Feb. 4, 1936. S. FURMAN 2,029,996

PRINTING MACHINE

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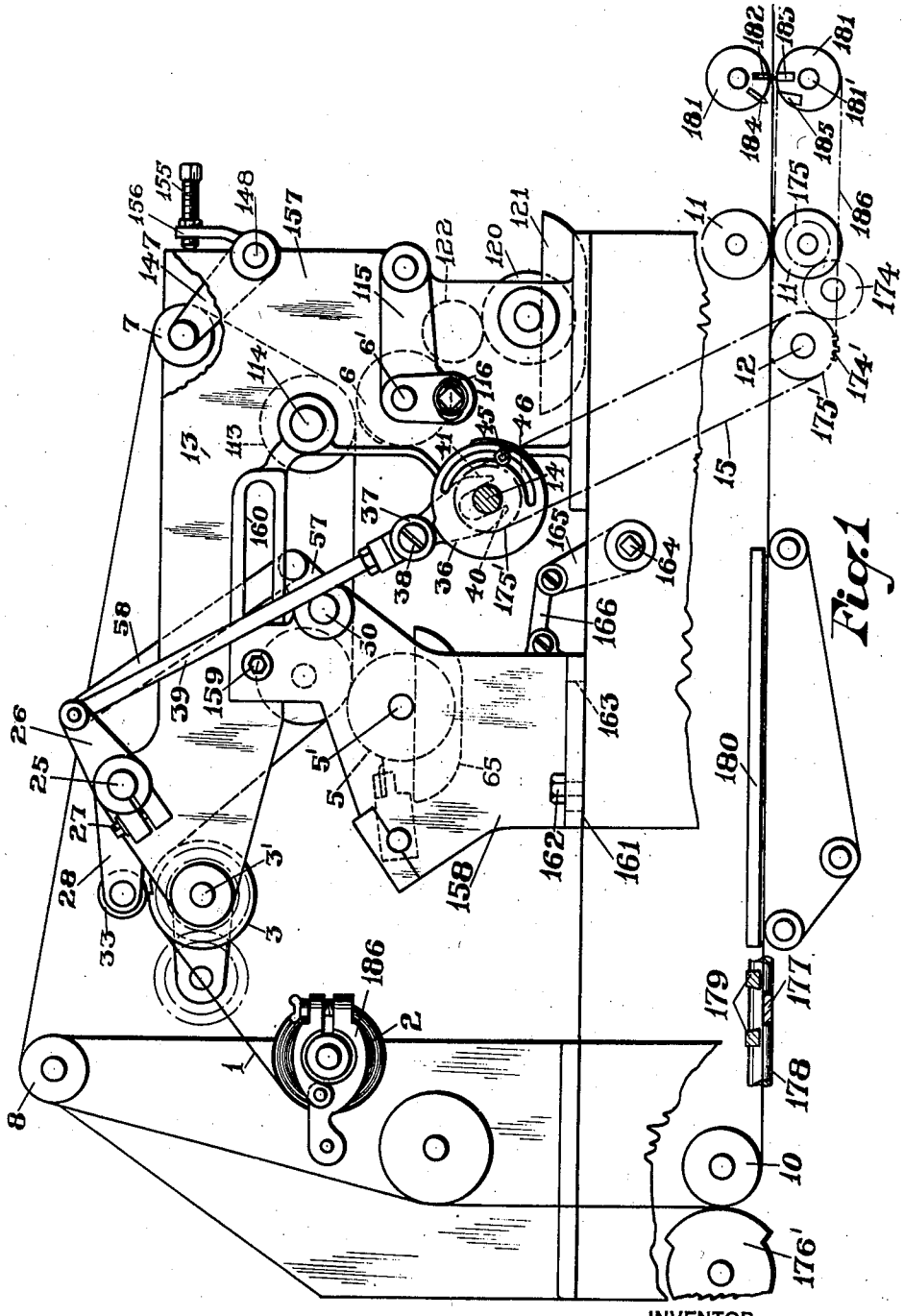


Fig. 1

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PRINTING MACHINE

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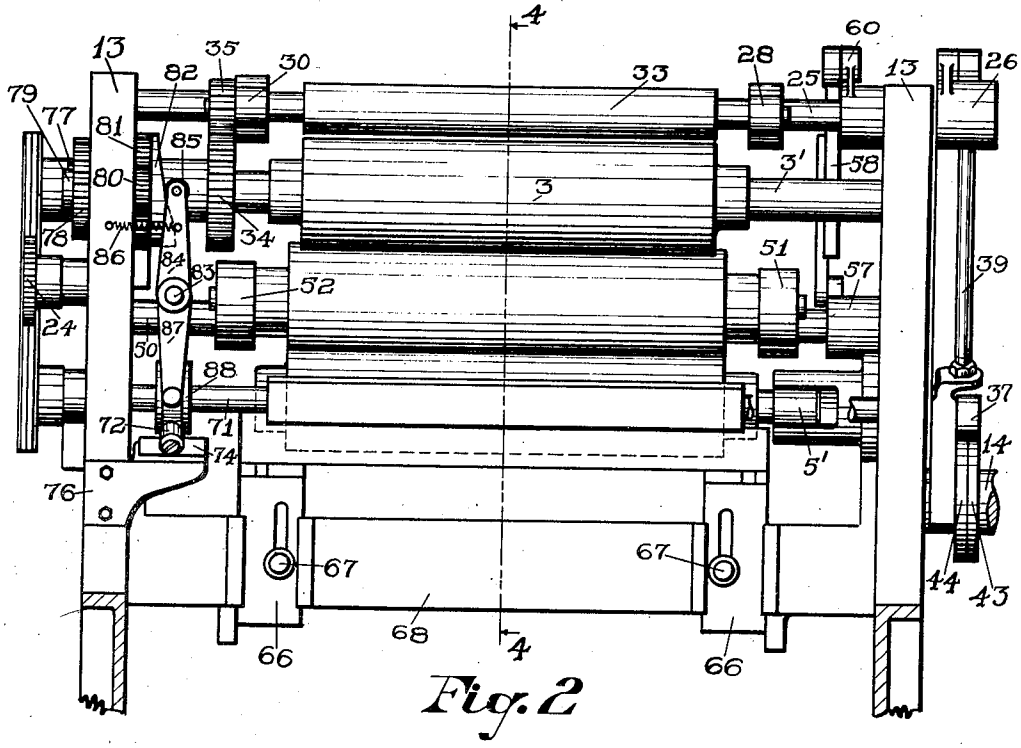


Fig. 2

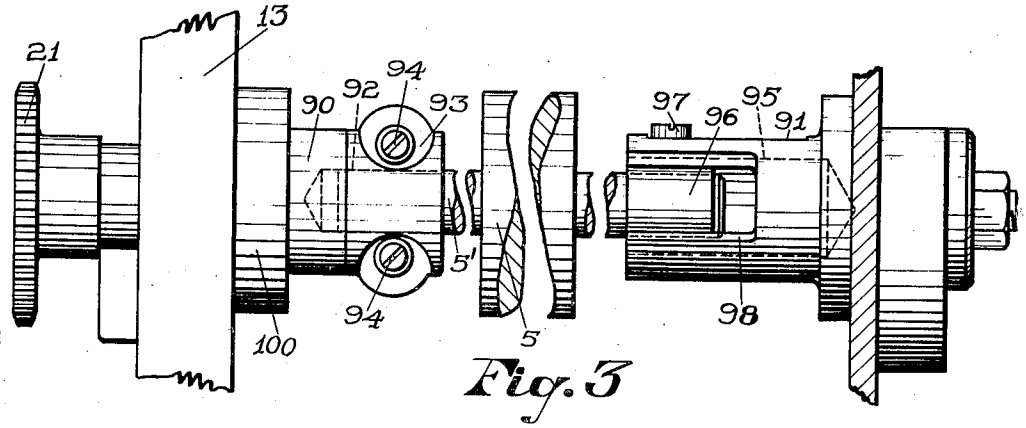


Fig. 3

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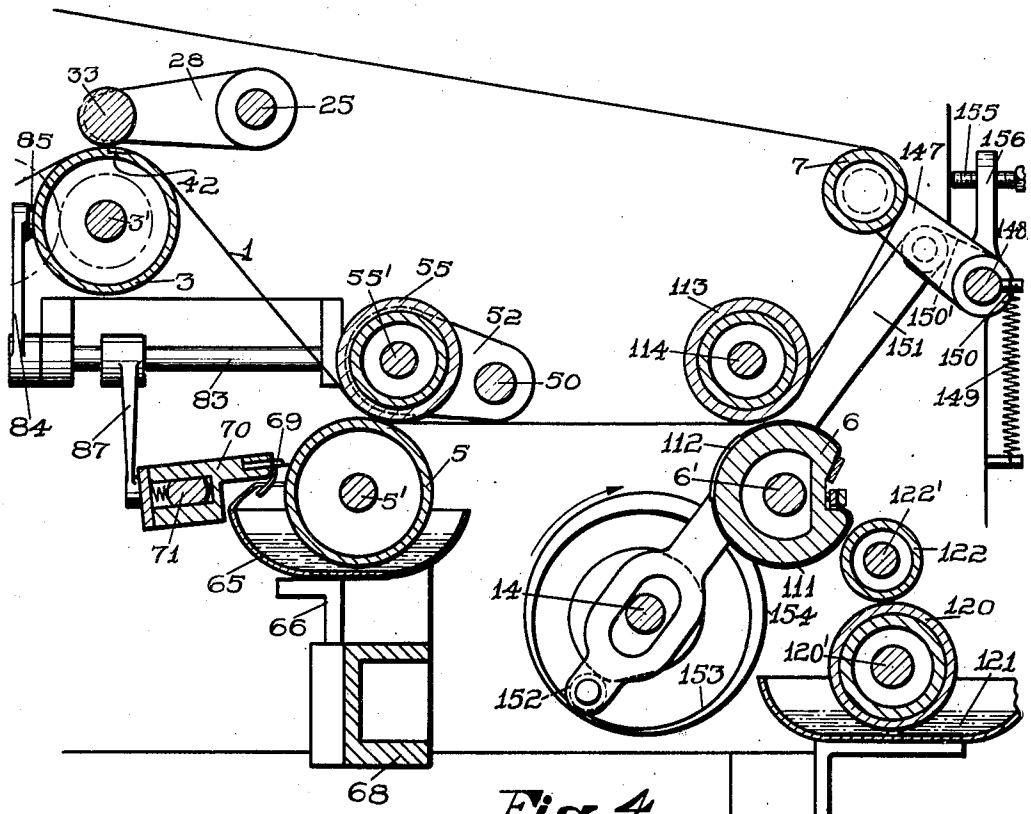


