

July 29, 1941.

C. PAULSEN

2,250,677

FEED MECHANISM FOR PRINTING PRESSES

Filed Dec. 6, 1939

4 Sheets-Sheet 1

FIG. 1

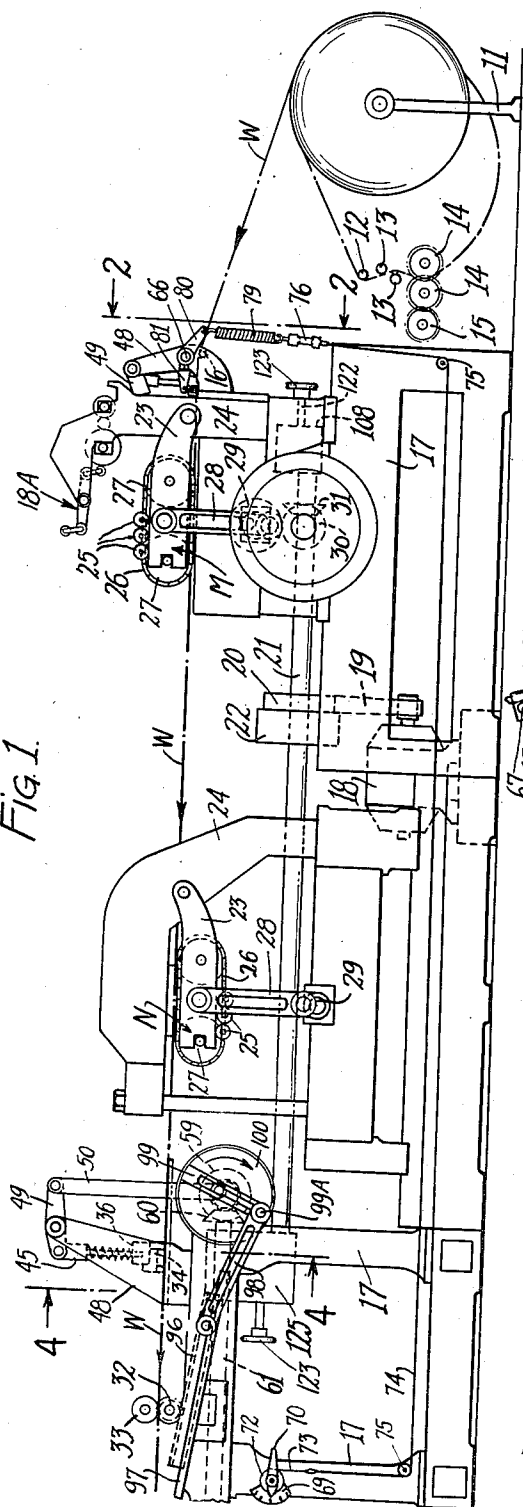


FIG. 7

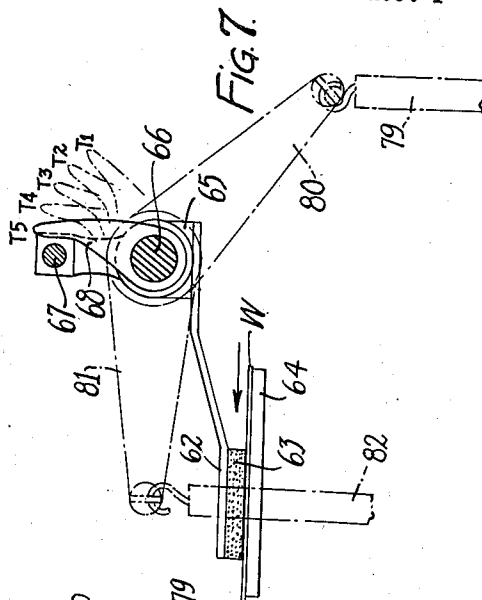
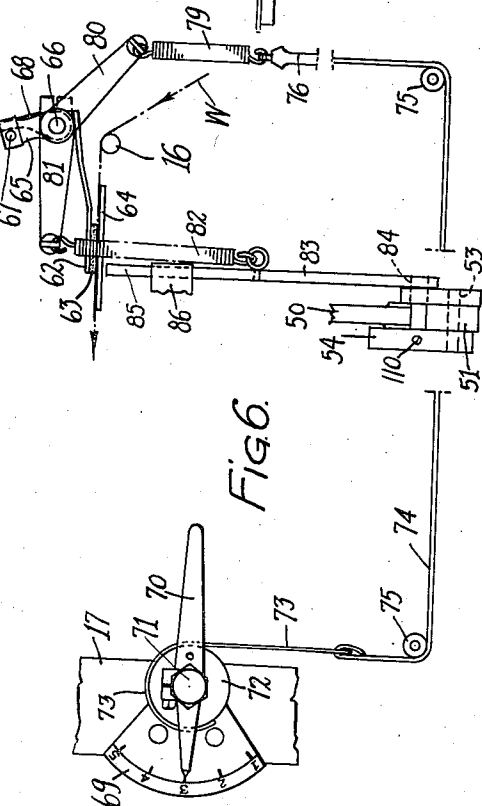


