

April 14, 1936.

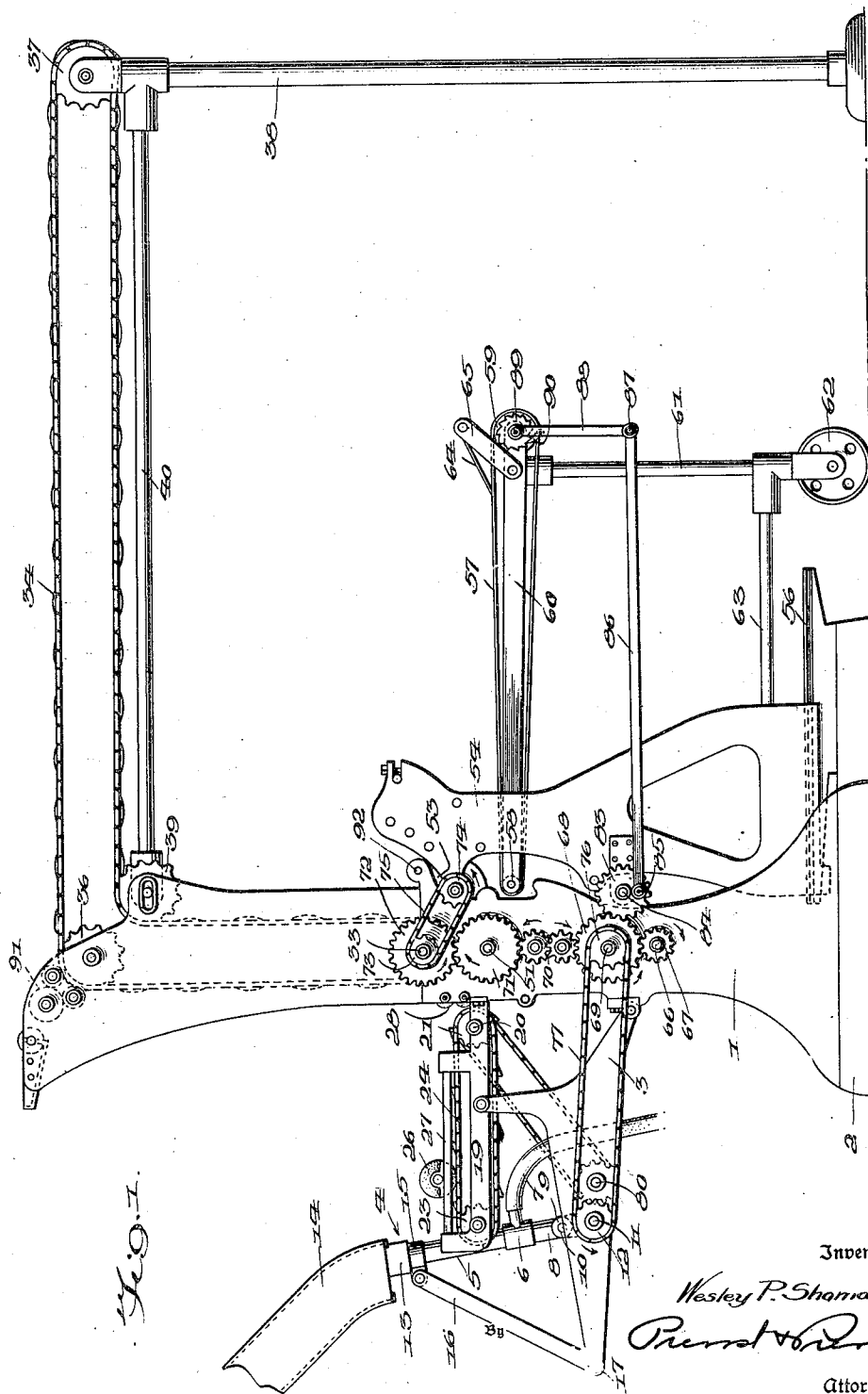
W. P. SHOMAKER

2,037,181

PRINTING AND COLLATING MACHINE

Filed Oct. 4, 1933

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

