May 1, 1934. C. B. RUSSELL 1,956,699

PRINTING MACHINE

Filed Nov. 3, 1932 3 Sheets-Sheet 1

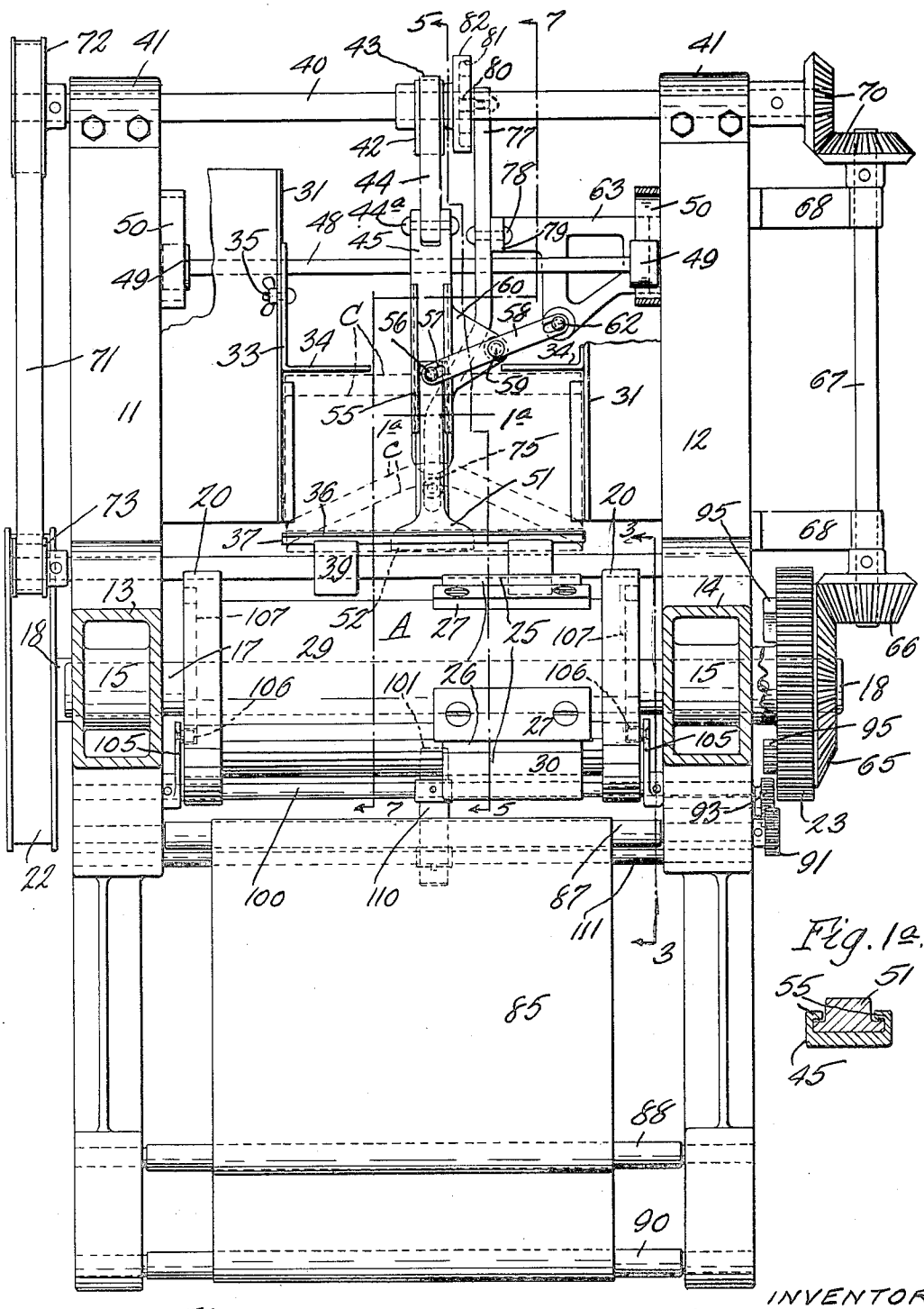


Fig. 1.

Fig. 1a.

