W. L. HAMILTON.

ROTARY PRINTING PRESS.

APPLICATION FILED FEB. 20, 1911.

1,003,737.

Patented Sept. 19, 1911.

2 SHEETS—SHEET 1.

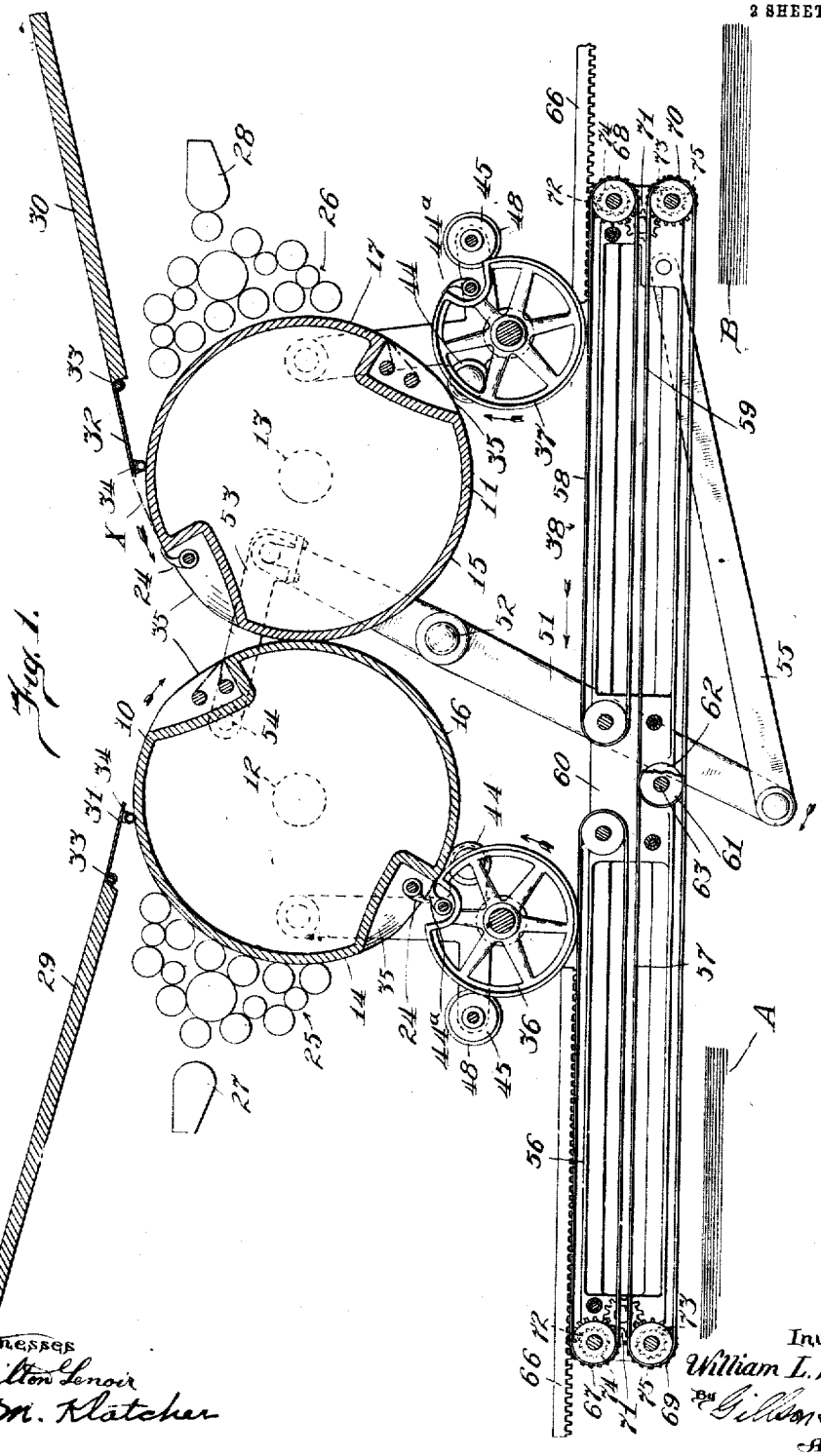

Fig. 1.

