of the cylinder and into the structure of said cylinder. Provision is made for a very accurate accomplishment of this adjustment by means of a leg *l* which extends out through a slot in the toothed rim T, and right and left-hand set screws *t t'* mounted in bearings in said toothed rim, and which bear against opposite sides of said leg *l*. Such adjustment is effected, as will be readily understood, by backing one of these screws and turning the other forward. As the impression cylinder and the printing

cylinders are geared together, by means of these toothed rims, it will be readily seen that their peripheral relation to each other may be varied as desired by means of these several slots and bolts. Longitudinally, the printing cylinders are adjusted by means of collars D′, secured on the ends of their shafts, outside of and in contact with the bearings which support said shafts, having set screws d', which enter V-shaped notches in the ends of the shafts, as shown in Fig. 8, the relation being such that the points of the set screws rest upon the opposite sides of the notches. It will be seen, by an inspection of this drawing, that by backing up one of these set screws, and forcing down the other, the shaft will be drawn in one direction or the other, as may be desired, and a very fine adjustment thus secured. Ordinary set-screws d^2 are provided by which, when the adjustment has been accomplished, the collars may be firmly secured in place. The bearings D^2 carrying the shafts of these printing cylinders rest in ways which are disposed radially to the impression cylinder, and said bearings are supported by adjusting screws d^3. As will be readily understood, the impression may be accurately regulated by these adjusting screws, as the printing cylinders can be adjusted toward or from the impression cylinder very accurately by this means.

The rolls E and E′ are a pair of rolls, one of which is driven from the impression cylinder, and the other from the first, by toothed gears, as shown. They are geared so that their peripheral speed is very slightly slower than that of the impression cylinder, and the paper, (which passes between them and thence onto the impression cylinder) is thereby slightly retarded, and stretched or held taut upon said impression cylinder. One of these rolls is capable of adjustment toward and from the other, so that the bearing or grip of said rolls upon the paper may be made sufficient to hold it back or retard it, while not sufficient to tear it. That is; so that if the paper is required faster than it will pass between these rolls at their usual speed, it will slip before being torn. It is intended, however, that the rolls shall be so speeded as only to properly stretch the paper, ordinarily.

The rolls F and F′ are similar to the rolls E and E′ in general construction and arrangement, and are geared to the impression cylinder in the same manner, except that they are geared so that their peripheral speed is slightly greater instead of slightly less than that of said impression cylinder. The paper passes between them as it leaves the press, and is by this means drawn tight at this time and a uniform tension continuously maintained.

I may use any desired means of adjusting these several rolls, one of which is shown in Fig. 10.

The roll F is a skeleton roll; that is, it consists of a number of disks, (see particularly Fig. 11) which are disposed along a shaft at such points that they will come in contact with the paper between the designs which are printed thereon. As said roll comes in contact with the face or printed side of the paper, this is necessary to prevent smearing. The other rolls either come in contact with the paper before it is printed, or with the back side, where there is no printing, and so are or may be solid rolls.

A means of adjustment for the rolls E′ and F′ is shown in Figs. 2 and 3, and more plainly in Fig. 10. In said views housings X are shown as bolted to the frame-work in which the bearings for these roll shafts are placed, said bearings being operated downwardly by thumb-screws W, and supported by springs S. The exact method of this adjustment is not important so that it is convenient and accurate.

The rolls G are skeleton rolls like the roll F, and are disposed at various places about the impression cylinder, and bear against it, and aid in keeping the paper in very close contact therewith. As heretofore repeatedly stated, accurate registry in this class of printing is of the highest importance, and these devices are all parts of the means by which the paper is so securely held to position while being printed, that this accuracy of registry is insured. Upon the machine which I have already built and used, these rolls G are not employed, as I have secured the desired results by the other means described, but I should regard them as necessary, or at least desirable, in many cases, and with certain characters of papers, or with a very large machine.

