No. 637,603. Patented Nov. 21, 1899.

E. HETT.

PRINTING PRESS.

(Application filed Jan. 21, 1899.)

(No Model.) 4 Sheets—Sheet 1.

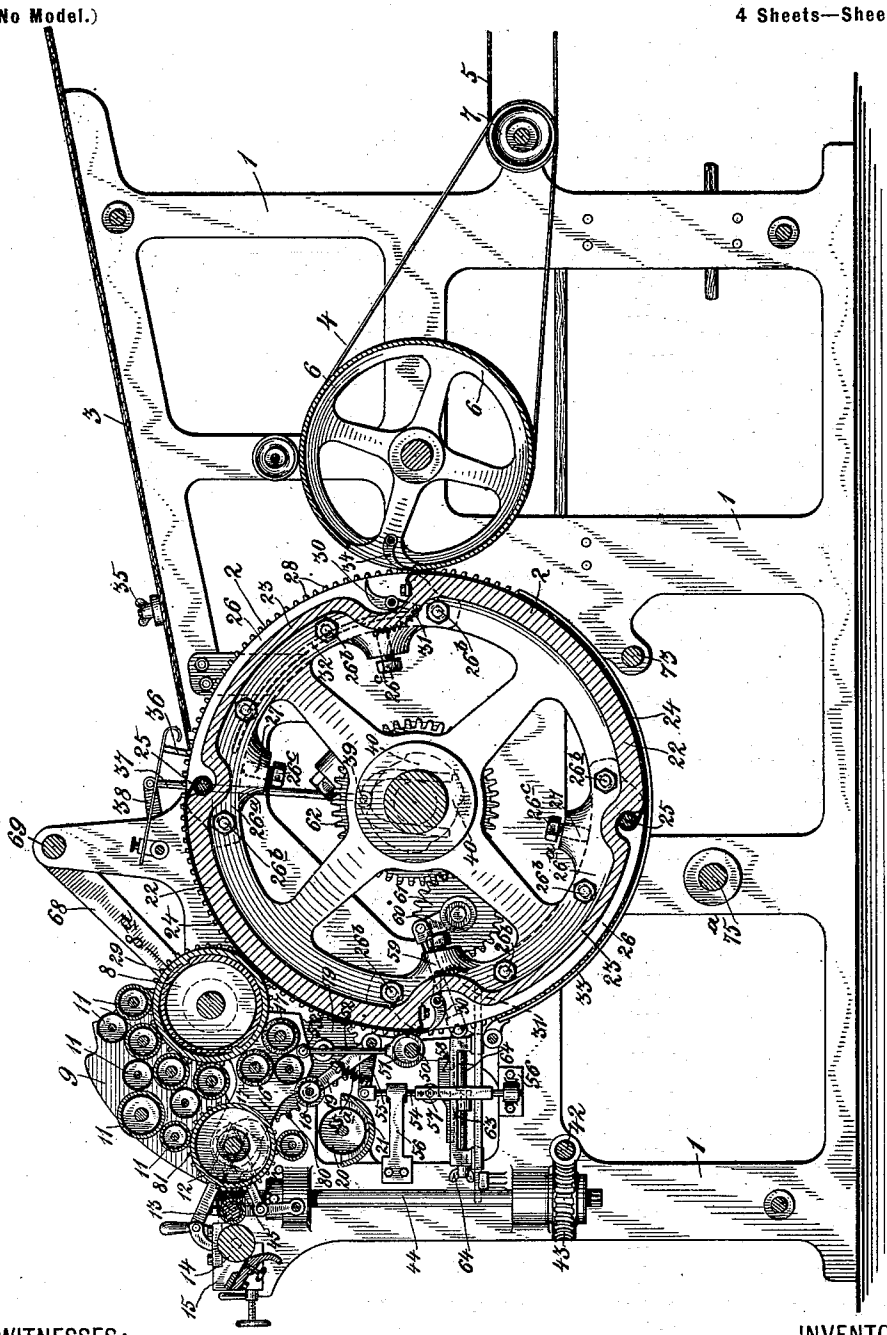

Fig. 1.