FIG. 6



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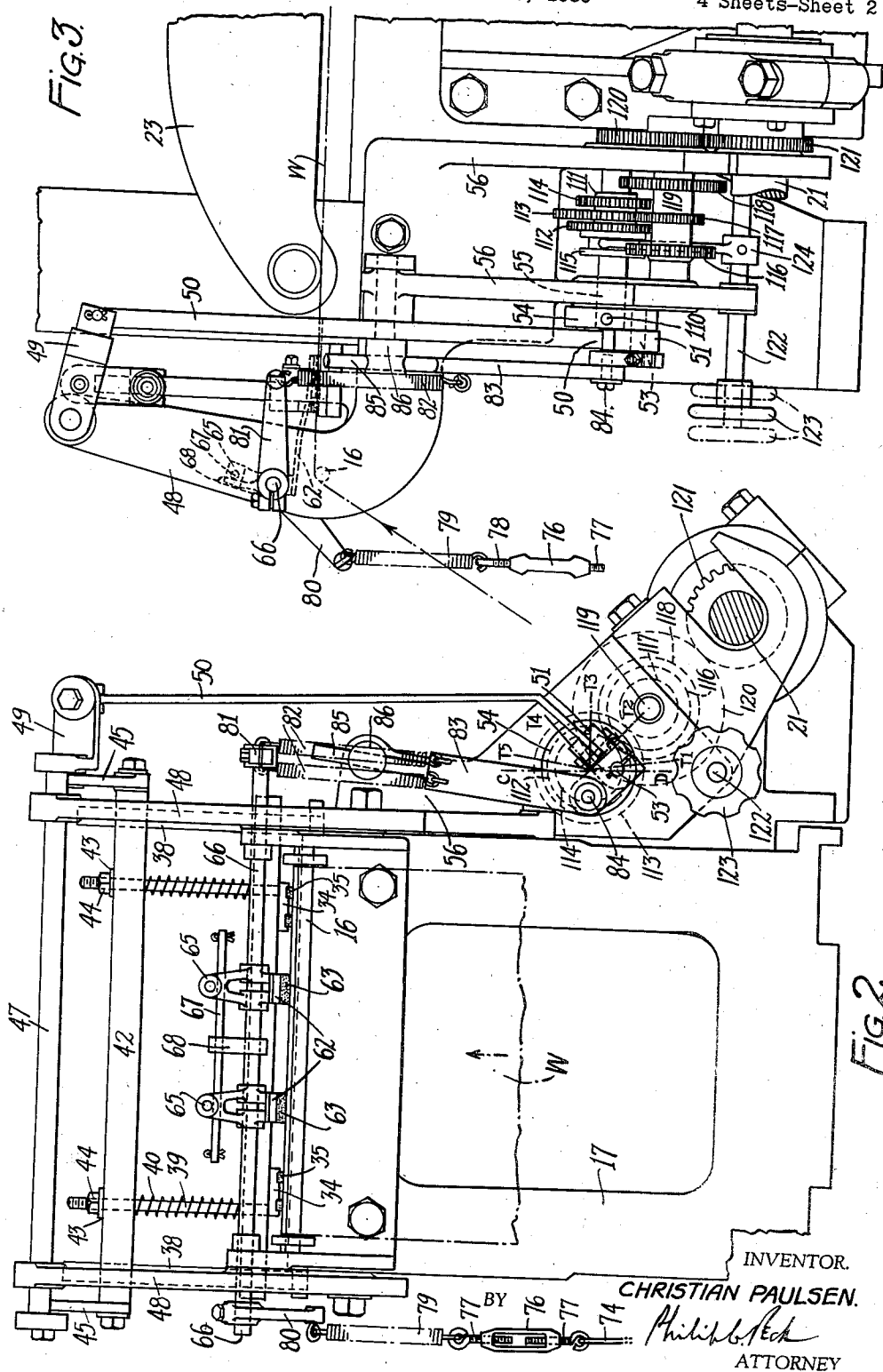
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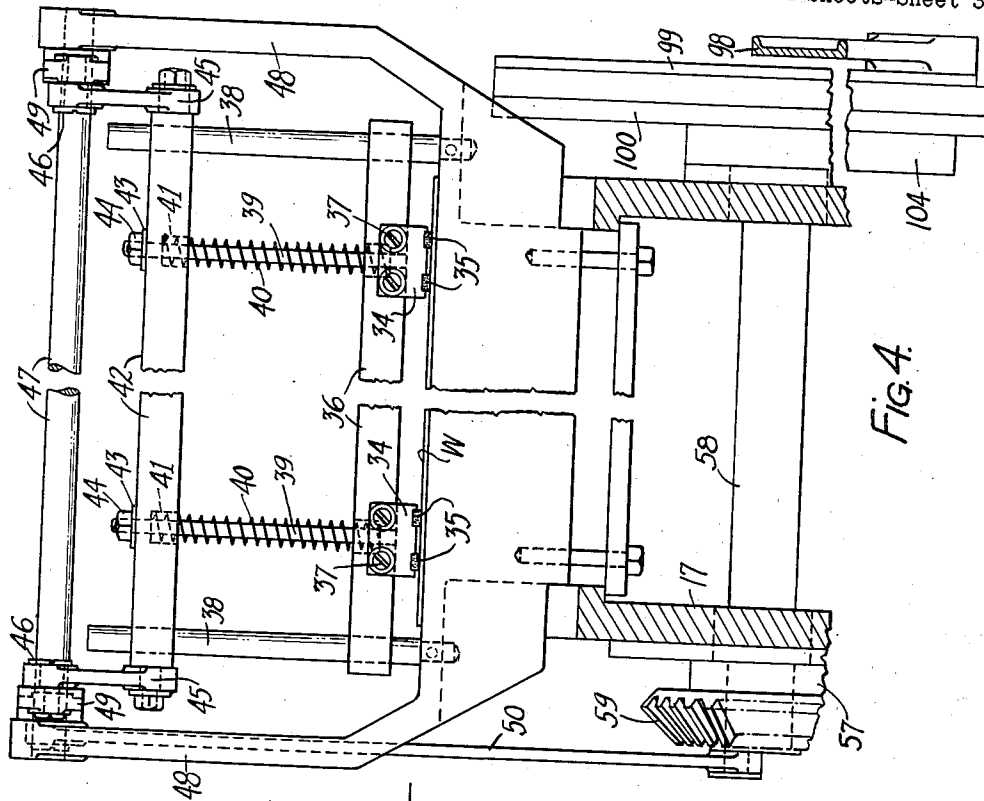


