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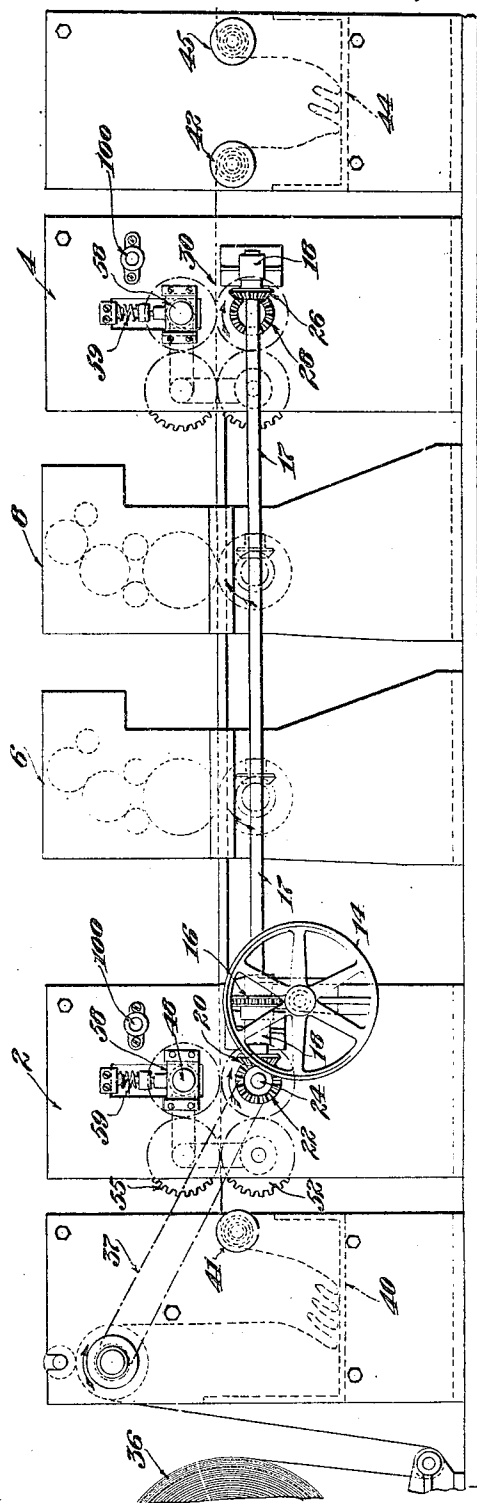
G. E. HOLMES

