

Nov. 21, 1933.

F. C. MARQUARDT

1,936,068

ROTARY WEB UNDER-SURFACE PRINTING MACHINE

Filed Oct. 28, 1932

4 Sheets-Sheet 1

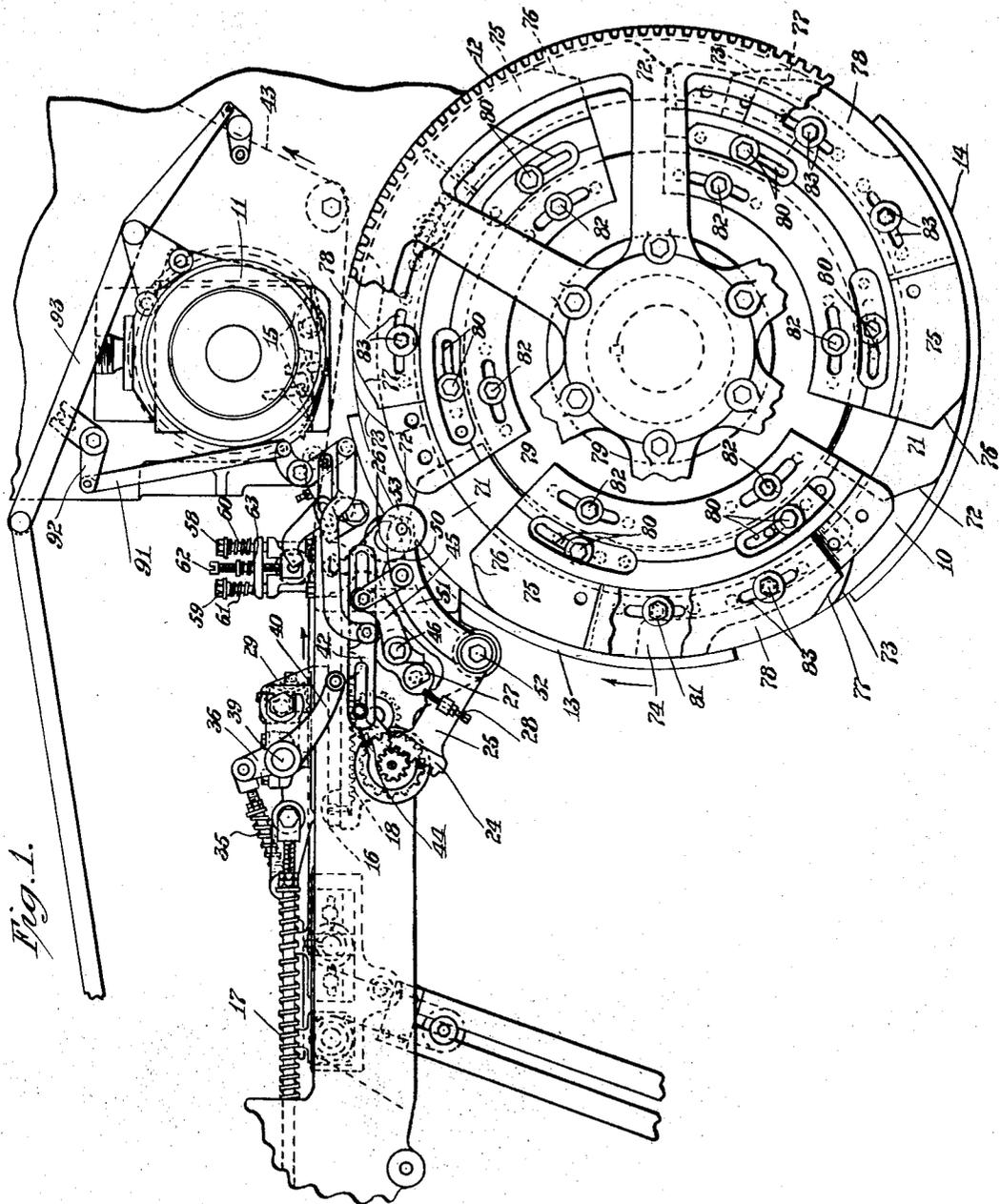


Fig. 1.

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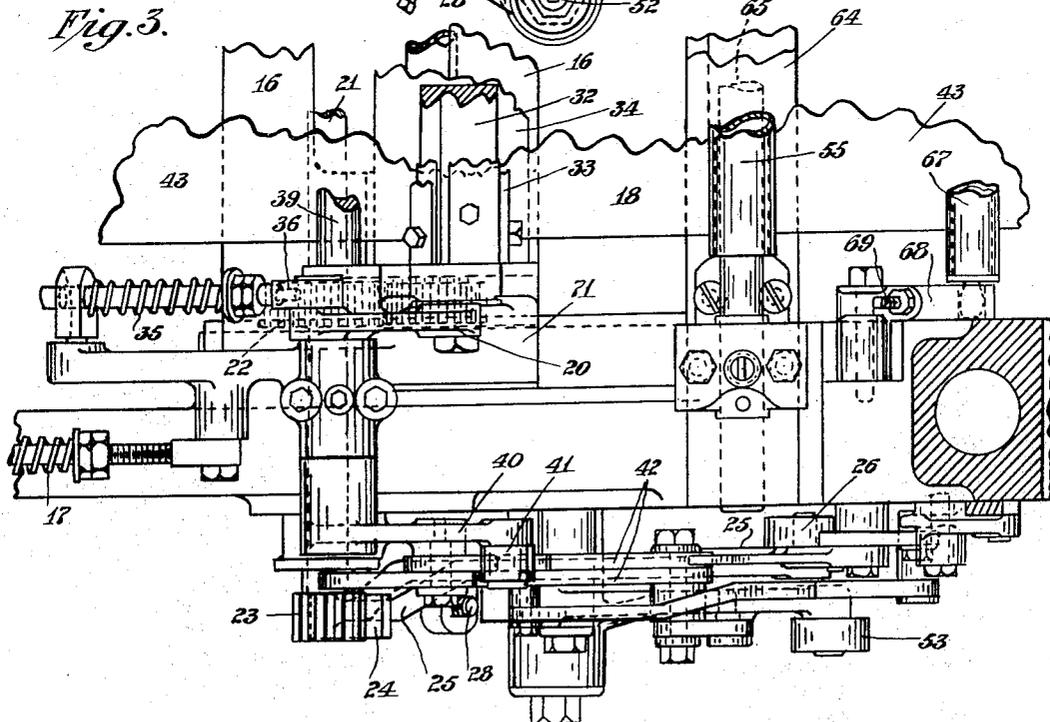
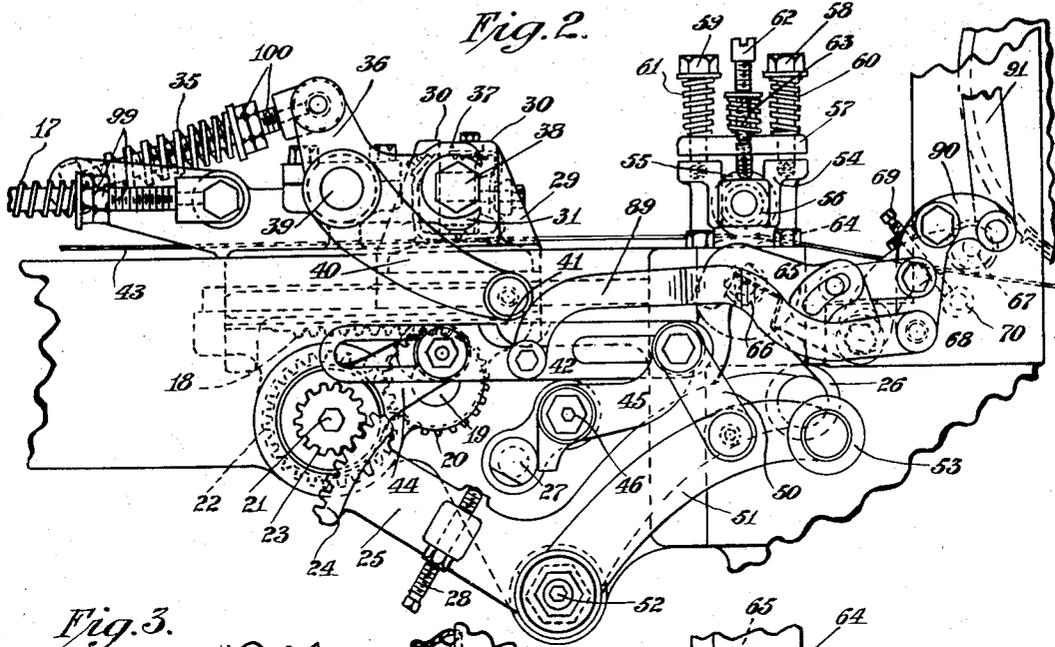
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ROTARY WEB UNDER-SURFACE PRINTING MACHINE