WITNESSES:

F. N. Rochrich.

Sidney C. Mann.

INVENTOR

Edward Hett

BY

Kenyon & Kenyon

ATTORNEYS

No. 637,603. Patented Nov. 21, 1899.

E. HETT.

PRINTING PRESS.

(Application filed Jan. 21, 1899.)

(No Model.) 4 Sheets—Sheet 2.

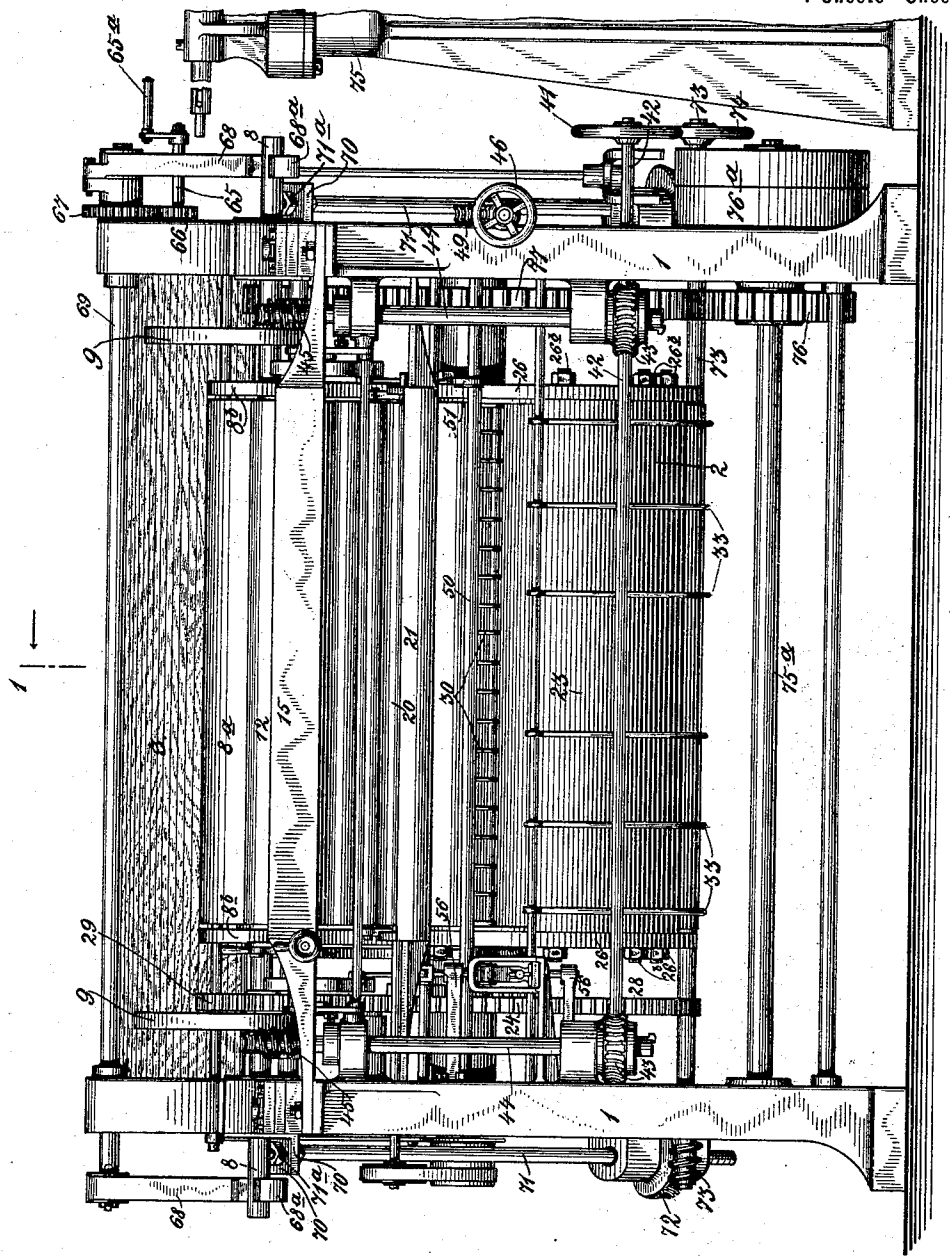

Fig. 2.