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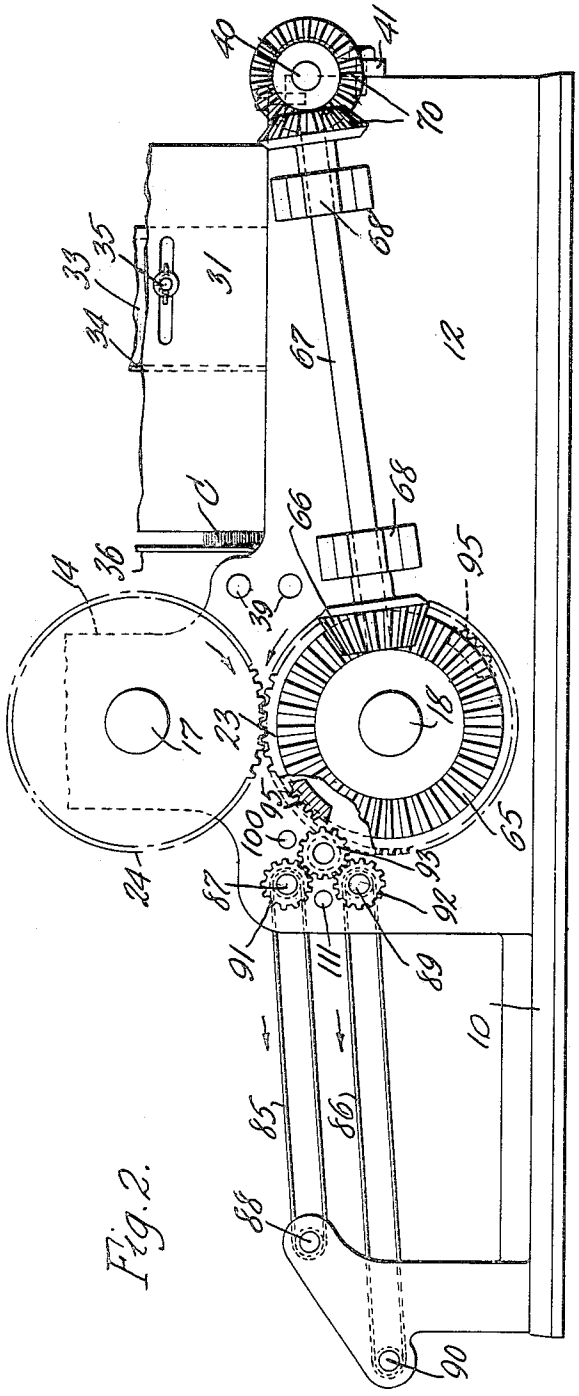


Fig. 2.

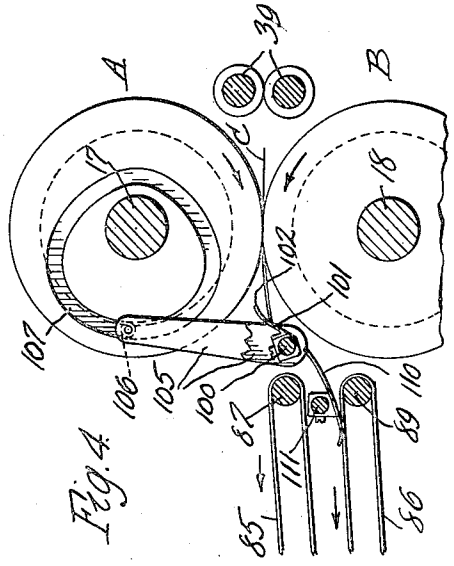


Fig. 4

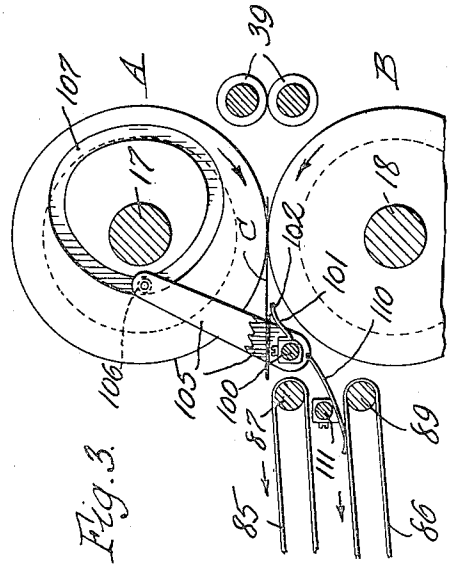


Fig. 3.