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4 Sheets-Sheet 2



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4 Sheets-Sheet 3

Fig. 4.

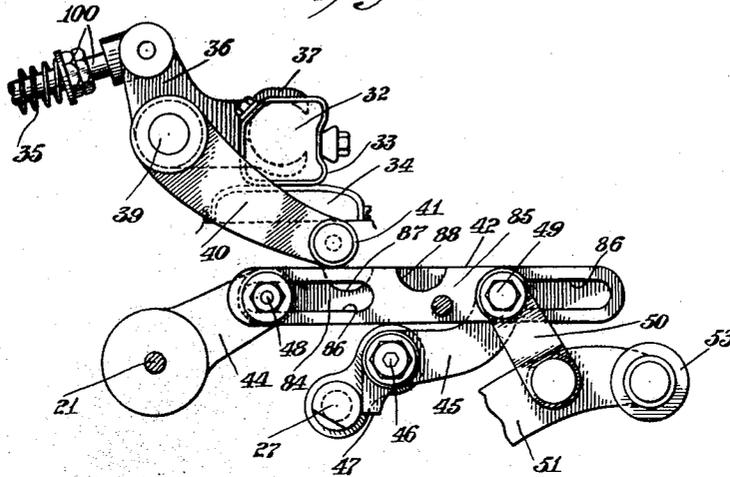
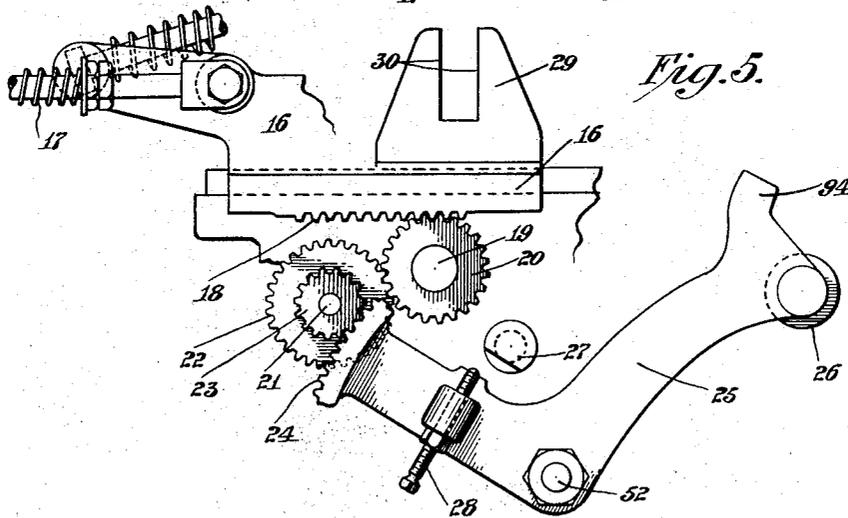


Fig. 5.



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4 Sheets-Sheet 4

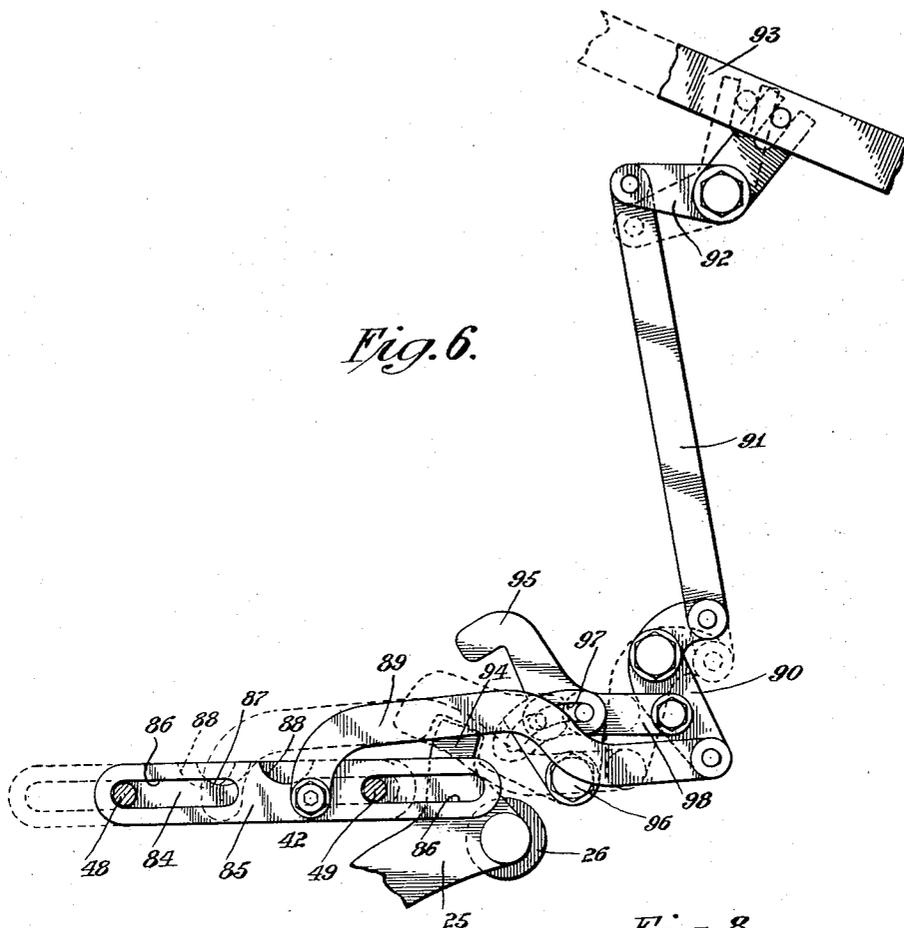


Fig. 6.