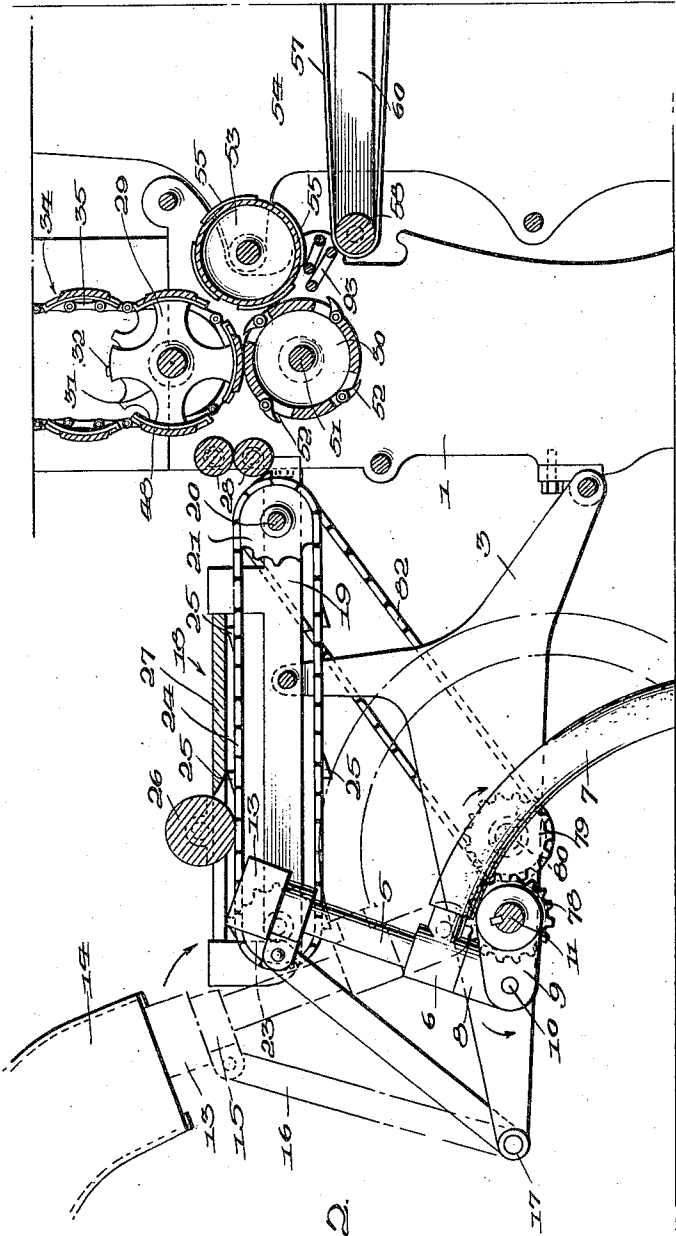


Fig. 2.

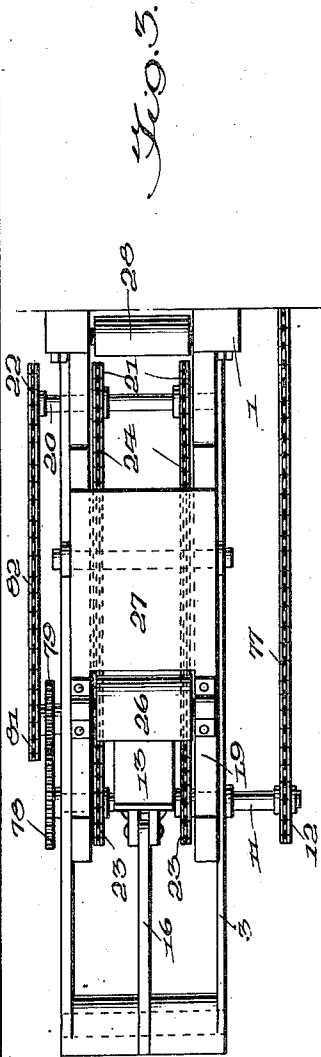


Fig. 3.

Inventor

Wesley P. Shomaker,

Print & Print

Attorneys

April 14, 1936.