WITNESSES:

Fr. N. Roehrich.

Sidney Mann.

INVENTOR

Edward Hett.

BY

Kenyon & Kenyon

ATTORNEYS

No. 637,603. Patented Nov. 21, 1899.

E. HETT.

PRINTING PRESS.

(Application filed Jan. 21, 1899.)

(No Model.) 4 Sheets—Sheet 3.

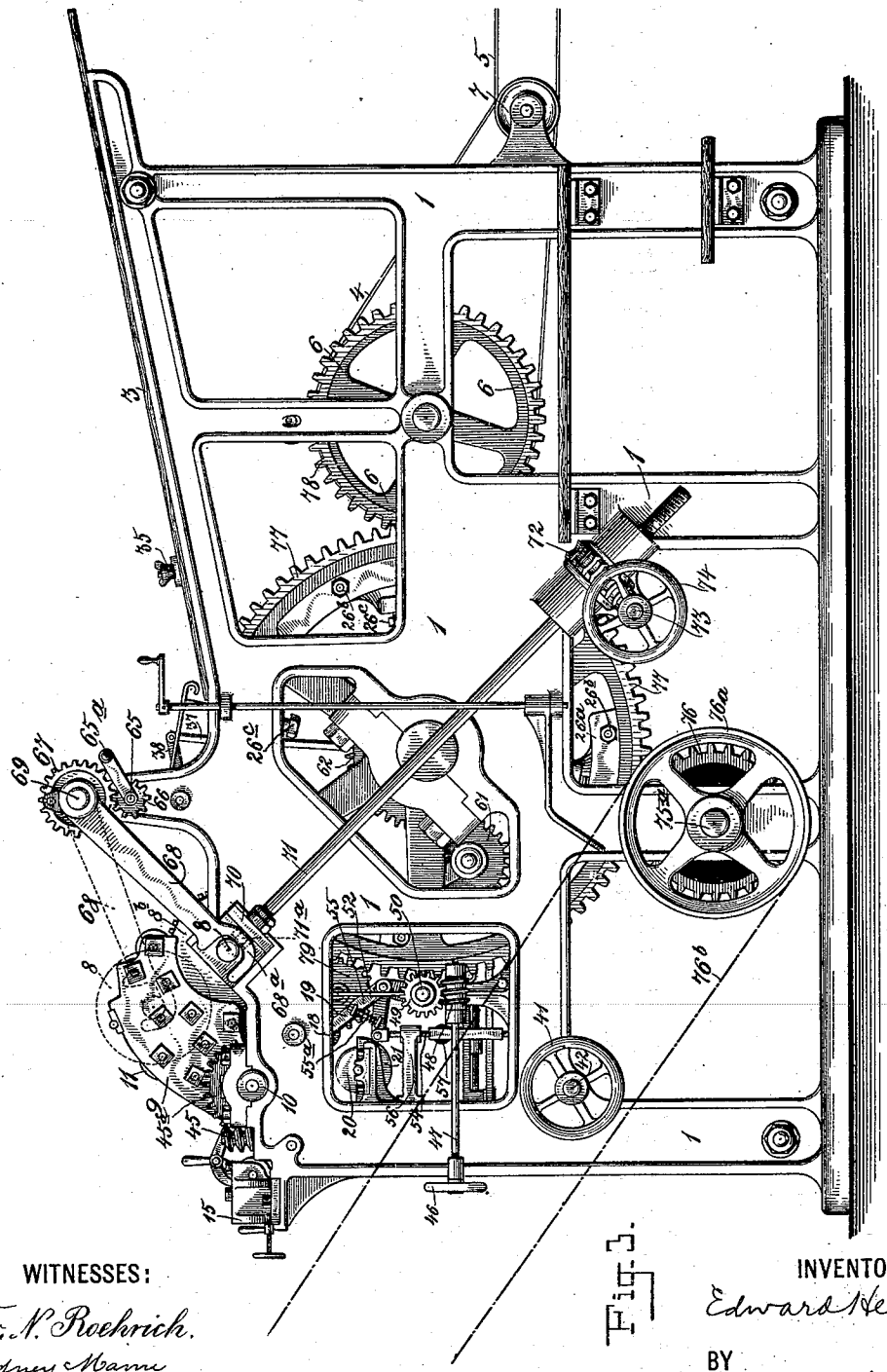

Fig. 3.