Fig. 4

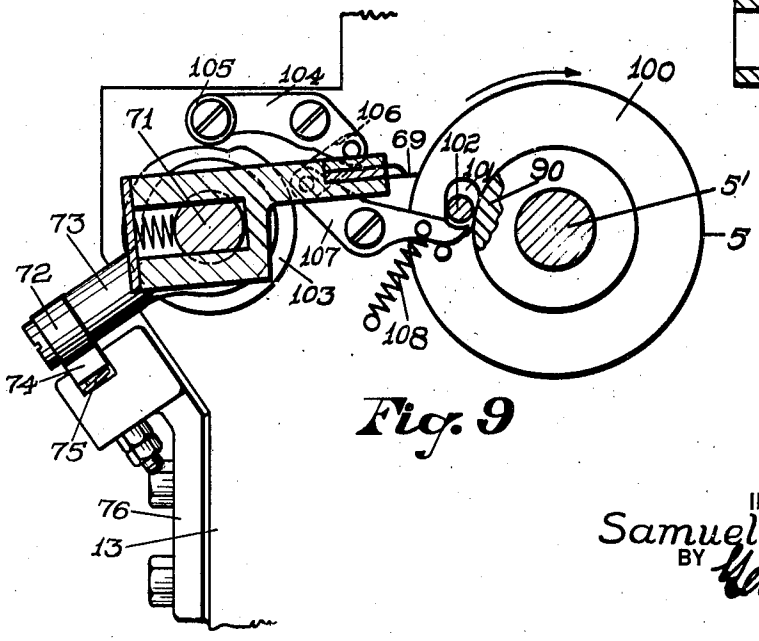


Fig. 9

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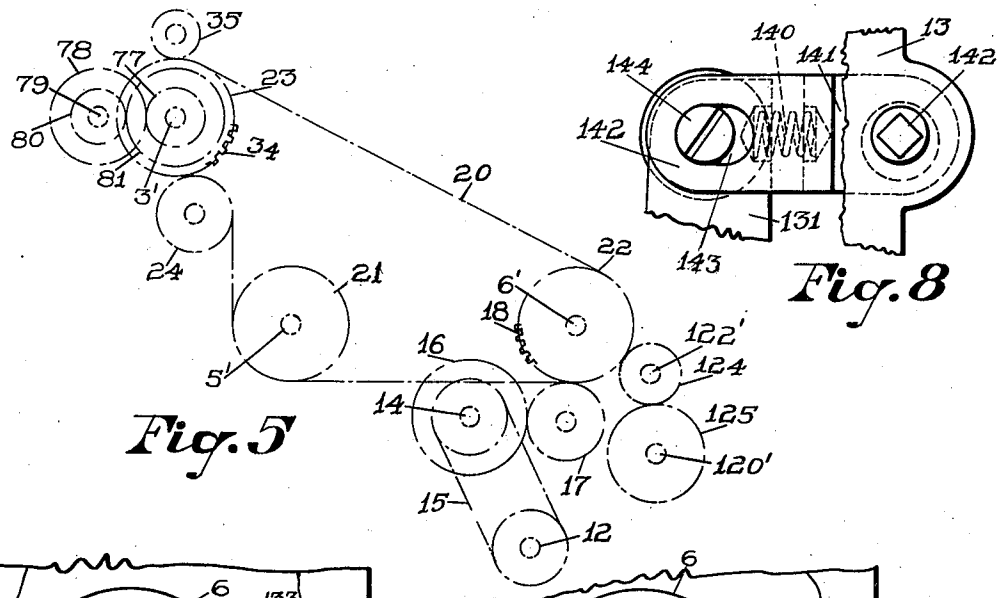


Fig. 5

Fig. 8

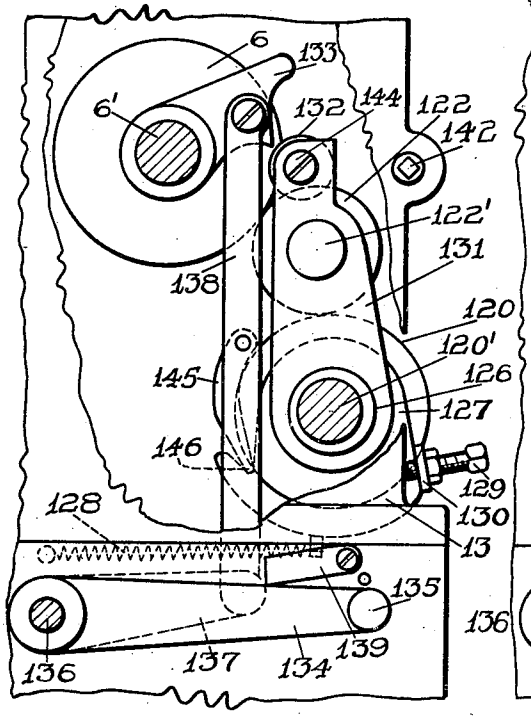


Fig. 6

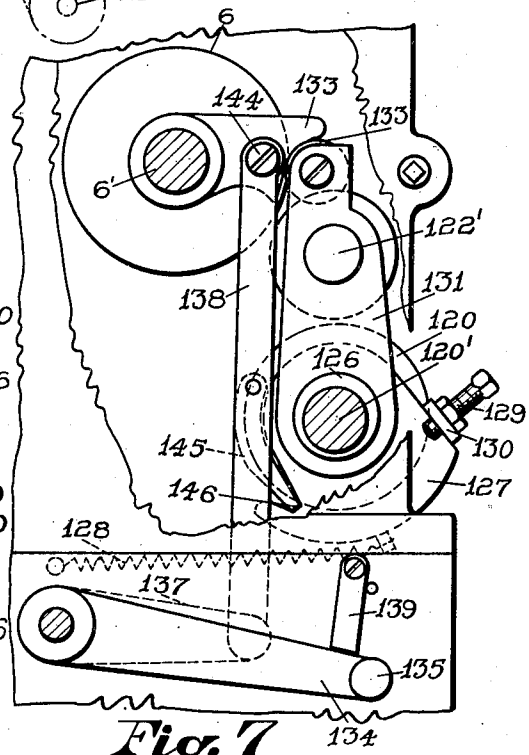


Fig. 7

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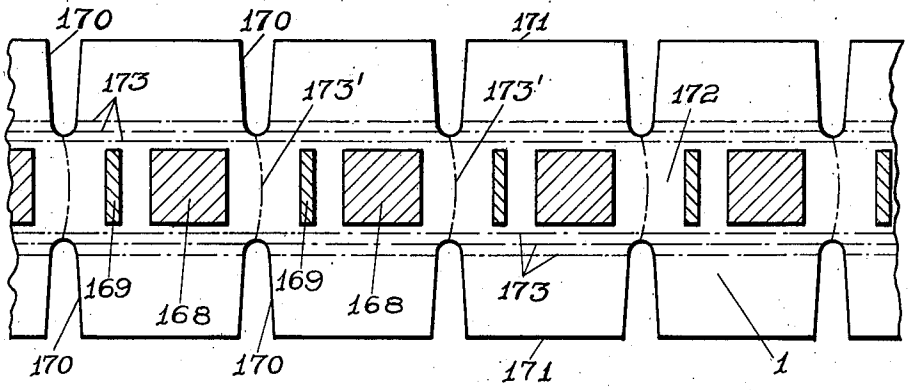