FIG. 4

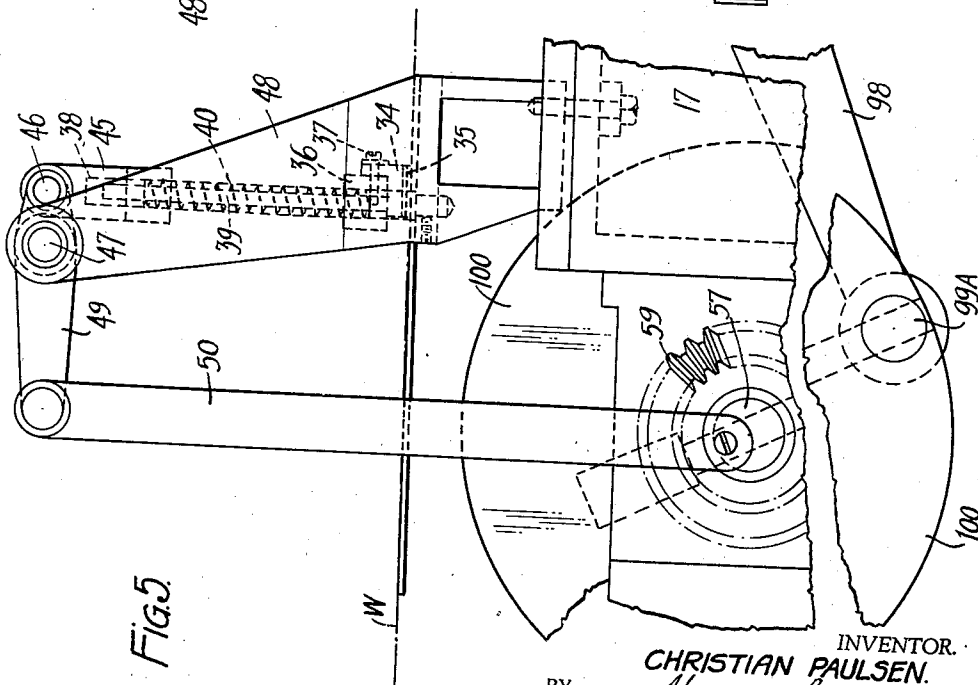


FIG. 5

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Fig. 8

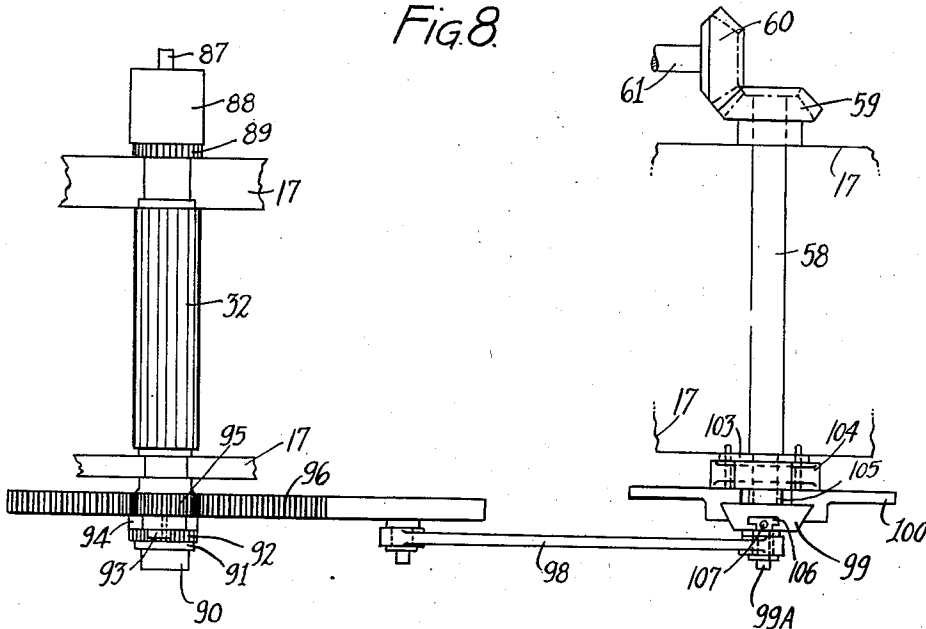
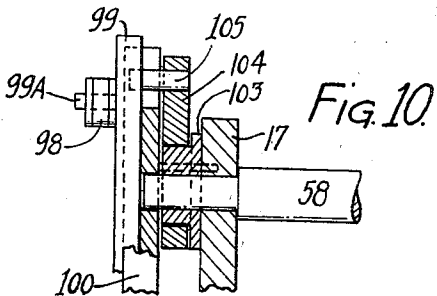
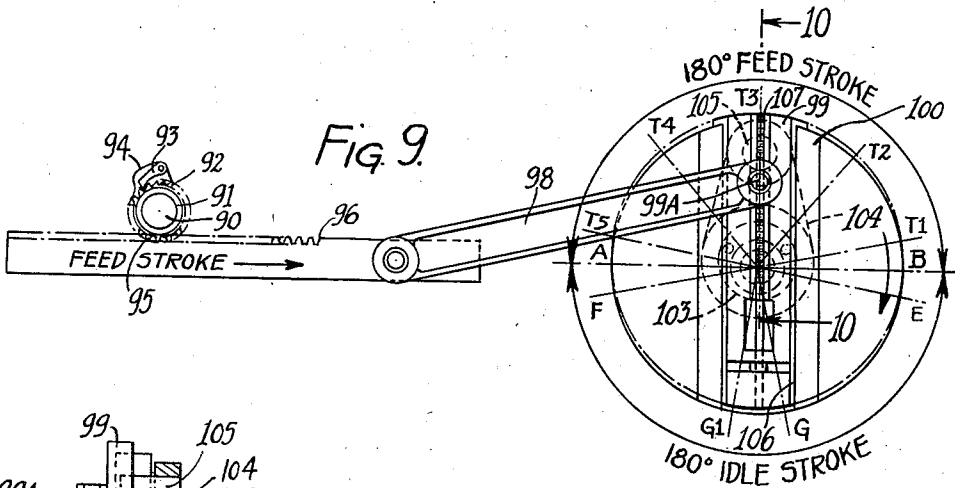


Fig. 9



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UNITED STATES PATENT OFFICE

2,250,677

FEED MECHANISM FOR PRINTING PRESSES

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Application December 6, 1939, Serial No. 307,730

20 Claims. (Cl. 271—2.4)

My invention relates to flat-bed printing presses for printing webs, and more particularly to an improved feed mechanism that also regulates the tension of the printed web as such web is intermittently advanced through the press between impressions.