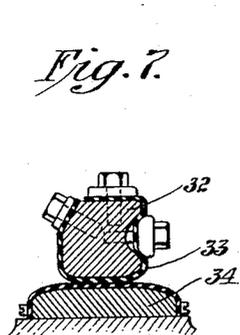


Fig. 7.

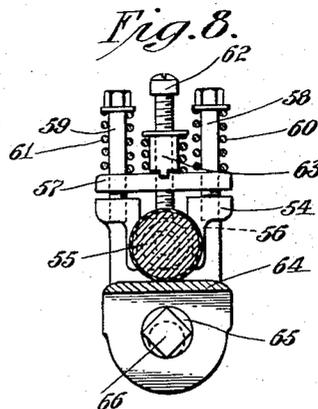


Fig. 8.

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UNITED STATES PATENT OFFICE

1,936,068

ROTARY WEB UNDER-SURFACE PRINTING MACHINE

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Application October 28, 1932. Serial No. 640,057

20 Claims. (Cl. 101—153)

The invention relates to rotary web undersurface printing machines of the type described in United States Letters Patent No. 1,576,293 dated March 9, 1926, and more particularly to a machine of this type embodying therein means by which the succeeding impressions upon the web may be brought into accurate, spaced but closely adjacent relation to each other.

The rotary printing machine disclosed in the Letters Patent above referred to, is designed particularly for printing postage stamps from engraved, intaglio or undersurface steel printing plates upon a continuous web of paper. Said machine has three such printing plates upon the plate cylinder, these plates being spaced apart in relation to each other, so as to afford intervals during each rotation of the plate cylinder during which the wiping and polishing webs may be fed following each wiping and polishing operation and preparatory to their action upon the succeeding plate upon the cylinder notwithstanding that the plate cylinder is continuously rotated. In said machine, the paper web is advanced in intermittent steps through the machine as a result of the clamping action thereon developed by a printing plate and the blanket upon the impression cylinder or D-roll, the feeding of the web ceasing immediately upon the passing of the impression cylinder or D-roll blanket from its engaging relation with a plate.

In steel printing plates, each plate has a marginal blank edge and in the machine above referred to the paper web is clamped between this blank marginal edge and the impression cylinder or D-roll blanket, thus leaving a blank space between impressions.

At the present time, postage stamps in rolls are extensively used and when stamps are produced from plates having marginal edges, it is necessary to paste rows of stamps together to form such rolls. While machines are in use which have the steel printing plates in closely abutting relation to each other so as to form a continuous impression upon the web, it is difficult with such machines to so wipe and polish the plates as to have uniform, clear, sharp lines in the impressions made thereby.

With the above conditions in mind, I have provided a rotary printing machine of the type above referred to embodying therein mechanisms by which the free run of the web during the making of each impression is permitted, but following the making of each impression, movement of the web will be immediately arrested and a retrograde movement imparted thereto to an extent to

ensure the locating of the succeeding impression upon the web, closely adjacent, but spaced slightly from the preceding impression. In this manner, overfeed of the web occurring during printing is compensated for.

The construction of the mechanism for thus drawing back the web is such as to permit extreme accuracy, not only in the timing of the various parts thereof in relation to the movements of the plate while engaged with the impression cylinder or D-roll, but as to the extent of the retrograde movement of the web. This latter is essential because of the necessity of spacing the stamps in succeeding impressions, a distance substantially equal to the spacing between different stamp designs upon the same plate in order to permit the use of rolls of stamps in various different stamp applying or delivery machines without the accumulation of error arising from an unequal spacing of stamps in the roll.

The mechanism of the invention is so constructed as to permit adjustment to accommodate the machine to plates of different sizes and also permit a great nicety in the timing of the operation of the various parts of the mechanism to secure a proper stoppage of the feeding of the web and its retrograde movement following such stoppage and preparatory to the succeeding feeding movement of the web.

A printing press embodying the invention is provided with a throw-off mechanism to interrupt the making of impressions by the machine, and the mechanism of the invention is also so constructed that upon the actuation of the throw-off mechanism, the web will be automatically held against movement and the mechanism used for drawing back the web will be made inoperative.

In the machine of the invention, not only is the web subjected to a continuing tensioning stress while it is being fed by the members of the printing couple, but a similar stress is applied thereto during the retrograde movement of the web so as to ensure the necessary short positive movement thereof and accuracy in its back feed. This latter is desirable because the drawing back of the web is a short rapid movement and during this movement, it is under no restraint from the members of the printing couple.

The timing and the operation of the various elements controlling the movements of the web for securing the desired spacing of succeeding impressions and in relation to the printing interval as to each plate upon the plate cylinder, is secured by means of cams carried by the plate cylinder shaft, these cams being adjustable cir-

cumferentially of the cylinder as determined by the position of the plates upon the cylinder. Each cam is also adjustable as to length so as to adapt the machine for use with plates of different sizes and also to ensure accuracy in the timing of the mechanism in its operative effect upon the web in a manner which will more fully appear hereinafter.

While the cams are so formed as to develop a definite length of throw of the co-operating member determining the extent of retrograde movement of the web, other adjustments are provided by which the operative effect of such cams may be varied so as to permit extreme accuracy in the movements of the parts in thus imparting movement to the web. These adjustments may also be used to make the drawback mechanism totally inoperative so that the machine may be used to print succeeding impressions in spaced relation to each other as determined by the marginal edges of the printing couple.

The invention consists primarily in a rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement including therein co-operating clamp members operative upon a web, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, and means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder; and in such other novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,

Fig. 1 is an elevation at one side of a printing machine embodying the invention adjacent the members of the printing couple;

Fig. 2 is an enlarged side view of the web controlling mechanism;

Fig. 3 is a plan view thereof;

Fig. 4 is a detail view of the clamp mechanism alone partly broken away;

Fig. 5 is a detail view of the mechanism for imparting movement to the clamp mechanism toward and from the plate cylinder;

Fig. 6 is a detail view of the throw-off mechanism disassociated from other parts of the web controlling mechanism;

Fig. 7 is a detail sectional view of the clamp members; and

Fig. 8 is a detail sectional view of the web tensioning mechanism.