Fig. 12

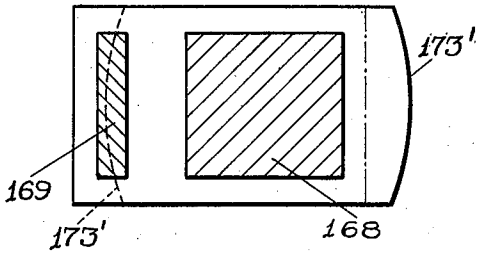


Fig. 13

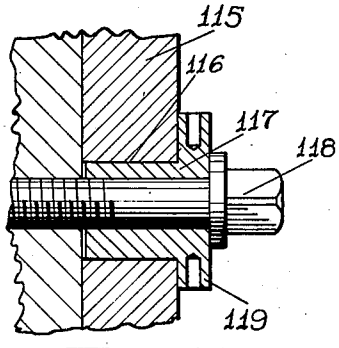


Fig. 11

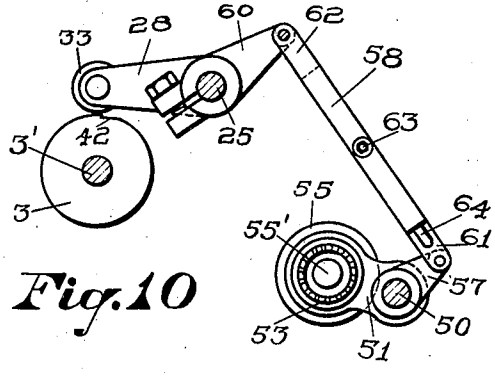


Fig. 10

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PRINTING MACHINE

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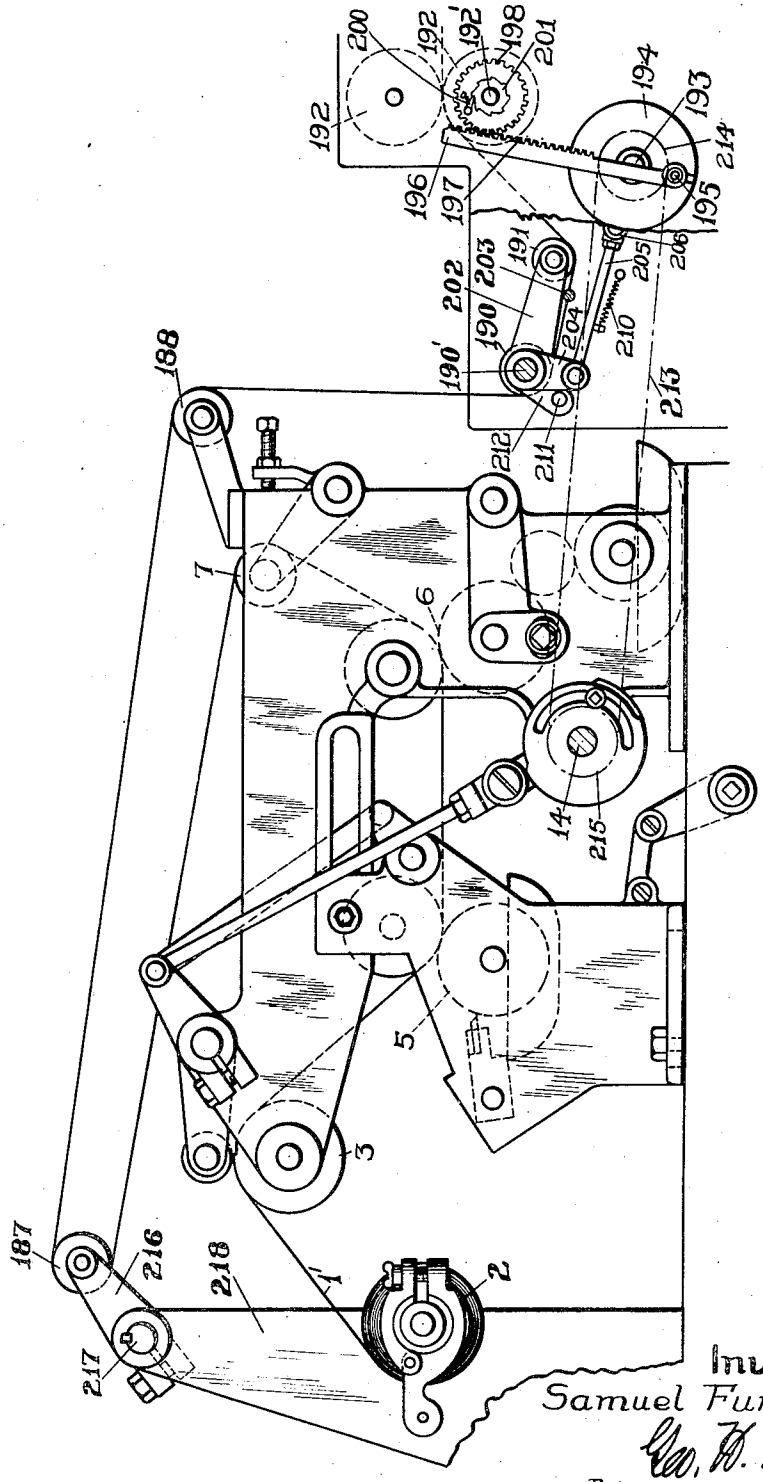


Fig. 4

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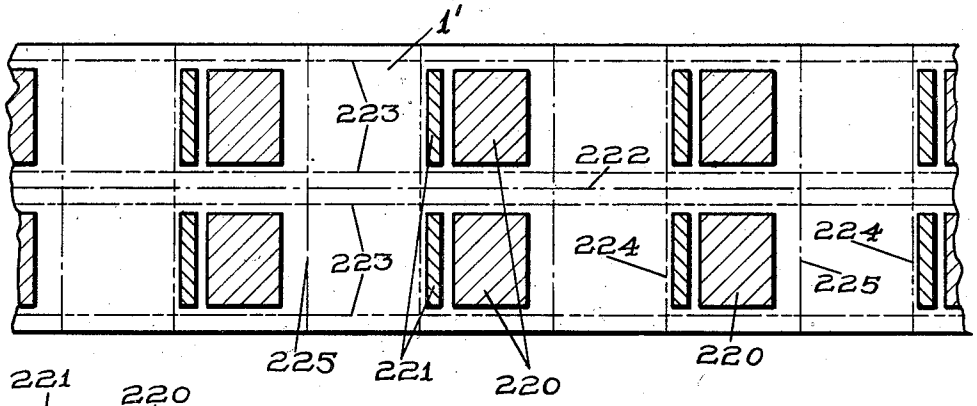


Fig. 16

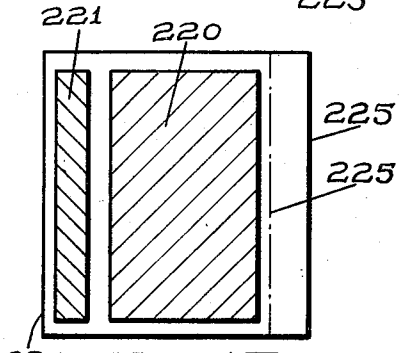


Fig. 17

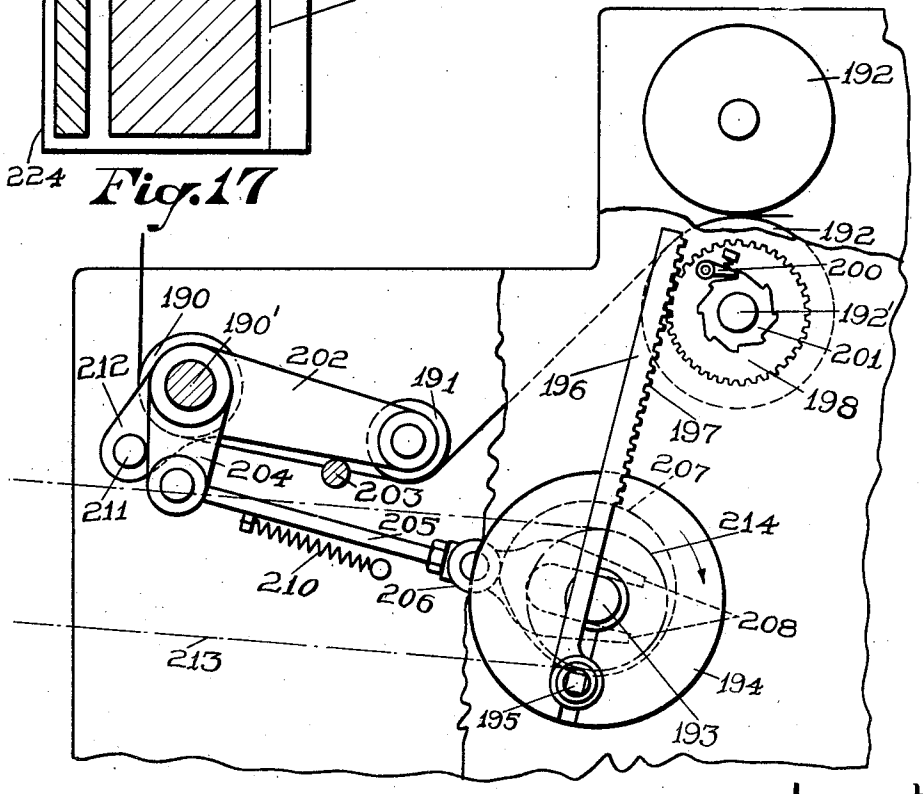


Fig. 15

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2,029,996

UNITED STATES PATENT OFFICE

2,029,996

PRINTING MACHINE

Samuel Furman, Worcester, Mass., assignor to United States Envelope Company, Springfield, Mass., a corporation of Maine

Application March 30, 1932, Serial No. 601,945

25 Claims. (Cl. 101—228)

The present invention relates to printing machines and particularly to machines for printing uniformly spaced impressions on a continuous strip or web.

In prior devices of this character, the printing is effected by passing the material to be printed between a printing roll and a pressure roll, the latter urging the material into contact with the printing surface on the printing roll. The web moves at the same speed as the surface of the printing roll so that a change in the spacing of the impressions on the web involves a corresponding change in the size of the printing roll, the circumference of which must be equal to the spacing of successive impressions. Thus, in order that a single machine may accommodate different spacing of impressions, it is necessary to provide a plurality of interchangeable various sized printing rolls, each of which prints successive impressions on the web in accordance with the circumference of the roll. It is accordingly one of the principal objects of the present invention to provide for printing spaced impressions on a continuous strip or web with the spacings of the impressions independent of the size of the printing roll.

Another feature of the invention resides in the printing of a plurality of series of spaced impressions by a plurality of printing operations which involves passing the web successively over a plurality of printing rolls, with said rolls in proper relation to locate the impressions made by each of said rolls in predetermined relation to each other.

Another feature resides in the arrangement of the printing machine for supplying the printed web under tension from said printing machine to the feeding mechanism of another machine which operates upon said web in accordance with the spacing of the impressions thereon, as, for example, a machine which forms envelopes with the printed impression on the front thereof. This feature involves the operation of the printing machine in timed relation to the mechanism of the other machine and the maintenance of the printing mechanism in proper spaced relation to the feeding mechanism of the other machine so that the spaced printed impressions will be properly located within the other machine.

Other and further objects and advantages of the invention will appear from the following detailed description taken in connection with the accompanying drawings in which:—

Fig. 1 is a front elevation of a printing machine embodying the invention, said machine being shown in relation to the feeding mechanism of a bag-forming machine in conjunction with which the printing machine operates, said bag-forming machine being shown diagrammatically.

Fig. 2 is a left hand end elevation of the printing machine of Fig. 1.

Fig. 3 is an enlarged detail view of the mounting for one of the printing rolls.

Fig. 4 is a vertical section along the line 4—4 of Fig. 2, through the printing machine.

Fig. 5 is a diagrammatic view showing the gear and chain drives for the printing machine.

Fig. 6 is a detailed view of a mechanism for spacing the ink transfer roll from the printing roll in inoperative position.

Fig. 7 is a view corresponding to Fig. 6 showing the mechanism in operative position.

Fig. 8 is a detail of a portion of the mechanism shown in Figs. 6 and 7.

Fig. 9 is a detail of one of the printing rolls with the mechanism for locking said roll against rotation in one direction.

Fig. 10 is a detail of the mechanism for feeding the web through the printing machine.

Fig. 11 is a detail of the adjustment of one of the printing rolls.

Fig. 12 is a plan view of the printed web before it enters the feeding mechanism of the bag-forming machine, showing the printed impressions in predetermined relation to cuts in said web made by said bag-forming machine.

Fig. 13 is a plan view of a completed bag into which the web is formed.

Fig. 14 is a view corresponding to Fig. 1 showing the printing machine in a modified form in conjunction with a machine which moves the web intermittently in the formation of a bag.

Fig. 15 is a detail of the mechanism for maintaining the web under tension.

Fig. 16 is a view corresponding to Fig. 12 showing the web in the machine of Fig. 14.

Fig. 17 is a plan view similar to Fig. 13 showing a completed envelope formed by the machine of Fig. 14.

Like reference characters refer to like parts throughout the drawings.