WITNESSES:

Fr. N. Roehrich.

Sidney Mann

INVENTOR

Edward Hett

BY

Kenyon & Kenyon

ATTORNEYS

No. 637,603. Patented Nov. 21, 1899.

E. HETT.

PRINTING PRESS.

(Application filed Jan. 21, 1899.)

(No Model.) 4 Sheets—Sheet 4.

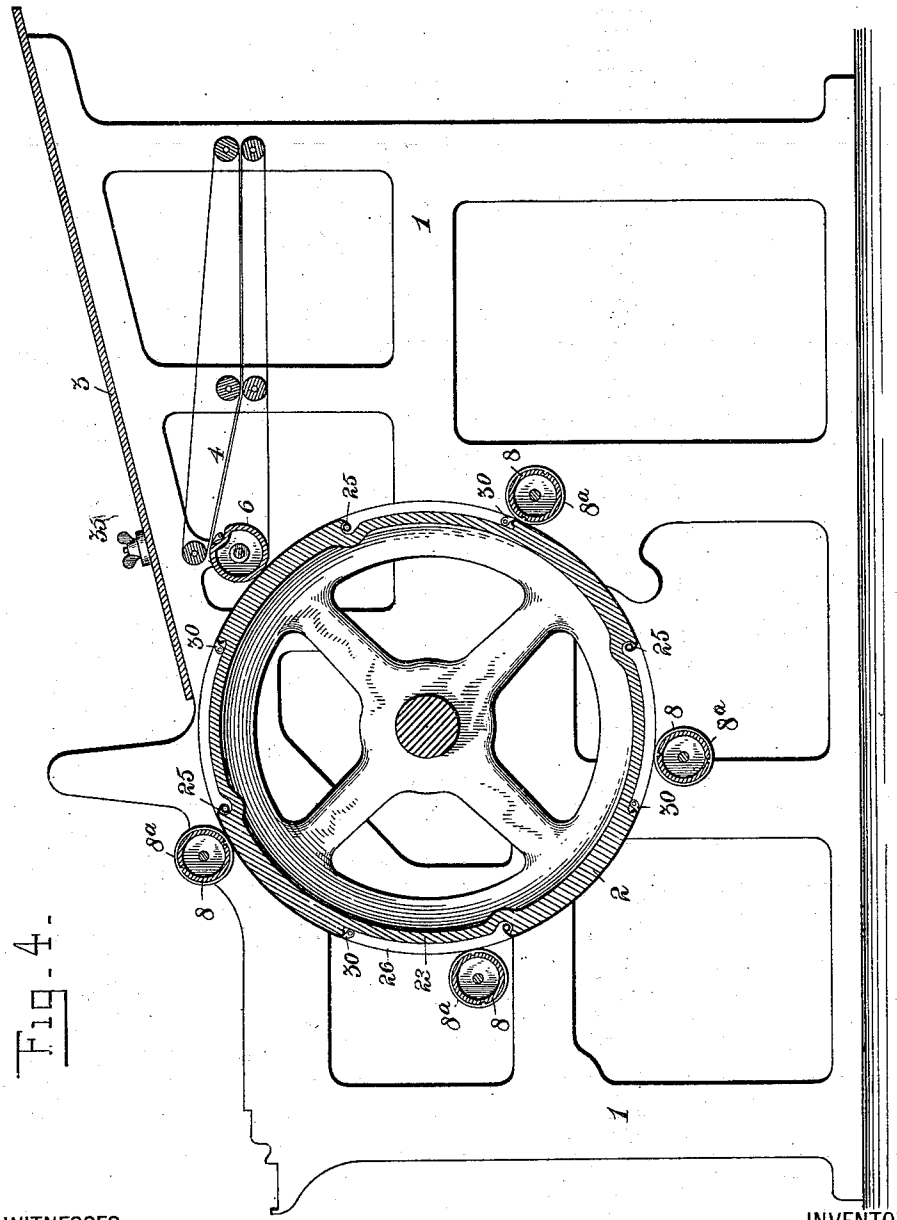

Fig. 4.