Like numerals refer to like parts throughout the several views.

In the accompanying drawings, I have shown only those portions of the printing machine disclosed in the above named Letters Patent which are essential to an understanding of the construction and function of those parts employed in securing accuracy in the web movement for the purpose of securing the desired closely adjacent spacing of succeeding impressions upon the paper web. The operation of those portions of the machine are well known from said Letters Patent and may be varied.

Referring to the accompanying drawings, the plate cylinder is shown at 10 and the impression cylinder or D-roll at 11. The plate cylinder is

adapted to carry three plates 12, 13 and 14 spaced in relation to each other, the distance between succeeding plates approximating the length of the gap indicated at 15 in the impression cylinder or D-roll.

In printing upon a web in a machine having a printing couple with spaced printing surfaces, the run of the web is intermittent since it occurs only during the engagement of the blanket of the impression cylinder or D-roll with a plate upon the plate cylinder, and when it is desired to have impressions from succeeding plates closely adjacent each other, it is necessary to impart retrograde movement to the web following the making of each impression.

In a machine embodying the invention, I provide a clamping mechanism adapted to act upon the web, including means whereby the clamping members may be actuated to engage them with the web when a retrograde web movement is required and disengage them from the web while it is being fed by the members of the printing couple, a properly timed actuating mechanism for this means, and a properly timed actuating means for imparting movement to the clamping members toward and from the members of the printing couple for imparting the desired amount of retrograde movement to the web. The actuating mechanism for the clamp members and the actuating means for imparting movement to the clamp include cams located adjacent each plate upon the plate cylinder.

In the embodiment of the invention shown in the drawings, the actuating means for imparting movement to the clamping members includes therein a carriage 16, slidably mounted in suitable guideways in the opposite side frames of the machine so as to be capable of movement toward and from the members 10 and 11 of the printing couple. Acting upon this carriage is a spring rod 17, the tension of the spring of which is increased with movement of the carriage from the plate cylinder and acts to impart movement of the carriage toward the plate cylinder to an extent defined by an adjustable stop mechanism controlling the operative effect of the actuating means employed for imparting the desired timing movement to the carriage.

The actuating means operative upon the carriage 16 as shown in the drawings include a toothed rack, such as 18 upon the under side of the carriage adjacent each side of the machine. Below the rack is a shaft 19 extending across the machine having keyed thereto a gear 20 enmeshed with each rack. Only one such gear and rack is shown in the drawings, it being understood that the mechanism may be duplicated to ensure an accurate right-line movement of the carriage.

A second shaft 21 extends across the machine adjacent the shaft 19, this shaft carrying gears 22 enmeshed with the gears 20. Also carried by the shaft 21 is a pinion 23 enmeshed with which is a gear segment 24 carried by one arm of an oscillatory bell crank lever 25, the other arm of which has mounted thereon an anti-friction roller 26. Adjacent the gear segment carrying arm of the lever 25 is a stop 27 co-operating with an adjustable micrometer stop screw 28 carried by said arm. This stop 27 and co-operating stop screw 28 are used to determine the lineal traverse of the carriage in a manner to be more fully referred to hereinafter.

Supported by the carriage 16 at opposite sides thereof are fittings 29 having vertically extend-

ing ways therein, indicated at 30, permitting vertical movement of guide blocks, such as 31, carrying a platen bar 32 provided with any desired friction facing material 33. This platen bar 32 extends transversely of the machine so as to engage the entire width of the paper web passing through the machine.

Extending transversely across the machine, from fitting to fitting 29, is a fixed platen bar 34 also provided with a friction surface. This bar extends parallel with the bar 32, said friction bars 32 and 34 constituting the clamp members herein referred to. The clamp bar 32 is normally engaged with the clamp bar 34 by the action of a spring rod 35. The means whereby the clamping members may be actuated to engage them with, or disengage them from, the web, in the form of the invention shown, includes therein a bell crank lever 36, having a forked arm 37 straddling a bearing stud 38 carried by the block 31. The bell crank lever 36 is carried by and imparts movement to a shaft 39 extending transversely of the machine, the bell crank lever and spring rod mechanism being duplicated upon opposite sides of the machine.

Secured to the shaft 39, at one side of the machine only, is a rock arm 40 carrying an anti-friction roller 41, this rock arm being unconnected with any part of the machine excepting the shaft 39. Mounted below the roller 41 is an elongated shoe 42 normally disengaged from, but adapted to engage and impart movement to, the rock arm 40.

The actuating mechanism for the means controlling the movements of the clamp members, in the embodiment of the invention shown in the drawings, includes an elongated shoe 42 supported by spaced rock arms 44 and 45 idly mounted respectively upon the shaft 21 and upon a bearing 46 adjacent the stop 27. By means of these rock arms parallel vertical movement may be imparted to the shoe, notwithstanding the longitudinal movement of the shoe and the arcuate movement of the arms. While the shoe is raised as a result of the application of power to the arm 45, it returns to its lowermost inoperative position by gravity, its descent being arrested by means of a heel 47 upon the arm 45, engageable with the stop bar 27.

Both arms 44 and 45 are pivotally connected with the shoe 42, at 43 and 49 respectively, and connected with the pivot 49 is one end of a link 50, the other end of which is pivotally connected with a rock arm 51 mounted upon the same bearing 52 as the bell crank lever 25, and carrying at its free end an anti-friction roller 53.

A detailed description of the shoe 42 in its relation to the operation of the throw-off mechanism, as distinguished from its relation to the clamp members will be given in connection with a description of said throw-off mechanism.

Carried by the frame of the machine, between the carriage 16 and the members of the printing couple, is a tensioning mechanism consisting of slotted fittings 54 at opposite sides of the machine. A roller 55 having a friction surface is mounted in bearing blocks 56, slidably mounted in the slotted portion of the fittings 54. A cap plate 57 projects across the top of each fitting 54, this cap plate having openings therein for the reception of guide pivot screws 58 and 59, tensioning springs 60 and 61 being interposed between the heads of these pivot screws and said plate.

Mounted in said plate and engaging the bear-

ing blocks 56 is an adjustment screw 62, by means of which the cap plate may be actuated to impart the desired tension to the springs 60 and 61. A spring lock nut 63 is used to hold the adjustment of the screw 62.

Carried by the fittings 54 is a platen 64 of anti-friction material, such as polished metal, the friction roller 55 being pressed in continuous engaging relation with said platen 64 by the springs 60 and 61. The purpose of this mechanism is merely to offer sufficient resistance to the movements of the web to limit the movements thereof by the clamp members to that determined by the setting for the actuating means for the carriage 16 and the overrun of the web during the following printing.

