Feb. 27, 1934. A. BROADMEYER 1,949,238

APPARATUS FOR OPERATING ON WOUND WEBS

Filed July 29, 1930 5 Sheets-Sheet 1

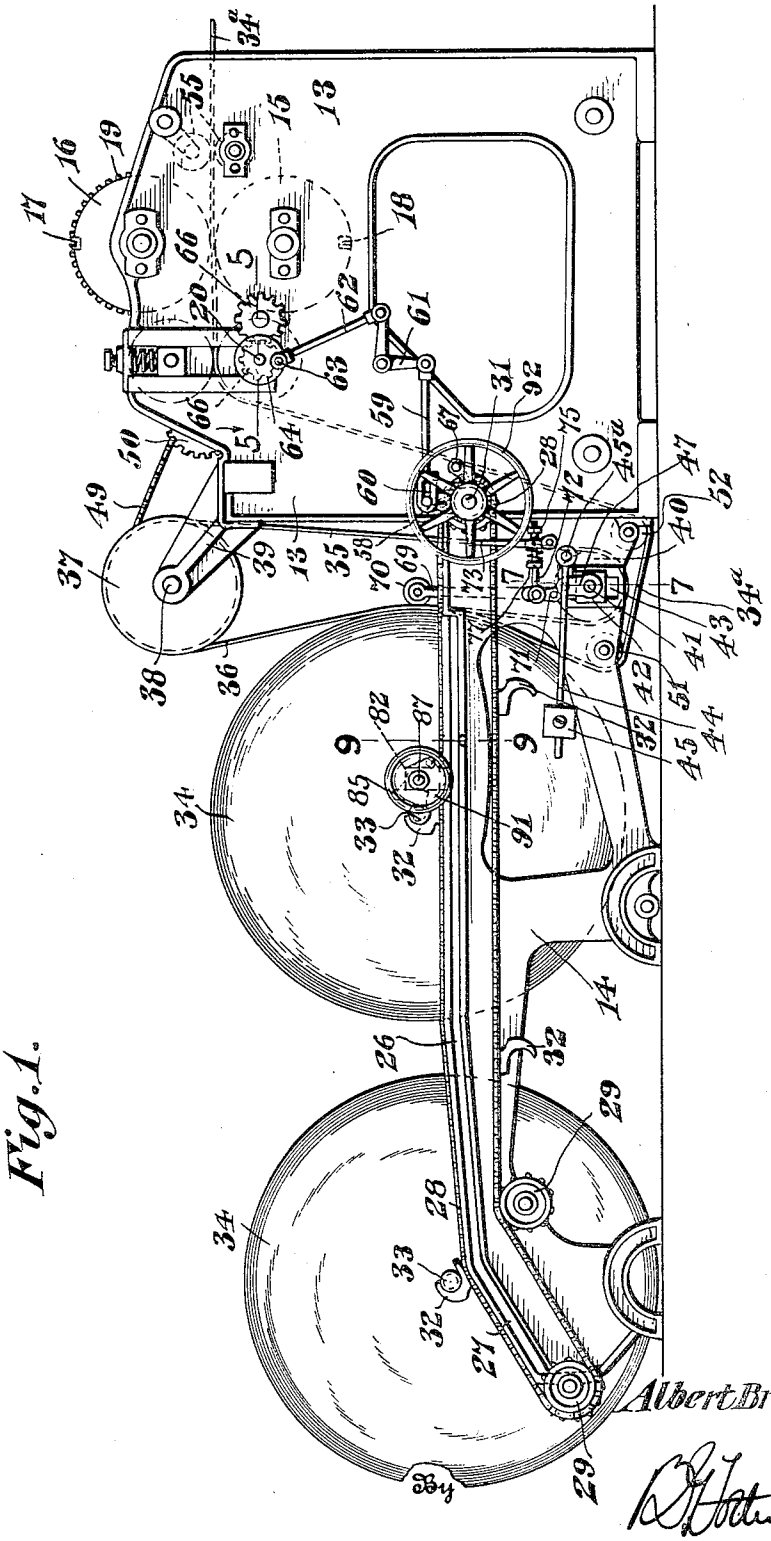


Fig. 1.