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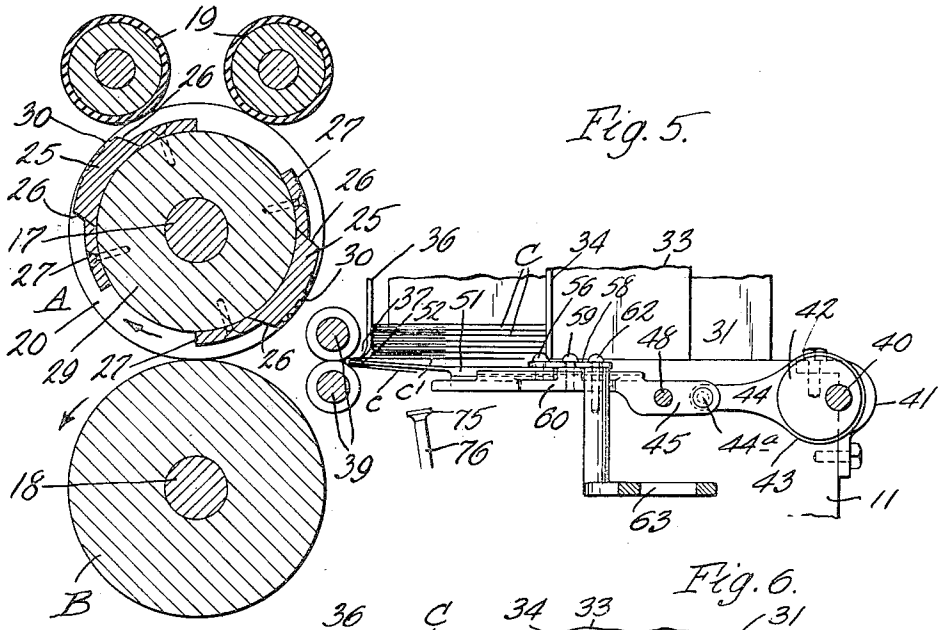


Fig. 5.

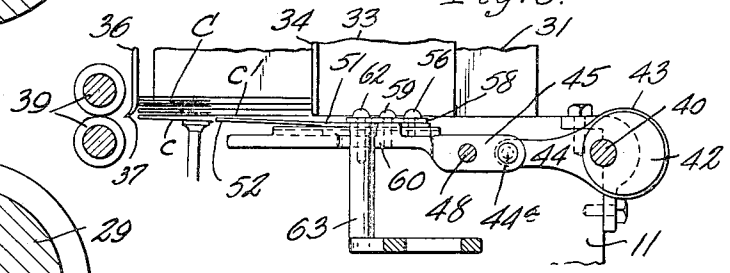


Fig. 6.

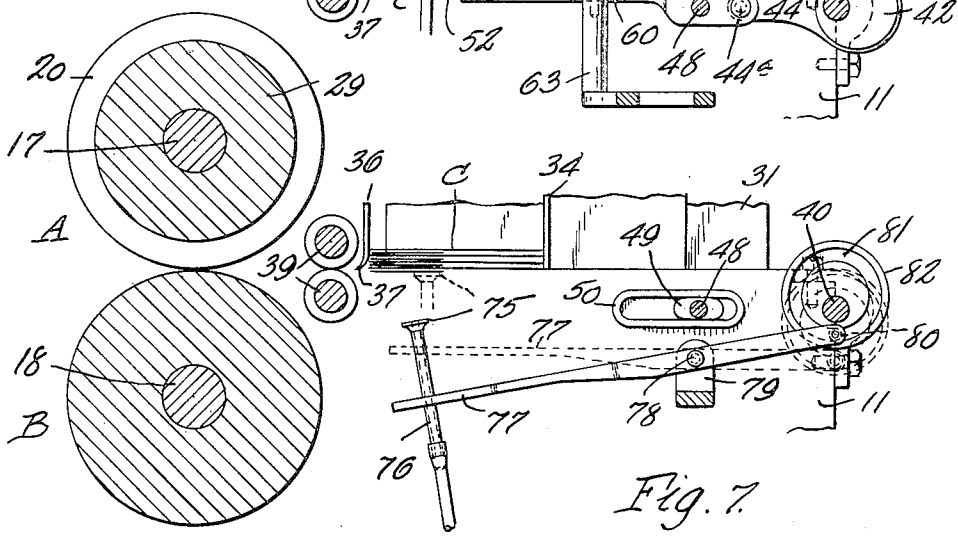


Fig. 7.