Acting upon the platen 64 is an eccentric shaft 65 provided with a squared end 66 by means of which the platen may be lowered to facilitate the threading of the web through the machine and restored to its operative relation with the roller 55.

Between the tensioning mechanism last described and the members of the printing couple is a weighted take-up roller 67 adapted to bear upon the web at all times and ensure its approach toward the members of the printing couple at a proper angle to avoid interference of the impression cylinder or D-roll with the web, prior to its engagement therewith, at the printing line. This roller 67 is carried by rock arms 68 at opposite sides of the machine, which rock arms each carry an adjusting screw 69 by means of which the take-up roller may be accurately located to secure the desired angle of approach of the web. The adjusting screws 69 engage stops 70 upon the frame of the machine.

It is obvious that the retrograde movement of the web must be timed in relation to the making of an impression by each plate upon the plate cylinder 10. In other words, there must be associated with each plate upon the cylinder, a part of the actuating mechanism for determining the timing of the operation of the clamping members, so far as their engagement or disengagement with the web is concerned, and of the movements of the actuating means for the carriage carrying the clamping members toward and from the printing couple, to ensure accuracy in the timing of the retrograde movement of the web resulting from this movement of the carriage and the engagement of the clamping members.

In the embodiment of the invention shown in the drawings, I employ two cams adjacent each plate 12, 13 or 14, one of which cams is engageable with the roller 26 and the other of which is engageable with the roller 53 upon the rock arm 51. The cams associated with each plate are identical with those associated with each of the other plates, so that a description of but one of these sets of cams is necessary.

The cam engageable with the roller 26 is shown at 71, this cam having a rise 72 and a fall 73, the distance between the rise and fall approximating the length of the printing plate, or slightly in excess thereof. The portion 74 of the cam carrying the fall 73 is adjustable in relation to the part of the cam carrying the rise 72, so as to adapt the machine for use with plates of different lengths or with plates in which the designs are of different lengths. The means of securing this adjustment will be referred to in connection with a description of the manner of mounting the cams in relation to the plate cylinder 10.

The cam co-operating with the roller 53 carried by the arm 51 is shown at 75, said cam having a rise 76 and a fall 77. The portion 78 of the cam carrying the fall 77 is adjustable in relation to the part 75 of the cam for the same reason that the parts 71 and 74 of the carriage actuating cam are adjustable, that is, to permit adjustment of the length of the cam according to the length of plate or design thereon.

The arbor of the plate cylinder is provided with a cam carrying spider 79, to which the cam section 71 is adjustably connected by the slot and bolt connections 80. The cam part 74 is connected to the cam part 71 by the slot and bolt connections 81. The cam part 75 is connected to the cam spider 79 by the slot and bolt connections 82, while the cam part 78 is connected with cam part 75 by means of the slot and bolt connection 83. The means of mounting the cams is merely a mechanical expedient and forms no part of the present invention.

In a machine adapted for use with plates of different lengths, or having thereon designs of different lengths, it is required that the cams be so mounted as to be susceptible to nicety in the adjustment of the rise and the fall thereof in relation to the forward edge of the design upon the plate, and in relation to the disengagement of the impression cylinder or D-roll with the rear edge of the plate. The location of the rise upon each cam is determined by the initial engagement of the blanket of the impression cylinder or D-roll with the plate, and is not coincident with the forward edge of the plate. This appears in Fig. 1 of the drawings. Furthermore, the clamp actuating cam has its fall so positioned that the clamp will be set substantially simultaneously with or immediately prior to the passage of the rear edge of the plate from engagement with the impression cylinder or D-roll. In setting the cams, the impression of the blanket and the makeready of the impression cylinder must be taken into account, as when extremely heavy pressures are used there is a flattening of the makeready for a material distance from the point of initial contact thereof with the plate.

In connection with the makeready of the impression cylinder or D-roll, attention is directed to the fact that care, during the makeready of the machine, must be exercised to ensure the engagement of the blanket with the plate at approximately the forward edge of the lines of the designs upon the plate, since feeding of the web by the printing couple should occur only substantially simultaneously with the beginning of the making of the impression and disengagement of the blanket with the plate as nearly as possible substantially simultaneously with the completion of the making of the impression to limit the over-feeding of the web as much as possible.

I will now describe the throw-off mechanism in its relation to the actuating means for the clamp members and the actuating mechanism for importing movement to said clamp members.

It is customary to equip machines of the type to which the invention relates with a throw-off mechanism by means of which the making of impressions is interrupted or by which the machine may be operated without making impressions as when cleaning the machine, making adjustments therein and preparing for a run. The throw-off mechanism shown in the drawings is that employed in the machine of Letters Patent herein referred to, so a detailed description of the mechanism is unnecessary particularly as it

may take a wide range of forms beyond that shown.

It is desirable in connection with the machine of the present invention to provide means whereby, notwithstanding the continued rotation of the plate cylinder and the cams rotating therewith, the carriage 16 and the clamp members carried thereby will be made inoperative to change the relation of the web to the printing couple while impressions are not being made, and the clamp members will be continued in a set position to avoid accidental movement of the web under these conditions.

To accomplish this result the shoe 42 is made in two sections 84 and 85, one of which carries the pivots 48 and 49 upon which the rock arms 44 and 45 are mounted and the other of which 85 is provided with elongated slots 86 to permit sliding movement of this part in relation to the part 84. Each part 84 and 85 is provided with a recess 87 or 88, which are normally out of register so as to present an uninterrupted shoe surface to the roller 41.

Pivotally connected with the part 85 is one end of a link 89, the other end of which is connected with one arm of a bell crank lever 90. The other arm of this lever is connected by a link 91 with one arm of a bell crank lever 92, the other arm of which is pivotally connected with the sliding actuating link 93 of the printing couple throw-off mechanism. With this construction, the actuation of the throw-off link 93 will bring the two recesses 87 and 88 in alinement with each other when the shoe approaches engaging relation with the roller 53 so that continued upward movement of the shoe will impart no movement to the arm 40. As shown in Fig. 2 of the drawings, the registration of the openings 87 and 88 results in part from the movements of the link 89 and in part from the upward movement imparted to the shoe, said link imparting an over-throw of the shoe part 85 to compensate for a longitudinal movement of the part 84 by the rock arms 44 and 45. As a consequence, when the throw-off mechanism is set the cam 75 will continue to raise and lower the shoe 42, but such movement of the shoe will not separate the clamp members 32-34 so that they will continue to grip the web and hold it against movement toward the printing couple. In fact, the purpose of this mechanism is merely to prevent movement of the web when the throw-off mechanism is actuated.

