

Dec. 17, 1940.

H. W. BEALL

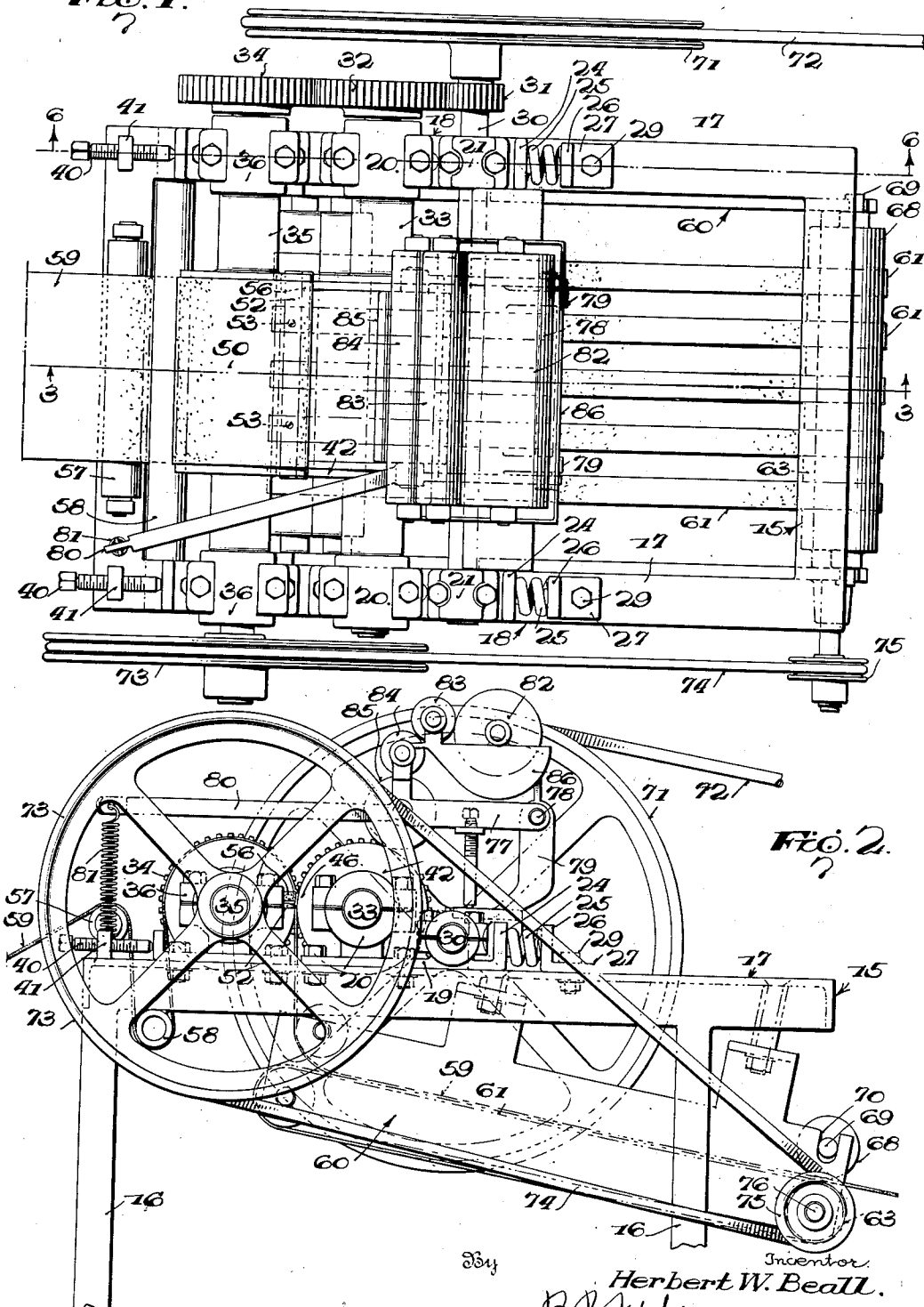
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PRINTING MACHINE

Filed Oct. 25, 1938

3 Sheets-Sheet 1

FIG. 1.