Heretofore it has been the general practice to apply a uniform tension to the web as the latter has been fed between impressions. However I have discovered that a steady tension is entirely inadequate for good register, particularly at high speeds. For example, when a steady tension is applied to hold the web at the end of the feed stroke, then there is too much tension to start the web at the beginning of the web stroke. Result is that the feed wheels used to advance the web will slip slightly at every feed, and also the extent of this slippage will not be the same at each feed, thereby causing short feeds and misregister.

The objects of my invention, among other things, is to provide an improved feed mechanism for the web in flat-bed presses that will overcome such defects, such mechanism embodying a variable tension device that is synchronized with the feed crank mechanism for advancing the web, whereby the web is left absolutely free at the beginning of the feed stroke, and thereafter the tension on the web is applied gradually with the maximum tension reached as required at the end of the feed stroke. By my improved mechanism I am enabled to feed the web at very high speeds without the slightest slippage.

Another object of my invention is to provide means for positively clamping the web at both ends of the press against any movement at the end of each feed stroke; also for keeping the web clamped during the printing stroke while serving to strip the web away from the form as the latter rises after making the impression. Such clamps are released again just before the web starts feeding for the succeeding impression, and the web is then entirely free for its forward travel. These web clamps are operated in timed relation with the feed crank for advancing the web, and since the feed crank may be operated one, two or three times for each printing impression, I have provided improved mechanism for changing the tension and clamp devices, such change in the feed being accomplished when the press is stopped in timing position.

Other objects and advantages will be hereinafter described and particularly pointed out in the appended claims, and I have shown a pre-

ferred embodiment of my invention in the accompanying drawings in which—

Fig. 1 is a side elevation of a flat-bed printing press printing one color on the upper side of a web and one color on the reverse side thereof with the printing heads shown on impression;

Fig. 2 is an enlarged end elevation taken on the line 2—2 of Fig. 1;

Fig. 3 is a side elevation of the parts shown in Fig. 2;

Fig. 4 is an enlarged end elevation taken on the line 4—4 of Fig. 1;

Fig. 5 is a side elevation of Fig. 5 looking from the left;

Fig. 6 is a detailed side elevation of the mechanism for varying the tension on the web;

Fig. 7 is an enlarged detail view of the tension setting devices;

Fig. 8 is a detailed top plan of the feeding mechanism for the web shown at the left of Fig. 1;

Fig. 9 is a side elevation of the parts shown in Fig. 8; and

Fig. 10 is a detail view, partly in section, taken on the line 10—10 of Fig. 9.

Similar numerals refer to similar parts throughout the several figures.

Referring to Fig. 1, the web of paper W in the form of a roll is rotatably mounted on the standard 11, and the web is led from the roll over the usual spring-tension roll 12, idler rolls 13 between the feed-rolls 14 rotated in unison by the spur gear 15 driven by any suitable mechanism. The web W below the feed-rolls 14 hangs in a loop to prevent snarling, and then passes upwardly around the web roll over the idler roll 16 (Figs. 3 and 6) into the zone of the first printing head as shown at the right of Fig. 1.

The frame 17 supports the two press units and the various mechanisms for controlling the feed of the web W as the latter passes to the left through the press as shown in Fig. 1. Power is supplied from the electric motor 18 through the belt 19 passing around the pulley 20 affixed to the drive shaft 21 journaled on the far side of the press shown in Fig. 1. The clutch for disconnecting the press and feed mechanisms from the drive shaft 21 is indicated by the numeral 22 (Fig. 1).

As shown in Fig. 1, the web W passes to the left to the first printing head M for the impression on the top side of the web, and then to the second printing head N for the impression on the under side of the web. These printing heads M and N are of usual construction and in themselves con-

stitute no part of the present invention. An outline description of one will suffice for both. Referring to the first head M, the form carrier 23 is pivotally mounted to the upright brackets 24 carried by the frame 17 which support the inking mechanism 18^A for inking the form rollers 25 affixed to the chains 26 passing around the sprockets 27. The form carrier 23 is connected by the link 28 to the crank 29 driven by the gear 30 meshing with the gear 31 mounted on the drive shaft 21. In both printing heads M and N the impression is shown as "on."

The web W is advanced through the press by the feed mechanisms shown at the left of Fig. 1, and such feed mechanisms comprise the under feed-roller 32 and upper pressure roller 33, the roller 32 being intermittently rotated by mechanism hereinafter to be described.

Two sets of clamps are used for holding the web at rest during impression, one set being located to hold the web before it passes to the printing head M and the other set of web clamps being positioned between the printing head N and feed rollers 32 and 33.