It is necessary, however, to avoid the creation of slack in the web when the throw-off mechanism is operative that no reciprocatory movement shall be imparted to the carriage. Hence, I provide means consisting of a stud 94 carried by one arm of the bell crank lever 25 adjacent the roller 26 co-operating with a latch hook 95 pivoted at 96 and having therein an arcuate slot 97. The bell crank lever 90 has pivoted thereto one end of a link 98, the other end of which carries a stud slidable in the arcuate slot 97. Normally, the lever 90 will maintain the latch member 95 out of engaging relation with the stud 94 and thus permit free oscillatory movement of the bell crank lever 25. When, however, the bell crank lever 90 is actuated as a result of the actuation of the throw-off mechanism, the latch hook 95 is permitted to engage the stud 94 so as to hold the said bell crank lever 25 in a position where the roller 26 cannot be engaged by its actuating cam 71. Consequently, the actuation of the throw-off mechanism will

not only prevent the disengagement of the clamp members, but will also prevent the oscillations of the carriage so long as the throw-off mechanism is operative.

5 The spring rods 17 and 35 are of the usual construction, the rod itself being slidable in a bearing in a suitable spring seat upon the frame of the machine, as to the rod 17, and upon the carriage 16 as to the rod 35, the springs of these
10 rods being seated between said spring seats respectively and adjustable spring seats 99 and 100 upon said rods.

The web is shown at 43.

15 The operation of the herein described machine is substantially as follows:—

In describing the operation of the machine, it will be assumed that the parts are approaching a position toward the completion of the making of an impression from the plate 12, and that the
20 blanket on the impression cylinder or D-roll is still engaged with said plate. At this time, the carriage 16 is held in its retracted position, or its position most remote from the members of the printing couple, by the action of the cam 71 upon
25 the roller 26; and the engagement of the roller 53 with the clamp actuating cam 75 is holding the clamp members 32—34 apart so as to permit the free run of the web as a result of its engagement between the plate 12 and the blanket
30 upon the impression cylinder or D-roll 11. While I refer to the free run of the web, it will be understood that the tensioning mechanism 54—64 while the clamp members 32—34 are disengaged
35 of a proper tension of the web to avoid wrinkling, and that the weighted take-up roller 67 between said tensioning mechanism and the members 10—11 of the printing couple, will ensure the desired direction of run of the web.

40 Immediately prior to the disengagement of the blanket upon the impression cylinder or D-roll from the plate 12, the fall 77 of the clamp actuating cam 75 permits the descent of the rock arm 51 and of the shoe 42, and the spring of the
45 spring rod 35 to rock the bell crank lever 36 in a manner to force the clamp member 32 downwardly so as to grip the web between it and the platen 34. During this actuation of the clamp members, the fall 73 of the cam 71 will have
50 passed the roller 26, thus permitting the spring of the spring rod 17 to advance the carriage 16 towards the members of the printing couple, the roller 26 following the fall of the cam so as to control this carriage movement. It is preferable
55 that the fall of the cam be so formed that the rate of travel of the carriage 16 will be the same as that of the web by the members of the printing couple. During this carriage movement, the clamp members 32—34 are in their engaging
60 relation to the web, and the carriage movement is accurately timed in relation to the web. Hence, during the run of the web, toward the conclusion of the making of the impression, the carriage 16 will travel with the web, and stoppage
65 of the carriage, inasmuch as the clamp members 32 and 34 are closed upon the web, will ensure an instantaneous stoppage of the web when the blanket of the impression cylinder or D-roll passes from engaging relation therewith. The
70 clamp members may however, be closed only substantially simultaneously with the conclusion of the carriage movement by adjustment of the cam part 73 in relation to the cam part 74 so as to delay the engagement of the clamp mem-
75 bers. When during the carriage movement

toward the printing couple, the clamp members are in their web disengaged relation, it is necessary that the fall 77 of the cam 75 shall be so set as to cause the clamp members to engage the web substantially simultaneously with the termi-
80 nation of the carriage movement and with the disengagement of the impression cylinder or D-roll from the plate.

Following these operations, and prior to the engagement of the blanket of the impression cylinder or D-roll with the succeeding plate 13, and while the clamp members are still engaged with the web, the rise 72 of the cam 71 by engagement with the roller 26, will through the oscillation of the bell crank lever 25, impart a
85 contra-clockwise movement to the segment 24, thus actuating the gear train 20—22—23 in a manner to impart movement to the carriage 16 away from the members of the printing couple. The amount of this movement is determined by
90 the setting of the adjusting screw 28, and may by means of this screw be determined with great nicety. Of course, the screw 28 does not have this effect by a limitation of the contra-clockwise movement of the bell crank lever 25 by the cam,
100 this being determined by the formation of the cam itself and the resistance to this return movement resulting from the compression of the spring of the spring rod 17, which during this operation holds the roller 26 against the cam.
105 The rise 72 of the cam 71 imparting this reciprocation of the carriage 16 against the tension of the spring of the spring rod 17 is associated with the plate 13. Following this movement of the bell crank lever 25, it will be held in this position
110 by the cam 71 during the printing interval.

Immediately upon the completion of the movement of the carriage 16 away from the members of the printing couple, the rise 76 of the cam 75 associated with the plate 13 by engagement with
115 the roller 53 lifts the arm 51, movement of which arm through the link 50 rocking the arms 44—45 with a contra-clockwise movement, and through the elevation of the shoe 42 similarly rocking the arm 40. The shoe 42 has a parallel vertical move-
120 ment accompanied by movement away from the printing couple, as a result of the arcuate movement of the arms 44—45. During the upward movement of the shoe 42, it engages the roller 41 upon the arm 40 thus rocking the shaft 39 of the
125 bell crank lever 36 against the tension of the spring of the spring rod 35 and moving the clamp member 32 away from the clamp member 34. This movement may be so nicely timed by a proper setting of the cam 75 that it occurs sub-
130 stantially simultaneously with the engagement of the blanket of the impression cylinder or D-roll with the design upon the plate 13. This relation of parts will be maintained by the cams 71 and 75 until towards the completion of the making
135 of the impression by the plate 13 and the operation of the impression cylinder or D-roll. The cycle of operation immediately above described is then repeated, in relation to the plates 13 and 14. This operation occurs as to every plate, and the cycle is
140 substantially as follows:

Advancement of the carriage carrying the clamp members toward the impression cylinder or D-roll during the making of an impression by one plate, during a portion only of which ad-
145 vancement the clamp members may be engaged with the web, the carriage speed being in step with the travel of the web. If desired, however, the setting of the cam 75 may be such as to maintain the clamping members 32 and 34 out of
150

engagement with the web during this movement of the carriage 16 and cause the engagement of said members with the web substantially simultaneously with the passage of the blanket of the impression cylinder or D-roll out of printing relation to the plate. In either case, the clamping members 32 and 34 will be operative when the feeding stresses upon the web, from the members of the printing couple, are relieved. Immediately thereafter, and prior to the engagement of the next plate 13 by the impression cylinder or D-roll, the carriage receives movement away from the printing couple while the clamp members are set upon the web, thus drawing the web back to an amount substantially equal to the unavoidable over-run of the web, so that each succeeding impression will be brought close to the preceding impression. This backward movement of the web is followed by a release of the web by the clamping members to permit the drawing of the web through the machine by the impression cylinder or D-roll and the plate.