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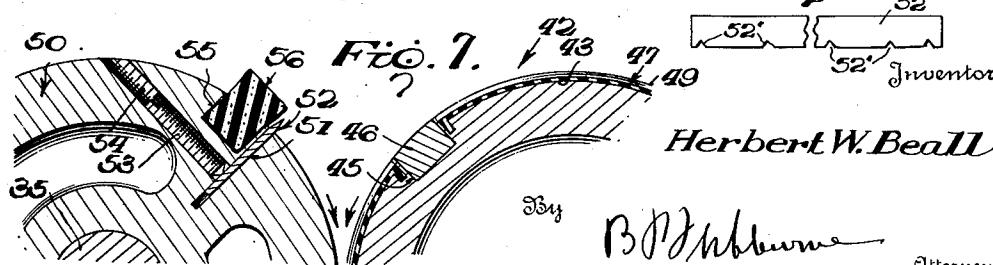
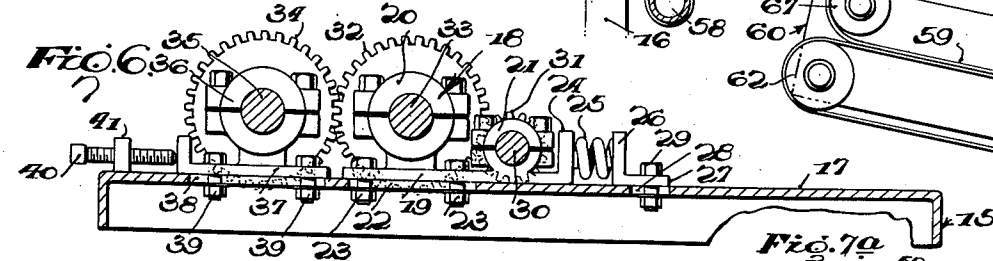
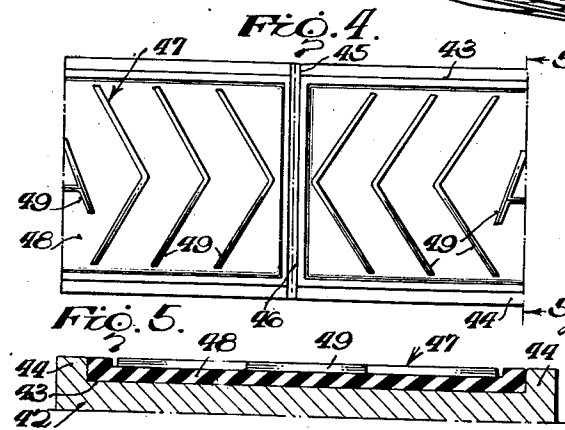
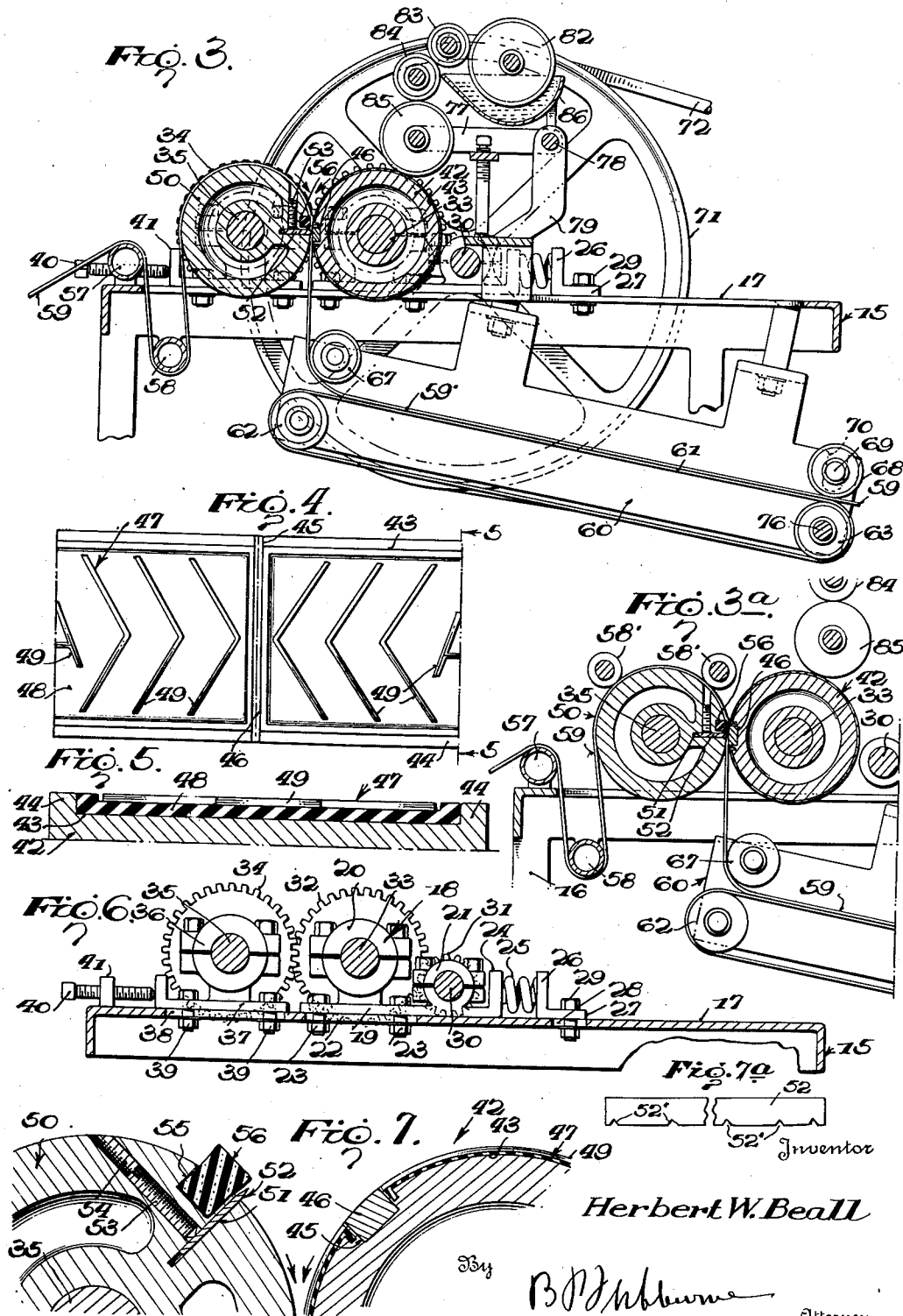
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PRINTING MACHINE