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Patented May 1, 1934

1,956,699

UNITED STATES PATENT OFFICE

1,956,699

PRINTING MACHINE

Charles B. Russell, Buffalo, N. Y., assignor to Clara A. Russell, Buffalo, N. Y.

Application November 3, 1932, Serial No. 640,935

5 Claims. (Cl. 101—232)

This invention relates to improvements in printing machines, and particularly to machines which are designed for use in printing the return addresses or the like impressions upon envelopes.

Such machines, as heretofore built, include a rotary, cylindrical printing cylinder upon which a type form, electrotype or other printing element or device for producing the impressions is mounted, and means for intermittently feeding the envelopes or articles to the printing cylinder. Since the size of the type form or other printing device is relatively small in comparison with the total circumference of said cylinder on the standard envelope printing machines, it follows that a large amount of time is lost in non-productive effort during each revolution of said printing cylinder.

An important object of the present invention is to materially increase the production of these machines by providing an improved printing machine with which a plurality of impressions may be produced during each revolution of the printing cylinder upon a corresponding number of envelopes or other articles; also to construct a printing machine of the kind described having an improved printing cylinder upon which a plurality of type setups, electrotypes or other printing devices may be arranged in circumferential, spaced relation for printing a plurality of impressions with each revolution of said printing cylinder.

Other objects are to produce an improved machine for printing envelopes and the like articles which is strong, durable and practical construction, and which will be capable of long and continuous operation without getting out of order; with which the envelopes or articles may be fed to the printing cylinder at a high rate of speed and in synchronism with the movement of the several printing devices on the printing cylinder to printing position to conform to the increased number of such devices provided; and also to effect such movement of the articles by improved means which are operable at the required high speed without increasing the speed of the printing cylinder, the drive means therefor and other parts of the machine above that now required in standard machines.

When printing envelopes on machines of the kind stated, the envelopes are usually arranged one upon another in an upright stack with the flaps facing downwards, the lowermost envelope resting at its side and bottom edges upon stack supporting flanges. In this position the flap of the lowermost envelope will extend in angular relation to the body thereof by the natural springiness of the paper, thus enabling a part of the feed mechanism to move between said flap and body, and by engaging the fold therebetween, advance the envelope to the printing cylinder. Thus, as each envelope is moved from the bottom of the stack, the next one will take its place. However, it takes an appreciable interval of time for the flaps of the envelopes to spring away from the bodies thereof when thus uncovered by the removal of the preceding envelope.

A further object, therefore, of the present invention is the provision of suitable means of novel construction with which the flaps of the envelopes are quickly and positively moved into spaced relation to the bodies, to thereby insure the flaps being so positioned in time for the proper entrance of the feed member between said flaps and bodies while operating at high speed as above described.

Another object of the invention is to provide novel means with which the printed envelopes are delivered from the printing cylinder and automatically sorted or separated into batches corresponding in number to the number of printing devices on the printing cylinder.

Various other objects and advantages will be apparent from the following description of an embodiment of my invention, and the novel features thereof will be particularly pointed out in connection with the appended claims.

In the accompanying drawings:

Fig. 1 is a plan view, partly in section, illustrating an embodiment of my improved printing machine.

Fig. 1*a* is a detailed section, on line 1*a*—1*a*, Fig. 1, showing a part of the feed mechanism.

Fig. 2 is a fragmentary side elevation of the machine, partly broken away to show certain parts thereof in section.

Figs. 3 and 4 are fragmentary, longitudinal, vertical sections, on line 3—3, Fig. 1, showing the means for sorting the printed envelopes or articles into batches, the parts being shown in two different positions in the respective figures.

Fig. 5 is a fragmentary longitudinal vertical section, taken approximately on line 5—5, Fig. 1, showing the article feeding mechanism in its advanced position.

Fig. 6 is a similar view thereof, with the feeding mechanism in its retracted position.