The first set of web clamps adjacent the printing head M are shown more particularly in Figs. 2-5 and comprise the following parts: The clamps 34 are spaced apart near the margins of the web W and have the cork pads 35 to bear on the web. The clamps 34 are secured to the lower slide bar 36 by screw bolts 37 (Figs. 4 and 5) to suitably space same to accommodate for different widths of the web W that may be used. The ends of the slide bar 36 are slidably mounted on the vertical guide posts 38 mounted on the frame 17, while the clamps 34 carry the upright guide rods 39 around which are coiled the springs 40, the upper ends of which are contained in sockets 41 formed on the upper slide bar 42 mounted on the guide posts 38. The upper ends of the rods are screw-threaded where they pass through the slide bar 42 and carry the washers 43 and adjusting nuts 44 to adjust the length of the rods 39 between the slide bars 36 and 42 and so control the force of the springs 40 for different weights of the web W. The upper slide bar 42 carries at each end the connecting links 45 mounted on studs 46 journaled on the cross shaft 47 carried by the brackets 48 supported on the frame 17. The studs are fastened to the drive levers 49 rocking on the shaft 47.

The drive link 50 for the first set of clamps 34 is pinned to one of the drive levers 49, and extends downwardly to the connecting link 51 journaled on the pin 53 carried by the crank disk 54 mounted on the stub shaft 55 journaled in the bracket 56 (Fig. 3). This stub shaft 55 is rotated from the drive shaft 21 by an interchangeable speed gearing mechanism hereinafter to be described.

The second set of web clamps 34 (located between the printing head N and the feed rollers 32 and 33) are of similar construction as those of the first set, and have similar actuating mechanism except that the drive link 50 is pinned to the crank disk 57 (Figs. 4 and 5) mounted on the cross-shaft 58 journaled in the frame 17. This shaft 58 carries the bevel gear 59 meshing with the bevel gear 60, mounted on the cutter drive shaft 61 (Fig. 1) that is actuated in timed relation with the drive shaft 21 by any suitable mechanism (not shown).

The web-tensioning mechanism comprises the following devices best shown in Figs. 1-3, 6 and 7, such mechanism being located adjacent the

web clamps 34 for the first printing head M: Two tension plates 62 are preferably used and they are arranged between the web clamps 34 as shown in Fig. 2. These plates 62 carry felt pads 63 to bear on the web W against the supports 64 carried by the frame 17 (Figs. 6 and 7). The plates 62 are mounted on the brackets 65 journaled on the rock-shaft 66 journaled in the frame 17. The upper ends of the brackets 65 have aligned holes through which extends the rod 67 by which the plates 62 may be adjusted laterally to each other to accommodate for different widths of the web W. Midway on the shaft 66 is fastened the swinging finger 68 which is adapted to bear against the rod 67 when the shaft 66 is rocked anti-clockwise (Figs. 6 and 7) so as to exert tension on the web through the plates 62. The degree of tension of the plates 62 on the web W is determined by the different positions of the finger 68 (shown in dotted lines in Fig. 7), the position T⁵ being the maximum tension while the minimum tension is that of the position T¹, with the tension decreasing from the T⁵ position through the T⁴, T³, T² to the T¹ positions according to the adjusting dial 69 (Figs. 1 and 6) on which the lever 70 pinned at 71 to the frame 17 may register at the will of the operator. The lever 70 carries the drum 72 around which is affixed the strap 73 to which is fastened the steel cable 74 that runs rearwardly over the pulleys 75 and is connected to the turn-buckle 76 by the adjustable screw bolt 78. The turn-buckle 77 carries the adjustable screw-bolt 78 to which is secured the coil spring 79 fastened at the upper end to the rock-lever 80 secured to one end of the rock-shaft 66.

The opposite end of the rock-shaft 66 carries the rock-lever 81 (Figs. 2 and 3) connected by a pair of coil springs 82 to the link 83 pivoted at 84 to the crank disk 54. The upper end of the link 83 carries the guide rod 85 that passes through a hole in the stud 86 journaled in the bracket 56. As the rock-lever 81 is raised and lowered by this mechanism the tension plates 62 are pressed against the web W under a yielding spring tension that may be varied according to the position of the finger 68 mounted on the rock-shaft 66 (Fig. 7).