PRINTING MACHINE

Filed March 30, 1926

5 Sheets-Sheet 1

Fig. 1



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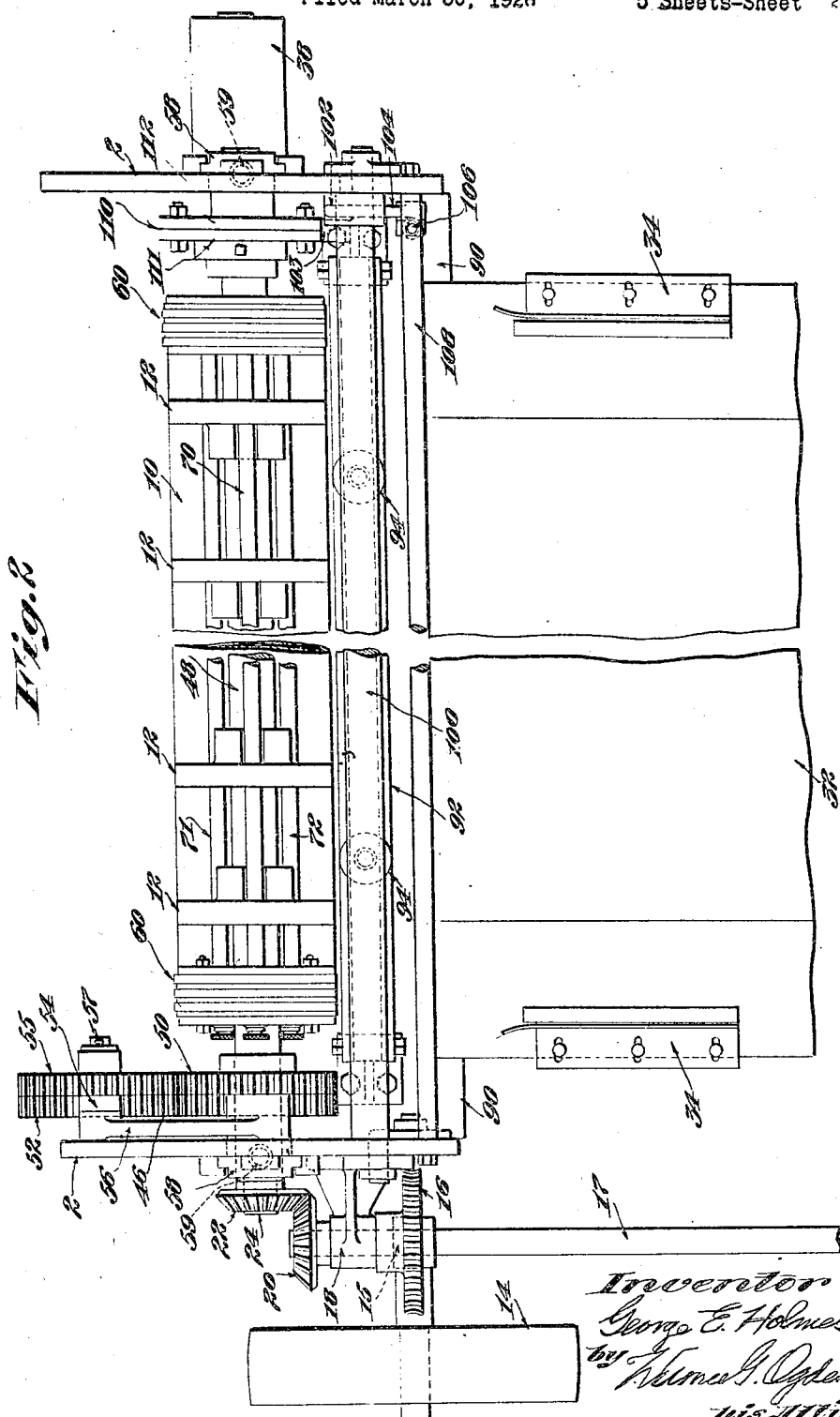
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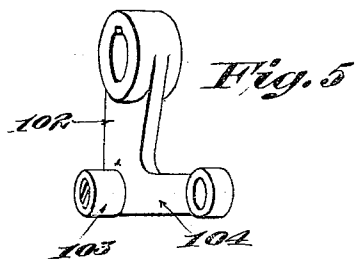
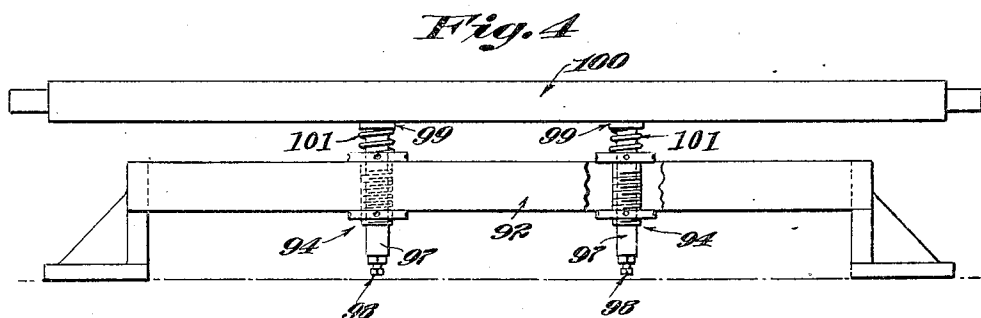
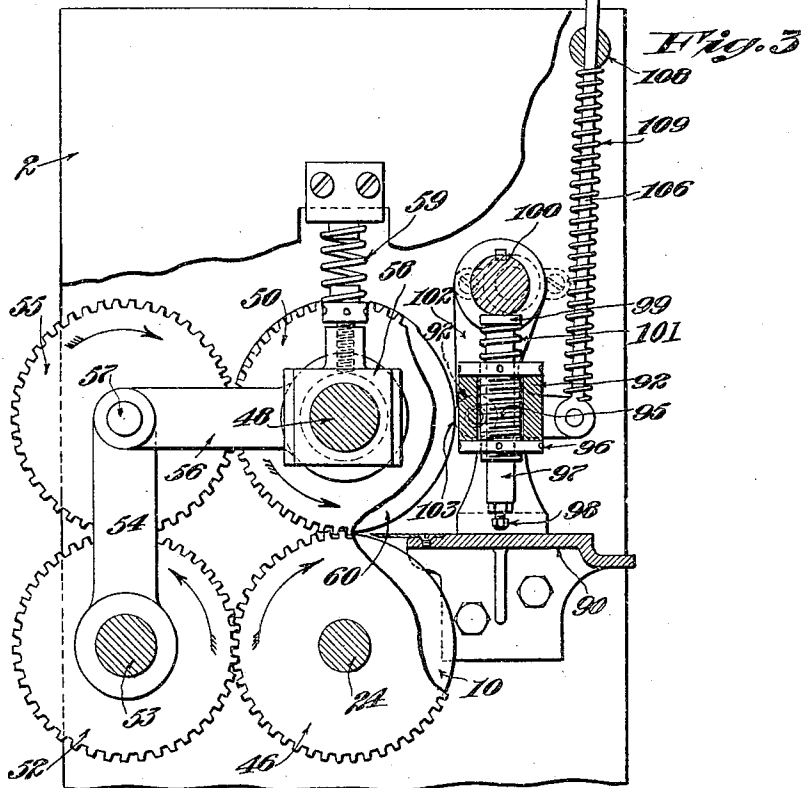
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PRINTING MACHINE