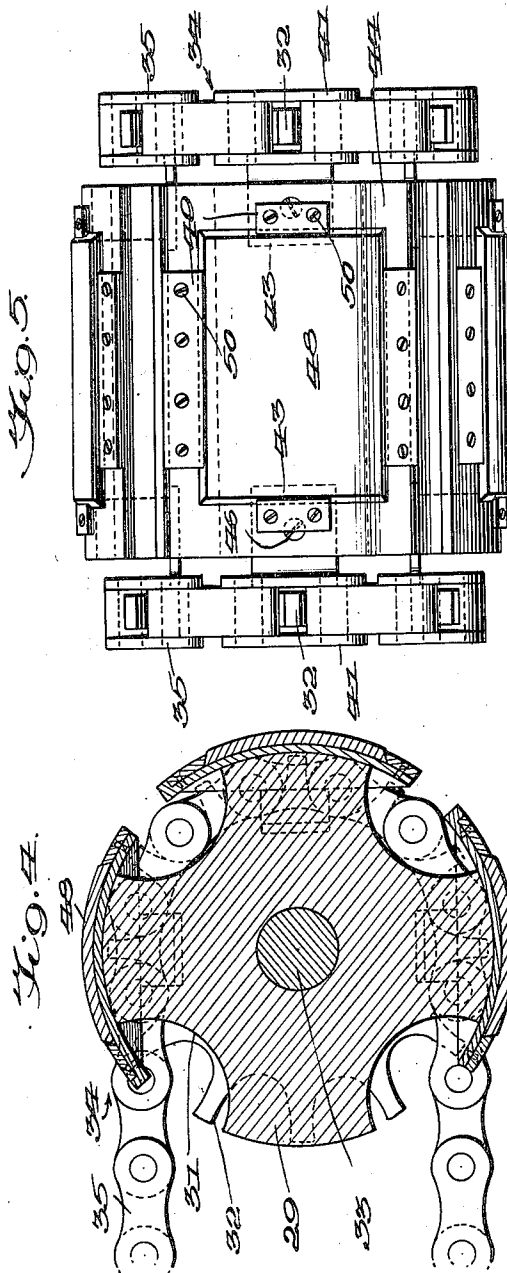
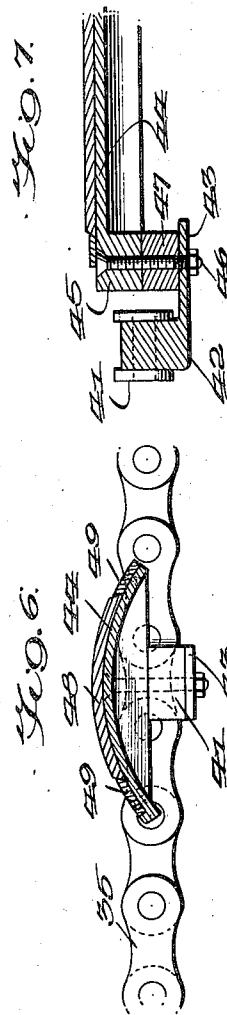
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PRINTING AND COLLATING MACHINE

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3 Sheets-Sheet 3



INVENTOR

BY *Wesley P. Shornaker,*
Print & Press
ATTORNEYS

UNITED STATES PATENT OFFICE

2,037,181

PRINTING AND COLLATING MACHINE

Wesley P. Shomaker, Richmond, Va.

Application October 4, 1933, Serial No. 692,158

13 Claims. (Cl. 101—216)

My invention consists in new and useful improvements in a combined printing and collating machine and has for its object to provide a mechanism of this character which will successively print different messages on a series of envelopes or other paper articles and at the same time arrange and deliver said printed articles in sets of a predetermined number.

This invention is particularly adapted for use in printing and collating church collection or contribution envelopes such as those conventionally employed, said envelopes being arranged in sets of fifty-two regular weekly envelopes with a varying additional number of special occasion envelopes in each set. It is essential that these sets of envelopes be arranged in proper order so that the date corresponding to the weekly message and the occasional message will appear on the correct envelope, and furthermore, so that each set will correspond with the other sets of the series.

Heretofore it has been generally the custom to print in advance a large number of envelopes with each of the desired messages and then either arrange them in the proper sets by hand before applying the respective dates and set numbers, or in some instances machines have been employed for automatically collating the printed envelopes prior to dating and numbering, a device of this type being shown and described in my co-pending application Serial No. 557,165, filed Aug. 14, 1931.

Numerous disadvantages have been prevalent in the use of these methods and machines. In the first place, where the envelopes are printed with messages in advance, they must be stored in groups according to the messages thereon, until they are required for filling an order, when they are taken out of storage, collated, dated, numbered and the name of the church printed thereon. This naturally involves an unnecessary waste of time and labor in handling and requires a considerable storage space. Furthermore, such practice has often been found to result in a large waste of stock for the reason that the style of messages used generally changes each year and unless all of the previously printed stock is used up in orders before the new season comes in, it is a total loss.