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3 Sheets-Sheet 2



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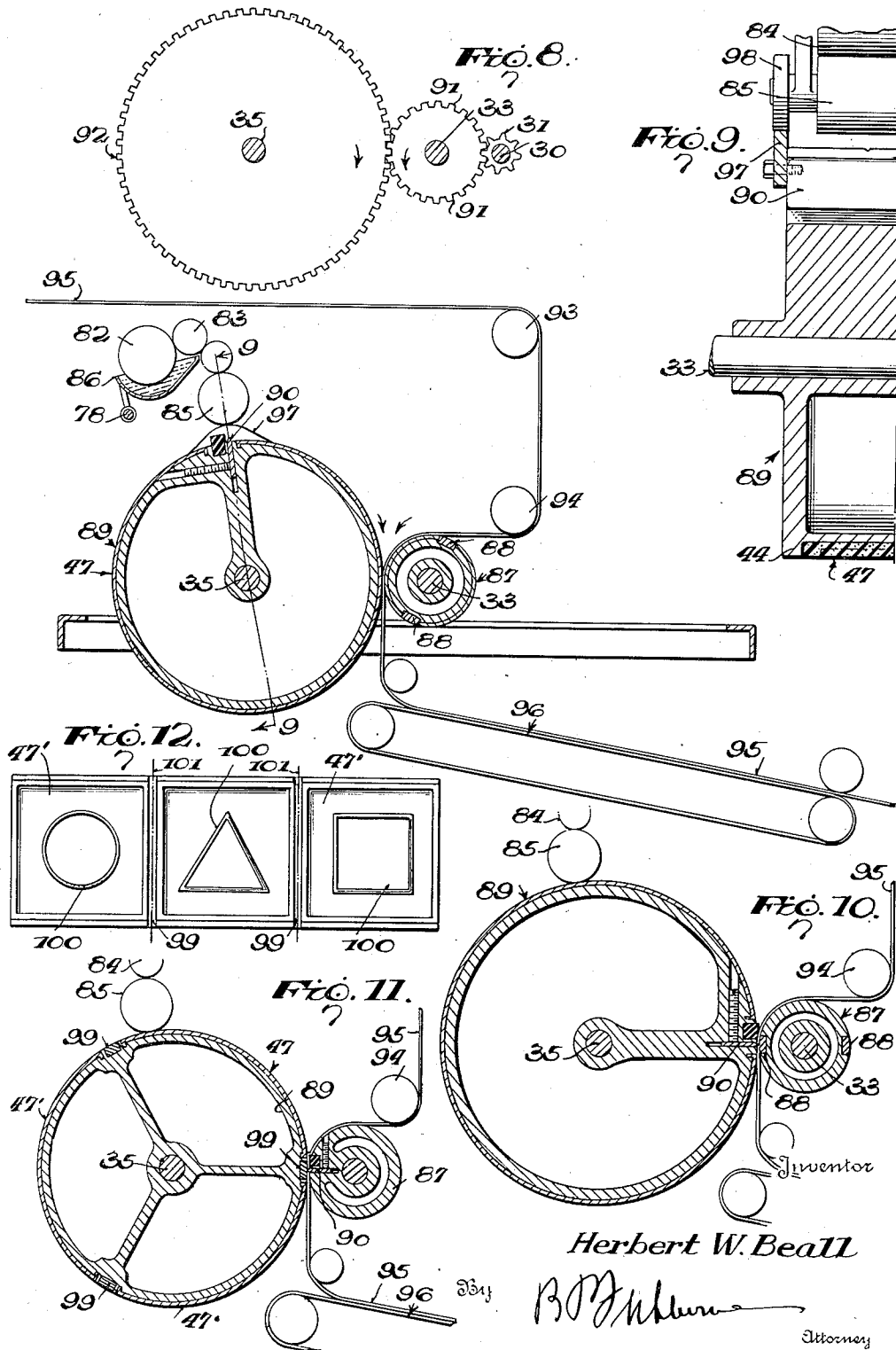
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PRINTING MACHINE

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UNITED STATES PATENT OFFICE

2,225,529

PRINTING MACHINE

Herbert W. Beall, Sumter, S. C.