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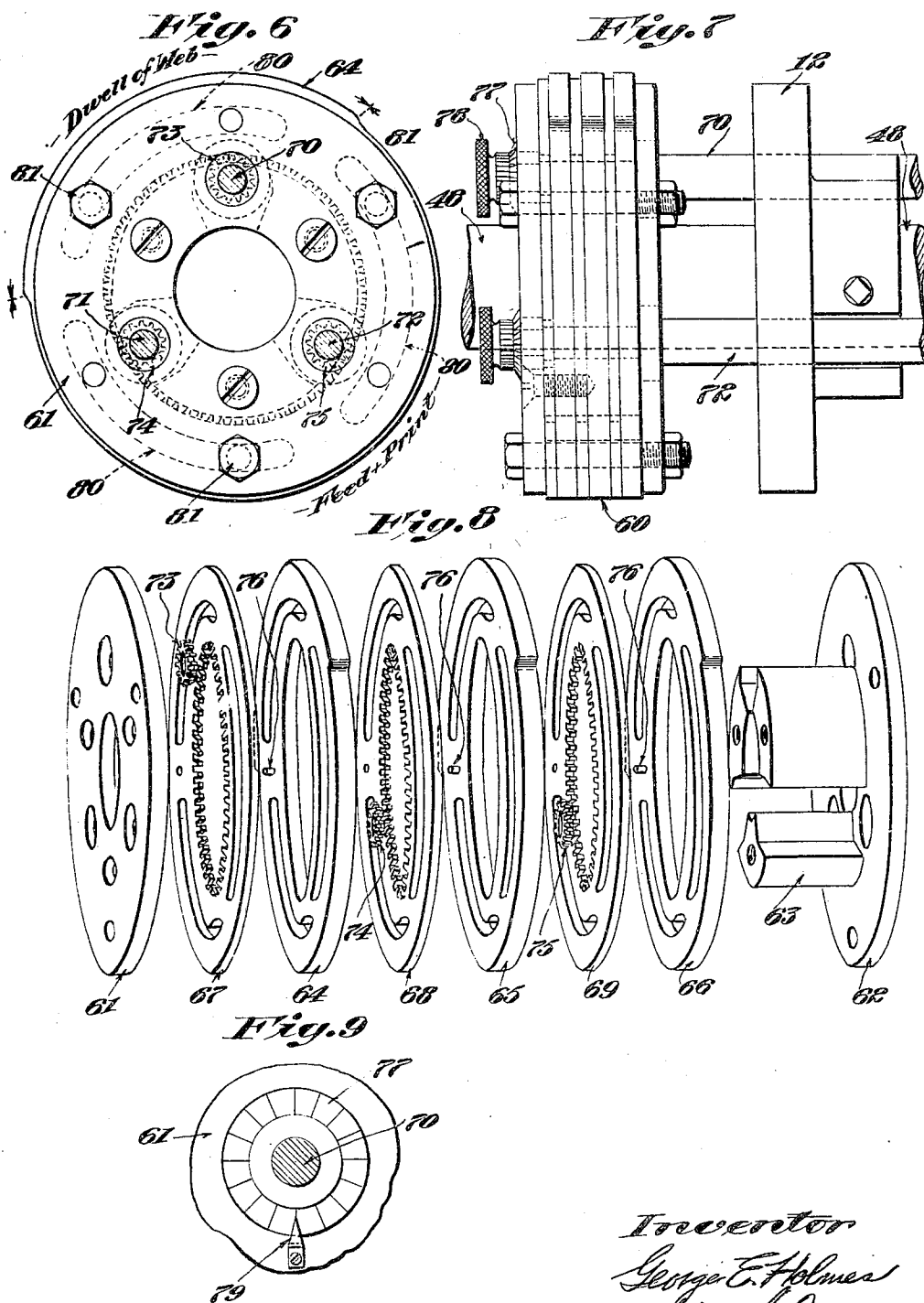
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PRINTING MACHINE

Filed March 30, 1926

5 Sheets-Sheet 4



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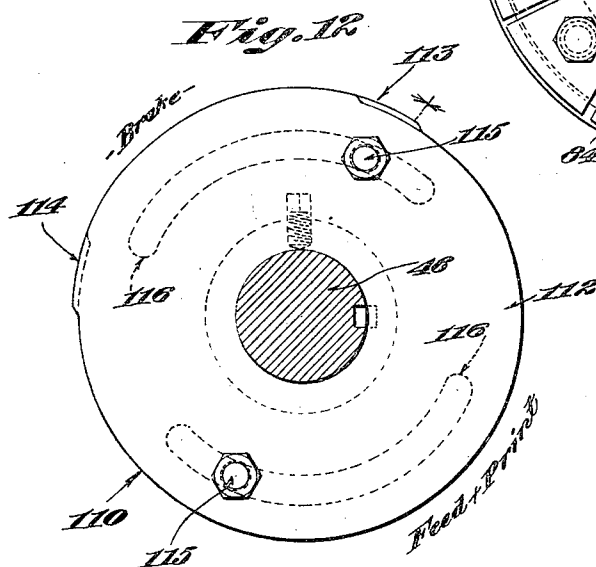
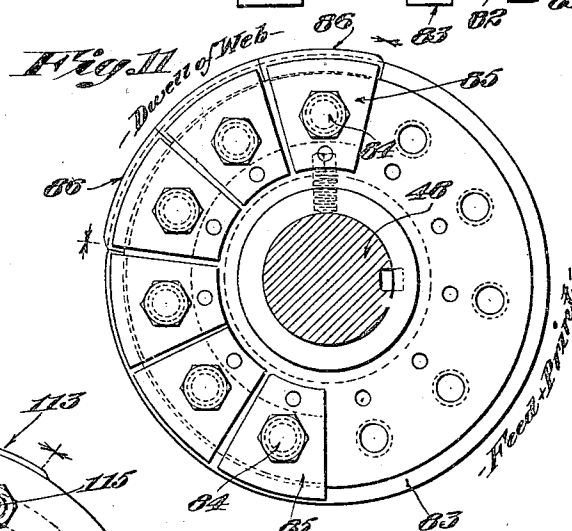
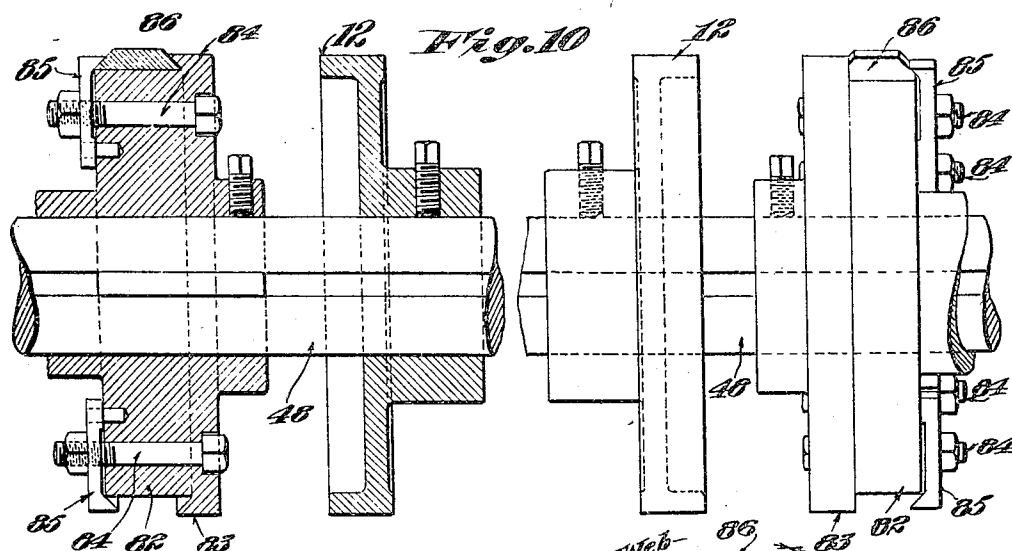
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE.