WITNESSES:

Sidney C. Mann.

Geo. H. Mills Jr.

INVENTOR

Edward Hett.

BY

Kenyon & Kenyon

ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD HETT, OF NEW YORK, N. Y.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 637,603, dated November 21, 1899.

Application filed January 21, 1899. Serial No. 702,896. (No model.)

To all whom it may concern:

Be it known that I, EDWARD HETT, a citizen of the United States, and a resident of New York, (New Dorp,) in the county of Richmond and State of New York, have invented certain new and useful Improvements in Printing-Presses, of which the following is a specification.

My invention relates to rotary sheet-presses. It has special reference to and is especially valuable in lithographic sheet-printing presses.

It has for its object to improve the printing member or members of such presses; to do away with the use of cumbrous and heavy printing-surfaces, especially the flat cumbrous and heavy stone surfaces heretofore employed in lithographic sheet-presses, and to substitute therefor rotary tubular printing-surfaces circumferentially unbroken and continuous in printing-surface, light in weight, capable of being placed in or removed from the press readily, economically, and without injury to the press or to the printing-surface or to its support, suitably supported, so as to be capable of accurate register during the printing operation; also, generally to improve and simplify the construction and operation of such presses and to improve their efficiency and working capacity; also, to provide improved means for regulating the pressure between a printing-cylinder and the impression-cylinder; also, to provide improved means for removing and replacing printing-cylinders, and, lastly, to provide improved means for operating the inking and dampening mechanisms.

My invention consists of the novel features of construction and combinations of parts herein shown and described.

Heretofore it has been customary in the practical use of presses for printing upon sheets, and especially in presses for printing upon sheets in the lithographic manner, to use flat printing-surfaces, such as flat stones or flat zinc plates. Such stones and plates are necessarily very heavy, cumbersome, and expensive. They are, moreover, wholly unfitted for use in rotary presses or in multi-color presses. In my improved device I employ one or more printing-cylinders, each consisting of an exterior hollow tubular form or shell and an interior form-supporting device readily separable from each other and removable from the press, the former having an outer rounded printing-surface circumferentially continuous and unbroken, with an impression-cylinder larger in diameter than the printing cylinder or cylinders and having suitable impression-surfaces and intervening blank surfaces or depressed surfaces.

I have shown in the drawings of this case my improved device as embodied in a rotary lithographic sheet-press, although my invention in some of its aspects is not limited to the use of my improved devices in such a press.

I will now proceed to describe the preferred form of my improved device shown in the drawings, in which similar numerals in the different figures refer to corresponding parts.

Figure 1 is a longitudinal section through the middle of the press. Fig. 2 is a rear elevation, and Fig. 3 a side elevation, of the same viewed from the left. Fig. 4 is a diagrammatic view showing a number of printing-cylinders in position.

1 is the framework of the press; 2, the impression-cylinder; 3, the feeding-table, and 4 and 5 are delivery-tapes rotating upon wheels 6 and 7, respectively.

8 and 8^a form a rotary lithographic-printing cylinder. This printing-cylinder consists of an interior supporting form-cylinder 8, with an exterior hollow printing-tube 8^a mounted upon it. The printing-tube 8^a is a hollow tube and has an outer smooth unbroken circumferentially-continuous rounded lithographic-printing surface. It is shown, for example, in the following pending applications filed by me—namely, Serial No. 537,582, filed February 7, 1895; Serial No. 568,179, filed November 7, 1895, and renewed January 20, 1899, Serial No. 702,845; Serial No. 735,445, filed November 1, 1899; Serial No. 735,446, filed November 1, 1899, and Serial No. 701,196, filed January 5, 1899. The printing-tube is slipped over a suitable interior supporting form-cylinder and is adjustably secured thereon and removable therefrom at will, and the whole device, consisting of the inner supporting form-cylinder and the outer printing-tube, can readily, economically, and safely be removed from the press and reinserted therein.