The invention is disclosed in connection with a bag-forming machine which operates on the web after the printing operation and through which the web is fed at a constant speed by constant speed rolls, the actuation of which will be more clearly pointed out hereinafter. Referring first to Fig. 1, the web 1, which is of any suitable material, is drawn from a roll 2 over a feed roll 3 in the printing machine. From the feed roll, the

web is carried over the surface of a plurality of printing rolls 5 and 6, around an idler 7 which maintains the web tight, and over idlers 8 and 10 to the rolls 11 in the bag-forming machine, said rolls 11 being driven at a constant speed from the main drive shaft 12 of said bag-forming machine.

The printing machine will be first described. Referring to Fig. 2, the machine embodies spaced frame members 13 which provide bearings for the several mechanisms by which the printing operation is procured. As best shown in Fig. 5, the main drive shaft 14 is journaled in the frame members and is actuated in timed relation to the rolls 11 by a chain 15 from the drive shaft 12 of the bag-forming machine. The drive shaft 14 carries a gear 16 adjacent one end thereof which meshes with an idler gear 17, the latter engaging a gear 18 equal in size to the gear 16 and carried by the end of the printing roll shaft 6', whereby each rotation of the drive shaft 14 procures a single rotation of the printing roll 6. The feed roll 3 and the printing roll 5 which are the same diameter as the roll 6, as shown in Fig. 4, are all rotated at the same rate of speed by a chain 20, Fig. 5, which passes over sprockets 21 and 22 on the printing roll shafts 5' and 6' and a sprocket 23 on the end of the feed roll shaft 3', whereby the surface speeds of the feed roll 3 and the printing rolls 5 and 6 are all equal. An idler sprocket 24 is located between the sprockets 21 and 23 and engages the chain 20 to keep said chain tight.

The feed roll 3 is arranged to feed a predetermined length of web to the printing rolls 5 and 6 for each rotation of said roll 3, although the length of the web fed is entirely independent of the circumference of the roll. Referring to Figs. 1 and 2, the feed roll shaft 3' is journaled at its opposite ends in the frame members 13 and a transverse rod 25 is journaled in the frame members 13 in parallel relation to the roll 3 and carries on its forward end thereof an arm 26 which is clamped against movement on said rod by a clamping screw 27. Spaced arms 28 and 30 which are secured against rotation on the rod 25 between the frame members 13 provide alined bearings at their outer ends for a movable rotating roll 33 which extends parallel to and is arranged to engage the surface of the feed roll 3. The roll 33 is actuated at the same surface speed as the roll 3 by means of intermeshing gears 34 and 35 secured to the feed roll shaft 3' and said moving roll shaft 33' respectively. The web 1 passes between the feed roll 3 and the movable roll 33, and engagement between said rolls as the movable roll 33 is brought into contact with the surface of the feed roll 3 procures a positive feeding movement of the web 1 toward the printing rolls, at the speed of said printing rolls.

The movable roll 33 is brought into contact with the surface of the feed roll 3 during a portion only of each rotation of said feed roll to procure a positive feed during the printing of each impression. As shown in Fig. 1, the main drive shaft 14 carries on its forward end an adjustable cam 36 which is engaged by a roller 37 mounted on a stud 38 on the lower end of a connecting rod 39, the upper end of said rod being attached to the arm 26. The lower end of the connecting rod 39 beyond the roller 37 provides parallel arms 40 and 41 which extend on opposite sides of the drive shaft 14 to support the roller 37 in proper position on the cam 36. As the roller 37 passes onto the raised portion of the cam 36, the rod 39 is urged upwardly, turning the transverse rod 25 counterclockwise, and pressing the movable roll 33 into contact with the surface of the feed roll 3, to procure movement of the web at the sped of the feed roll 3. As best shown in Figs. 4 and 9, a small longitudinal groove 42 is provided in the feed roll 3 and is positioned so that the edge of said groove is engaged by the movable roll 33 as said movable roll 33 is brought into engagement with the driving roll, thereby procuring a positive movement of the web.

The printing machine in the position of Fig. 1 is at the start of the feeding movement of the web through the printing machine just as the roll 37 has been raised by the cam 36, thereby bringing the movable roll 33 into engagement with the feed roll 3 at which time the edge of groove 42 is directly beneath said roll 33. From this point, the web moves at the speed of the feed roll 3 until the cam 36 is rotated to bring the depressed portion of the cam beneath the roller 37 which separates the feed roll 3 and the roll 33 to allow movement of the feed roll 3 relative to the web 1. As the drive shaft 14 rotates at the same rate of speed as the feed roll 3, the positive feeding movement of the web occurs through a portion only of each rotation of the drive shaft while the movable roll is in engagement with said feed roll.

The length of web to be fed at each rotation of the feed roll 3 is determined by the adjustment of the cam 36 which, as best shown in Figs. 1 and 2, comprises a pair of similarly shaped disks 43 and 44, each having projecting portions thereon and rotatable relative to one another to bring the projecting portions more or less in alinement to shorten or lengthen the projecting portion of the cam 36.

The roller 37 extends over the entire width of the two disks 43 and 44, which are locked in adjusted position by a clamping bolt 45 extending through an arcuate slot 46 in the disk 43 and being screw threaded in the disk 44, Fig. 1. The engagement between the feed roll 3 and the movable roll 33 is determined by adjustment of the length of the connecting rod 39 or by adjustment of the location of the arm 26 relative to the transverse rod 25.

From the feed roll 3, the web is carried to the printing roll 5 which, in the construction shown, is arranged for gravure printing. Referring to Figs. 1 and 2, the ends of the shaft 5' for the gravure printing roll 5 are journaled in bearings provided by the frame members 13 and a transverse rod 50 is mounted in bearings in the frame members 13 in parallel relation thereto. Said rod 50 has arms 51 and 52 secured thereto between said frame members 13, and the ends of said arms 51 and 52 carry ball bearing members 53, see Fig. 10, which support a rod 55' having a pressure roll 55 parallel to roll 5 mounted thereon, whereby said roll 55 is free to rotate in the arms 51 and 52. As shown in Figs. 2 and 10, the rod 50 also carries a projecting arm 57 secured thereto with the outer end of said arm connected by an adjustable link 58 to an arm 60 mounted on the transverse rod 25 and movable therewith. Thus, as the movable roll 33 is brought into contact with the feed roll 3, the pressure roll 55 is brought into contact with the gravure roll 5 to press the web 1 against the printing surface of said roll 5. The pressure between the gravure roll and said printing roll is determined by adjustment of the link 58 which, as shown in Fig. 10, comprises members 61 and

62, said members being slidable longitudinally relative to one another and being secured in adjusted position by a clamping bolt 63 which extends through a slot 64 in the arm 61, and which is tightened to hold said members 61 and 62 against relative movement.

The gravure roll 5 is supplied with printing fluid from a pan or tank 65 which is supported on brackets 66, Figs. 2 and 4, adjustably secured by clamping members 67 to a cross bar 68 which connects the frame members 13, said tank receiving the lower portion of the roll 5. A doctor blade 69, Fig. 4, which is in contact with the surface of the gravure roll for the removal of surplus printing fluid therefrom is supported by a member 70 carried by a rod 71, the ends of which are supported by the frame members 13. The doctor blade 69 is normally held in engagement with the gravure roll 5 at a predetermined pressure by a roller 72 carried by an arm 73 on the rod 71, said roller engaging a member 74 which provides a plane surface parallel to the rod 71, the member 74 being resiliently supported in position by springs 75 beneath said member, said springs 75 and the member 74 being carried by a bracket 76 secured to one of the frame members 13, Fig. 9.

The doctor blade is reciprocated longitudinally over the surface of the gravure roll to avoid uneven wear on said roll. As best shown in Figs. 2 and 5, the feed roll shaft 3' carries a gear 77 meshing with a gear 78 carried on a stub shaft 79 journaled in one of the frame members 13. A second gear 80 on the shaft 79 meshes with a gear 81 rotatable on the feed roll shaft 3', said gear 81 carrying a cylindrical cam 82. A shaft 83 carries an arm 84 secured thereto and the end of said arm supports a roller 85 in contact with the surface of the cam 82, the roller 85 being maintained in contact with said cam by a spring 86. The lower end of a second arm 87, secured on the shaft 83, engages a grooved collar 88 on the doctor rod 71 so that as the roll shaft 3' is rotated, the cam 82 rocks the shaft 83, whereby the doctor blade is reciprocated slowly over the surface of the gravure roll.

The gravure roll support is arranged to permit a change of rolls when the impressions on the web are to be changed. To this end, as best shown in Figs. 2 and 3, the gravure roll shaft 5' instead of being directly journaled in the frame members is carried by supporting members 90 and 91 which are journaled in the frame members 13. The support 90, which carries on the outer end the sprocket 21, has an axial bore 92 in the inner end thereof, with a portion of the bore defined by a removable cap 93 secured in position by screws 94, removal of the cap permitting removal of the end of the shaft 5' from the bore 92. As the shaft 5' is clamped against rotation by the cap 93, the rotation of the gravure roll 5 is secured through rotation of the support 90 by the sprocket 21.

The support 91 has a cylindrical recess 95 axially therein in which a sleeve 96 is slidable, and the latter, when positioned in the left hand end of the recess 95, is arranged to receive and support the right hand end of the shaft 5', with said sleeve locked in this position by a set screw 97. A cut-out portion 98 in the support 91, provides an opening in the side of the recess 95 through which the end of the shaft 5' may be withdrawn upon release of the set screw 97, and axial movement of the sleeve 96 to the right out of engagement with the shaft 5'. Upon removal of the cap 93, said shaft 5' may be carried slightly to the right, as indicated in Fig. 3, to withdraw the left hand end of the shaft from the end of the bore 92, after which the roll shaft 5' and the roll 5 thereon may be withdrawn from the members 90 and 91. Thus the construction shown provides for accurate centralization of the shaft 5' relative to the axes of the supporting members 90 and 91 and permits replacement of the gravure roll by a similar roll having a different engraving thereon.

The gravure roll 5 is prevented from counterclockwise rotation while the doctor blade is in contact with said roll by mechanism most clearly shown in Fig. 9. Referring to Figs. 3 and 9, one of the frame members 13 has an annular ring 100 secured thereto, said ring surrounding the supporting member 90 for the gravure roll shaft 5'. The ring 100 is provided with a substantially vertical slot 101 which is tangential to the cylindrical surface of the supporting member 90 at a point substantially in the horizontal plane of the gravure roll axis. A roller or cylindrical pin 102 is received in the slot 101 in parallel relation to the axis of the supporting member 90, and said pin is normally urged by gravity against the surface of the supporting member 90 and wedges between said member and the side of the slot to lock said member 90 against counterclockwise rotation.