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PRINTING MACHINE.

Application filed March 30, 1926. Serial No. 98,469.

This invention relates to printing machines and more particularly to adjustable rotary printing presses for operating on a continuous web of material.

5 It is highly important that such presses be universal in character. This means printing with equal facility and accuracy on any web material, for example, a paper web from a 15 pound tissue up to a heavy cardboard or a textile web of either fine or coarse material; and having provision for a fine degree of adjustability to permit printing "all sizes" within the range of the printing unit that is employed.

15 In the production of a perfect product from adjustable rotary printing presses, it is essential that the inking rolls be kept rotating continuously so that the ink on the product will be of the same uniformity, that is, no light or dark lines because the inking rolls are permitted to rest on the plate. Accordingly one important feature of the present invention comprises a construction and arrangement of the mechanisms for operating the printing unit, or units, and for feeding the web of material thereto, that provides for a uniform motion, or rate of speed, of the printing unit through both printing and non-printing periods. When printing multi-20 colors the registry of the head-lines, on the two, or more, printing plates, must be perfect as the web advances past the printing units and a continuous, uniform rate of speed of all the printing units, successfully eliminates the loss of register due to the necessity of overcoming the inertia of the parts when the printing units are stopped during the non-printing periods, or their speed of rotation is materially changed. This is true, not only for multi-color printing, but for two or more successive operations upon the web of material. This feature of uniform speed of the printing unit extends, therefore, to any other auxiliary units that may co-operate therewith such as units for perforating, scoring, punching, and the like.

To obtain the accuracy of register, just described as essential, the feature of uniformity in the speed of rotation of the printing or other units is combined with a two-unit web-controlling mechanism that features a positive drive of the web by means of two commonly driven feeding couples, one located in advance of the first unit that operates on the web and the other located beyond the last

unit, if more than one unit is employed, and a positive control of the advance of the web providing for an instantaneous and complete stoppage continuing during the periods of non-printing, but no longer, while yet maintaining at all times a uniform tension on that portion of the web between the two-web-controlling units, i. e. the portion being operated upon. In order to ensure a web feed of the kind described the portions of the web in advance of the first feeding couple and beyond the second feeding couple are held loosely so that the "operative portion" between the web-controlling units is the only part held under tension and, because of the design, this operative portion may be advanced or held as a single unitary element without any variation of tension and consequent loss of register during successive cycles, or operations of the printing unit. It is this positive control of the web feed with relation to the movement of the units for operating thereon that makes the printing press of the present invention absolutely "universal" and thus a distinct advance in the art over prior adjustable rotary presses that are designed for one kind or type of work, for example, cloth or bag work.

In order to provide universality in the production of variable sized sheets from the same size of printing cylinder, or its equivalent, a further feature of the invention comprises control devices for the web-feeding mechanism that permit the utilization of any decimal part of the bearer circumference of the printing cylinder as the length or "size" to be printed on the web. These control devices may preferably be adjustable clamping means for engaging the web and for determining the relative periods of advance and of rest thereof according to the adjusted length and operation of the feeding couples.

In general the features and mechanisms of the present design secure a positive, but adjustable, control of the web-feed that perfectly synchronizes the feed to the size of the form to be printed from, thus providing for perfect registration of any number or kind of operating units on the web. Furthermore, the novel design minimizes waste and gives great flexibility in printing or otherwise operating upon webs of various natures. As a further advantage a high speed can be maintained with economy and without loss of accuracy.

To the accomplishment of the objects heretofore outlined, and such others as may hereinafter appear as will readily be understood by those skilled in the art, the invention comprises the features and combinations of parts hereinafter described and then particularly pointed out in the appended claims.

The various features of the invention will best be understood from a description of the preferred embodiment thereof illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal elevation illustrating an adjustable rotary printing press provided with the novel features of this invention. The drawing shows two units for operating on the web located between the two pairs of web-feeding rollers, but there may be one only or more than two such units, and while the drawing illustrates plate cylinder printing units it will be understood that flat bed and platen or offset printing units may be substituted therefor, or any other useful operating unit may be substituted therefor or added thereto, except that units for completely severing and for folding the web must be placed beyond the second feeding couple. This view also illustrates the two novel slack boxes for the web, in front of and beyond the web-feeding mechanism, and a portion of the usual unwind mechanism, it being understood that the rewind mechanism, if used, will draw the printed and/or otherwise treated web from the second slack box;

Fig. 2 is a plan view of a portion of the press showing the first web-feeding couple and associated parts;

Fig. 3 is a view in elevation, and partly in section, of the mechanism for rotating the forward web-feeding couples and for operating the upper feed roll, and the brake for stopping the advance of the web;

Fig. 4 is a detail, in elevation, of the web-clamping tips, the frame therefor and their actuating eccentric;

Fig. 5 is a disconnected detail, in perspective, of the lever arm through which the brake eccentric is rotated to actuate the web-clamping tips;

Fig. 6 is a detail, in elevation, of the outer end of one of the adjustable cams for controlling the period of engagement of a feeding couple with the web, the shafts receiving the adjusting thumb nuts being shown in section;

Fig. 7 is a front elevation of one end of an upper web-feeding roll showing the assembly of adjustable cams illustrated in Fig. 6;

Fig. 8 is a view, in perspective, of the various parts making up the cam sections of Figs. 6 and 7 arranged side by side in the order of assembly;

Fig. 9 is a detail of the dial and pointer providing for an accurate and equal adjustment of the upper feed-roll engaging cams

at each end of the shaft on which they are mounted;

Fig. 10 is a view, in elevation, of an upper web-feeding roll (broken at center) illustrating a modified form of adjustable cam that may be substituted for the adjustable cam of Figs. 6 to 8;

Fig. 11 is a view, in end elevation, of the modified form of cam shown in Fig. 10; and

Fig. 12 is a view, in end elevation, of the adjustable cam for controlling the actuation of the brake actuating eccentric.