Fig. 7 is a similar view, taken approximately on line 7—7, Fig. 1, illustrating the means for

positively moving the flaps of the envelopes or articles away from the bodies thereof prior to or in alternation with the advance movement of the feed mechanism.

The various parts of the machine may be operatively supported in any suitable manner. In the embodiment illustrated, there is provided a frame including a base 10 having upright parallel, longitudinal side members 11 and 12, which are provided with upright extensions 13 and 14 respectively. Arranged in said extensions 13 and 14 are suitable bearings 15 in which a transverse horizontal shaft 17 is rotatably journalled. Fixed upon said shaft 17 between the side members 11 and 12 of the machine is my improved printing cylinder A, and arranged below and in operative relation to the same is an impression cylinder B suitably mounted upon a second shaft 18 also rotatably journalled in suitable bearings in the side frame members 11 and 12. The extensions 13 and 14 also support suitable inking mechanism for the printing cylinder A, two inking rollers 19 of such mechanism being shown in Fig. 5.

The printing cylinder A, is provided with circumferential spaced bearing members 20 adapted to have rolling or frictional contact with the periphery of the impression cylinder B.

Suitable drive mechanism is provided for rotating the cylinders A and B in the direction of the arrows, Figs. 3 and 4, the means shown comprising a pulley or a primary drive member 22 secured on one end of the shaft 18 of the impression cylinder B and a spur gear 23 secured on the other end of said shaft 18 and which meshes with a similar gear 24 of corresponding size secured to the adjacent end of the shaft 17 of the printing cylinder A.

In accordance with this invention, the printing cylinder A is provided with means for mounting upon the periphery thereof a plurality of printing devices or elements 25 arranged in spaced circumferential order. These devices 25 may be type forms or setups, electrotypes or other suitable instrumentalities for printing an impression upon the articles presented thereto. As illustrated for example in Figs. 1 and 5, there are two of the devices 25 disposed at diametrically opposite sides of the printing cylinder A and, as shown, they are in the form of electrotypes or similar unitary matrices which are provided with beveled longitudinal edges 26 which may be secured beneath undercut guide or securing members 27 detachably secured to the body 29 of said cylinder. The body 29 is of less diameter than the bearing portions 20 before alluded to, while the printing or impression surfaces 30 of the printing devices 25 are arranged in the same circumferential plane as the surface of said bearing parts 20, so as to be capable of contacting with an envelope or other article when said printing faces 30 move into printing position with, or relation to, the surface of the impression cylinder B.

Thus, it will be seen that a plurality of impressions can be printed upon articles passing through the bight between the printing and impression cylinders with each revolution of the printing cylinder A, the number, of course, corresponding with the number of printing devices 25 which may be mounted upon said cylinder A.

The machine is provided in advance of the printing cylinder with means of suitable construction for supporting a stack of envelopes or other articles C. In the construction illustrated, there is provided a pair of upright longitudinal, parallel plates or walls 31 which are adjustable towards one another transversely of the machine, and upon each of these plates 31 there is mounted a plate or member 33 having an offset transverse upright portion 34, as shown in Fig. 1. The plates 33 are adjustable lengthwise of the plates 31 by means of suitable bolts or adjusting members 35. By this construction, the plates 31 can be adjusted towards each other to conform to the length of the envelopes or articles to be printed upon, while the plates 33 are adjusted lengthwise relatively to the plates 31 so as to place the parts 34 thereof in engagement with the bottom edges of the envelopes. The envelopes are held by said parts 34 against an upright back wall 36, the lower portion 37 of which is preferably curved towards the printing cylinders, and the extreme edge of which is disposed in a horizontal plane extending through the bight between said cylinders A and B.

A pair of contacting feed rollers 39 are arranged adjacent said lower edge of the plate 36 at opposite sides of the aforementioned horizontal plane and are adapted to rotate so as to engage an envelope or article moved into the bight between said feed rollers and advance the same to printing position, from which they are in turn delivered by the rotation of the cylinders A and B.

Mechanism of improved construction is provided for feeding the envelopes or articles one at a time to the feed rollers 39, said mechanism being synchronized so as to present an envelope or article to the cylinders A and B each time one of the printing devices 25 moves to printing position.