The doctor blade may be rotated to inoperative position after the removal of the bracket 76 carrying the member 74 which supports said blade in position, and, when said blade moves to inoperative position, the pin 102 is withdrawn from locking position. Referring to Fig. 9, as the doctor blade is swung to inoperative position, a cam 103 secured to the rod 71 and rotatable with the doctor blade, engages and elevates the end of a lever 104, which carries a roller 105 in engagement with said cam 103. The opposite end of said lever 104 is connected by a link 106 to a lever 107 which, as in the case of the lever 104, is pivoted on the frame member 13. The free end of the lever 107 extends beneath the pin 102 so that as the cam 103 elevates the roller 105, the cylindrical pin 102 is raised out of engagement with the supporting member 90, thereby permitting the gravure roll 5 to be turned counterclockwise, the doctor blade being out of contact with said roll. A spring 108 holds the lever 107 out of engagement with the pin 102 when the doctor blade is in engagement with the gravure roll.

Following the gravure printing operation, which has been described, the web is carried to a second printing mechanism which procures a second printing operation on the web. In the construction shown, the second printing operation is done by the printing roll 6 which, as shown in Fig. 1, is journaled in bearings provided by the frame members 13. This roll 6, Fig. 4, carries on the surface thereof a flexible member 111 tightly secured to the roll with relief printing surfaces 112 secured to and extending beyond the member 111 to provide for relief printing on the web. A pressure roll 113 parallel to the printing roll 6 is freely rotatable on a shaft 114, the ends of which are supported in the frame members 13, and urges the web 1 into contact with the printing surfaces on the printing roll 6. Since the printing roll 6 and the pressure roll 113 are in fixed relation to each other during the operation of the machine, the surface of the printing roll is out of engagement with the surface of the

pressure roll except when the printing surfaces 112 are positioned between said rolls, and thus the web 1 is movable relative to the surface of the printing roll 6 between successive impressions on said web.

The relief printing roll 6 is adjustable toward and away from the pressure roll to procure a greater or less pressure on the printing surfaces. Referring to Figs. 1 and 11, a bell crank lever 115 is pivotally mounted at one end on one of the frame members 13 and a similar bell crank lever, not shown, is pivoted in a like manner on the other frame member 13, said levers providing bearings for opposite ends of the printing roll shaft 6'. As the position and adjustment of the levers is the same for both, only the lever 115 will be described. A depending arm on the lever 115 has a horizontal slot 116 which receives an eccentric sleeve 117 carried on a stud bolt 118 on the frame 13. The sleeve 117 has an annular flange 119 by which said sleeve is turned on the bolt 118, to rock said lever 115 about its pivotal support on the frame, to vary the spacing between the printing roll 6 and the pressure roll 113, said sleeve being clamped in adjusted position by tightening the bolt 118.

Ink or printing fluid is transferred to the printing surfaces on the relief printing roll from a fountain roll 120, the lower surface of which extends within a tank or pan 121 supported on the frame in the manner disclosed with reference to tank 65. The surface of the fountain roll 120 is in engagement with a transfer roll 122 which engages the printing surfaces 112 of the printing roll. As best shown in Fig. 5, the fountain and transfer rolls 120 and 122 are driven in unison with the printing roll 6. The printing roll shaft 6' carries the gear 18 which meshes with a gear 124 on the transfer roll shaft 122' for moving said transfer roll at the same surface speed as the printing roll, and a gear 125 on the fountain roll shaft 120' meshes with the gear 124 on the transfer roll to drive the fountain roll 120 at a surface speed slightly less than the surface speed of the transfer roll to procure a creeping action between said rolls which maintains the surface of the transfer roll free from accumulations of dried printing material.

When the machine is brought to rest, the transfer roll is manually spaced from the printing roll and the fountain roll. Referring now to Figs. 6 and 7, the fountain roll shaft 120', which is journaled in the frame members 13, carries eccentric sleeves 126 located between said frame members with one sleeve adjacent each of said frame members. Only one of the sleeves 126 is shown since the mechanism associated therewith is duplicated for either end of the shaft 120'. Each eccentric sleeve 126 is carried by a disk 127 which is urged clockwise by a spring 128, the latter being secured at one end to the frame member 13, said disk being held in adjusted position by an adjusting bolt 129 in a lug 130 on said disk, said bolt engaging a portion of the frame member 13 to limit the clockwise rotation. Each eccentric sleeve 126 provides a support for an upwardly extending link 131 in which the end of the transfer roll shaft 122' is journaled. Adjustment of the bolt 129 turns the eccentric sleeve and thereby raises or lowers the link 131 to move the transfer roll toward or away from the fountain roll.

The link 131 on each end of the fountain roll carries at the upper end thereof a roller 132 which is engaged by a latch 133, the latter being pivotally mounted on the printing roll shaft 6', and engagement between said latch 133 and the roller 132 moves the link 131 clockwise to space the transfer roll from the printing roll. Movement of the latch 133 into engagement with the roller 132 is procured by manual downward movement of an arm 134 which carries a handle 135 on the end thereof and is attached to a transverse shaft 136 supported in the frame 13 to which shaft a second arm 137 is secured, the end of the latter arm 137 being connected by a link 138 to the latch 133. Depression of the handle 135 moves the latch 133 downwardly into engagement with the roller 132. In this position the arm 134 is locked by a pivoted locking member 139 on the frame member 13, said member 139 engaging the arm 134 in its lower position.

Referring to Fig. 8, the link 131 is urged toward the printing roll 6 normally to support the transfer roll in contact with the printing surfaces on said printing roll 6 by a spring 140 which engages at one end a lug 141 mounted on a stud 142 on the frame member 13 with the opposite end of said spring engaging the upper end of the link 131. The lug 141 carries an overlying flange 142 which is provided with a slot 143 receiving a pin 144 on the end of the link 131 to limit the rocking movement of the link 131 about the eccentric sleeve 126. The transfer roll 122 is accordingly held in contact with the printing surface of the printing roll 6 when the latch 133 is out of engagement with the roller 132.

The link 138 carries a pawl 145 pivotally mounted thereon, said pawl normally depending in engagement with a cut-out portion 146 of the disk 127 so that, as said link 138 is moved downwardly in response to depression of the handle 135, the disk 127 and accordingly the eccentric sleeve 126 are rotated counterclockwise to raise the transfer roll out of contact with the fountain roll. The rolls are returned to engaging position by movement of the locking member 139 to release the arm 134, thereby permitting the parts to be returned under the influence of the spring 128.

As above stated, the printing device is arranged to supply the web at a constant speed to a machine operating in conjunction therewith. As best shown in Figs. 1 and 4, the idler or tension roll 7 over which the web 1 is carried is journaled in the ends of arms 147 carried by a shaft 148, the ends of which are mounted in the frame members 13. A spring 149 engages a pin 150 on said shaft 148 and tends to turn said shaft clockwise, thereby maintaining a tension on the web as it is fed through the printing machine and taking up the slack in the web, since the web moves at a faster rate during the printing operation than the constant speed at which the web is carried away from the machine.

In order that successive impressions on the web shall be properly spaced apart, a fixed distance is established from the feed roll 3 to the constant speed rolls 11 between which the web moves at a uniform speed, said feed roll 3 and the printing mechanism being driven in timed relation to the constant speed roll as above stated. To this end the tension roll 7 is returned to a predetermined position at the beginning of each successive printing operation. Referring now to Fig. 4, the shaft 148 carries an arm 150' secured to a connecting rod 151 which carries on its opposite end a roll 152 engaging a groove 153 in a cam 154 which is rotatable with the drive shaft 14, thereby procuring movement of the tension roll 7 in predetermined relation to the rotation of the drive shaft.

At the start of the feeding operation of the web through the printing machine, the roll 152 is in a portion of the groove 153, the spacing of which corresponds to the diameter of the roll, whereby the connecting rod is held against movement and the tension roll is accordingly positively located in the same position at the beginning of each feeding operation. As soon as the positive feeding movement of the web begins, the roll 152 enters a portion of the cam groove 153 which is substantially wider radially than the diameter of the roll and the tension roll 7 is free to move in response to the spring 149 to keep the web tight. When the cam 154 has completed the greater part of its revolution, the roll 153 again enters a narrowing portion of the groove which brings the tension roll 7 into the same predetermined relation which it occupied at the beginning of the preceding feeding movement. The tension roll is also positively located at the beginning of the feeding movement by an adjusting bolt 155 which is carried by an arm 156 secured to the shaft 148.

The constant speed rolls 11 which engage the web positively at all times carry a length of web therebetween, for each rotation of the drive shaft 12, equal to the desired spacing of the impressions on the web, and the roll 3 is made to feed substantially the same length of web through the printing machine by adjustment of the cam 36. Accordingly, between each successive positive feeding movement of the roll 3 the web comes to rest in the printing machine, although it is being drawn away from said printing machine at a constant speed, since the tension roll 7 permits the web to be drawn away from said printing machine. It is desirable, however, to adjust the cam 36 so that the length of web fed by the positive feeding movement of the roll 3 is slightly less than the desired spacing of the impressions on said web. Thus, between successive feeding movements of the roll 3, the web is moved slowly through the printing machine by the rolls 11 (the web then being free to pass through said printing machine by reason of the spacing between the feed roll 3 and the movable roll 33 and also between the printing rolls and the pressure rolls therefor), thereby preventing the web from stopping entirely and avoiding the excessive tension necessary for starting the web from rest.

When the length of web fed by the roll 3 is substantially equal to the length of web fed by the rolls 11, the arrangement of the machine causes the web to be in motion through the printing machine at the start of the feeding movement by the roll 3. As above pointed out, the narrowing portion of the groove 153 in the cam 154 positively returns the tension roll 7 to its initial position and this positive return movement is so timed that the rolls 11 begin to draw the web through the printing machine to start said web in motion before said roll 7 reaches initial position. It will be apparent that the adjustment of the cam 36 is such that the length of web fed through the printing machine is equal to or less than the length of web passing between the constant speed rolls 11, whereby the spacing of the rolls in the printing machine to permit free movement of the web therethrough permits the web to be under the control of the rolls 11. In this manner, the constant speed rolls 11 move the web through the printing machine to establish the desired length of web, even though the length of the web fed through the printing machine is shorter, and thus any accumulated error in the different lengths of web fed by the separate feeding mechanisms is avoided.