These disadvantages exist whether the printed envelopes are collated by hand or by machine. Obviously hand collating is a decided set-back in time and labor, and with the machines used for this purpose, the filling of the magazines and

changing of stock for different requirements is an element of considerable importance.

It is the primary object of my present invention to overcome these disadvantages, and to this end I have provided a mechanism which will print and collate the envelopes as required, the only storage necessary being that of the unprinted stock which of course does not require the carefully classified storage necessary in the old practice. Furthermore, it is obvious that this unprinted stock may be purchased by the printer as required and hence he does not find it necessary to store large quantities of envelopes.

A further object of my invention resides in an improved endless chain of printing plates and the means whereby said plates are removably secured to the chain.

A still further object of my invention is to provide a suction extractor particularly adapted for successively removing individual envelopes from a stack or hopper and delivering the same to the printing and collating mechanism.

With the above and other objects in view which will appear as the description proceeds, my invention consists in the novel features herein set forth, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

Referring to the drawings in which numerals of like character designate similar parts throughout the several views,

Fig. 1 is a view in side elevation showing my complete machine.

Fig. 2 is a sectional view taken through a portion of Fig. 1 and showing the suction extractor, feeding mechanism and printing and impression rollers.

Fig. 3 is a top plan view of the extractor and feed mechanism shown in Fig. 2.

Fig. 4 is an enlarged detail sectional view of the plate cylinder showing a portion of the plate chain.

Fig. 5 is a plan view from one side of the plate cylinder showing one means for securing the printing plates on the chain.

Fig. 6 is a longitudinal section taken through the chain and one of the printing plates, and

Fig. 7 is a fragmentary transverse section showing a structural detail of the plate chain.

In the drawings, 1 represents the main frame of the machine supported on a suitable base 2 and carrying on its front side a bracket 3 adapted to support the suction extractor and feed mechanism. The suction extractor 4 comprises a vertical tubular arm 5 supported at its lower ex-

tremity by and in communication with a suction coupling 6 which is in turn in communication with a suction tube 7 leading from any suitable source of vacuum. At the lower end of the coupling 6, I provide an extension 8 which is operatively connected to a crank arm 9 by means of a pin or bolt 10, said crank arm being rotatably mounted in the bracket 3 on a transverse shaft 11, the outer end of which has keyed thereto a sprocket wheel 12 as will be hereinafter set forth. The upper end of the tubular arm 5 carries a sucker head 13 which may be of any suitable design for removing envelopes or paper articles from the open lower extremity of the stack or hopper 14. Immediately below the sucker head 13 and closely engaging the periphery of the arm 5 I provide a yoke 15 to which the upper end of a link or lever 16 is pivotally secured, the lower end of the latter being pivoted at 17 to the outer end of the bracket 3.

It will thus be seen that upon the counter-clockwise rotation of the sprocket wheel 12, the sucker block 13 will be caused to travel about a clockwise arc through the medium of the crank arm 9 and the link 16, said sucker block in its extreme upward position engaging the lowermost envelope in the stack 14 and extracting said envelope by first separating the leading edge of the envelope from those remaining in the stack and then carrying the envelope downwardly through an arcuate path. It will be seen that by withdrawing the lowermost envelope at an angle of inclination in this manner, I avoid the possibility of a vacuum between two adjacent envelopes which might cause the delivery of more than one at a time.

18 represents a chain feed mechanism which comprises a sub-frame 19 supported by the forward edge of the main frame 1 in any suitable manner and extending horizontally therefrom. This frame is made up of two parallel spaced side plates which support a transverse shaft 20 at the end adjacent the frame 1, said shaft having keyed thereto intermediate the side plates of the frame 19, spaced sprocket wheels 21. One end of the shaft 20 extends through the frame 19 and has fixed to its outer end a sprocket wheel 22 by means of which rotation of the shaft 20 is effected as will hereinafter appear. The opposite end of the frame 19 carries two spaced co-axial sprocket wheels 23 rotatably mounted on short shafts supported by the frame 19 and the respective sprocket wheels 21 and 23 on either side of the frame are connected by endless feed chains 24, the latter being provided at spaced intervals on their horizontal outer faces with projecting lugs 25 for engaging the rear edges of envelopes deposited thereon by the sucker block 13.