In the embodiment of the invention illustrated, said feed mechanism preferably includes a horizontal shaft 40 extending crosswise of the machine, and which is operatively journalled in suitable bearings 41 on the side frame members 11 and 12. The shaft 40 is provided between its ends with an eccentric 42 about which is arranged an eccentric strap 43 provided with a rearwardly extending arm 44. Secured by a pivot 44a to the rear end of the arm 43 is a primary feed slide or member 45 which is adapted, in the movements of the eccentric 42, to be advanced and retracted towards and from the feed rollers 39 and printing and impression cylinders A and B. The member 45 is preferably guided in its movements by a horizontal, transverse rod or shaft 48 passing transversely through said member and having horizontal slides or parts 49 at the ends thereof which are arranged to move in horizontal guide slots or parts 50 formed on or secured to the upright side members 11 and 12.

The article feed mechanism also includes a secondary feed slide or member 51 having at its front end a relatively thin, transverse, horizontal edge portion 52 which is adapted, in the forward stroke of the feed mechanism, to pass into the space between the flap c and the body c' of the lowermost envelope C in the stack, move thence into engagement with the fold at the top edge of the envelope, and advance this envelope to the feed rollers 39, as shown clearly in Fig. 5.

To effect the necessary movement of the secondary feed slide or member 51, the latter is operatively connected to and movable by the primary feed member 45 in such a manner that the stroke of the member 51 is increased so as to effect a considerably greater travel or stroke of the member 51 relatively to that of said member 45. For this purpose the tail portion of the mem-

ber 51 is fashioned so as to slidably engage in guides 55 extending longitudinally of the primary member 45. (See Fig. 1*a*.) Said tail portion of member 51 is provided with a pivot or pin 56 engageable in a slot 57 at one end of a transversely extending, horizontal lever 58 which is pivoted between its ends at 59 upon a lateral extension 60 of the primary feed slide or member 45. The opposite end of the lever 58 is connected to a fixed pivot 62 suitably supported upon a bracket or part 63 secured to and extending laterally from the side frame member 12. In the arrangement shown, the two opposite portions of the lever 58 are of about equal length and it will be seen that for a given movement of the primary slide 45, the secondary slide 51 will have approximately double that movement in each direction. Obviously, the ratio of movement between the two parts can be readily changed to suit conditions by changing the relative lengths of the two parts of the lever 58. In this way the feed mechanism can be very compactly arranged so as to occupy a relatively small space lengthwise of the machine as, since a relatively short stroke is required for the member 45, the eccentric 42 can likewise be made small, and its weight therefore kept within practical limits.

There being two of the printing devices 25 arranged in circumferential order upon the printing cylinder A, it is necessary for the feed mechanism to present two envelopes or articles C to the printing cylinder during each revolution of the latter. Accordingly, the shaft 40 which actuates the feed mechanism is arranged to be driven in a two to one ratio to the cylinder A. Any suitable means may be used for this purpose, that shown including a bevel gear 65 secured on or forming part of the drive gear 23 of the impression cylinder B, and which meshes with a half size bevel pinion 66, secured on one end of a countershaft 67 extending lengthwise of the machine and journalled in bearings 68 on the side wall 12 thereof. The opposite end of the shaft 67 is arranged adjacent one end of the shaft 40 and said ends of these shafts are provided with intermeshing bevel gears 70 corresponding in size to the bevel gear 66. By this arrangement, the shaft 40 is rotated twice for each revolution of the printing cylinder A, thus positively actuating the feed mechanism a corresponding number of times in synchronism with the movements of the printing devices 25.

If desired, the feed rollers 39 before mentioned may also be driven at suitable speed and in appropriate directions by means of a belt 71 passing over a pulley 72 secured to the other end of the shaft 40 and over a pulley 73 on the shaft of one of the feed rollers 39. The feed rollers are preferably rubber surfaced so that it is only necessary to drive one of the rollers directly, the other one turning by frictional contact therewith.

In machines of this sort heretofore constructed and having only one printing device mounted upon the printing cylinder A, there has been ample time during each revolution of the latter for the envelope flaps or corresponding parts of other folded articles to spring away from the bodies thereof before the passage of the feed member of the feed mechanism therebetween, since the latter is required to advance only once during each revolution of the printing cylinder. However, since in the present invention the feed mechanism is required to move more than once for each revolution of the printing cylinder, there is a possibility that the advance stroke of the feed mechanism would be so fast that the feed member thereof would move to a position to enter between the flap and the body of the lowermost envelope in the stack before said flap had moved away from the body thereof to a sufficient extent to permit such entry, in which case the mechanism would fail to feed an envelope for each impression of the printing cylinder.