It will be noted that the length of the web fed by the printing machine is varied by adjustment of the cam 36, this single adjustment taking care of any desired change in length of the web within the limits of the machine. No other adjustment of the entire printing machine is involved except the adjustment of the individual printing rolls toward or away from each other to vary the location of the separate impressions relative to one another on the web. In this manner, the printing machine may be quickly adjusted for spacing the successive impressions on the web a greater or less distance apart.

The relative position of the gravure and relief printing impressions on the web is varied by adjustment of the printing rolls 5 and 6 toward or away from each other. As best shown in Figs. 1 and 2, the frame members 13 each comprise a main frame portion 157 which supports the relief printing mechanism, the tension roll 7 and the feed roll 3, and a movable frame portion 158 which supports the gravure printing mechanism. The movable portion 158 is connected at its upper end to the main portion 157 of the frame by a bolt 159 which extends through a longitudinal slot 160 provided in the main portion 157. The lower edge of the movable portion 158 is slidable along a way 161 provided by the machine and a bolt 162 extends through a slot 163 in the lower end of the movable portion 158. The opposite movable portions 158 of the opposite frame members 13 are caused to move together by turning movement of a shaft 164 which extends transversely of the machine, said shaft carrying arms 165 adjacent opposite ends thereof which are connected by links 166 to the movable portions 158. Thus the location of the relief printing relative to the gravure printing may be adjusted to the desired extent by movement of the gravure mechanism toward or away from the relief printing mechanism, said movable portions 158 which carry the gravure printing mechanism being locked in adjusted position by tightening of the bolts 159 and 162.

The drive for the feed roll 3 and the printing rolls 5 and 6, above disclosed, is not interfered with by the adjustment of the gravure mechanism since the idler 24 is carried on the movable portion 158 and has its periphery in vertical alinement with the sprocket 21 on the gravure roll shaft 5' and in horizontal alinement with the sprocket 23 on the feed roll shaft 3' so that regardless of the position of the gravure roll, the chain is maintained at the desired tension.

The above described printing machine is arranged to operate in conjunction with a suitable bag-forming machine diagrammatically shown in Fig. 1 which operates upon the web 1 to form a bag of the type shown in Fig. 13. Fig. 12 shows the web 1 with the spaced impressions 168 formed by the gravure printing roll 5 and similarly spaced impressions 169 formed by the relief printing roll 6. The web 1 is provided with opposed notches 170 corresponding in spacing to the spacing of the impressions 168 and 169, said notches being located between successive printed impressions. The web in this form has the opposite edges 171 of the web folded over onto the central portion 172 thereof and secured together to form a flat tube, the opposite edges of said tube having reentrant creases with the fold lines for the creases indicated by the dot-dash lines 173. After this folding

operation takes place, the web is cut transversely along the dot-dash lines 173' and the end thereof is folded up as shown in Fig. 13 to form the completed bag with the printed impressions 168 and 169 on the front surface thereof.

In order that the printed impressions 168 and 169 may be properly located on the front of the finished bag, the printing mechanism is driven in timed relation to the mechanism which forms the web into the bag as above pointed out. Referring now to Fig. 1, which illustrates the bag-forming machine diagrammatically, the constant speed rolls 11 between which the web 1 is fed are driven from the drive shaft 12 for the bag-forming machine through an intermediate idler gear 174 which meshes with a gear 174' on the shaft 12 and a gear 175 on the shaft 11' for the lower constant speed feed roll 11. The size of the gear 174 is variable to change the rate of speed of said constant speed rolls for different lengths of bags, in order that the length of web passing between said rolls 11 for each rotation of the drive shaft 12 shall be equal to the desired spacing of the printed impressions. As shown in Fig. 1, the drive shafts 12 and 14 each carry similarly sized sprockets 175' over which the chain 15 passes, so that the drive shafts rotate at the same rate of speed.

After the web 1 leaves the printing machine and is carried over the idler 8, it passes downwardly over the idler roll 10 which presses a longitudinal edge of said web against a gumming roll 176' for the application of adhesive material to said edge for securing opposite edges of said web together in the formation of the bag. Following the gumming operation, the notches 170 are formed in the opposite sides of the web by rotary choppers 177 carried on shafts 178 (only one chopper and shaft being shown) which are actuated in timed relation to the drive shaft 12 in any suitable manner, said choppers cooperating with stationary blades 179 to remove one pair of opposed notches 170 for each rotation of said drive shaft. From the choppers 177, the web is drawn, by the rolls 11, through a feeding mechanism 180 comprising a series of stationary folding blades of the usual construction which fold the web longitudinally and forms the reentrant creases in the opposite edges of the bag and the rolls 11 beyond the folding mechanism 180 press the folded web flat to cause the overlapping edges of the web to adhere together. Beyond the rolls 11 the web is passed between spaced folding and cutting rolls 181, which sever the web along lines 173' and fold the bottom of the bag. The upper roll 181 carries a folding blade 182 which engages the web in the position of the bottom fold of the bag and presses the web adjacent said fold into a gripper 183 carried by the lower roll 181, the web being thereafter severed by a knife 184 in the upper roll 181 which cuts the web along the line 173' by engagement with a block 185 in the lower roll 181, thereby severing a substantially completed bag from the end of the web. The rolls 181 are driven in timed relation to the drive shaft 12 by a chain 186 which engages sprockets, not shown, on the drive shaft 12 and on the shaft 181' for the lower roll 181, said sprockets being equal in size so that one rotation of the drive shaft 12 procures a corresponding rotation of the rolls 181, said folding and cutting operation occurring once for each rotation of the drive shaft 12 and in timed relation thereto. The rolls 181 are spaced apart so that the web 1 passes therebetween independently of the movement of said rolls, said web being moved by the constant speed rolls 11 in the usual manner.

The proper location of the spaced impressions on the finished bag is dependent upon the positions of the choppers 177 and the rolls 181 relative to the printed impressions on the printing rolls 5 and 6. The constant speed rolls 11, as above stated, are in predetermined timed relation to the choppers 177 and also to the rolls 181 by reason of the connections from the drive shaft 12, and the impressions on the web are properly located on the bag by variation of the timed relation of the printing operation and the operations of the bag-forming machine. The change in timing to position the impressions is procured by shifting the sprocket 175' angularly on the drive shaft 14, thereby varying the time of the printing operation relative to the operation of the bag-forming machine, and thus locating printed impressions in desired position on the web in relation to the notches formed by the choppers 177 and to the bottom fold formed by the rolls 181.

The operation of the printing machine in conjunction with the bag-forming machine which will be clear from the above description will be briefly outlined. In the position of the printing machine shown in Fig. 1, the positive movement of the web through the printing machine has been initiated by the cam 36 on the drive shaft 14 which has urged the moving roll 33 into contact with the feed roll 3. Prior to this movement of the roll 33 the web is drawn slowly over the roll 3 in response to the pull exerted on the web by the constant speed rolls 11 with the tension roll 7 moving counter-clockwise as the web is drawn through the rolls 11. Just as the moving roll 33 engages the feeding roll 3, the tension roll 7 is brought to the predetermined position of Fig. 1, to establish a fixed length of web between the constant speed rolls 11 and the feed roll 3. From this position, the web 1 is fed by the feed roll 3 at the surface speed of the printing rolls and in contact with the printing surface thereof, the pressure roll 55 having been moved into engagement with the surface of the printing roll 5 at the beginning of this positive movement of the web. As the printing rolls 5 and 6 are rotated continuously and at the same speed as the feed roll 3, the printing surfaces 112 on the printing roll 6 are brought into contact with the pressure roll 113 during the positive movement of the web by the feed roll 3, and printing by these surfaces and by the gravure roll 5 occur without blurring of the impressions. The web during this feeding movement moves faster than it is drawn between the constant speed rolls 11 and is maintained under tension by clockwise movement of the tension roll 7 in response to the spring 149, the roll 152 on the rod 147 having entered the wide portion of the cam groove 153, thus allowing the roll 7 to move freely. The impression made on the web by the printing roll 6 is in proper relation to the preceding impression made on the web by the roll 5, the relative position of the impressions being varied by movement of the rolls 5 and 6 toward or away from each other, as above disclosed.

The positive feeding movement of the web continues with the slack taken up by the roll 7 until the roller 37 engages the depressed portion of the cam 36 when the moving roll 33 is separated from the driving roll 3 and the pressure roll 55 separated from the gravure roll 5, the pressure roll 113 being then out of contact with the printing surface 112 of the printing roll 6. The roll 2 is provided with a brake 186 and following the

separation of the feed roll 3 and the roll 33, the rate of movement of the web is materially decreased by the brake, whereby the idler roll 7 starts its return movement to the position of Fig. 1, the web being drawn from the printing machine by the rolls 11. This return movement of roll 7 occurs at a predetermined rate since the roll 152 is in the narrow portion of the cam groove 153 and the return rate is such that the rolls 11 draw the web 1 slowly through the printing machine to avoid complete stopping of the movement of the web through said machine. Just as the printing machine finishes one complete printing operation, the machine reaches the position shown in Fig. 1, with tension roll 7 in positively located position for the beginning of a subsequent operation which is carried through in the manner above described.

The spacing of the impressions on the web is thus determined by the movement of the web between the rolls 11 which, as above pointed out, move the web a distance equal to the spacing of successive impressions on the web for each rotation of the drive shaft 12 and accordingly for each rotation of the drive shaft 14 in the printing machine. After the printing operation, the web is notched by the choppers 177 and thereafter folded, in the formation of a bag, by the folding mechanism 180 which turns in the sides and by the end-folding mechanism on the rolls 181. As above pointed out, if the printed impressions are not properly located on the front of the bag, as shown in Fig. 13, the timing of the printing machine relative to the drive shaft of the bag-forming machine is varied by adjustment of the sprocket 175' so that the position of the printed impressions relative to the choppers 177 is varied and the printed impressions are properly located on the finished bag.