As will be seen from Figs. 2 and 3, the sucker block 13 in its downward movement passes between the chains 24 adjacent the sprocket wheels 23 and in doing so deposits the extracted envelope on the top run of the feed chains 24, whereupon the lugs 25 engage the rear edge of the envelopes and feed them forwardly. Preferably I employ a rubber roller 26 which extends across the frame 19 above the chains 24 at a point immediately adjacent the path of movement of the sucker block 13 where the latter intercepts said chains to deposit an envelope thereon. This roller may or may not be geared as desired. 27 represents a cover for that portion of the frame between the roller 26 and its inner end, to prevent the envelopes from becoming dislodged from the moving chains. 28 represents a pair of feed

rollers rotatably secured to the forward edge of the main frame 1 in direct line with the top run on the feed chains 24 whereby the envelopes are fed from the feed chain to the plate cylinder and impression cylinder 29 and 30 respectively.

The plate cylinder 29 comprises a body portion provided with a plurality of longitudinally extending recesses 31 so that it is substantially cross-shaped in transverse section as shown in Figs. 2 and 4. Thus the body portion of this cylinder in the form shown in the drawings, provides four bearing surfaces for the printing plates as will be hereinafter described. At either end of the cylinder 29 I provide sprocket wheels 32 which together with the cylinder are keyed to the shaft 33 and mounted transversely in the frame 1 with the lower peripheral extremity of the cylinder 29 in line with the feed rolls 28.

The plate chain 34 consists of a pair of spaced endless chains each made up of a plurality of links 35 of conventional design and adapted to pass over the respective sprocket wheels 32 on opposite ends of the blade cylinder 29. As shown in Fig. 1, these chains pass upwardly over a pair of spaced sprocket wheels 36 mounted in the frame 1, then horizontally to a second pair of sprocket wheels 37 mounted at the upper end of a vertical standard or support 38 which forms a part of the frame 1, over said sprocket wheels, back horizontally and then over a third pair of sprocket wheels 39 and back down to the sprocket wheels 32 on the plate cylinder. The upright standard 38 is supported at its upper extremity by a horizontal bar 40 which extends from the upright 38 to the frame 1 and is adjustably secured to the latter by any suitable means so that the standard 38 and support for the pair of sprockets 37 may be moved toward or away from the sprocket wheels 36 and 39 when the chain 34 is lengthened or shortened.

The chain 34 is adapted to carry a series of printing plates by inserting at predetermined points specially constructed links 41 shown in detail in Figs. 6 and 7. These special links are substantially the same as the conventional links 35 with the exception that the inner member is extended downwardly as at 42 in the form of a lug which carries a right angular arm 43, the special links of the opposite chains being correspondingly arranged so that the angular arms 43 project inwardly toward one another as shown in Fig. 5. These arms 43 are adapted to support plate bases 44 which extend between or bridge the pair of chains and are concave on their inner sides so as to conform in shape to the bearing surfaces of the plate cylinder 29, the ends of said bases being thickened as at 45 and drilled and threaded to receive bolts 46 by means of which they are secured to the respective arms 43. Preferably in order to raise the plate bases 44 above the path of the chains, I provide spacers 47 which are interposed between the thickened ends 45 and the arms 43.

The outer faces of the bases 44 are convex and of a curvature to correspond with that of the plate cylinder 29 so that as the chains and bases travel around the cylinder 29 for printing engagement, they form substantially three-fourths of a complete cylinder. Each of the bases 44 is adapted to carry a correspondingly curved printing plate 48 which is secured in place by any suitable means. In the drawings, I have shown the edges of the printing plates 48 beveled and have provided retaining plates 49 which are correspondingly beveled along one edge and

adapted to be held in place in engagement with the adjacent edges of the plates 48 by means of screws 50.

Each of these plates 48 carries the type for a different message, one for each of the fifty-two weeks of the year and additional special occasion messages when used for printing sets of church collection envelopes. Generally different churches or churches of different denomination require different messages and when it is necessary to change the series of messages, the individual plates 48 may be readily removed by unscrewing and lifting off one of the retaining plates 49 and sliding the printing plate off of its base after which it may be replaced by the new plates in the reverse manner.

Immediately below the plate cylinder 29, the impression cylinder 30 is rotatably mounted in the frame 1 on a transverse shaft 51, said cylinder being of conventional form and provided with a plurality of automatic nippers 52 for gripping the leading edge of each envelope as it passes from the feed rollers 28 and retaining said envelope during its passage between the plate cylinder 29 and the impression cylinder. In the form of my invention shown in the drawings, the impression cylinder 30 is provided with four of these nippers, one for each of the bearing surfaces of the plate cylinder.