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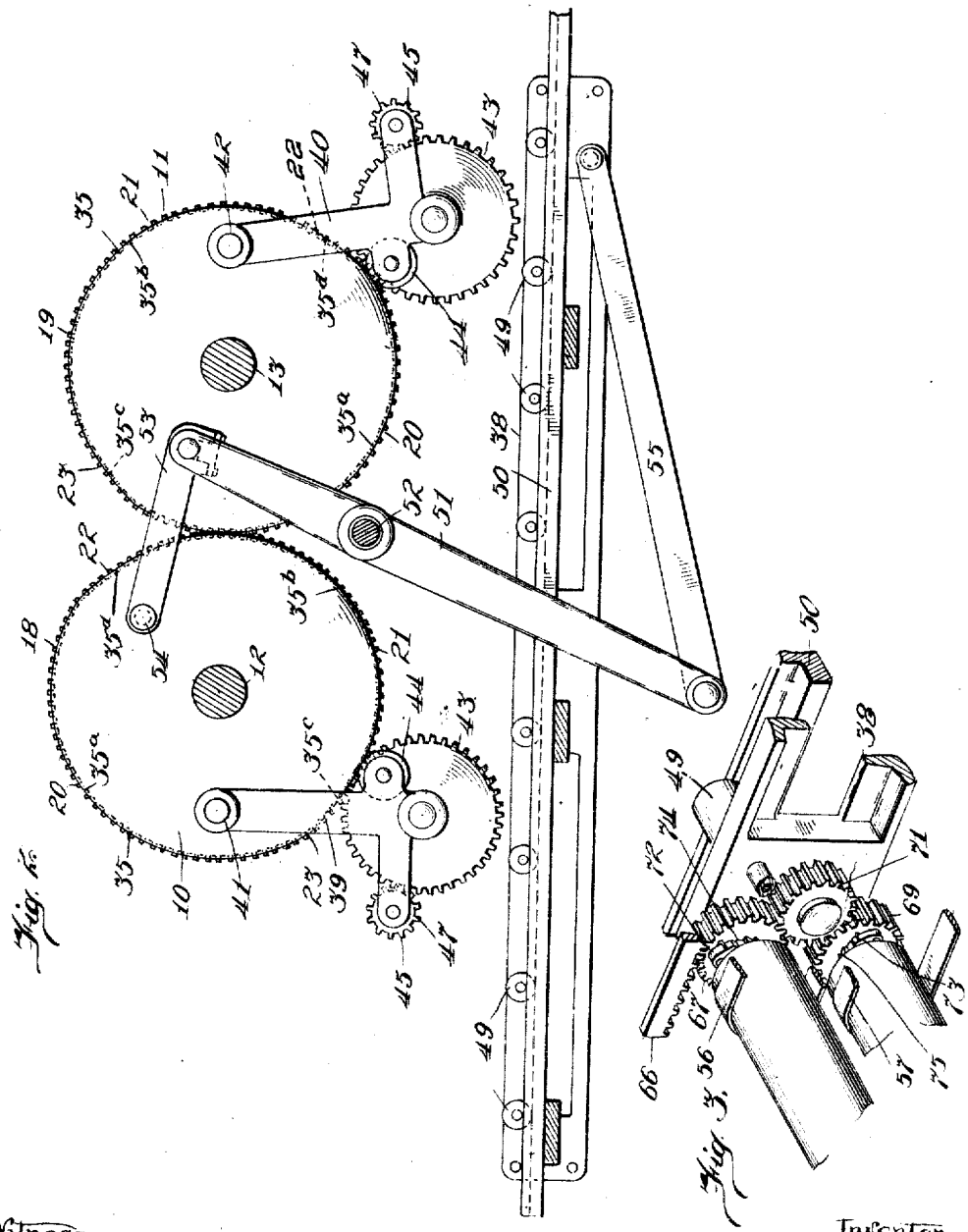

Fig. 3.

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UNITED STATES PATENT OFFICE.

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ROTARY PRINTING-PRESS.

1,003,737. Specification of Letters Patent. Patented Sept. 19, 1911.

Application filed February 20, 1911. Serial No. 609,791.

To all whom it may concern:

Be it known that I, WILLIAM L. HAMILTON, a citizen of the United States, and resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Rotary Printing-Presses, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to rotary printing presses; and the object of the invention is to provide a printing press which shall be of increased capacity and shall have its operative parts compactly and conveniently arranged.

The invention contemplates the use of a pair of cylinders each having printing and impression surfaces of different radius, the printing and impression surfaces of one cylinder coöperating, respectively, with the impression and printing surfaces of the other cylinder.