The mechanism for actuating the under feed roller 32 comprises a compound crank motion that is best shown in Figs. 1 and 8-10: This feed-roller 32 is mounted on the shaft 87 which carries on the far end the usual friction brake hub 88 and feed gear 89. On the near end of the shaft 87 are secured the friction disk 90 and operating ring 91 together with the feed ratchet 92 that is engaged by the feed pawl 93 pinned to the pawl disk 94. The feed pinion 95 meshes with the feed rack 96 carried by the bar 97 (Fig. 1), and this feed rack 96 is connected by the link 98 to the slide 99 carried by the crank disk 100 mounted on the cross-shaft 58 that is driven from the shaft 61 through the bevel gears 59 and 60 (Fig. 8). A very slow accelerated and also a slow retarded motion is imparted to the feed-roller 32 by the mechanism shown in Figs. 8-10: The eccentric 103 is stationary and dowelled to the frame 17 while the eccentric link 104 is connected by the pin 105 to the slide 99 (Figs. 9 and 10). The slide 99 is provided with the T slot 106 and adjusting screw 107 so that the length of the feed may be adjusted to any length within the limits of the crank disk 100. As this disk 100 rotates in the direction of the arrow (Figs. 1 and 9), the slide 99 will follow the ec-

centric 103 and since this eccentric is dowelled in relation to motion, the motion of the feed rack 96 will be neutralized at both the beginning as well as at the ending of each feed stroke. The critical point of action is where the pawl 93 engages the ratchet 92, which is at the very beginning of the stroke as the crank pin 99A on the slide 99 passes the line A—B (Fig. 9). After passing this point in the direction of the arrow the pawl 93 has engaged the ratchet 92 and the feed roller 32 starts to rotate (anti-clockwise) with the web W held in contact with the roller 32 by the pressure of the upper feed-roller 33. As soon as the web has started its forward movement the critical point has passed for this particular feed, since the web will not slip after once it has started. Such starting of the web takes place during the first five to ten degree angular movement of the crank disk 100.

Referring to Fig. 9, the travel from A to B is the feed stroke and the idle stroke is from B to A. The web W is at rest and the printing accomplished during the idle stroke. The web during the printing period is held by the clamps 34 to keep same from shifting and these clamps 34 also act to strip the web from the printing plate as the plate is lifting. Such clamps 34 are in operation while the crank disk 100 travels from E to F and the printing occurs between G and G¹.

The web clamps 34 are actuated in timed relation with the feed crank, and since the feed crank may be operated one, two or three times for each printing impression, a change gear box for changing the tension on the web through the plates 62 as well as the clamp mechanism is provided and is best shown in Fig. 3.

The gear box 108 (Fig. 1) comprises the following mechanism whereby a change may be made from single to double or triple feed: Referring to Fig. 3, the stub-shaft 55 is journaled in the bracket 56 and the crank disk 54 is fastened to the shaft 55 by the pin 110. The sleeve 111 is slidably keyed to the shaft 55 and carries the change gears 112, 113 and 114 as well as the grooved collar 115. Complementary change gears 116, 117 and 118 are secured to the shaft 119 journaled in the bracket 56, the shaft 119 also carrying the gear 120 that meshes with the drive gear 121 mounted on the drive shaft 21 (Figs. 2 and 3). Slidably mounted in the bracket 56 is the push rod 122 having the handle 123, the rod 122 carrying the arm 124 that engages the grooved collar 115 (Fig. 3). By shifting the push rod 122 the three sets of coacting change gears are brought into cooperating relation. The gears 113 and 117 are in mesh as shown with the handle 123 in its full line position for single feed, and the gears 112 and 116 are in mesh for double feed when the handle 123 is pulled to the left (Fig. 3), while the gears 114 and 118 are in mesh for triple feed when the handle 123 is in the right-hand dotted position (Fig. 3). This change from one feed to another should be made when the press is stopped in timing position as shown in Fig. 1. A similarly constructed change gear box marked 125 is also used for the feed mechanism at the left side of Fig. 1 that is likewise changed in accordance with the proper gears in engagement as heretofore described in the box 108.

In operation and referring to Fig. 1, the printing heads M and N are shown on the impression, and in this position the operations of the feed, clamping and tension mechanisms are synchro-

nized with the web W at rest. When the web is at rest the feed crank pin 99A is half way on the idle or return stroke (Fig. 9). When this crank pin reaches the point A the feed pawl 93 engages the ratchet 92 and the web W starts to feed. Assuming that the tension lever 70 (Fig. 1) is set with the pointer at 5 (Fig. 6), which is the maximum tension, such tension will begin to take effect when the feed crank pin 99A reaches the point T⁵ (Figs. 2 and 9). The web W at the start of the feed is entirely free and the tension is applied gradually until the crank pin 99A arrives at the point B at the end of the feed. Had the lever 70 been pointed at T¹ instead of T⁵, the crank pin 99A would reach T¹ (Fig. 9) before the tension would be applied to the advancing web, and the amount of tension at the end of the feed stroke would be proportionately less than if the pointer on the lever 70 (Fig. 6) was set at T², T³, T⁴ or T⁵. The crank pin 84 (Fig. 2) is also shown in timing position, and the marking C—D corresponds to the marking A—B (Fig. 9), while the designations (T¹ to T⁵ inclusive) correspond in the same order as on the feed crank (Fig. 9). In both cases these markings indicate where the tension begins to take effect, and on Fig. 7 show where the finger 68 engages the tension rod 67.