It will be understood from the embodiment of the invention illustrated that the main feature of novelty is the improved control of the advance of the web on which the printing or other units operate. In this connection those skilled in the art will recognize that any kind of printing unit may be employed, and that any of the operations auxiliary to printing such as scoring, perforating or creasing, or cutting and punching, so long as the web is not completely severed, may also be performed by the provision of suitable units for these purposes along the "operative portion" of the web.

In Fig. 1 the forward web-controlling unit is shown as mounted in a stand 2 and the rear unit as mounted in a stand 4 spaced some distance from the stand 2. Between these stands there is shown diagrammatically two rotary, raised-plate printing presses 6 and 8 which, as hereinbefore stated, is merely illustrative of the various operations that may be performed on the taut run of the web extending between the stands 2 and 4. The feeding couple forming a part of the forward control unit is best shown in Figs. 2 and 3, 10 indicating the cylindrical lower roll and 12 the skeleton upper roll.

Power for driving the feed rolls is derived from a belted pulley 14 (Figs. 1 and 2) having a worm 15 on its shaft that meshes with a worm wheel 16 on a longitudinal shaft 17 rotatably supported at each end by brackets 18 secured to the feed roll stands 2 and 4. The forward end of the shaft 17 has a bevel gear 20 that meshes with an equal bevel gear 22 on the end of the shaft 24 of the feed roll 10. The other end of the shaft 17 has a like bevel gear 26 that meshes with an equal bevel gear 28 on the end of the shaft of the lower feed roll of the rear web-feeding couple in the stand 4 indicated generally by 30. The rear control unit is a duplicate of the forward control unit, except in one particular presently to be referred to, so that one only need be described in detail. Intermediate the gears 20 and 26 are located as many like gears as are requisite to operate the various operating units selected for use on the web being fed through the machine. Since as illustrated the forward feeding rolls 10 and 12 and the plate and impression cylinders of the printing presses in the stands 6 and 8 are all of the same diameter,

the surface speed of all these web-engaging rolls is the same, and the rate of speed at which the forward feeding couple advances the web is unaffected when the printing presses are operating.

It is highly important, as well known to those skilled in the art, that the amount of tension or tautness of the operative portion of the web be maintained constant whether the web is moving or not. Otherwise it will be impossible to secure the exact lengths of fed web for each successive cycle of operations of the synchronized feeding couples and accuracy of register will be lost. To insure a uniform tension on the operative portion of the web held taut by the rotating forward and rear feeding couples, it has been found desirable to minutely increase the diameter of both rolls of the rear pair, in the stand 4, so that this rear feeding pair has a very slight increased surface speed. In practice, with 22 in. x 36 in. plate cylinders in the rotary presses each forward feeding roll would have an exact 22 in. circumference and each rear feeding roll would have, say, a 22 1/64 in. circumference. This very slight difference is sufficient to maintain a constantly taut operative section in the web that is essential for accurate register as the printed web passes along through successive cycles.

Between the web-controlling units and opposite the printing units the web is supported on a bed 32 which may have the usual adjustable side guides 34 (Fig. 2). The web is withdrawn from a reel 36 (Fig. 1) by suitable unwind mechanism driven by a belt 37 from a pulley 38 (Fig. 2) on the feed roll shaft 24. Intermediate the unwind mechanism and the forward feeding pair is a slack box 40 (Fig. 1), the web lying in several loops in this box and being guided to the forward feeding couple over a guide roll 41. At the rear of the machine the printed web emerges from the rear feeding couple 30, passes over a guide roll 42 into a second slack box 44 and then over another guide roll 45 to a rewind mechanism of any convenient or desired construction (not shown). These two slack boxes are important features since they insure positiveness of control by receiving and constantly maintaining from six to eight feet of the web at each end in a loose condition and absolutely prevent any drag or restraining tensions whatsoever, tending to disturb accuracy of register as the web enters the machine or leaves it to be rewound or otherwise handled. The web-controlling units are, therefore, free to handle the taut operative run of the web without reference to the condition of any mechanism at either end of the machine located outside the control of these units.

Web controlling; feed roll lifting mechanism.—Referring now to Figs. 2 and 3 the lower feed roll 10 comprises, preferably, a hollow cylinder having end blocks for the

shaft bearings. Between the bevel gear 22 and the adjacent end of the roll 10 the shaft 24 carries a wide gear 46. The upper feed roll 12 comprises, preferably, a plurality of disks (Fig. 2 and 10) spaced along a central shaft 48. The shaft 48 carries a narrow gear 50 above, and enmeshed with, the gear 46. In front of the gear 46, and enmeshed therewith, is a second wide gear 52 mounted on a stub shaft 53 which latter supports a vertical frame 54 which carries a second narrow gear 55 enmeshed with both the gears 50 and 52. An arm 56 is extended forwardly from shaft 48 and is pivotally connected at 57 to the frame 54. The bearings 58 at each end of the upper feed roll shaft 48 are in slide boxes in the stand 2, the roll being yieldingly held down by springs 59 (see Fig. 1). By means of this construction, since all four gears are of the same pitch diameter, the upper feed roll may be lifted from the lower feed roll at will while still being positively and continuously driven. Furthermore, since both rolls are of the same diameter they are driven at the same surface speed and even though they may be separated varying distances by variations in the thickness of the stock forming the web there is no back lash or lost motion in the gear train to injuriously affect the accuracy of register.