Application October 25, 1938, Serial No. 236,931

18 Claims. (Cl. 101-227)

My invention is a machine for printing flexible sheets.

An important object of the invention is to provide a machine for manipulating a continuous web of flexible material, such as cloth, to print sections of the same in succession and to successively cut each printed section, in whole or in part.

A further object of the invention is to provide a machine of the above mentioned character having means to grip the traveling web, prior to cutting, in whole or in part, and to then complete the severance of each successive section printed.

A further object of the invention is to provide a machine of the above mentioned character so constructed that the tendency of the cloth being printed to adhere to the cylinders is overcome, and the successive sections are freely discharged from between the cylinders.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a plan view of a machine embodying my invention,

Figure 2 is a side elevation of the same,

Figure 3 is a vertical longitudinal section taken on line 3-3 of Figure 1,

Figure 3a is a view similar to Figure 3, showing a slight modification of the invention,

Figure 4 is a plan view of the printing element and roll, showing the same arranged flat for the purpose of illustration,

Figure 5 is a transverse section taken on line 5-5 of Figure 4,

Figure 6 is a longitudinal section taken on line 6-6 of Figure 1, parts in elevation,

Figure 7 is an enlarged transverse section through the printing and cutting rolls, parts broken away,

Figure 7a is a side elevation of the blade or cutter,

Figure 8 is a partly diagrammatic view of a further modified form of the invention, the printing and compression rolls being shown in transverse section,

Figure 9 is a transverse section taken on line 9-9 of Figure 8,

Figure 10 is a view similar to Figure 8, showing a different ratio of circumference between the printing roll and the compression roll,

Figure 11 is a similar view, showing a further modification of the machine, and

Figure 12 is a plan view of the printing roll and printing elements of the machine shown in Figure 11, the parts being laid out flat for the purpose of illustration.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 15 designates a horizontal preferably rectangular frame supported at a suitable elevation by legs 16. The frame includes longitudinal rails 17.

Mounted upon the horizontal rails 17 are bearing units 18, each of which includes a base 19 and carrying bearing sleeves 20 and 21. Each base 19 has a plurality of openings, receiving bolts 23, extending through elongated slots 22, and securely attaching the bearing units to the rail 17. It is preferred that the bearing unit be capable of sliding longitudinally of the rail 17, and for this reason the bolts 23 will not be tightened up to clamp the base 19 to the rail 17. Each base 19 is provided at one end with an upstanding flange 24, engaging a heavy compressible coil spring 25, engaging a flange 26, formed upon a foot 27. This foot has a bolt 29, passing through an elongated slot 28, whereby the foot 27 may be longitudinally adjusted upon the rail 17 and clamped thereto in the selected adjusted position. While it is preferred that the base 19 be free to act against the compressible coil spring 25, yet I contemplate employing the bolts 23 to directly clamp the base 19 to the rail 17.

A transverse horizontal shaft 30 is journaled in the bearing sleeves 21 and is provided with a pinion 31, rigidly secured thereto and the pinion 31 engages a pinion 32. The pinion 32 is rigidly mounted upon a shaft 33, carried in the bearing sleeves 20. The pinion 32 engages a pinion 34, rigidly mounted upon one end of a shaft 35. This shaft 35 is journaled in bearing sleeves 36. Each bearing sleeve 36 is carried by a base 37, carrying bolts 38, extending through elongated slots 38'. Each base 37 is mounted upon the rail 17 and bolts 39 or the like secure the base 37 to the rail, but the bolts are not ordinarily screwed up sufficiently tight to rigidly clamp the base to the rail. Each base 37 is longitudinally adjusted toward the shaft 33 by means of an adjusting bolt 40, engaging the base 37, and having screw-threaded engagement within an opening formed in an upstanding ear 41, rigidly attached to the rail 17.

In the embodiment of the invention as shown in Figures 1 to 3 inclusive, a printing roll 42 is

mounted upon the shaft 33 to rotate therewith. This printing roll has its periphery recessed, as at 43, forming end radially extending flanges 44. Arranged in openings 45 formed in the flanges 44 is a cutting block 46, preferably formed of hard steel, and held in place by any suitable means. Arranged within the recess 43 and held therein by any suitable means is a printing element 47. This printing element may be formed of metal, rubber, hard rubber or compressible rubber, or any other suitable material. The printing element embodies a foundation plate 48, carrying a raised design or configuration 49. The top or outer surface of the design or configuration 49 is substantially flush with the periphery of the flanges 44.