In the modification shown in Fig. 14, the printing machine corresponds substantially in construction to the printing machine above disclosed and the same reference characters are applied to this printing machine which operates in conjunction with the intermittently actuated feed rolls of a bag-forming machine of the type disclosed, for example, in the Novick Patent No. 1,691,027, granted November 6, 1928. In this arrangement of the printing machine, however, the roll 7 remains stationary and operates merely as an idler roll, with other mechanism, as will hereinafter appear, operating to maintain the web under tension. In this modification, the web 1 passes from the tension roll 7 of the printing machine around an idler 187 and over a second idler 188, both of said idlers, as well as said roll 7, being fixed in position, and thence around idlers 190 and 191, the latter being movable, to the feed rolls 192 of the bag-forming machine between which the web is intermittently fed.

As best shown in Fig. 15, the drive shaft 193 of the bag-forming machine carries a disk 194 having a radially adjustable pin 195 on which an arm 196 is pivotally mounted. The arm 196 has a rack 197 formed thereon which engages with a pinion 198 mounted for rotation on the lower feed roll shaft 192', said pinion carrying a pawl 200, which engages with a ratchet 201 secured to the shaft 192'. With the drive shaft 193 rotating clockwise, the shaft 192' and accordingly the feed rolls 192 are rotated clockwise during half of each revolution of the drive shaft 193 and the pinion 198 rotates on the shaft 192' during the other half of the revolution of said drive shaft.

In order to take up the slack and to maintain the web under tension between the printing machine and the intermittently actuated feed rolls 192, the idler roll 191, above described, is mounted for free swinging movement. Said idler roll 191 is carried by arms 202 secured to the shaft 190' on which the idler roll 190 is rotatably mounted. The weight of the idler roll 191 and the arms 202 tend to swing said roll clockwise about the shaft 190' to maintain the web 1' under tension and a pin 203 beneath one of the arms 202 prevents excessive downward movement of said roll 101, said pin positively locating said roll 191 at the beginning of the feeding movement of the web between the rolls 192. The shaft 190' carries a depending arm 204 pivotally mounted thereon, said arm having a connecting rod 205 connected thereto, the other end of the rod 205 supporting a roller 206 in engagement with a cam 207 on the drive shaft 193. The rod 205 beyond the roll 206 provides spaced fingers 208 which extend on opposite sides of the shaft 193 to support the roller 206 in proper relation to the cam. A spring 210 normally urges the rod 205 toward the right to maintain the roll 206 in engagement with the cam 207 at all times. A pin 211 on an arm 212 integral with one of the arms 202 is engaged by the arm 204 as the latter moves to the left to procure positive downward movement of the roll 191, said roll being free to move upwardly as the arm 204 moves to the right under the influence of the spring 210.

The bag-forming machine is driven in timed relation to the printing machine by a chain 213 which passes over sprockets 214 and 215 on the drive shaft 193 of the bag-forming machine and the drive shaft 14 of the printing machine respectively, said sprockets being equal in size so that a single rotation of the drive shaft 193 procures a corresponding rotation of the drive shaft 14. The machines are so timed that the intermittently actuated feed rolls 192 begin the feeding operation at substantially the same time that the feeding movement of the web occurs in the printing machine, as will be apparent from a consideration of Fig. 14, in which the printing machine is shown just at the beginning of the feeding operation, and the actuating mechanism for the intermittently actuated feed rolls 192 of the bag-forming machine is in a position to start the movement of said intermittently actuated rolls.

From a consideration of Figs. 14 and 15, which represent the parts in the same relative positions, the printing machine is just beginning the positive movement of the web 1 through said machine with the tension roll 7 positively located to procure a predetermined length of web between the feed roll 3 and the intermittently actuated rolls 192 of the bag-forming machine. At the same time, the roll 191 is positively located, as most clearly shown in Fig. 15, since the pin 211 is in engagement with the arm 204 so that upward movement of the roller 191, except as governed by the cam 207 on the drive shaft 193, is prevented. As each rotation of the drive shaft 193 of the bag-forming machine moves a length of web 1 between the rolls 192 equal to the length of web necessary for the formation of a complete bag, the spacing of the impressions formed by the printing machine will be equal to the length of web necessary for the formation of the completed bag.

In order to locate the printed impressions properly on the front of the bag, the idler roller

187 is carried by arms 216 mounted on a shaft 217 carried by the frame 218 which provides the support for the roll 2 from which the web is drawn, and the position of the roll 187 is varied by swinging said roll about the shaft 217 and locking the roll in adjusted position, thereby varying the length of web between the printing rolls 5 and 6 and the intermittently actuated rolls 192 of the bag-forming machine.

Referring now to Figs. 16 and 17 which show the type of bag formed on this machine, the web 1' has spaced impressions 220 formed by the gravure roll 5, each rotation of the gravure roll providing opposed impressions transversely in alinement on the web and similarly the web has transversely alined impressions 221 formed by the relief printing roll 6, successive relief impressions 221 being spaced in accordance with the gravure impressions 220. After the web has passed between the intermittently actuated feed rolls 192, the web is cut longitudinally along the line 222 to define two strips, each of which is formed into bags in the bag-forming machine. After the web is cut along the line 222, the outer edges of each strip are folded along the lines 223 and the strip is subsequently folded transversely along the lines 224 to form the completed bag of Fig. 17 with the printed impressions 220 and 221 on the front side thereof, each completed bag being cut from the web along the lines 225, the formation of such a bag being fully described in the above noted Novick patent.

The operation of the machine of Figs. 14 and 15, which will be clear from the above description will be briefly summarized. The drive shafts 14 and 193 are in the relative angular positions shown. With the drive shaft 14 in the position for the beginning of the positive feeding of the web 1 through the printing machine, the drive shaft 193 is in a position to initiate the rotation of the rolls 192, as shown, to procure a feeding movement of the web between said rolls. In this position, the length of web between the feed roll 3 and the intermittently actuated rolls 192 is positively determined by the positive location of the roll 191 against the pin 203 in response to the rotation of the cam 207 which has its high point directly beneath the roll 206 when the machine is in the position shown, the roll 7 being fixed in position. As the drive shaft 193 rotates clockwise, the web is fed through the rolls 192, the roll 191 moving upwardly from its lowermost position to allow the web to pass between said rolls. The upward movement of the roll 191 is possible since the high point of the cam 207 passes from beneath the roll 206 as the feeding movement of the rolls 192 is initiated. Continued feeding movement of the web through the rolls 192 continues to raise the roller 191 until the end of the feeding movement at which time the roll 191 begins its downward movement under the influence of gravity to maintain the web tight as it is fed from the printing machine. It will be noted that the cam 36 of the printing machine is so arranged that the web is fed through at least one-half of each rotation of the drive shaft, thus said web is always fed through the printing machine at a slower rate than the feeding movement between the rolls 192. The roll 191 acts to maintain the web under tension by its weight and also to establish a predetermined length of web between the feed roll 3 and the rolls 192 at the beginning of each feeding movement of the web, said roll being positively located by the cam 207. As the drive shaft 193 approaches the position shown in Fig. 14, the cam 207 urges the roller 191 downwardly so that at the beginning of each successive feeding movement of the web, said roller is in its lowermost position in engagement with the pin 203 to establish the predetermined length of web between said machines. The proper positioning of the roll 191 accordingly procures the predetermined spacings of the impressions on the web in accordance with the length of web passed between the rolls 192 at each actuation thereof. In this modification, as in the preceding modification, the free movement of the web through the printing machine between successive printing operations prevents excessive tension on the web between said machines to break said web, as a result of the printing machine feeding too short a length of web, said rolls 192 acting as master rolls. Thus by the provision of the positive downward movement of the roll 191, any inaccuracy in the relative lengths of web fed through the printing machine and between the rolls 192 is compensated for, and by adjustment of the cam 36 so that the length of web fed through the printing machine shall be equal to or slightly less than the length of web fed between the rolls 192, the rolls 192 will procure the necessary movement of the web through the printing machine to compensate for the inaccuracy of the adjustment of the feed for the printing machine.

From the foregoing, it will be apparent that the printing machine provides for printing spaced impressions on a continuous web with the spacing of the impressions independent of the circumference of the printing rolls and that the printing machine is arranged to supply the web to another machine in conjunction with which the printing machine operates with the printed impressions on said web properly located relative to the operative mechanism of the auxiliary machine. The printing machine provides for printing a plurality of series of spaced impressions on the same continuous web with one series of impressions in proper spaced relation to those of the other series. In operating the printing machine in conjunction with an auxiliary machine, said machines are driven in timed relation in order that the spaced impressions shall be properly located relative to the operations performed on the web by the auxiliary machine with provision for taking up the slack and compensating for the different rates of travel of the web in the two machines so that the rates of movement of the web through the printing machine may be dissimilar to the rates of movement of the web through the auxiliary machine.

I claim,

1. In a machine for printing spaced impressions on a continuous web by gravure printing, a gravure printing roll, a pressure roll to press the web against the printing roll, means for feeding a predetermined length of web between said rolls for each rotation of the print roll, said feeding means comprising a driving roll having the same surface speed as the printing roll, and a movable roll engaging said driving roll and pressing the web against said driving roll during a portion only of each rotation of said driving roll for advancing the web between the printing and pressure rolls at the same speed as the rolls, and means for spacing the surface of the pressure roll from the printing roll during a portion of each rotation of the printing roll while the movable roll is spaced from the driving roll to provide for a

relative movement between said web and the surface of the printing roll.

2. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll to press the web against the printing roll, means for feeding a predetermined length of web between said rolls for each rotation of the print roll, mechanism operative beyond the printing operation for positively moving the web at a constant speed, and means for maintaining said web under tension between said feeding means and said constant speed means, and for establishing a predetermined length of web between the feeding means and the positively moving means at the beginning of each feeding movement by said feeding means.

3. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll to press the web against the printing roll, means for feeding a predetermined length of web between said rolls for each rotation of the print roll, mechanism for procuring an operation on said web after the printing operation, said mechanism carrying the web from said printing roll at a predetermined rate, and means for maintaining said web under tension between said feeding means and said mechanism, and for establishing a predetermined length of web between said mechanism and the feeding means at the beginning of each feeding operation.

4. In a machine for printing spaced impressions on a continuous web, a plurality of spaced printing mechanisms, each mechanism comprising a printing roll, and a pressure roll for each printing roll for pressing the web into contact with the printing surface of said rolls, means for feeding a predetermined length of web between the printing rolls and pressure rolls for each rotation of said printing rolls, with the length of web independent of the circumference of the rolls, means for supporting said pressure rolls for movement of the surfaces thereof relative to the surfaces of the printing rolls, means for maintaining said web under tension and for taking up the slack between said printing rolls, and means to vary the spacing between said printing mechanisms in accordance with the spacing of the impressions on said web.

5. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll for pressing the web against the printing roll, means for feeding a predetermined length of web between said rolls for each rotation of the print roll, with the length of web independent of the circumference of the printing roll, means for procuring movement of said web at a constant speed after the printing operation, and means for maintaining said web under tension between said feeding means and the means for moving the web, and for establishing a predetermined length of web between said constant speed-moving means and said feeding means at the beginning of each printing operation.

6. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll for pressing the web against the printing surface of the printing roll, means for feeding a predetermined length of web between said rolls for each rotation of the printing roll and at the surface speed of the printing roll, means operable after the printing operation for procuring operations on predetermined lengths of said web in accordance with the spacing of the impressions thereon, including means for positively advancing said web at a predetermined rate, means for actuating the feeding means in timed relation to the last-mentioned means, and means for establishing a predetermined distance between the positively-advancing means and the feeding means between successive printing operations while the feeding means are inoperative.

7. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll for pressing the web against the printing surface of the printing roll, means providing for feeding a predetermined length of web between said rolls for each rotation of the printing roll and providing for movement of the web relative thereto between successive feeding operations, means operable after the printing operation for moving the web at a constant speed, means for actuating said moving means in unison with said feeding means, said feeding means procuring a faster movement of the web during the feeding operation than the constant speed movement of the web after the printing operation, and means for maintaining said web under tension and for taking up the slack between said feeding means and said constant speed means.

8. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll for pressing the web against the printing surface of the printing roll, means providing for feeding a predetermined length of web between said rolls for each rotation of the printing roll and providing for movement of the web relative thereto between successive feeding operations, said means comprising a feed roll moving at a constant speed and a movable roll engaging said driven roll during a portion only of each rotation of said driving roll, constant speed means operable beyond the printing operation for moving the web at a constant speed, means for maintaining said web under tension between said feeding means and said moving means, and means for establishing a predetermined length of web between said constant speed means and said feeding means at the initiation of each feeding movement.

9. In a machine for printing spaced impressions on a continuous web, a plurality of spaced printing rolls, a pressure roll for each printing roll for pressing the web into contact with the printing surfaces of said rolls, means for feeding a predetermined length of web between the printing rolls and the pressure rolls for each rotation of said printing rolls, the length of web being independent of the length of the circumference of said rolls, means for moving said printing rolls toward or away from each other to provide for different spacing between successive impressions on said web, and means for actuating said printing rolls in unison with the surfaces of said rolls moving at the same rate of speed.

10. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll to press the web against the printing roll, means for feeding a predetermined length of web between said rolls for each rotation of the print roll, said feeding means comprising a driving roll and means engaging said driving roll and pressing the web against said roll during a portion only of each rotation of said driving roll, means operable after the printing operation for moving said web, said moving means and said driving roll being actuated in unison, and means for maintaining said web under tension between said feeding means and said moving means and for establishing a predetermined length of web between said moving means and

said feeding means between successive feeding operations.

11. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll to press the web against the printing roll, means for feeding a predetermined length of web between said rolls for each rotation of the print roll, said feeding means comprising a driving roll and means engaging said driving roll and pressing the web against said roll during a portion only of each rotation of said driving roll, means operable after the printing operation for intermittently actuating said web in accordance with the spacing of the impressions on said web, and means for maintaining said web under tension between said feeding means and said moving means and for establishing a predetermined length of web between said feeding means and said moving means between successive feeding operations.

12. The combination with means for operating on predetermined lengths of a continuous web, of means for printing impressions on said web before said first means becomes operative in accordance with the lengths of web to be operated on, said printing means comprising a printing roll, a pressure roll for pressing the web against the printing roll, means for feeding a predetermined length of web corresponding to the spacing of the impressions between said rolls for each rotation of the printing roll, means for spacing the surface of the pressure roll from the printing roll between successive impressions on said web, means for maintaining said web under tension between said feeding means and said first-mentioned means, and means for operating said feeding means in timed relation to said first-mentioned means, whereby each impression on the web is in predetermined relation to the length of web operated upon by said first-mentioned means.

13. The combination with a mechanism for operating upon a continuous web, said mechanism having a master roller over which said web is carried at a constant speed, of a printing mechanism for printing spaced impressions on said web before it reaches said master roller, said printing mechanism comprising a printing roll, a pressure roll, means for separating said printing roll and said pressure roll between successive impressions on said web, means for feeding said web between said rolls, comprising a feed roll and a movable roll pressing said web against the feed roll during a portion only of each rotation of the feed roll, and means to maintain the web under tension between said printing mechanism and the master roller.

14. The combination with a mechanism for operating upon a continuous web, said mechanism having an intermittently actuated master roller over which said web is carried, of a printing mechanism for printing spaced impressions on said web before it reaches said master roller, said printing mechanism comprising a printing roll, a pressure roll, means for separating said printing roll and said pressure roll between successive impressions on said web, means for feeding said web between said rolls, comprising a feed roll and a movable roll pressing said web against the feed roll during a portion only of each rotation of the feed roll, and means to maintain the web under tension between said printing device and the master roller.

15. The combination with a mechanism for operating upon a continuous web, said mechanism having a master roller over which said web is carried at a constant speed, of a printing mechanism for printing spaced impressions on said web before it reaches said master roller, said printing mechanism comprising a printing roll, a pressure roll, means for separating said printing roll and said pressure roll between successive impressions on said web, means for feeding said web between said rolls, comprising a feed roll and a movable roll pressing said web against the feed roll during a portion only of each rotation of the feed roll, and means to maintain the web under tension between said printing device and the master roller and to establish a predetermined length of web between the feed roll and the master roller at the beginning of each feeding movement of the web by said feed roll and movable roll.

16. The combination with a mechanism for operating upon a continuous web, said mechanism having an intermittently actuated master roller over which said web is carried, of a printing mechanism for printing spaced impressions on said web before it reaches said master roller, said printing mechanism comprising a printing roll, a pressure roll, means for separating said printing roll and said pressure roll between successive impressions on said web, means for feeding said web between said rolls, comprising a feed roll and a movable roll pressing said web against the feed roll during a portion only of each rotation of the feed roll, and means to maintain the web under tension between said printing device and the master roller, and to establish a predetermined length of web between the feed roll and the master roll at the beginning of the feeding movement of the web by said feed roll.

17. The combination with a mechanism for operating upon a continuous web, said mechanism having an intermittently actuated master roller over which said web is carried, of a printing mechanism for printing spaced impressions on said web before it reaches said master roller, said printing mechanism comprising a printing roll, a pressure roll, means for separating said printing roll and said pressure roll between successive impressions on said web, means for feeding said web between said rolls, comprising a feed roll and a movable roll pressing said web against the feed roll during a portion only of each rotation of the feed roll, means to deliver the web from the printing machine at a substantially constant speed, and means to establish a predetermined length of web between the feed roll and the master roll at the beginning of the feeding movement of the web by said feed roll.

18. In a machine for printing spaced impressions on a continuous web, a print roll, a pressure roll to press the web into contact with the printing surface of the print roll, means for feeding a predetermined length of web between said rolls for each rotation of said print roll, means for separating said pressure roll and said print roll between successive impressions on said web, and means involving a single adjustment for varying the spacing of the impressions on the web.

19. In a machine for printing spaced impressions on a continuous web, a print roll, a pressure roll to press the web into contact with the printing surface of the print roll, means for feeding a predetermined length of web between said rolls for each rotation of said print roll, and means for spacing said pressure roll from said print roll between successive impressions on said web, and means involving a single adjustment for varying the spacing of the impressions on said

web by varying the length of web fed by said feeding means.

20. In a machine for printing spaced impressions on a continuous web, a plurality of spaced printing rolls, a pressure roll for each printing roll for pressing the web into contact with the printing surface of said rolls, means for feeding a predetermined length of web between the printing rolls and pressure rolls for each rotation thereof, with the length of web independent of the circumference of the rolls, means for supporting said pressure rolls for movement of the surfaces thereof relative to the surfaces of the printing rolls, means for moving said web at a predetermined rate after it passes between said rolls, means for maintaining said web under tension between said feeding means and said moving means, and means involving a single adjustment for varying the spacing of the impressions on said web.

21. The combination with a mechanism for operating upon a continuous web, said mechanism having a master roller over which said web is carried at a predetermined rate, of a printing mechanism for printing spaced impressions on said web before it reaches said master roller, said printing mechanism comprising a printing roll and a pressure roll, and means for feeding said web between said rolls, comprising a feed roll and a movable roll pressing said web against the feed roll during a portion only of each rotation of said roll, and means to maintain the web under tension between said printing mechanism and the master roller, and to establish a predetermined length of web between the feed roll and the master roller at the beginning of each feeding movement of the web by said feed roll.

22. In a machine for printing spaced impressions on a continuous web, the combination with a gravure printing roll, and a pressure roll for pressing the web against the printing roll, of means for feeding a predetermined length of web between said rolls for each rotation of the printing roll and at the surface speed of the printing roll, and means for spacing the surface of the pressure roll from the printing roll between successive printing operations while the feeding means is inoperative.

23. In a machine for printing spaced impressions on a continuous web, a printing roll, a pressure roll for pressing the web against the printing surface of the printing roll, means for feeding a predetermined length of web between said rolls for each rotation of the printing roll, means operable on said web after the printing operation for positively advancing the web at a predetermined rate, means for establishing a predetermined length of web between the web-advancing means and the feeding means between successive printing operations, and means providing for movement of said web relative to the feeding means while said length-establishing means is operative.

24. In a machine for printing spaced impressions on a continuous web, a printing mechanism, means for feeding a predetermined length of web through said printing mechanism for each printing operation, means operable on said web after the printing operation for positively advancing the web at a predetermined rate, means for establishing a predetermined length of web between the web-advancing means and the feeding means between successive printing operations, and means to provide for free movement of the web through the printing mechanism and feeding means during the operation of said length-establishing means.

25. In a machine for printing spaced impressions on a continuous web, a printing mechanism, and means for feeding a predetermined length of web through said printing mechanism for each printing operation, said means comprising a feeding roll rotatable at the surface speed of the printing roll of the printing mechanism, and a movable roll engageable with the feeding roll during a predetermined portion of each rotation of said feeding roll, said feeding roll having a notch therein, the lagging edge of said notch being engageable with the movable roll when the latter is moved into engagement with the feeding roll to provide for a positive advance of the web positioned between said rolls.

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