The slide bearings 58 permit the upper feed roll 12 to be lifted to stop the feed when a non-printing portion of the plate cylinder, for example, is passing the web. One mechanism for raising the roll 12 is illustrated in Figs. 6 to 9. For an "all size" press the period during which the web is to dwell may be variable within wide limits and may equal the time required for almost any decimal portion of the circumference of the upper roll to pass the lower roll. The roll lifting mechanism must, therefore, be adjustable within wide limits.

As illustrated in Figs. 2 and 6 to 9 the shaft 48 is provided at each end with an adjustable cam-type roll lifting mechanism indicated generally by 60. This comprises two end plates 61 and 62, the latter having a hub 63 which supports six intermediate disks. Three disks 64, 65 and 66 each have a 120° cam riser and the other three disks 67, 68 and 69 (at the left, respectively, of the cam disks viewing Fig. 7) each have an internal gear. Three rods 70, 71 and 72 pass through the end plates, through the central openings in all six disks at each end of the shaft 48 and through the intermediate feed roll disks 12 (see Figs. 2 and 7) and carry, respectively, spur gears 73, 74 and 75 that mesh with the internal gears on disks 67, 68 and 69 respectively. Each cam disk has a pin 76 that enters a hole in the adjacent geared disk so that each pair may move as one. At the outer face of the end plate 61 the rods have dials 77 (Fig. 9) and may be turned by a head 78 (Fig. 7)

to any desired setting indicated by a pointer 79. When the rods are rotated the gearing causes a shifting in the angular relation of the cam risers. With this construction the upper feed roll may be lifted from the lower feed roll, by reason of the cam risers riding thereon, for varying periods of time the minimum being that consumed by a rotation through one-third of a revolution and the maximum being any decimal part of a revolution that may be desired above the minimum one-third. Each disk has three marginal slots 80 (Fig. 6) and all six disks and the end plates are held together by three stay bolts 81 passing through these slots which are loosened when an adjustment is to be made. This mechanism provides for a very fine adjustment above a dwell of the web for one-third of a revolution, and this minimum dwell can be reduced if in practice it is found desirable, by adding more cam disks and controls therefor. Ordinarily at least one half of the bearer circumference of the plate cylinder is used by the printing form, but special work can be taken care of in the manner indicated.

Another type of cam mechanism for lifting the upper feed roll to cause a dwell in the web feed is illustrated in Figs. 10 and 11. In this case a disk 82 is secured at each end of the upper feed roll shaft 48, the circumferential surface of said disk having an undercut margin 83. The opposite face may have secured thereto, by bolts 84, any number of clamps 85 which co-operate with the undercut margin, as shown at the left of Fig. 10, to hold one or more cam pieces 86 in position. The length of the cam, as thus built up, determines the length of the dwell in the web feed. Variable length cam pieces will give any range for the dwell that may be required.

Web controlling; web-clamping devices.—As has been stated an essential of accurate register is such a complete control of the feeding couples that they must revolve in synchronism, both in web-feeding position and when the two upper rolls are lifted to effect a dwell in the advance of the web. In order that the advance may be instantly checked when the frictional grip of the feeding couples is released, auxiliary web controlling means is provided for each control unit in the form of a web clamp or brake at each end of the operative run, that function to positively and accurately maintain the same tension or tautness of the web between the two web-clamps during the period of the dwell, that is produced by the action of the couples while feeding. This unfailingly secures an exact and equal length of web between the feeding couples at each successive cycle of operations, without which accuracy of register can not be obtained.

The web clamp or brake is best shown in Figs. 3 to 5 and its operating cam in Fig. 12.

Referring first to Fig. 3, just to the rear of the forward feeding couple is a bracket 90 that extends transversely of the stand 2 and forms a table level with the bite of the rolls. The table 90 supports a cross frame composed of two spaced bars 92. Mounted between the bars 92, in a manner to be freely adjustable transversely, are any desired number of web-clamping members 94 (Fig. 4). These each comprise an externally threaded, headed sleeve 95, clamped in position by a spanner nut 96 below the bars, and a plunger 97 slidable within the sleeve. The plunger has a vertically adjustable web-clamping tip 98 at its lower end and a coiled spring about its upper end confined between the head of the sleeve and a head 99 on the plunger. Above the bars 92, and journaled in the stand 2 is a rock-shaft having an eccentric 100 with which each clamping member head 99 is engaged by pressure from its spring 101. A cam may be substituted for the eccentric but since the vertical movement to be imparted to the clamping devices is extremely slight, a few thousandths of an inch being sufficient, an eccentric may conveniently be used. At the end of the rock-shaft opposite the gear train 46—52—55—50 there depends a lever arm 102 (Fig. 5) keyed to the shaft and carrying a roll 103. The lever arm 102 also has a horizontal extension 104 to the free end of which is pivoted a rod 106 extending upward and through a bore in a horizontal rod 108 supported loosely, for swiveling, by the stand 2. The rod 106 is surrounded by a coiled spring 109 that continually presses the roll 103 toward the feeding couple and while the couple is feeding the eccentric is in such an angular position that the springs 98 may maintain the web-clamping tips free of the web.

In order to cause the web-clamping tips to function as a brake by engaging the web an actuator for rotating the eccentric 100 is provided. This actuator is in the form of an adjustable cam 110 (Figs. 2 and 12) similar to the cams 60, and is mounted on the upper feed roll shaft 48 opposite the roll 103. As illustrated the cam 110 may comprise two disks 111 and 112 (Fig. 2) having, respectively, cam risers 113 and 114 (Fig. 12) of any desired length. The disk 112 is provided with two marginal holes for receiving clamping bolts 115 that pass through marginal slots 116 in the disk 111. The effective length of the cam, formed by a combination of the two risers, may be varied by an angular adjustment of the two disks. As shown in Fig. 12 the cam 110 is of a length effective for applying the brake during the period of the dwell effected by the adjustment of the cams 60, as shown in Fig. 6. Rotation of the cam 110 causes its riser to engage the roll 103 and to rotate the eccentric 100 against the pressure of the springs 109 and 98. The plungers

97 are thus slid downward through their respective sleeves 95 until the clamping tips 98 engage the web.