It will be seen that my adjustable feed mechanism as hereinbefore described embodies a variable tension device that is synchronized with the feeding mechanism so as to leave the web entirely free as the feed stroke begins with the tension variably and gradually applied during the feed stroke and reaching the maximum at the end of such feed stroke, while my feed mechanism also embodies means for holding the web at both ends of the press against any movement at the end of each feed stroke and at the same time the web is clamped during the printing stroke, such clamping means also serving to strip the web from the form as the latter rises after impression, and leaves the web free for the next forward feed.

I do not wish to be limited to the particular type of printing-press shown, since the same may be changed in its structural details without sacrificing the advantages derived from the use of my improved mechanism for feeding the web therethrough.

I claim as my invention:

1. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, and means separate from the traveling web and operatively connected with said feeding means for gradually applying tension directly to the web during its forward feed.
2. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, means actuated by said feeding means for gradually applying tension to the web during its forward feed, and means for varying the amount of tension so applied.
3. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, and means actuated by said feeding means for initially applying tension to the web including means for gradually increasing the tension applied to the web during its forward feed.
4. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, means for applying tension to the web during its forward feed, and means for actuating said feeding means and said tension means in timed relation to free the web from said tension means when the web starts its forward motion.

5. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, means for gradually applying tension to the web during its forward feed, and means for actuating said feeding means and said tension means in timed relation to free the web from said tension means when the web starts its forward motion.

6. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, means for initially applying tension to the web including means for gradually increasing the tension applied to the web during its forward feed, and means for actuating said feeding means and said tension means in timed relation to free the web from said tension means when the web starts its forward motion.

7. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, means actuated by said feeding means for gradually applying tension to the web during its forward feed, and means for variably controlling the tension so applied.

8. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, and means for initially applying tension to the web including means for gradually increasing a variably controlled tension applied to the web during its forward feed.

9. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, and separate means each actuated by said feeding means for clamping the web adjacent both ends of said unit during the printing.

10. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, and separate means each actuated by said feeding means for clamping the web adjacent both ends of said unit during the printing, said clamping means stripping the web from said unit after impression.

11. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, separate means each actuated by said feeding means for clamping the web adjacent both ends of said unit during the printing, and means for releasing said clamping means before said feeding means begins its next cycle.

12. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit, separate means each actuated by said feeding means for clamping the web adjacent both ends of said unit during the printing, said clamping means stripping the web from said unit after impression, and means for releasing said clamping means before said feeding means begins its next cycle.

13. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit including a mechanism for forwarding said web a plurality of feeds for a printing impression, and means actuated by said feeding means for gradually applying tension to the web during each of said feeds.

14. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit including a mechanism for forwarding said web a plurality of feeds for a printing impression, means for gradually applying tension to the web during each of said feeds, and means for varying the amount of tension so applied.

15. A feed mechanism for a printing unit comprising means for intermittently feeding a web to said unit including a mechanism for forwarding said web a plurality of feeds for a printing impression, and means actuated by said feeding means for clamping the web adjacent both ends of said unit during printing.

16. In a feed mechanism for a flat-bed printing press, means for intermittently feeding a web to the press, means for clamping the web at rest during impression, and means for gradually applying tension to the web during its forward feed between impressions.

17. In a feed mechanism for a flat-bed printing press, means for intermittently feeding a web to the press, means for clamping the web at rest during impression, means for gradually applying tension to the web during its forward feed between impressions, and means for synchronizing the operation of said clamping means and said tension means to free the web as the latter begins its forward feed.

18. In a feed mechanism for a printing press, means for intermittently feeding a web to said press, means actuated by said feeding means for applying an increasing tension on the web during its forward feed, and means for variably controlling the tension so applied.

19. In a feed mechanism for a printing press, means for intermittently feeding a web to said press, separate means each actuated by said feeding means for clamping the web adjacent both ends of the press during impression, and means for varying the number of feeds for said web during a single impression.

20. A feeding mechanism for advancing a web of material comprising means for intermittently advancing said web and means separate from the travelling web and operatively connected with said feeding means for gradually applying tension directly to the web during the periods of its forward feed.

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