In the accompanying drawings Figure 1 is a central vertical longitudinal section of a printing press embodying the invention, the supporting framework of the machine being omitted for simplicity of illustration; Fig. 2 is a side elevation of the machine, details of the supporting framework being shown in section but the main part of the frame and the feed tables and inking rolls being omitted; and Fig. 3 is a perspective view showing a detail of a sheet delivering mechanism which may be used upon the machine.

In carrying out the invention, a pair of oppositely rotating cylinders 10, 11, are provided. These cylinders are mounted on parallel shafts, as 12, 13, and they are most desirably of the same size and of like construction. As shown, each cylinder has a printing surface, as 14, 15, and an impression surface, as 16, 17. A set of ink-distributing rolls, as 25, 26, each of which is supplied by a fountain, as 27, 28, is provided for engaging the printing surface of each of the cylinders 10, 11. This ink-distributing mechanism may be of any well known construction, and is herein shown merely in outline. The two sets of ink-distributing rolls 25, 26, and the fountains 27, 28, for supplying the same, are located upon the remote side of the cylinder, as 10, 11, with which they respectively coöperate, from the other cylinder.

In order that the impression surfaces, as 16, 17, of the cylinders will not be directly engaged by the ink-distributing rolls, as 25, 26, during the rotation of the cylinders, the two parts of the cylinders are of unequal radius, the radii of the printing surfaces, as 14, 15, of each cylinder being the greater. Preferably, however, the two cylinders are of such size that the sum of the radii of the printing surface of each cylinder and of the impression surface of the other cylinder is equal to the distance between the axes of the cylinders. The impression surface, as 16, 17, of each cylinder thereby provides a support for a sheet, while it receives an impression from the printing surface, as 14, 15, of the other cylinder.

To provide for a repeated alternate coöperation of the printing surface, as 14, 15, of each cylinder with the impression surface, as 16, 17, of the other cylinder, during the continued rotation of the cylinders 10, 11, the linear circumferential extent of the printing surface, as 14, 15, of each cylinder is equal to the extent of the impression surface, as 16, 17, of the other cylinder measured in the same way. As the two cylinders 10, 11, are most desirably of like construction, the circumferential extent of the printing and impression surfaces of each cylinder are, therefore, preferably equal.

For causing the two cylinders 10, 11, to coöperate in the manner just described, whereby two sheets are printed during each revolution of the cylinders, they are simultaneously rotated in opposite directions. As shown, the cylinders are geared together by means of intermeshing cam gears 18 and 19, mounted, respectively, on the supporting shafts 12 and 13. Preferably each of the cam gears 18, 19, comprises two circular portions 20 and 21 (Fig. 2), the circular portion 20 being equal in circumferential extent and of the same radius as the printing surface, as 14, 15, of the corresponding cylinder, and the circular portion 21 of each of the gears 18, 19, being of the same circumferential extent and of the same radius as the impression surface, as 16, 17, of the corresponding cylinder. The circular portions 20 and 21 of each of the cam gears 18, 19, are connected by oblique gear portions 22 and 23.

During the operation of the machine, one of the cylinders, as 10, is continuously rotated at a uniform speed in the direction indicated by the arrow on Fig. 1, by power

mechanism (not shown). The other cylinder, as 11, is turned in the opposite direction at a variable angular speed, by reason of the intermeshing of the cam gears 18, 19, the circular portions 20 and 21 of the gear 18 engaging, respectively, with the parts 21 and 20 of the gear 19. By constructing the gears in accordance with the proportions here described, the surface speed of the printing surface 15 of the cylinder 11 is maintained uniform with that of the impression surface 16 of the cylinder 10, while these surfaces are coacting to print a sheet, and the surface speed of the impression surface 17 of the cylinder 11 is maintained uniform with that of the printing surface 14 of the cylinder 10 when a sheet is being printed by the coaction of the two last-mentioned surfaces. A proper coaction of the cylinders 10, 11, is preferably further insured by equipping each with a marginal rim or flange 35, such flanges of the two cylinders being in continuous rolling contact. These flanges 35 correspond with the "bearers" usually employed upon rotary printing presses, except that in their peripheral outline they follow the irregular contour of the cylinders 10, 11, and of the pitch lines of the cam gears 18, 19, whereby each takes the form of a cam having circular portions 35^a and 35^b of unequal diameter connected by oblique portions 35^c and 35^d.