The ink rolls H are in themselves not very different from the ink rolls in some other forms of printing presses. As shown I prefer to use a rather large number of them, but neither in number nor arrangement is there any special novelty. The bearings H′, however, by which those of them which come in immediate contact with the type or plates are supported, are arranged radially to the printing cylinders, and the bolts h by which they are secured to the frame are likewise set upon lines concentric to said printing cylinders. By this means they may be adjusted somewhat, peripherally of said printing cylinders, by means of said bolts and the slots in the bearings through which they pass, and be thus arranged to distribute the ink as desired, without varying their pressure upon the plates or type. This is best illustrated in Fig. 12, but is shown generally in Figs. 2 and 3.

The duct inking rollers I are in themselves substantially the same as in other forms of printing presses. They are, however, driven somewhat differently. A lever I′ is pivoted to the frame-work of the machine by a pivot i, and has its lower arm connected to a rod I^2 which is connected to arms on the rock-shafts of said vibrating rolls, while its upper arm extends up and carries an anti-friction roller

i' which comes in contact with a cam I^3 on the shaft of the impression cylinder. The anti-friction roller is held in contact with the cam by a spring attachment I^4 secured at one end to the arm of the lever, and to the other end to the frame-work. As the shaft of the impression cylinder revolves, said spring, of course, causes the upper end of the lever to travel back and forth, as the larger or smaller parts of said cam come in contact with the anti-friction roller, and thus the rod I^2 is driven endwise and the vibrating rolls thrown back and forth, first into contact with the rolls in the ink reservoirs, and then with the large ink rolls of the train, which communicate the ink to the type or plates on the printing cylinders. The ink reservoirs J are also of a common and well known construction.

The operation of this machine may be briefly recapitulated as follows;—Referring particularly to Fig. 4, a line is drawn which indicates the course of the paper. Starting from the roll (not shown) of paper, it travels in the direction of the arrow x over rolls in the upper part of the frame-work, down between the rolls E and E′, and around the impression cylinder, receiving, as it passes, impressions from the various printing cylinders, thence out between the rolls F and F′, and over other rollers off in the direction indicated by the arrow w. The printing cylinders, as will be readily understood, each bear plates or type embodying that portion of the design which it is desired to print, which is to be printed in one color, and as the paper passes under each cylinder, it receives from that cylinder that color. Passing on, it receives the next color from the next, and so on until the printing is completed. In the press which I have used the first printing cylinder with which the paper comes in contact has been provided with red ink, the second with yellow, the third with blue, and the fourth with black.

By means of the press herein shown and described, I have been enabled to use roll paper in the making of playing cards, and have successfully printed such cards as accurately as has heretofore been accomplished by any other process, with but little care of the machine after once being adjusted, and at great speed, as four packs of cards are printed at each revolution of the impression cylinder.

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

1. The combination, with a cylinder of a printing press, of collars secured on the shaft thereof alongside the bearings, and notches in said shaft, and set screws in said collars adapted to engage with the opposite sides of said notches, whereby said shaft may be moved endwise, by loosening one and tightening the other.

2. The combination, with the impression cylinder of a printing press, of a set of rolls through which the paper passes before reaching said impression cylinder, geared to run at a slightly less peripheral speed than said cylinder, whereby the paper is retarded and held taut as it passes onto said cylinder before being printed, substantially as set forth.

3. The combination, with the impression cylinder of a printing press, of a set of rolls arranged near to and driven from said cylinder and thus adapted to directly receive the paper as it comes from said cylinder after being printed, which said rolls are geared to run at a slightly greater peripheral speed than said cylinder, whereby said paper is pulled taut after it leaves said cylinder, after being printed, substantially as set forth.

4. The combination, in a printing press, of a central impression cylinder, several printing cylinders equally disposed about said impression cylinder, and skeleton rolls (as G and F) disposed about said impression cylinder, following the printing cylinders, whereby the printed paper is held closely against said impression cylinder after each impression until ready for final delivery from the machine, substantially as shown and described.

5. The combination, with the printing cylinder of a printing press, of ink rolls arranged radially about said printing cylinder, the bearings whereof are slotted and secured by bolts passing through said slots and entering the frame-work at points in a line concentric to said cylinder, thus permitting a circumferential adjustment of said ink rolls without varying their pressure upon said printing cylinder, substantially as set forth.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 24th day of December, A. D. 1891.

SAMUEL J. MURRAY. [L. S.]

Witnesses:
J. C. McCUTCHEON,
CHESTER BRADFORD.