Mounted upon the shaft 35, to turn therewith, is a coacting compression roll 50, disposed in close or substantial contacting relation to the printing roll 42. The rolls 42 and 50 are driven in unison and turn in opposite directions, as indicated by the arrows in Figure 3.

The roller 50 has a longitudinal radial groove 51, extending longitudinally of the same throughout the entire length of its periphery and this groove receives a blade or cutter 52, adapted to project radially for a short distance beyond the periphery of the roll 50. After adjustment of the blade 52, it is adapted to be clamped in the selected adjusted position by means of set screws 53, having screw-threaded engagement within openings 54, as shown. Since the roll 50 carries the cutter or blade 52, the circumference of the roll 50 defines the length of the completed article to be printed and cut. The blade 52 may have notches 52', to leave narrow connecting parts of the web.

The roll 50 is also provided adjacent to the groove 51 with a groove 55, extending radially, and receiving a gripper 56, arranged at the rear and preferably next to the blade or cutter. The gripper 56 is preferably resilient and may be formed of compressible rubber and may be secured within the groove 55 by shellac or any other suitable means. The numerals 57 and 58 designate upper and lower non-rotating tension producing cylinders or rods, suitably mounted upon the frame 15. The web 59 to be printed, such as a web of cloth, is first fed over tension element 57, under the tension element 58, and over roll 50 and downwardly between the roll 50 and the companion printing roll 42.

In the form of the invention shown in Figure 3a, I provide additional feed rolls 58', preferably rubber covered, arranged to engage the web on the roll 50 and turned by contact therewith.

Means are provided to separate each successive printed article, partly cut from the web, such means comprising a support 60, arranged beneath the rolls 42 and 50 and suitably suspended from the frame 15. An endless conveyor belt 61 is mounted in the support 60 and is passed about rollers 62 and 63. An upper guide roll 67 is arranged near and above the roll 62. The guide roll 67 is preferably arranged slightly to the right or in advance of the point of delivery of the rolls 42 and 50. Arranged near and above the roll 60 is a friction roll 68, having a shaft 69 vertically movably mounted within vertical slots 70. The web after passing the cutter is discharged downwardly and passes the rear side of the roll 67 and is deposited upon the conveyor belt 61 and travels with the conveyor belt, but not as fast as the conveyor belt. When the free end of the web 75 passes beneath the roll 68 and the belt, the web

is prevented from slipping with respect to the belt 61 and hence is pulled, the conveyor belt 61 traveling at a higher speed than the web 59 passing about the roll 50. The leading printed section is therefore completely torn or separated from the web, at the line of cutting 59'.

The shaft 30 is driven by a pulley 71, engaging a belt 72, in turn driven by any suitable source of power. The rotation of the pulley 71 is transmitted to the pinion 32, and the cylinders 42 and 50 are rotated in unison in opposite directions. The shaft 35 has a large pulley 73 rigidly mounted thereon, engaged by a belt 74, engaging a smaller pulley 75. This smaller pulley is rigidly mounted upon a shaft 76, upon which the roller 63 is rigidly mounted. It is thus seen that the shaft 76 is driven from the shaft 35 but at an increased speed.

Means are provided to suitably apply ink to the printing element 47 carried by the printing roll 42. This means comprises a vertically swinging frame 77, pivoted at one end, as shown at 78, to stationary uprights 79. The frame 78 has a longitudinally extending arm 80, connected with a retractile coil spring 81, the opposite end of which is attached to the frame 17. Suitably mounted upon the frame 77 is a train of inking rolls 82, 83, 84 and 85, the roll 85 being the transfer roll to apply the ink to the printing element 47. The roll 82 is the fountain roll contacting with the ink in the pot 86. Any other suitable means may be employed for properly inking the printing element 47.

The operation of this form of the invention is as follows:

The rolls 42 and 50 are driven in the direction of the arrows, Figure 3, and the web of cloth 59 or the like is passed about the stationary friction elements 57 and 58 and then about the roll 50 and downwardly between the rolls 42 and 50. In the starting of the machine, the free end of the web is first placed between the gripper 56 and the printing cylinder 42, and the machine turned over slightly so that the web will be held by the gripper and the printing roll 42. When the rolls 42 and 50 are power driven, as explained, the web is drawn downwardly between the rolls 42 and 50 and the design is printed on each successive leading section of the web, such leading section passing to the left of the guide roll 67 and having its free end deposited on the endless belt 61. The belt 61 feeds this leading section forwardly, but the belt travels faster than the leading section. When the drum 50 has made a complete revolution, blade 51 will engage and substantially sever the web, the leading section not being completely separated from the web, but preferably attached thereto by relatively small uncut portions which may be produced by notches in the blade 51, or the blade may be so adjusted that it will not entirely cut through the web but will cut through the longitudinal threads of the same for the major portion of their diameters. It is desired that the leading section be not completely severed from the web so that the leading section may be properly deposited upon the traveling endless conveyor 61 and will serve to properly guide the succeeding section being printed, upon the endless conveyor. The function of the guide roll 67 is to prevent the discharging printed web sections from adhering to the rolls 42 and 50, and the discharge of the two leading web sections upon the conveyor 61, before the leading web section is torn or completely separated from the next trailing web section, also prevents the next web 75