In accordance with this invention, therefore, I have provided means for positively engaging and moving the flaps of the envelopes away from the bodies thereof, said means being synchronized so as to alternate with the movements of the feed mechanism and thereby assure the proper feeding of the envelopes or articles.

In the embodiment of the invention illustrated, said means includes a suction cup or device 75 arranged at the upper end of a tube or passage 76 suitably connected to any available source of suction, such as a pump, not shown. The tube 76 is fixed to one end of a longitudinally extending lever 77, which is mounted between its ends upon a transverse, horizontal pivot 78 arranged in a lug or part 79 of the bracket 63 before mentioned. The opposite end of the lever 77 is connected to suitable means for moving the suction cup 75 upwardly into contact with the flap of an envelope and then downwardly so as to move the flap away from the body of that envelope, in alternation with the advance movements of the edge portion 52 of the secondary feed member 51. For this purpose, said end of said lever 77 may be provided with a roller 80 operatively engaging in a circular cam groove 81 of a cam disk or member 82 eccentrically mounted upon and fixed to a suitable rotating member, such as the shaft 40.

While the foregoing arrangement is deemed desirable, the suction mechanism just described could be arranged transversely of the machine and the cam disk 82 mounted upon the shaft 67 or other suitable actuating member, if desired.

By arranging a plurality of the printing devices 25 upon the printing cylinder A two or more separate jobs can be printed at the same time. It is therefore desirable to separate the alternately printed envelopes or articles C as they are delivered from between the printing and impression cylinders A and B so as to keep the printed articles in separate batches. This result may be accomplished in different ways, a practical arrangement being shown in the drawings, in which the separating or sorting mechanism includes a plurality of endless belts or conveyors corresponding in number to the number of printing devices on the printing cylinder. Two of such conveyors 85, 86 are illustrated. These conveyors travel in the direction of the arrows, Figs. 2–4, being mounted for this purpose on horizontal, transverse rollers or shafts 87, 88, 89 and 90 respectively. The shafts 87 and 89 are provided with gear pinions 91, 92, meshing with an intermediate pinion 93 so as to thereby drive the members 85, 86 in the same direction. The pinion 93 may be actuated in any suitable manner but is preferably driven intermittently and in synchronism with the discharge of the printed articles from between the cylinders A and B so that the articles will be permitted to gather or stack up upon the upper runs of the conveyors 85, 86 from which they may be taken at intervals. The intermittent rotation of the pinion 93 may be effected in any suitable way, as by means of a pair of diametrically opposed gear segments 95 secured to the inner face of the gear 23 of the

impression cylinder in position to mesh with and turn the pinion 93 twice during each revolution of cylinder B and consequently of cylinder A, see Figs. 1 and 2. In this way an advance movement of the conveyors 85, 86 is effected for every movement of a printing device 25 to printing position.

For the purpose of delivering the articles alternately upon the upper runs of the conveyors 85, 86, there is provided a horizontal, transverse rock shaft or member 100 arranged adjacent the point of delivery of the printed articles and in advance of the shafts 87 and 89 before mentioned. This rock shaft is provided with a curved finger or plate 101 which extends upwardly towards the horizontal plane of contact between the cylinders A and B with its free edge 102 so disposed as to be movable alternately into and out of position across said horizontal plane or plane of delivery of the printed articles, and in synchronism with such delivery movement. The rock shaft is provided with a pair of rock arms 105, the upper end of each of which is provided with a roller 106 which engages in a cam groove or track 107 formed in the adjacent bearing member or part 20 of the printing cylinder A. The form and proportion of the cams 107 is such that in the position of the parts shown in Fig. 3, the envelope or article being delivered from the printing position will pass over the edge 102 of the member 101 and will be deposited upon the upper run of the upper conveyor 85. During the continued rotation of the printing cylinder A, the cam 107 will move to the position shown in Fig. 4, thus turning the rock shaft 100 to a position in which the edge 102 of the member 101 will be moved upwardly into the path of the next printed article to be delivered, thereby diverting the same downwardly towards the lower conveyor 86.