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APPARATUS FOR OPERATING ON WOUND WEBS

Filed July 29, 1930 5 Sheets-Sheet 2

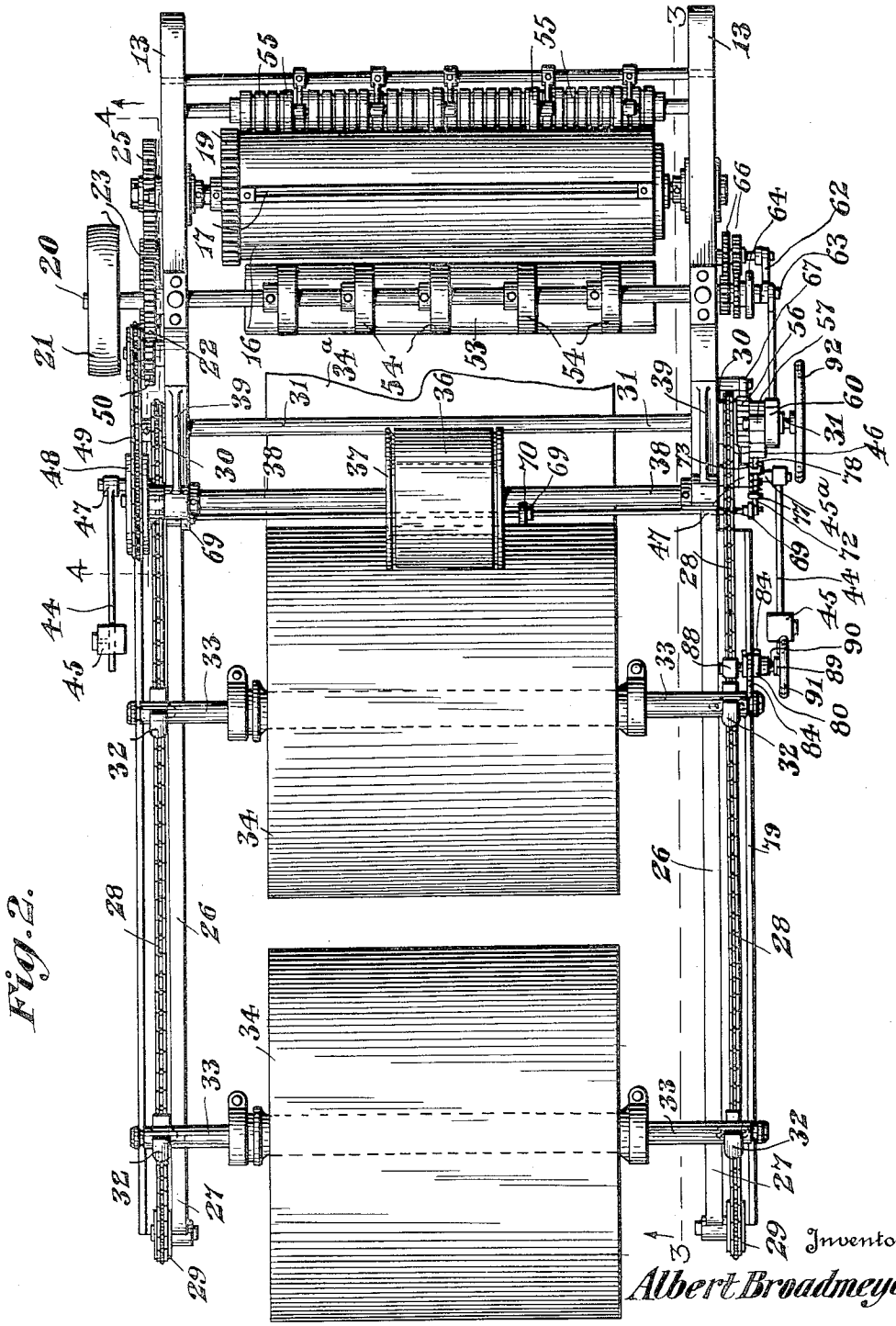


Fig. 2.