53 represents a border printing cylinder or ornamenting cylinder which is rotatably mounted transversely in an auxiliary frame 54, said cylinder 53 being provided with a series of printing plates or surfaces 55 arranged around its periphery so that after an envelope has passed the plate cylinder 29, it is carried by the nippers 52 on the cylinder 30, between the latter and the border cylinder for ornamentation. The purpose of this separate border cylinder is to enable the application of ornamentation or borders of a different color from that applied by the plates 48.

The auxiliary frame 54 as shown in Fig. 1 is mounted at its lower extremity on a track or guideway 56 which forms a part of the main support 2, whereby said auxiliary frame and the border cylinder carried thereby may be moved longitudinally away from the main frame 1 to afford access to the plate cylinder and impression cylinder. An endless conveyor 57 is arranged immediately below the border cylinder 55 and passes over suitable rollers 58 and 59 carried transversely in a support 60, one end of which is mounted in the auxiliary frame 54 with its opposite end supported by an upright 61, the lower end of which embraces a roller or wheel 62 which rests on the floor. The upright 61 is reinforced and held rigidly to the auxiliary frame 54 by a horizontal rod or bar 63 and thus forms substantially a part of said auxiliary frame. Adjacent the roller 59 at the outer end of the support 60 I provide a stop member 64 carried at the upper end of upwardly extending arms 65, the lower extremity of said stop member resting lightly upon the upper surface of the endless conveyor 57 whereby the printed envelopes carried along by the conveyor are prevented from falling off the outer end of the conveyor and are gathered in collated relation for removal by the operator.

All of the above-described mechanisms are either geared or otherwise operatively connected in timed relation so as to insure their synchronous movement. In the form of my invention shown in the drawings, a shaft 66 leads directly

from any suitable source of power and carries at one end a gear 67 which is adapted to turn in clockwise direction and meshes with a larger gear 68 mounted immediately above the gear 67 on a shaft 69. Through a train of gears 70, the gear 68 is in turn operatively connected to a gear 71 fixed to the outer end of the shaft 51 which carries the impression cylinder 30, thus imparting clockwise rotation to the latter. A gear 72 is fixed on the shaft 33 carrying the plate cylinder 29 and is adapted to mesh with the gear 71 so that counter-clockwise rotation of the plate cylinder is effected. As before stated, the rotation of the plate cylinder through the medium of the sprocket wheels 32 causes the plate chain 34 to travel about its endless path.

By means of sprocket wheels 73 and 74 mounted on the transverse shafts which carry the plate cylinder 29 and the border cylinder 53, respectively, together with a sprocket chain 75, counter-clockwise rotation is imparted to the border cylinder 53. Obviously instead of this arrangement of sprocket chain and sprocket wheels, the border cylinder 53 may be operated by a train of gears but for the purposes of illustration, the mechanism just described is sufficient.

On the shaft 69 adjacent the gear 68 I mount a sprocket wheel 76 which is operatively connected to the sprocket wheel 12 on the crank arm shaft 11 by means of a sprocket chain 77, whereby counter-clockwise rotation is imparted to the crank arm 9. At the opposite end of the shaft 11 I provide a gear 78 as clearly shown in Figs. 2 and 3, which is adapted to mesh with a second gear 79 carried on a shaft 80 on the frame 3, said shaft also having keyed thereto a sprocket wheel 81. A sprocket chain 82 operatively connects the sprocket wheel 81 with the sprocket wheel 22 mounted on the shaft 20 for operating the feed chains 24. It will be noted that the counter-clockwise rotation of the sprocket wheel 12 is transformed into the clockwise rotation of the sprocket wheel 81 by the gears 78 and 79, so that the movement imparted to the feed chain sprocket wheels 21 and 23 is in a clockwise direction and thus the top run of the feed chains travels in a direction toward the printing mechanism.

A gear 83 rotatably mounted on a shaft 84 carried in any suitable manner by the sub-frame 54, is adapted to mesh with the gear 68 on the main frame 1 and said gear 83 has eccentrically mounted thereon as at 85, one end of a rod or bar 86, the other end of which is pivotally secured as at 87 to a ratchet arm 88. The ratchet arm 88 is pivotally secured at its upper end to a ratchet wheel 89 which is operatively connected to the shaft carrying the roller 59 on the frame 60, and, through the medium of a pawl 90 on the ratchet arm, the endless conveyor 57 is advanced step by step upon the clockwise rotation of the gear 83. This mechanism is timed to accommodate the delivery of the printed articles delivered thereon from the printing mechanism.