The deflecting action of the member 101 upon the envelopes or articles may be continued by a stationary curved deflecting member or plate 110 supported upon a horizontal transverse rod 111 mounted in the frame side members 11 and 12. The member 110 is preferably made of yielding material, its upper edge being disposed adjacent the lower edge of the movable member 101 while its lower edge rests yieldingly upon the upper run of the conveyor 86. In this way the articles diverted to this conveyor are first arrested and yieldingly held between the member 110 and the conveyor, and are then freed and anvanced upon a subsequent intermittent movement of said conveyor.

In machines for printing envelopes as heretofore constructed and herein described, the parts are arranged to operate at the highest speed possible consistent with continued, accurate results and minimum wear and stoppage due to breakage.

The improved machine constructed in accordance with the present invention is designed so as to operate without increasing the speed of those parts, such as the relatively heavy printing and impression cylinders over that of prior machines, while the feed mechanism, suction mechanism and delivery and sorting means, comprising small and relatively light weight parts, can be operated safely and practically at the required higher speed for delivering a plurality of envelopes for each revolution of the printing cylinders, with the minimum of wear and loss of time in operation.

Thus a machine is provided with which greatly increased production may be had, without materially increasing the cost of manufacture, and which may be driven by substantially the same amount of power as is required for former machines of much lower capacity.

I claim:

1. In a printing press, a revolvable printing cylinder having a plurality of printing devices circumferentially arranged thereon for printing a corresponding number of impressions upon each revolution thereof, means for supporting a stack of articles each to receive an impression from one of the devices on said cylinder, drive means for revolving said printing cylinder, a rotatable element, feed means operable by the rotation thereof for removing articles one at a time from said stack and presenting the same for operation thereupon by the printing cylinder, and operative connections between said printing cylinder drive means and said rotatable element for rotating the latter as many revolutions to one revolution of said printing cylinder as there are printing devices on the latter to enable impressions therefrom to be made upon a corresponding number of articles.

2. In a printing press, a revoluble printing cylinder having a plurality of printing devices circumferentially arranged thereon for printing a corresponding number of impressions upon each revolution thereof, means for feeding a like number of articles one after another to said cylinder and each revolution thereof, a plurality of delivery belts corresponding in number to the number of devices on said printing cylinder, means for effecting delivery of the printed articles upon one after another of said belts to separate the articles into batches, a rotary drive member for turning said printing cylinder, driving means for said belts, and radially spaced parts on said drive member corresponding in number to the number of elements on said printing cylinder and which are intermittently engageable one after another with said belt driving means during each revolution of said printing cylinder for advancing said belts step by step in synchronism with the delivery of said articles thereupon.

3. In a printing press, a revoluble printing cylinder, means for supporting a stack of articles to be printed, feed mechanism for removing articles one at a time from the bottom of said stack and shifting the same into printing relation to said cylinder, said mechanism including a primary slide, means for reciprocating the same, a secondary slide for engaging and feeding the articles, and operative connections between said slides for reciprocating said second slide by and relatively to said primary slide.

4. In a printing press, a revoluble printing cylinder, means for supporting a stack of articles to be printed, feed mechanism for removing articles one at a time from the bottom of said stack and shifting the same into printing relation to said cylinder, said mechanism including a primary feed member, means for reciprocating the same, a secondary feed member for engaging and feeding the articles, and a lever pivoted at its opposite ends respectively to said secondary feed member and to a fixed pivot, and between its ends to said primary feed member whereby reciprocation of said primary feed member causes reciprocation of said secondary feed member in the same direction and relatively to said primary feed member.

5. In a printing press, a printing cylinder, driving mechanism for revolving the same, means for supporting a stack of articles to be printed, feed mechanism for removing articles one at a time

from the bottom of said stack and shifting the same into printing relation to said cylinder, said mechanism including a primary slide, a revoluble shaft, an eccentric thereon operatively connected to said primary slide for reciprocating the same, a secondary slide for engaging and feeding the articles, operative connections between said slides for reciprocating said second slide by and relatively to said primary slide, and driving connections between said printing cylinder drive mechanism and said eccentric shaft for rotating the latter in synchronism with the rotation of said printing cylinder.

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