9 is a swinging frame pivoted on shaft 10, supporting and carrying the usual inking-rollers 11 and adapted, as will be hereinafter described, to move the inking-rollers into or out of operative position. 12 is the ink-distributing cylinder, 13 an oscillating roller to carry ink from the ink-fountain roller 14 to ink-distributing roller 12, and 15 is the ink-fountain. These detailed parts of the inking mechanism are constructed and operate in the usual way, and as they form no part of my present invention will not be further described.

16 is a swinging frame also pivoted upon shaft 10, supporting the usual damping-rollers 17 and adapted, as will be hereinafter described, to move the damping-rollers into or out of operative position.

18 is a water-roller mounted upon oscillating arm 19 and adapted, as will be hereinafter described, to carry water from water-fountain roller 20 in water-fountain 21 to damping-rollers 17.

Impression-cylinder 2 has a plurality of impression-surfaces. As shown in the drawings, it has two, 22 22, each adapted in conjunction with printing-tube 8^a to print a single sheet. Between these impression-surfaces are depressed surfaces 23. The impression-surfaces 22 22 have the usual rubber covering 24, secured at one end by bolts and at the other moved upon a roller 25, by means of which it can be kept at the proper degree of tautness. At each end of the impression-cylinder are two rim-segments 26. Each of these rims extends only part way around the periphery of the impression-cylinder and registers with one of the depressed surfaces 23. It is supported upon and forms part of a segmental plate 26^a, which is secured to the impression-wheel by bolts 26^b and screws and nuts 26^c, passing through screw-threaded opening 27 in the framework of the impression-wheel. These rims 26 engage with similar rims 8^b upon the printing-cylinder 8 8^a when the depressed surfaces 23 are under it and prevent that cylinder from dropping downward at such times. By means of the bolts 26^b working in slots in plate 26^a and in the framework of the impression-cylinder and by means of screw bolts and nuts 26^c working in openings 27 rims 26 can be moved slightly inward or outward to compensate for varying thicknesses of the rubber coverings 24 and the paper used, and thus tend to prevent jars, and so that it will run smooth.

28 is a gear-wheel mounted upon the shaft of impression-cylinder 2 and having teeth meshing with gear-wheel 29, mounted upon the shaft of form-cylinder 8 for the purpose of communicating motion from the impression-cylinder to the printing-cylinder.

30 30 are grippers for seizing and holding the sheet upon the impression-cylinder. Springs 31 force the grippers to seize and hold the sheet. Cam 32 upon the framework strikes the end of the gripper as the gripper reaches it in its revolution and releases the sheet, which is at once seized by grippers 34 on wheel 6 and is drawn over that sheet onto delivery-tapes 4 and thence to delivery-tapes 5.

33 are curved arms to support the sheet as it passes beneath impression-cylinder 2.

35 35 are side guides to properly register the sheet.

36 is a stop to prevent the feeding of a sheet while the depressed surfaces are opposite to the printing-cylinder. Stop 36 is connected to and is lowered and raised by rod 37, pivotally connected to stop 36 by arm 38 and carrying at its other end wheel 39, bearing against cam 40, the latter mounted upon the shaft of impression-cylinder 2.

Swinging frames 9 and 16, carrying the inking and dampening rollers, respectively, are swung into and out of operative position by the following-described mechanism:

41 is a hand-wheel mounted upon worm-shaft 42, the worm upon the shaft engaging with worm-wheel 43, mounted upon shaft 44. This shaft 44 has at its upper end a worm 45, which meshes, with teeth 45^a, with a segment of worm-wheel mounted upon and integral with swinging frame 9. By turning hand-wheel 41 one way or the other frame 9 is swung up or down.

46 is a hand-wheel on the rear of the press and is mounted upon a shaft 47, which carries a worm 48 at its inner end. This worm engages with worm-wheel 49 upon shaft 50. Upon this shaft is an eccentric 51, carrying rod 52, the latter pivotally secured at 53 to swinging frame 16. As hand-wheel 46 is turned one way or the other swinging frame 16 is swung up or down.