Any suitable inking mechanism may be employed for inking the plates on the chain 34, such for example as the device 91 at the upper end of the frame in Fig. 1. Also a second color or border inking device 92 is provided for inking the border cylinder 53.

Conventional means may be employed for transferring the printed articles from the impression cylinder to the endless conveyor 57, such mechanism being shown diagrammatically at 93 in Fig. 2 and consisting of a pair of spaced belts traveling in opposite directions over suitable roll-

ers. The printed articles are deposited from the impression roller between the two belts and are thereby delivered onto the top run of the endless conveyor 57.

5 Having thus described the construction of my improved collating and printing machine, its operation is as follows:—

A quantity of plain stock or unprinted envelopes is stacked in the inclined hopper 14, being supported by any suitable lugs or fingers at the lower open end of the hopper. The machine is then set into operation and the rotation of the shaft 11 through the medium of the sprockets and chains just described, causes the crank arm 9 to rotate in a counter-clockwise direction about the axis of the shaft 11. This crank arm, being pivotally connected to the sucker arm 5, causes the latter to reciprocate, and due to the linkage arrangement 16, the sucker block 13 partakes of a clockwise arcuate movement, in its extreme upward position, engaging the lowermost envelope in the stack 14. Through the medium of the tube 7 and any suitable timed valve mechanism (not shown), a suction is created in the sucker block 25 which causes the same to grip said lowermost envelope and in the downward movement of the extractor mechanism the envelope is withdrawn at an angle and deposited on top of the feed chains 24, whereupon the suction is automatically cut off. The two positions of the extractor mechanism are shown in Fig. 2, the dotted line position showing the sucker block about to withdraw an envelope from the stack, and the full line position illustrating the delivery upon the feed chains. After delivering the envelope onto the feed chains, the extractor continues in its arcuate path and returns to withdraw the next envelope from the stack.

The lugs 25 on the feed chains engage the rear edge of the envelope and cause the same to travel under the roller 26 and deliver it to the feed rollers 28 which in turn convey the envelope to the impression cylinder 30 where its leading edge is gripped by one of the nippers 52 on the impression cylinder thus causing said envelope to pass between the impression cylinder and the plate cylinder 29. During the travel, the plate cylinder is rotating in timed relation with the impression cylinder so as to present the respective printing plate 48 to the face of the gripped envelope. After passing the plate cylinder 29, the envelope is carried into engagement with one of the printing plates 55 on the border cylinder 53 after which it is automatically released by the nipper and conducted through suitable mechanism 93 to the delivery table or endless conveyor 57.

The envelopes are delivered upon the conveyor 57 in the order in which they are printed by the chain of plates 34 and are thus collated or arranged in series. Hence they may be run through a dating and numbering machine in the order in which they are delivered onto the conveyor 57, and then placed in boxes or packages according to sets.

As hereinbefore stated, when it is desired to change any or all of the printed matter to be applied to the blank stock, the printing plates 48 may be readily removed from the chain and others substituted therefor. Furthermore, when it is necessary to add to or subtract from the number of printing plates on the chain according to the number of envelopes desired in any particular series, the alteration in the length of the chain may be compensated for by adjusting

the position of the upright support 38 toward or away from the main frame 1.

From the foregoing it is believed that the construction and advantages of my invention may be readily understood by those skilled in the art without further description, it being borne in mind that numerous changes may be made in the details disclosed without departing from the spirit of the invention as set forth in the following claims.

What I claim and desire to secure by Letters Patent is:—

1. In a printing press, a printing mechanism comprising an impression cylinder, a plate cylinder and an endless chain of printing plates, said chain comprising a pair of transversely spaced endless conveyors, means bridging said conveyors for supporting printing plates, printing plates thereon, means at the opposite extremities of said plate cylinder for engaging the respective conveyors so as to cause said plates to travel around said plate cylinder and to be successively presented to said impression cylinder, a hopper for articles to be printed, means for feeding said articles to said printing mechanism, and a second printing cylinder arranged to cooperate with said impression cylinder for applying additional printed matter to said articles.