The cylinders 10, 11, are each equipped with sheet-gripping fingers 24, which coöperate with the impression surfaces 16, 17, of the cylinders for retaining sheets of paper thereon. These sheet-gripping fingers may be of any usual and well known construction. The cylinders 10, 11, will be supplied with paper to be printed alternately, and preferably this will be done from separate feed boards, as 29, 30. These feed boards are shown as taking the simplest form of construction, whereby sheets of paper supported thereon are delivered to the gripping fingers 24 of the corresponding cylinders 10, 11, by hand, though obviously feed boards equipped with any well known form of automatically operated sheet-feeding mechanism may be employed.

In order that the feed boards 29, 30, may readily coöperate with the grippers 24 in delivering sheets to the impression surfaces 16, 17, of the cylinders 10, 11, respectively, while still permitting the edges of the boards to clear the printing surfaces 14, 15, of the cylinders, each of the feed boards is jointed adjacent its edge, as indicated at 33, and the inner portions, as 31, 32, of the board are vertically oscillated during the rotation of the cylinders. As shown, the oscillatable inner portion, as 31, 32, of each of the feed boards 29, 30, carries a cam shoe 34, which rides upon the cam bearing surface 35 of the corresponding cylinder, whereby the inner portions 31, 32, of the feed boards are raised to clear the printing surfaces 14, 15, of the cylinders 10, 11, and are permitted to fall into close coöperative relation with the impression surfaces 16, 17, respectively.

Any convenient form of delivery mechanism may be employed for removing the printed sheets from the impression surfaces 16, 17, of the cylinders 10, 11. As shown, a pair of delivery rolls 36, 37, and a single reciprocating tape carriage 38 are employed. One of the delivery cylinders 36, 37, coöperates with each of the cylinders 10, 11, whereby the cylinders 36, 37, deliver sheets to the tape carriage 38 in alternation and adjacent opposite ends of the carriage. Preferably each of the delivery cylinders 36, 37, is rotatably mounted at its ends in links, as 39, 40, and gear pinions 43, coaxially mounted with each of the delivery cylinders and turning with them, are continuously maintained in engagement with the cam gear, as 18, 19, of the corresponding cylinders 10, 11, by the swinging of the links. As the means provided for supporting the two ends of the delivery cylinders 36, 37, at the opposite sides of the machine are of like construction, that at one side of the machine only is shown. The links 39, 40, are each pivotally hung from a fixed support, as at 41, 42, and for swinging the links each carries a cam roller 44, which rides upon one of the cam bearing surfaces 35.

The delivery cylinders 36, 37, are equipped with the usual grippers 44^a, and guide rollers 45 journaled in arms 46 formed on the links 39, 40, coöperate with the grippers in holding sheets upon the cylinders. Preferably the guide rollers 45 are continuously driven by gear pinions 47, coaxially mounted with the guide rollers and meshing with the pinions 43. If desired, a rotatable cutter 48, for slitting the sheet carried by the corresponding delivery cylinder 36, 37, may be coaxially mounted with one or both of the guide rollers 45.

The carriage 38 is provided upon each side with rollers, as 49, which run upon stationary rails, as 50, provided at each side of the frame of the machine. As the two sides of the carriage and corresponding parts of the frame of the machine are preferably of like construction, one side only of the carriage is shown in detail. The carriage is preferably reciprocated upon the rails, as 50, during each revolution of the cylinders 10, 11. Any convenient mechanism may be employed for effecting such a reciprocation of the carriage, and there is shown for this purpose a lever 51, pivoted intermediate its ends upon a fixed support 52, and having one of its ends connected by a link 53 to a wrist-pin 54, which turns with one of the cylinders, as 10, whereas

the other end of the lever 51 is connected by a link 55 to the carriage.