section from adhering to the roll 67. Before the leading end of the leading web sections passes between the rolls 63 and 68, the cut trailing end 59' thereof has passed the guide roll 67 and is contacting with the conveyor 61. As soon as the leading edge of the leading web section passes between rolls 63 and 68, the leading web section then travels faster than the next trailing web section and is torn or separated therefrom and is thus discharged as an individual section, from the machine.

In Figure 8, I have shown a modification of the machine. In this modification, the numeral 87 designates a compression roll, corresponding to the compression roll 50. The compression roll 87 has longitudinal grooves in its periphery, within which are secured cutting bars 88, preferably formed of hard steel. These bars are diametrically oppositely arranged. The compression roll 87 does not carry the cutter or blade. The numeral 89 designates a combined printing and cutting roll, arranged in close relation to the roll 87, and preferably yieldingly mounted as described in connection with the rolls 42 and 50. The roll 89 carries a printing element, such as the printing element 47, the ends of this printing element being spaced apart for a distance corresponding to the width of the cutting bars 88, and the blade or knife 90 and gripper 56 are arranged between the ends of the printing element. The blade or knife 90 corresponds to the blade or knife 51. The rolls 87 and 89 are preferably positively geared together, and for this purpose, the roll 87 has a gear 91, rigidly secured thereto and having the same pitch diameter as the roll 87, and the roll 89 has a gear 92 rigidly secured thereto and having the same pitch diameter as the roll 89, the gears 91 and 92 being in mesh, so that the rolls 87 and 89 turn in opposite directions, as indicated by the arrows. The roll 87 is driven in a similar manner as indicated in connection with the roll 42.

The numerals 93 and 94 designate stationary tension cylinders or elements about which the web 95 is passed, said web discharging upon the conveying and tearing off device 96, which is identical with the conveying and tearing off device including the belt 61 as described in connection with the first form of the invention.

The inking device is substantially identical with that shown in connection with the first form of the invention, except that it has been moved so that the roll 85 is positioned to contact with the roll 89. This inking device includes the pivoted frame 77 and the spring 81 which normally holds the roll 85 in contact with the roll 89. Since the roll 89 carries the knife 90, it is preferred to raise the frame 77, when the blade 90 approaches the roll 85, to prevent contact between these elements. This is accomplished by placing a cam 97 upon the roll 89, which cam is positioned at the blade and projects radially and circumferentially beyond the blade. The cam 97 is disposed outwardly beyond the ends of the rolls 87 and 85, and will engage a roller 98 secured to the shaft of the roll 85.

In the operation of the second form of the invention, the web 95 is fed over the stationary tension devices 93 and 94 and passes between the rolls 87 and 89. The leading section of the web is printed by contact with the printing element carried by the roll 89 and then discharges upon the conveyor device 96 and is then partly severed by the blade 90, and subsequently separated from

the web by the device 96, as explained. The circumference of the roll 89 determines the length of the section to be printed and cut. I contemplate having the roll 89 readily removable, so that other rolls 89 of different circumferences may be used, to thus vary the length of the section printed. It is preferred to have the circumference of the roll 89 vary in units which is one-half of the circumference of the coacting roll 87. For instance, the roll 89 may have a circumference of three feet and the roll 87 a circumference of one foot. With the rolls 89 and 87 arranged as shown in Figure 8, the roll 87 would make three revolutions while the roll 89 would make one revolution, so that the cutting bar 88 will then meet the blade, to sever the fabric. The next size roll 89, Figure 10, would have a circumference of three and one-half feet. When the roll 87 made three and one-half revolutions, roll 89 would then make one revolution, with the result that the other cutting bar 88 (with relation to the cutting bar which is brought into action when the roll 87 has made one complete revolution) then meets the blade to sever the fabric. The next size roll 89 would be four feet in circumference and the roll 87 would make four revolutions to one revolution of the roll 89, and the cutting bar 88 would meet the blade, as described in connection with Figure 8.