The mechanism for giving a reciprocating motion to water-roller 18 to cause it to convey water from water-fountain roller 20 to damping-rollers 17 is as follows:

Secured to arm 19 by spring 55^a is arm 55, pivotally connected to rod 54, the latter adapted to work up and down in bearings 56 56 and carrying wheel 57. Wheel 57 rests upon a cam-surface 58, which has a higher level at one end than the other, the two level surfaces being connected by an inclined plane surface. Cam-surface 58 rests upon sliding bar 63. A screw 64, secured in the sliding bar, passes through a nut secured to cam-surface 58.

59 is a bar pivotally secured to sliding bar 63 at one end and at the other end to arm 60, the latter being mounted on the shaft of gear-wheel 61. Gear-wheel 61 is driven by gear-wheel 62, mounted upon the shaft of impression-cylinder 2. As these gear-wheels revolve sliding bar 63 moves backward and forward, rod 54 rises and falls, and water-roller 18 oscillates between fountain-roller 20 and damping-rollers 17. The length of time during which water-roller 18 makes contact with water-fountain roller 20 can be varied by turning screw 64 to the right or left, which causes cam-surface 58 to occupy a more or

less forward or backward position upon sliding bar 63.

My improved device for removing and replacing the printing-tube or form-cylinder consists of the following-described mechanism:

65 is a shaft having a crank-handle 65^a at one end and gear-wheel 66 at the other. This gear-wheel meshes with gear-wheel 67, fixedly mounted upon revoluble shaft 69.

68 68 are arms fixedly secured to shaft 69 and having each a bent finger 66^a at its end encircling the ends of the shaft of form-cylinder 8. The ends of the shafts also rest in a bearing of which 70 is the bottom plate. Shaft 71 runs through an opening in plate 70 and is normally secured in that position by nut 71^a. By unloosening that nut and turning crank-handle 65^a form-cylinder 8 and printing-tube 8^a can be raised into the position shown in dotted lines in Fig. 3, when the form-cylinder or the printing-tube, or both, can easily be removed by means of standard 75 or by any other suitable means. As these means form no part of my present invention, they will not here be further described or shown. By turning hand-wheel 65^a in the opposite direction arms 68 will be lowered and any form-cylinder or printing-tube borne thereon will be brought into operative position.

71 is a shaft passing at one end through plate 70 and secured in that position by nut 71^a and being screw-threaded at its other end where it passes through the center of a worm-wheel 72 and where it engages with screw-threads cut upon the interior of the worm-wheel. A hand-wheel 74 is mounted upon a worm-shaft 73, the worms of the latter engaging with worm-wheels 72. By turning wheel 74 in one direction the pressure between the cylinder 2 and printing-tube 8^a is increased and by turning it in the other the pressure is diminished, or the printing-cylinder is entirely separated from the impression-cylinder, as when the press is stopped.

Upon shaft 75^a is mounted pulley 76^a, upon which runs belt 76^b. Gear-wheel 76 is also mounted upon shaft 75^a and meshes with gear-wheel 77 upon the shaft of impression-cylinder 2, the teeth of gear 77 meshing with the teeth of gear-wheel 78, mounted upon the shaft of cylinder 6. By this means power is communicated through pulley 76^b to impression-cylinder 2 and cylinder 6. Gear 28 on impression-cylinder 2 meshes with gear 29 on form-cylinder 8 and drives the latter cylinder. Gear 28 also drives gear-wheels 79 80, and through them and gear 81 on ink-distributing cylinder drives the latter cylinder and through it the various inking-rollers by any well-known method of driving such inking mechanism.

It will be noted that in my improved press the printing-cylinder makes at least two complete revolutions while printing but one impression. Meanwhile the dampening and inking mechanisms are continuously operative. The printing-tube is thus dampened and inked twice as much as in the ordinary lithographic press and the printing is correspondingly improved.

In using my improved rotary printing-cylinder and printing-tube, with its continuous printing-surface, in a press for printing upon sheets it is necessary to use an impression-cylinder with a circumference at least twice as great as that of the printing-cylinder, so that a blank or depressed space upon the former will register with each alternate revolution of the latter. Preferably an impression-cylinder is used with two or more impression-surfaces and with two or more blank or depressed intervening surfaces, so that a plurality of sheets can be printed at each revolution of the impression-cylinder. The working capacity of the press is thus increased and the impression-surfaces work more satisfactorily.