Only a light pressure is required and the vertical adjustability of the tips 98 in their plungers 97 permits a very fine adjustment so as to provide just the pressure needed for the kind of material being operated upon, and no more. The lateral adjustability of the web-clamping members 94 is highly useful when the press is used for printing books. This adjustment permits placing the members above the margins between the pages composing the form whatever the width of the pages may be. It will be observed that the clamping approach of the members 94 is perpendicular to the web, hence their engagement and disengagement exert no component influence on the web, that is, no tendency to influence register.

It will be understood that a duplicate of the brake mechanism, just described, co-operates with the rear web-feeding couple 30. It will further be understood that while the illustrated constructions for determining the periods of feed and dwell of the web are simple and may conveniently be controlled from the feeding means, in its broader aspects the invention includes within its scope any operative means for separating and closing the feeding couples at such specified intervals as may be requisite to obtain the variable size sheets.

Operation.—Assuming that the presses are size 22 x 36 and that the form on the plate cylinder is to print substantially 15 inches on the web, then the illustrated design of the cams 60 will be adjusted for a feeding and printing period of substantially two-thirds of the angular movement of the feed rolls through one cycle with a lifting of the rolls and consequent dwell during substantially one-third of said angular movement. The cylindrical lower feed rolls being driven at the same speed as the plate cylinder co-operate positively at all times with the cams 60 to lift the upper feed rolls immediately the desired length of web has been advanced. Before the upper feed rolls rise the brake cams 110, adjusted as shown in Fig. 12, have started the clamping tips 98 downward so that they will function to engage the web either at or just before the instant it is relieved of pressure from the upper feed rolls. At the completion of the dwell period this operation is reversed, the upper feed rolls being lowered in advance of the rising of the clamping tips so that the exchange of one pressure for the other, as before, is substantially at the same instant. This timing, because of the continuous control of the web by either the feed rolls or the brakes, provides for the constant tension throughout the operative portion of the web that is essential to effect a register of head lines when the portion of the web printed

by the first press reaches the printing position of the rotating form on the plate cylinder of the second press.

The feeding couples, operating units, and controls for effecting the feed and dwell of the web are all synchronized so that exact lengths of the web are fed at successive cycles. The slack at either end prevents drag on the operative portion of the web, and the provision of positive control mechanism both in advance of and at the rear of the various units for operating on the web insures the exactitude of feed and uniform control of the condition and the movement of the entire run of the web between said mechanisms that must be obtained if the press is to be universal, that is, operable with the same accuracy on all kinds of web material and permitting any type of rotary unit to operate on the web along its tensioned portion between the forward and rear feeding couples. This feature is materially aided by the fact that the feeding couples are so designed that the web is gripped at both sides by direct contact of the feed rolls.

Although the drawings illustrate merely two printing presses operating on the tensioned run of the web between the two web-controlling units, those skilled in the art will recognize that a variety of other combinations of the printing and auxiliary units may be made without departing from the scope of the present invention. These alternative arrangements are not illustrated because the rearrangements can be made by the mere process of substitution when the characteristics of the product are known. In this connection it is to be noted that the term "unit" is employed in a generic sense and defines not only printing from either rotary or flat bed and platen presses, but also such operations as numbering, bronzing, perforating, cutting-off, scoring, tabbing, creasing, blanking, slitting, etc. and the term "print" includes these auxiliary operations as well as printing.

It is preferred to employ the specific construction and arrangement of the parts shown and described, since this construction and arrangement is the simplest and most efficient embodiment of the invention which has yet been devised. It will be understood, however, that this construction and arrangement is not essential since the invention is not limited to the illustrated details of construction, nor to the conjoint use of all of its features because they may be variously rearranged, re-grouped or modified, within the skill of the artisan, without departing from the true scope of the actual invention characterizing features of which are set forth in the following claims by the intentional use of generic terms and expressions inclusive of various modifications.

What is claimed as new, is:—

1. In a web printing press, a printing unit, intermittently operating rotary feed couples

both in front and rear of said unit, both members of the couple at the rear having a very slightly greater surface speed than the couple at the front, and means for revolving said couples in synchronism.

2. In a printing press of the type in which a web of material is fed intermittently past a printing unit, means for holding a portion of the web to be operated upon under tension, and means for maintaining the uniformity of said tension both while the web is advancing and during the dwells between advances.

3. In an adjustable, rotary multi-process printing machine, web feeding mechanism comprising two spaced pairs of feed rolls for gripping the web above and below and maintaining the intermediate section under an even tension as it is advanced, an intermittently acting operating unit between said feeding pairs, means for separating the rolls of each feeding pair after said unit ceases to operate, and means for retaining the said tension in said intermediate section during the dwell caused by the separation of said feeding pairs.

4. In an adjustable, rotary multi-process printing machine, web feeding mechanism comprising two spaced pairs of feed rolls for gripping the web above and below and maintaining the intermediate section under an even tension as it is advanced, an intermittently acting operating unit between said feeding pairs, means for separating the rolls of each feeding pair after said unit ceases to operate, and means operating at each end of said intermediate section acting to preserve the original tension thereof during the dwell caused by the separation of said feeding pairs.