2. In a printing press, an impression cylinder, a plate cylinder, sprocket wheels at the opposite extremities of said plate cylinder, a pair of spaced endless chains adapted to pass around the respective sprocket wheels, means carried by said chains and bridging the same for supporting printing plates, printing plates thereon, means for rotating said plate cylinder so as to successively present said plates to said impression cylinder, means on said impression cylinder for gripping an article to be printed, and means for successively feeding such articles to said impression cylinder, the periphery of said plate cylinder being provided with a plurality of bearing surfaces adapted to support said printing plates during the printing operation, all of the moving parts of said mechanism being operatively connected in timed relation.

3. In a printing press, an impression cylinder, a plate cylinder, sprocket wheels at the opposite extremities of said plate cylinder, a pair of spaced endless chains adapted to pass around the respective sprocket wheels, certain of the links of said chains being provided with transversely extending supporting arms, the arms of each chain projecting toward and arranged in alignment with the respective arms of the adjacent chain, means secured to said arms intermediate said chains for supporting printing plates, printing plates thereon, means for rotating said plate cylinder so as to successively present said plates to said impression cylinder, means on said impression cylinder for gripping an article to be printed, and means for successively feeding such articles to said impression cylinder, all of the moving parts of said mechanism being operatively connected in timed relation.

4. Apparatus as claimed in claim 3 wherein said last named means comprise supporting members extending across said chains and having a curvature corresponding to that of said plate cylinder.

5. Apparatus as claimed in claim 3 wherein said last named means comprise supporting members extending across said chains and having a curvature corresponding to that of said

plate cylinder, and means for removably securing said printing plates to said supporting members.

5 6. In a printing and collating machine, a frame, printing mechanism carried by said frame and comprising an impression cylinder, a plate cylinder and a relatively long endless chain of printing plates adapted to travel around said plate cylinder so as to successively present said
10 plates to said impression cylinder, said chain extending vertically for a predetermined distance, means adjacent the upper end of said frame for operatively supporting the vertical runs of said chain, another portion of said chain extending
15 substantially horizontally, means for operatively supporting the horizontal portions of said chain, and means for successively feeding articles to be printed to said printing mechanism.

20 7. A printing and collating machine as claimed in claim 6 including an inking mechanism located at the upper end of said frame adjacent the supporting means for one of said vertical runs.

25 8. In a printing and collating machine, a frame, printing mechanism carried by said frame and comprising an impression cylinder, a plate cylinder and a relatively long endless chain of printing plates adapted to travel around said plate cylinder so as to successively present said plates to said impression cylinder,
30 means carried by the upper portion of said frame for operatively supporting a vertically extending portion of said chain, an auxiliary frame for supporting a substantially horizontally extending portion of said chain, and means for successively feeding articles to be printed to said
35 printing mechanism.

9. A printing and collating machine as claimed in claim 8 wherein said auxiliary frame is adjustably connected to said frame.

40 10. A printing and collating machine as claimed in claim 8 wherein the major portion of said chain extends horizontally overhead, said

auxiliary frame being adjustably connected to said frame to support said overhead portion.

11. In a printing and collating machine, a main frame, printing mechanism carried by said frame and comprising an impression cylinder, a plate cylinder and a relatively long endless chain of printing plates adapted to travel around said plate cylinder so as to successively present said plates to said impression cylinder, means to operatively support said chain within a space
10 of less longitudinal extent than the distance traversed by said chain, a sub-frame movable toward and away from said main frame and carrying a second printing cylinder arranged to cooperate with said impression cylinder for applying additional printed matter to said articles,
15 and means for successively feeding articles to be printed to said printing mechanism, all of said moving parts being operatively connected in timed relation.

12. In a printing press for continuously printing successively different subject matter on each of a predetermined number of blanks to form sets of consecutively arranged printed articles, an impression cylinder, a plate cylinder,
25 an endless printing chain having fixed thereon a predetermined number of consecutively arranged printing plates, drive means for causing said chain to continuously travel around said plate cylinder so as to successively present said
30 plates to said impression cylinder, a hopper for blanks to be printed, means for successively feeding said blanks between said impression cylinder and the respective printing plates, and means for collecting said printed articles consecutively arranged in sets.

13. A printing press as claimed in claim 12 including a second printing cylinder arranged to cooperate with said impression cylinder for applying additional printed matter to said blanks.

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WESLEY P. SHOMAKER.