My invention is not restricted to the use of but one of my improved rotary printing-cylinders with an impression-cylinder. As many printing-cylinders may be used with the impression-cylinder as the latter has impression-surfaces, and the number of the latter can be increased by increasing the size of the impression-cylinder. In such a press each printing-cylinder may be arranged, if desired, to print in a different color from those of the other printing-cylinders. Such a press is shown in Fig. 4. The press there shown is provided with four printing-cylinders, each preferably adapted to print in a different color from that of each of the other printing-cylinders. In this figure I have not shown the inking and dampening mechanisms and the driving parts of the press, omitting all of these and other parts for the sake of clearness. This figure is intended merely to form a diagrammatic sketch showing the manner in which more than one printing-cylinder can be arranged around the impression-drum in embodying my invention in a multicolor-sheet printing-press.

By my improved devices the construction of rotary sheet-printing presses is simplified. The operation of such presses is improved and their efficiency increased. The printing-surfaces of such presses are greatly improved. The printing member or members thereof are easily removable and replaceable and interchangeable. A plurality of sheets may, if desired, be printed at each revolution of the impression-cylinder, and damping and inking mechanisms are made more effective. My improved press, moreover, permits of the easy, economical, and safe insertion into and withdrawal from the press of printing cylinders or tubes and of their accurate adjustment in the press for the purpose of accurate registering. It also provides simple and improved means for regulating the pressure be-

tween the printing and impression cylinders and also for operating the inking and damping mechanisms.

My invention in some of its aspects is applicable to cylindrical relief plate-printing, as where a planographic or lithographic printing cylinder is after the design is transferred to it by suitable means, as by deep etching, developed into a relief-printing cylinder with which no damping devices would be necessary in the printing. My invention, moreover, makes it more feasible to obtain exact register in printing with more than one color and more than one printing-surface at a time—that is to say, in multicolor-printing—and also more feasible to obtain such register where the colors are separately printed. Moreover, the angular relationship of the printing and impression surfaces in their rolling contact when the latter is larger in diameter than the former and intermittent printing action when its surface is discontinuous, taken in connection with the removability and exact interchangeability of the printing-cylinders and their method of support, achieves a very clear and readily-controlled and superior and economical character of sheet-printing.

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

1. The combination in a rotary printing-press, of a printing-cylinder consisting of an interior form-supporting device and an exterior removable and replaceable printing-tube, having a circumferentially-continuous unbroken printing-surface, with a circumferentially-discontinuous cylindrical impression-surface larger in circumference than the printing-cylinder, substantially as set forth.

2. The combination in a rotary lithographic-printing press, of a printing-cylinder consisting of an interior form-supporting device and an exterior removable and replaceable printing-tube, having a circumferentially-continuous unbroken lithographic-printing surface, with a circumferentially-discontinuous cylindrical impression-surface larger in circumference than the printing-cylinder, substantially as set forth.

3. In a press, the combination with an impression-cylinder, of a printing-cylinder supported in movable bearings, screw-threaded shafts secured to said bearings, worm-wheels having screw-threaded openings through which the screw-threaded portions of the shafts extend, a worm-shaft and worms thereon adapted to mesh with the worm-wheels and means for turning the worm-shaft, whereby the pressure between the impression-cylinder and printing-cylinder may be varied or the two cylinders may be separated, substantially as set forth.

4. The combination in a press with a swinging frame adapted to carry the inking or dampening rollers, of a rod secured to the swinging frame having a ring at its other end, an eccentric mounted upon a shaft and adapted to turn within said ring, a worm-wheel on said shaft, a worm mounted upon a worm-shaft and engaging with said worm-wheel, and means for turning the worm-shaft whereby the inking or dampening mechanism may be brought into or be removed from operative position.

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

EDWARD HETT.

Witnesses:
EDWIN SEGER,
GEO. W. MILLS, Jr.,