5. In an adjustable, rotary multi-process printing machine, web feeding mechanism comprising two spaced pairs of feed rolls for gripping the web above and below and maintaining the intermediate section under an even tension as it is advanced, an intermittently acting operating unit between said feeding pairs, a common operating train for driving both feeding pairs at the same angular rate of speed, automatic roll separating means timed to operate after said unit ceases to operate, and automatic means co-operating with each feeding pair for engaging the web before release by the feeding pairs and preserving the tension during the dwell caused by such release.

6. In an adjustable, rotary multi-process printing machine, web feeding mechanism comprising two spaced pairs of feed rolls for gripping the web above and below and maintaining the intermediate section under an even tension as it is advanced, a rotary operating unit having intermittent effectiveness on the web located between said feeding pairs, a common operating train for driving said feeding pairs and unit at the same angular speed, and automatic means for releasing the

web from the control of said feeding pairs and placing it under control of braking means substantially at the instant said pairs become non-effective whereby to preserve the original tension of the web for future operations of said unit.

7. In a machine of the character described, web feeding mechanism comprising upper and lower equal feed rolls above and below the web for directly engaging the web, one of said rolls being rotatable only and the other being rotatable and movable vertically away from the web, gears on said rolls for driving one from the other, additional upper and lower gears enmeshed with each other and with the upper roll gear and lower roll gear respectively, all of said gears being of like pitch, and a frame permitting relative rolling of said additional gears when the movable feed roll is moved away from the other feed roll to maintain the same angular speed in all positions of said movable feed roll without loss of motion.

8. In a machine of the character described, web feeding mechanism comprising upper and lower equal feed rolls above and below the web for directly engaging the web, one of said rolls being rotatable only and the other being rotatable and movable vertically away from the web, gears on said rolls for driving one from the other, additional upper and lower gears enmeshed with each other and with the upper roll gear and lower roll gear respectively, all of said gears being of like pitch, a frame permitting relative rolling of said additional gears when the movable feed roll is moved away from the other feed roll to maintain the same angular speed in all positions of said movable feed roll without loss of motion, and automatic means for separating the feed rolls for a portion of each revolution thereof.

9. In a machine of the character described, web feeding mechanism comprising upper and lower equal feed rolls above and below the web for directly engaging the web, one of said rolls being rotatable only and the other being rotatable and movable vertically away from the web, gears on said rolls for driving one from the other, additional upper and lower gears enmeshed with each other and with the upper roll gear and lower roll gear respectively, all of said gears being of like pitch, a frame permitting relative rolling of said additional gears when the movable feed roll is moved away from the other feed roll to maintain the same angular speed in all positions of said movable feed roll without loss of motion, means operating automatically for separating the feed rolls, at least once during each revolution thereof, and mechanism for varying the period that said rolls remain separated.

10. In a machine of the character described, intermittent web feeding mechanism, and

web braking mechanism operating to engage the web at each dwell thereof and comprising a table below the web, two spaced transverse bars above the web, plungers having web clamping tips held between said bars and longitudinally adjustable along said bars, an eccentric above the plungers, means for maintaining the plungers in engagement with the eccentric, and means for rotating the eccentric to depress the plungers and clamp the web upon said table.

11. In an adjustable rotary web printing machine, a rotary printing unit, two pairs of web feeding rolls in advance of and at the rear of said unit each forward roll having the same circumference as the bearer circumference of the plate cylinder of said unit and each rear roll having a circumference very slightly greater than said bearer circumference, means for driving all the feed rolls and said plate cylinder from a common rotating shaft, and synchronously operating means for releasing the web from its control by said feeding pairs, while said shaft continues to function, and for placing it under control of a brake at such times as it is not desired to print on the web.

12. In a multi-process web printing machine, intermittent web feeding means comprising two pairs of feed rolls, one roll of each pair being driven from the other and both pairs being continuously driven at the same angular speed from a common driving shaft, and means for separating the rolls of each feeding pair and replacing them in web feeding relation while said shaft continues to operate, the driving connection from one roll to the other being constructed and arranged to permit such movements without back lash or lost motion.

13. In a web printing machine, intermittent web feeding means at each end of the operative run of the web whereby said run is tensioned for the operation thereon of operating units located between said web feeding means, and means for driving the web feeding means and said units at the same constant and uniform angular speed.

14. In a web printing press, a printing unit, a pair of feed rolls, one at each side of the web, having continuous web engaging surfaces, means for continuously driving both rolls at the same angular speed to advance the

web past said printing unit, and automatic means for interrupting the effective operation of said feed rolls without lost motion and while maintaining their angular speed.

15. In a web printing press, a printing unit, a pair of feed rolls for advancing the web past said unit, adjustable to grip varying thicknesses of web, mechanism for driving both rolls at the same angular speed in all positions of adjustment, and means for separating the rolls at least once during each revolution thereof to stop the feed of the web for a limited time.

16. A machine of the character described having, in combination, an unwind mechanism for a web, means for feeding the web and for maintaining a uniform tension throughout the operative run thereof, a printing unit or units for operating on said tensioned run of the web, means for producing slack in the web between the unwind mechanism and said tensioned run of the web, and means for producing slack at the other end of said tensioned run of the web in advance of rewinding mechanism for the printed web.

17. In a web-printing machine, a printing unit, web-controlling units, both in advance and to the rear of said printing unit, comprising mechanism for advancing said web step-by-step and for maintaining a uniform tension throughout the operative portion of the web during both the advances and the dwells thereof, each of said forward and rear control units having its own independently operated adjustments for varying the length of time that the web advances to accommodate the feed to printing units having different operating characteristics.

18. In a web-printing press, a printing unit, web-controlling units, both in advance and to the rear of said printing unit each comprising a rotary feeding couple for gripping the web and a co-operating web-clamping device, mechanism associated with each unit for successively releasing the web from control of the feeding couple and placing it under control of the clamp and then vice versa, and each unit also having means operable independently of each other for adjusting said mechanism to vary the relative timing of said web feeding and clamping operations.

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