In Figure 11, I have shown a further modification of the invention. In this figure, the printing roll 89 is shown as having a circumference of three feet and the compression roll 87 a circumference of one foot, for the purpose of illustration. The blade or cutter 90 is removed from the roll 89 and mounted upon the roll 87. The circumference of the roll 89 is divided into three equal parts by cutting bars 99, and printing elements 47', corresponding to the printing element 47 are arranged in the spaces between these cutting bars 99. The printing elements have raised designs 100 and will print a plurality of designs upon the web 95, for each rotation of the roll 89, and the web will be severed, in part, on the lines 101. Since the blade 90 is transferred from the roll 89, the cam 97 is also omitted.

I also contemplate employing the cutting means, and tearing means, without the printing means.

It is to be understood that the forms of my invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the shape, size and arrangement of parts, may be resorted to, without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, what I claim is:

1. In a machine of the character described, a roll having a raised design and a compression roll arranged in close relation so that the web passed between them will be fed by contact with the same, a blade carried by one roll and extending longitudinally of the roll to cut the web and define the length of the cut web by a line of cutting, a gripper carried by one roll to engage with the web at a point behind the line of cutting and before the cutting action occurs, a conveyor having its take-up end arranged near the rolls to receive the web discharging from the rolls, and means disposed at a point spaced from the take-up end of the conveyor to engage with the leading web section and exert a pulling action thereon to separate the same from the next web section.

2. In a printing machine of the character described, a printing roll, a compression roll arranged in close relation to the printing roll so that a web passed between the rolls will be fed by contact with the same, a blade carried by one roll and extending longitudinally of such roll to press the web against the other roll and cut the web and thereby define the length of the cut web by a single line of cutting, and a resilient gripper carried by one roll to engage the web and press the same into contact with the companion roll, a conveyor having its take-up end arranged near the printing and compression rolls to receive the web therefrom, means to drive the conveyor faster than said rolls, and means to press the leading portion of the leading web section into engagement with the conveyor to travel with the conveyor at the same speed therewith, said means being spaced from the take-up end of the conveyor for a distance greater than the length of the web sections so that two web sections will contact with the conveyor before the leading web section is separated from the trailing web section.
3. In a printing machine of the character described, a printing roll, a companion compression roll, a substantially straight blade carried by the compression roll and extending longitudinally of such roll to cut the web upon the printing roll and thereby defining the length of the cut web by a single line of cutting, and a resilient gripper carried by the compression roll and adapted to extend radially beyond the cutter to press the web against the printing roll before the cutting action occurs, a conveyor to receive leading and trailing web sections thereon, and means to separate the leading web section from the trailing web section while the web sections are upon the conveyor.
4. In a printing machine of the character described, a printing roll, a companion compression roll, the web being fed between such rolls, a blade carried by one roll to at least partly cut the web against the other roll, means carried by one roll to grip the web against the other roll prior to the completion of the cutting operation, and means receiving the cut web from the rolls and after such reception pulling the same to separate the leading section.
5. In a printing machine of the character described, a printing roll, a companion compression roll, a blade carried by one roll to cut the web passing between the rolls, a gripper carried by one roll to engage the web, and web conveying means arranged beneath the rolls to receive the web passing from such rolls, said conveying means being adapted to first effect the longitudinal travel of the web from the rolls and subsequently exert a pull upon the leading cut section of the web to separate such section.
6. A printing machine of the character described, comprising a printing roll, a companion compression roll, the web being passed between the rolls and fed downwardly to contact therewith, a blade carried by one roll to cut the web, a conveyor arranged beneath the rolls at a point to receive thereon the downwardly feeding web, a guide roll arranged between the conveyor and one of the first named rolls, means spaced forwardly from the guide roll to hold the web to the conveyor so that it travels therewith at the same speed, the arrangement being such that the conveyor effects the longitudinal travel of the web from the rolls before the web holding

means separates the leading web section, means to drive the first named rolls, and means to drive the conveyor at a higher speed than the first named rolls.

7. In a printing machine of the character described, a printing roll, a companion compression roll, the web being passed between the rolls, a blade carried by the printing roll to cut the web, a yielding gripper carried by the printing roll, and means to receive the leading portion of the cut web from the rolls and to convey the same for a substantial distance from the rolls and subsequently exert a pull upon the leading portion to separate the same.

8. A printing machine of the character described, comprising a compression roll, a printing roll, the web being fed between the rolls, the circumference of the printing roll being different from and in a selected ratio with respect to the circumference of the compression roll, a blade carried by the printing roll and extending longitudinally of such roll, and a cutting bar carried by the compression roll to meet the blade.

9. In a printing machine of the character described, a compression roll, a printing roll, the printing roll having a circumference different from and in a selected ratio with the circumference of the compression roll, a blade carried by the printing roll and extending longitudinally of such roll, and a plurality of cutting bars carried by the compression roll, one of the cutting bars being arranged to meet the blade.