In order to limit the quantity of movement required of the carriage 16, the makeready of the impression cylinder or D-roll should be such as to ensure the engagement of its blanket with only that portion of the plate having the design thereon as otherwise there will be a likelihood of the smudging of the impression and offsetting upon the blanket of the impression cylinder or D-roll and excessive movement of the web by the clamp members will be required.

So far as the limitation of the amount of movement of the carriage 16 is concerned, this is secured by so setting the adjustment screw 28 that the movement of the bell crank lever 25 will be so limited in its clockwise movement as to permit the springs of the spring rods 17 to move the carriage 16 a distance which will permit movement of the carriage in the other direction to the desired extent only.

When the cams 71 and 75 are so set in relation to each other and to the plate with which they are associated, as to cause engagement of the clamp members with the web and movement of the carriage 16 at the same speed as the web, toward the completion of the making of the impression, the tensioning mechanism 54-64 may be dispensed with if desired, although I prefer to use this tensioning mechanism, irrespective of the timing of the setting of the clamp members, as affording an additional safeguard for ensuring an even running of the web to secure its proper tensioning at times when the clamp members are disengaged therefrom.

The operation of the throw-off mechanism upon the actuating means for the clamp members and for the drawback carriage needs no further description, it being understood that when this mechanism is operative, the clamp members will be in engagement with the web at all times until the throw-off mechanism is employed to cause the operation of the machine to resume the making of impressions.

The cams 71 and 75 may be adjusted circumferentially of the plate cylinder to synchronize the timing in the operation of the clamp members and the drawback mechanism with due regard to the length of a plate used upon the plate cylinder. If only one plate be used upon the cylinder, the other cams may be removed therefrom. This, however, will seldom occur.

If it be desired to operate the machine with succeeding impressions spaced apart so as to leave

a margin about each impression, the adjustment screw 28 may be so set as to maintain the roller 23 out of the path of the cam 71 and to hold the carriage stationary in its retracted position. When the machine is so set, the actuation of the shoe 42 will result merely in an intermittent engagement and disengagement of the clamp members with the web, so that these members will act merely to check the run of the web following the making of each impression and permit the free run thereof during the making of each impression, and the setting of the cam 75 must be such as to result in the engagement of the clamp members with the web only substantially simultaneously with the disengagement of the blanket of the impression cylinder or D-roll from the plate. If desired, however, the clamp member 32 may be blocked in its elevated position, thus bringing the rock arm 40 out of the operative range of the shoe 42 and maintaining the clamp members 32 and 34 out of engagement with the web at all times during the run of the machine.

It is not my intention to limit the invention to the precise details of construction shown in the accompanying drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement including therein co-operating clamp members operative upon a web, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, and means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder.

2. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement including therein co-operating clamp members operative upon a web, a tensioning mechanism between said clamp members and said plate cylinder, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, and means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder.

3. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, and a throw-off mechanism whereby said cylinders may be made inoperative, of means controlling the web movement including therein co-operating clamp members operative upon a web, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, means making said

clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder, and connections between said throw-off mechanism and the means for imparting movement to said clamp members whereby, simultaneously with the operation of said throw-off mechanism to make said cylinders inoperative, movement of the clamp members toward and from the plate cylinder is prevented.

4. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, and a throw-off mechanism whereby said cylinders may be made inoperative, of means controlling the web movement including therein co-operating clamp members operative upon a web, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder, and connections between said throw-off mechanism and said means for making the clamp members inoperative whereby, simultaneously with the operation of said throw-off mechanism to make said cylinders inoperative, actuation of said means making said clamp members inoperative is prevented.

5. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, and a throw-off mechanism whereby said cylinders may be made inoperative, of means controlling the web movement including therein co-operating clamp members operative upon a web, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder, connections between said throw-off mechanism and the means for imparting movement to said clamp members whereby, simultaneously with the operation of said throw-off mechanism to make said cylinders inoperative, movement of the clamp members toward and from the plate cylinder is prevented, and connections between said throw-off mechanism and said means for making the clamp members inoperative whereby, simultaneously with the operation of said throw-off mechanism to make said cylinders inoperative, actuation of said means making said clamp members inoperative is prevented.

6. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of a reciprocatory carriage, clamp members upon said carriage, actuating means for moving said carriage alternately toward and from the plate cylinder including a cam carried by and rotat-

able with the plate cylinder adjacent each plate thereon, means actuated by said cams respectively, and connections between said means and said carriage, and means making said clamp members inoperative upon the web during the making of an impression and for making said clamp members operative upon the web during movement of said carriage away from said plate cylinder.

7. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of a reciprocatory carriage, clamp members upon said carriage, actuating means for moving said carriage alternately toward and from the plate cylinder including a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, means actuated by said cams respectively, and connections between said means and said carriage, adjustable means controlling the length of reciprocatory movement of said carriage, and means making said clamp members inoperative upon the web during the making of an impression and for making said clamp members operative upon the web during movement of said carriage away from said plate cylinder.

8. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of a reciprocatory carriage, clamp members upon said carriage, actuating means for moving said carriage alternately toward and from the plate cylinder including a cam carried by and rotatable with the plate cylinder, adjacent each plate thereon, a bell crank lever co-operating with said cams respectively, and connections between said bell crank lever and said carriage, and means making said clamp members inoperative upon the web during the making of an impression and for making said clamp members operative upon the web during movement of said carriage from said plate cylinder.

9. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of a reciprocatory carriage, clamp members upon said carriage, actuating means for moving said carriage alternately toward and from the plate cylinder including a rack upon said carriage, a gear enmeshed with said rack, a bell crank lever, a gear segment on one arm thereof, a shaft, gears upon said shaft enmeshed respectively with said segment, and with said gear enmeshed with said rack, a cam carried by and rotatable with the plate cylinder adjacent each plate thereon operative upon the other arm of said bell crank lever, a stop adjacent one arm of said bell crank lever and an adjustment screw carried by said arm, co-operating with said stop whereby the length of movement of said carriage is defined, and means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said carriage from said plate cylinder.

10. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing ele-

ments in spaced relation to each other, of a reciprocatory carriage, clamp members upon said carriage, actuating means for moving said carriage alternately toward and from the plate cylinder including springs having a thrust upon said carriage toward said plate cylinder, a rack upon said carriage, a gear enmeshed with said rack, a bell crank lever, a gear segment on one arm thereof, a shaft, gears upon said shaft enmeshed respectively with said segment, and with said gear enmeshed with said rack, a cam carried by and rotatable with the plate cylinder adjacent each plate thereon operative upon the other arm of said bell crank lever, a stop adjacent one arm of said bell crank lever and an adjustment screw carried by said arm, co-operating with said stop whereby the length of movement of said carriage is defined, and means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said carriage from said plate cylinder.

11. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement, including therein a pair of clamp bars, one of which is movable toward and from the other into and out of engaging relation with a web, a rock shaft, a bell crank lever, one arm of which is engageable with said movable clamp bar, a spring acting on the other arm of said lever with a normal tendency to engage said movable clamp bar with said fixed clamp bar, a rock arm on said shaft, actuating means for said rock arm including a shoe engageable therewith, a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, means actuated by said cams respectively, connections between said means and said shoe whereby said clamp bars are alternately engaged with, and disengaged from, a web, and means for moving said clamp members alternately toward and from said plate cylinder.

12. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement, including therein a pair of clamp bars, one of which is movable toward and from the other into and out of engaging relation with a web, a rock shaft, a bell crank lever, one arm of which is engageable with said movable clamp bar, a spring acting on the other arm of said lever with a normal tendency to engage said movable clamp bar with said fixed clamp bar, a rock arm on said shaft, actuating means for said rock arm including a shoe engageable therewith, whereby said clamp bars are alternately engaged with, and disengaged from, a web, parallel rock arms supporting said shoe, a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, a rock arm actuated by said cams respectively, connections between said last named rock arm and one of said first named rock arms, a stop adjacent one of said first named rock arms, a heel carried by said adjacent rock arm engageable with said stop, and means for moving said clamp members alternately toward and from said plate cylinder.

13. A rotary web undersurface printing machine embodying therein the combination with

an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement including therein a reciprocatory carriage, actuating means for moving said carriage alternately toward and from the plate cylinder including a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, means actuated by said cams respectively, and connections between said means and said carriage, a pair of clamp bars carried by said carriage, one of which is movable toward and from the other into and out of engaging relation with a web, a rock shaft, a bell crank lever, one arm of which is engageable with said movable clamp bar, a spring acting on the other arm of said lever with a normal tendency to engage said movable clamp bar with said fixed clamp bar, a rock arm on said shaft, actuating means for said rock arm including a shoe engageable therewith, a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, means actuated by said cams respectively, and connections between said means and said shoe whereby said clamp bars are alternately engaged with, and disengaged from, a web.

14. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of a reciprocatory carriage, clamp members upon said carriage, actuating means for moving said carriage alternately toward and from the plate cylinder including a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, the cams adjacent each plate comprising a plurality of sections adjustable circumferentially of the cylinder and in relation to each other, one of said sections having a rise and the other having a fall, means actuated by said cams respectively, and connections between said means and said carriage and means making said clamp members inoperative upon the web during the making of an impression and for making said clamp members operative upon the web during movement of said carriage away from said plate cylinder.

15. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement, including therein a pair of clamp bars, one of which is movable toward and from the other into and out of engaging relation with a web, a rock shaft, a bell crank lever, one arm of which is engageable with said movable clamp bar, a spring acting on the other arm of said lever with a normal tendency to engage said movable clamp bar with said fixed clamp bar, a rock arm on said shaft, actuating means for said rock arm including a shoe engageable therewith, a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, the cams adjacent each plate comprising a plurality of sections adjustable circumferentially of the cylinder and in relation to each other, one of said sections having a rise and the other having a fall, means actuated by said cams respectively, and connections between said means and said shoe whereby said clamp bars are alternately engaged with, and disengaged from, a web, and means for moving said

clamp members alternately toward and from said plate cylinder.

16. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement including therein a reciprocatory carriage, actuating means for moving said carriage alternately toward and from the plate cylinder including a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, means actuated by said cams respectively, and connections between said means and said carriage, a pair of clamp bars carried by said carriage, one of which is movable toward and from the other into and out of engaging relation with a web, a rock shaft, a bell crank lever, one arm of which is engageable with said movable clamp bar, a spring acting on the other arm of said lever with a normal tendency to engage said movable clamp bar with said fixed clamp bar, a rock arm on said shaft, actuating means for said rock arm including a shoe engageable therewith, a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, means actuated by said cams respectively, connections between said means and said shoe whereby said clamp bars are alternately engaged with, and disengaged from, a web, each of said cams adjacent each plate comprising a plurality of sections adjustable circumferentially of the cylinder and in relation to each other, one of said sections having a rise and the other having a fall.

17. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement including therein co-operating clamp members operative upon a web, a tension mechanism comprising a platen between said clamp members and said plate cylinder, a friction roller co-operating with said platen, and means yieldably forcing said roller toward said platen, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, and means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder.

18. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, and a throw-off mechanism whereby said cylinders may be made inoperative, of means controlling the web movement including therein co-operating clamp members operative upon a web, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder, a bell crank lever, a lock member, a mem-

ber engageable thereby carried by the means imparting movement to the clamp members toward and from the plate cylinder, a link having a lost motion connection with said lock member and with one arm of said bell crank lever, a second bell crank lever, one arm of which is engageable by said throw-off mechanism, and a link connecting the other arms of both of said bell crank levers whereby, simultaneously with the operation of said throw-off mechanism to make said cylinders inoperative, movement of the clamp members toward and from the plate cylinder is prevented.

19. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, and a throw-off mechanism whereby said cylinders may be made inoperative, of means controlling the web movement, including therein a pair of clamp bars, one of which is movable toward and from the other into and out of engaging relation with a web, a rock shaft, a bell crank lever, one arm of which is engageable with said movable clamp bar, a spring acting on the other arm of said lever with a normal tendency to engage said movable clamp bar with said fixed clamp bar, a rock arm on said shaft, actuating means for said rock arm including a shoe engageable therewith, said shoe comprising two relatively movable sections each having a recess therein, said recesses normally being out of register, a cam carried by and rotatable with the plate cylinder adjacent each plate thereon, means actuated by said cams respectively, connections between said means and said shoe whereby said clamp bars are alternately engaged with, and disengaged from, a web, means for moving said clamp members alternately toward and from said plate cylinder, a bell crank lever, a link connection between one arm of said bell crank lever and said movable shoe section, a second bell crank lever, one arm of which is engageable by said throw-off mechanism, and a link connecting the other arms of both of said bell crank levers whereby, simultaneously with the operation of said throw-off mechanism to make said cylinders inoperative, the recesses in said shoe sections will be registered to prevent engagement of said shoe with said rock arm.

20. A rotary web undersurface printing machine embodying therein the combination with an impression cylinder and a plate cylinder adapted to receive a plurality of printing elements in spaced relation to each other, of means controlling the web movement including therein co-operating clamp members operative upon a web, a tension mechanism between said clamp members and said plate cylinder, a weighted guide roller between said tensioning mechanism and said cylinders, means whereby the position of said guide roller may be adjusted, means actuating said clamp members to alternately impart movement thereto toward and from the plate cylinder, and means making said clamp members inoperative upon the web during the making of an impression, and for making said clamp members operative upon the web during movement of said clamp members from said plate cylinder.

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