The carriage 38 is preferably equipped with two pairs of superimposed tape tables, as 56, 57, and 58, 59. The upper and lower tape tables 56, 57, and 58, 59, of the two pairs are preferably located in horizontal alinement on the carriage. The inner ends of the upper tape tables 56, 58, are separated, as shown at 60, whereas the lower tape tables 57, 59, preferably have their inner end rolls 61, 62, mounted upon a common shaft 63. Provision is made for driving the tapes of one of the upper tables 56, 58, and of the lower table adjacent the other end of the carriage, as 59 or 57, during the reciprocation of the carriage in each direction, the tapes of the other two tables then remaining stationary but being driven during the movement of the carriage in the reverse direction. As shown, a stationary gear rack 66 extends along the frame of the machine adjacent one side, and gear pinions 67, 68, coaxially mounted with the outer end rolls of the upper tape tables 56, 58, mesh with the gear rack 66 and are rotated thereby during the reciprocation of the carriage. Each of the gear pinions 67, 68, in turn rotates a gear pinion, as 69, 70, coaxially mounted with the outer end rolls of the lower tape tables 57, 59, respectively, through the medium of an idle gear pinion 71, rotatably mounted upon the side frame of the carriage. The gears 67, 69, and 68, 70, at the opposite ends of the carriage 38 carry oppositely facing spring pawls, as 72, 73, and these spring pawls coöperate, respectively, with ratchets 74, 75, formed upon the ends of the outer end rolls of the upper and lower tape tables 56, 57, and 58, 59. By means of this arrangement the upper turns of the tapes of the tables 56 and 59 are driven to the right, as viewed in Fig. 1 of the drawings, when the carriage 38 is moved to the left, the tapes of the tables 57 and 58 then remaining stationary, whereas the upper turns of the tapes of the tables 57 and 58 are moved to the left, as viewed in Fig. 1, when the carriage 38 is moved to the right, the tapes of the tables 56 and 59 then remaining stationary.

In the operation of the device, a sheet delivered to the press from the feed board 30, as at X, will be laid upon the tape table 58 when the carriage 38 is moved to the left, as viewed in Fig. 1, and a sheet delivered to the press from the feed board 29 will be delivered to the tape table 56 when the carriage 38 is moved to the right, viewed in the same way. When the carriage 38 is moved to the right, as viewed in Fig. 1, the sheet which was laid upon the tape table 58 during the last succeeding movement of the carriage in the reverse direction, will be passed off of the inner end of the tape table 58 on to the table 57, and on the next succeeding movement of the carriage 38 to the right this sheet will be passed off of the end of the tape table 57 on to a suitable support, as at A (Fig. 1). Similarly, during each movement of the carriage 38 to the left, as viewed in Fig. 1, the sheet which was deposited upon the tape table 56 during the last preceding movement of the carriage 38 to the right, will be passed off of the inner end of the tape table 56 on to the tape table 59, and upon the next succeeding movement of the carriage 38 to the right this sheet will be passed off of the end of the tape table 59 on to a suitable support, as at B. Sheets printed by the cylinder 10 are thus deposited below the feed board 29, where they may be conveniently examined by an operator standing within reach of the ink fountain 27, and sheets printed by the cylinder 11 are deposited at B, where they may be conveniently examined by an operator standing within reach of the ink fountain 28. Furthermore, the sheets are maintained upon the tape tables 56, 59, and 58, 57, respectively, a sufficient length of time to permit the ink to set.

The sheet delivery mechanism shown and described is not claimed herein, for the reason that it is reserved for a separate application.

I claim as my invention—

1. In combination, a pair of oppositely rotating cylinders each having printing and impression surfaces, the radius of curvature of the impression surface of each cylinder being shorter than the radius of curvature of the printing surface of the same cylinder and the printing and impression surfaces of each cylinder coöperating, respectively, with the impression and printing surfaces of the other cylinder at each revolution of the cylinders.

2. In a rotary printing press, in combination, a pair of cylinders each having printing and impression surfaces, the printing surface of each cylinder being of greater radius than the impression surface of the same cylinder, and a pair of intermeshing cam gears coaxially mounted with the respective cylinders and turning with them, each of the said cam gears having circular portions the pitch lines of which have radii equal to the radii of the printing and impression surfaces of the corresponding cylinder.

3. In a rotary printing press, in combination, a pair of like cylinders each having printing and impression surfaces, the printing and impression surfaces of each cylinder being of equal extent but of different radius, the printing surface having the greater radius, and a pair of equal intermeshing cam gears coaxially mounted with the respective cylinders and turning with them,

each of the said cam gears having circular portions of equal extent but of different radii, the radii of the said circular gear portions being equal, respectively, to the radii of the printing and impression surfaces of the cylinders.

4. In a rotary printing press, in combination, a pair of parallel cylinders each having printing and impression surfaces, the printing surface of each cylinder being of greater radius than the impression surface of the same cylinder, and the sum of the radii of the printing surface of each cylinder and of the impression surface of the other cylinder being equal to the distance between the axes of the cylinders, and means for rotating the cylinders at relatively variable angular velocity whereby the surface speeds of the printing and impression surfaces of one cylinder will alternately be uniform with the surface speeds of the impression and printing surfaces of the other cylinder, respectively.

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