10. In a printing machine of the character described, a compression roll, a printing roll arranged for coaction with the compression roll, the printing roll being larger than the compression roll and having its circumference in a multiple of the circumference of the compression roll, a blade carried by the printing roll and extending longitudinally of such roll, and a cutting bar carried by the compression roll and extending longitudinally of such roll to meet the blade.

11. In a machine of the character described, a pair of coacting rolls to receive a web between them and feed the web, means to mark the web, a blade carried by one roll to partly sever the web, an endless traveling conveyor having its intake end arranged to receive the web from the rolls, means to drive the conveyor faster than the rolls, and means to press the leading end of the leading web section against the conveyor to cause it to travel therewith at the same speed.

12. In a machine of the character described, a compression roll of fixed diameter and having diametrically oppositely arranged cutting bars, a removable printing roll for coaction with the compression roll and having a larger diameter than the compression roll and having a circumference in a selected ratio with relation to the compression roll, a blade extending longitudinally of the printing roll and serving to meet one of the cutting bars when the printing roll has made a complete revolution, a gripper carried by the printing roll, means for feeding the web downwardly between the two rolls, and a device receiving the web passing downwardly from the two rolls and serving to convey the web from the rolls and then exert a pulling action upon the same to sever the leading cut section.

13. In a machine of the character described, a compression roll of fixed diameter having diametrically oppositely arranged cutting bars, a removable printing roll for coaction with the compression roll and having a larger diameter

than the compression roll and having a circumference in a selected ratio with relation to the circumference of the compression roll, a blade extending longitudinally of the printing roll and serving to meet one of the cutting bars when the printing roll has made a complete revolution, a gripper carried by one roll, an inking device to engage the printing surface of the printing roll, means to move the inking device from the printing surface as the blade approaches the inking device so that the blade will clear the inking device, means for feeding the web downwardly between the two rolls, and a device receiving the web passing downwardly from the two rolls and moving the web from the rolls and exerting a pulling action from the web to sever the leading cut section.

14. In a machine of the character described, a compression roll of given circumference, a printing roll of larger diameter than the compression roll and having its circumference in a selected ratio with respect to the circumference of the compression roll, cutting bars carried by the printing roll and dividing the circumference of the same into circumferential sections, each section having a length substantially equal to the length of the circumference of the compression roll, a blade carried by the compression roll and arranged to meet each succeeding cutting bar when the compression roll has made a complete revolution, a gripper carried by one roll, and a device to receive the web from the rolls and moving the web from the rolls and to exert a pulling action thereon to sever the leading cut section.

15. In a machine of the character described, a compression roll of given circumference, a printing roll of larger diameter than the compression roll and having its circumference in a selected ratio with respect to the circumference of the compression roll, cutting bars carried by the printing roll and extending longitudinally thereof and dividing the circumference of the same into circumferential sections, each section having a length substantially equal to the length of the circumference of the compression roll, a blade carried by the compression roll and extending longitudinally thereof and arranged to meet each succeeding cutting bar when the compression roll has made a complete revolution, and a gripper carried by the compression roll and arranged near the cutter to engage the web.

16. A printing machine, comprising a printing a printing roll, a companion compression roll, the web being fed between the rolls, a blade carried by one roll and extending longitudinally of the same to transversely cut at least in part the web for producing a web section of selected length, an endless conveyor receiving the web from the rolls and having a length greater than the length of the cut web section, means to rotate the rolls, means to drive the endless conveyor faster than the rotation of the rolls, and a tension roll arranged near the discharge end of the endless conveyor to grip the leading end of the cut web section to the endless conveyor, the arrangement being such that the cut web section and the leading end of the web engage and travel with the endless conveyor before the tension roll grips the web section to the endless conveyor.

17. In a machine for marking and cutting a web into web sections, companion opposed rolls, the web being fed between the rolls, means to mark a design upon the web sections, a blade carried by one roll to cut at least in part the web for producing web sections of a selected length, an endless conveyor receiving the web from the rolls and having a length greater than the length of the cut web section, means to rotate the rolls, means to drive the endless conveyor faster than the rotation of the rolls, and a tension device to grip the leading end of the leading cut web section to the endless conveyor, the tension device being spaced from the take-up end of the conveyor for a greater distance than the length of the leading cut web section, the arrangement being such that the leading web section and the trailing web section are arranged upon the endless conveyor subsequently to which the leading web section is separated from the trailing web section.

18. In a machine for marking and cutting a web into web sections, companion opposed rolls, the web being fed between the rolls, means to mark the web sections, a blade carried by one roll to at least partly cut the web against the other roll, means carried by one roll to grip the web against the other roll prior to the completion of the cutting operation, and means receiving the cut web from the rolls and after such reception pulling the same to separate the leading web section.

HERBERT W. BEALL.