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APPARATUS FOR OPERATING ON WOUND WEBS

Filed July 29, 1930 5 Sheets-Sheet 3

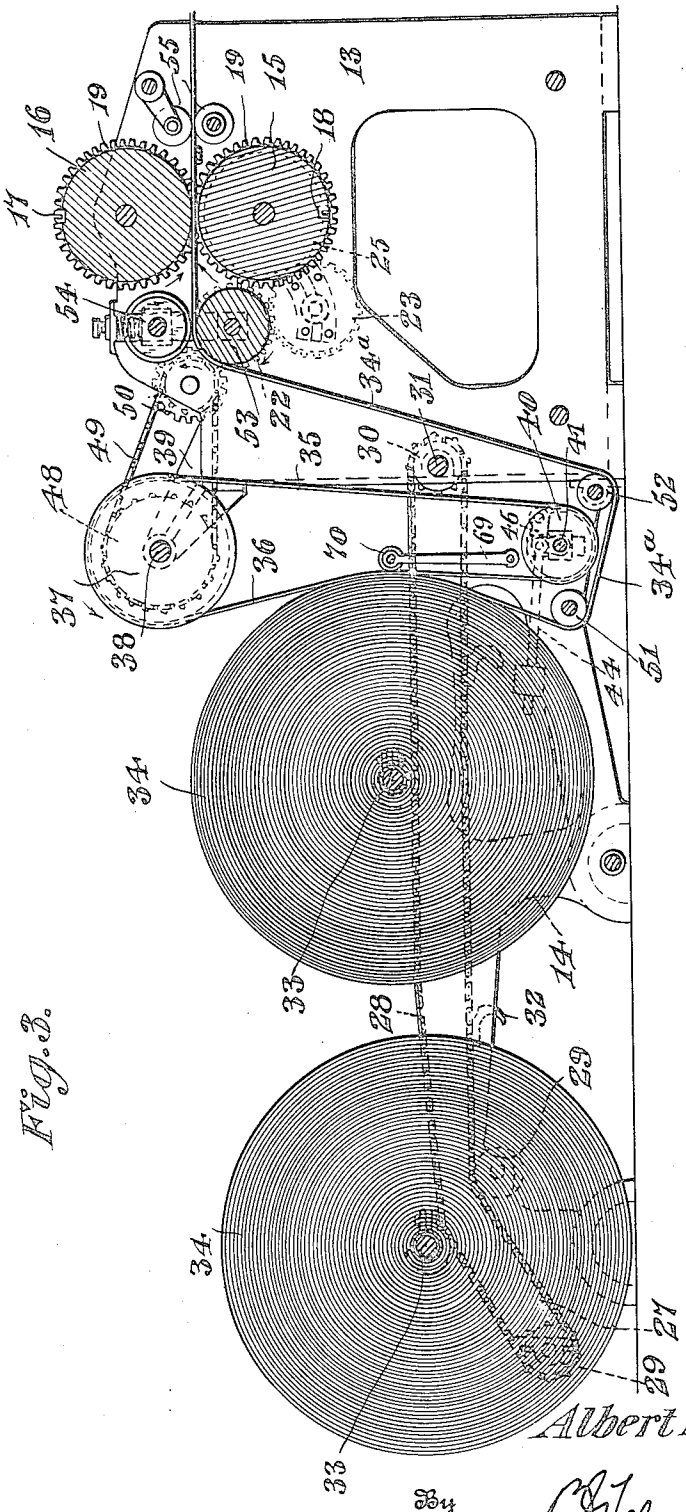


Fig. 3.

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APPARATUS FOR OPERATING ON WOUND WEBS

Filed July 29, 1930 5 Sheets-Sheet 4

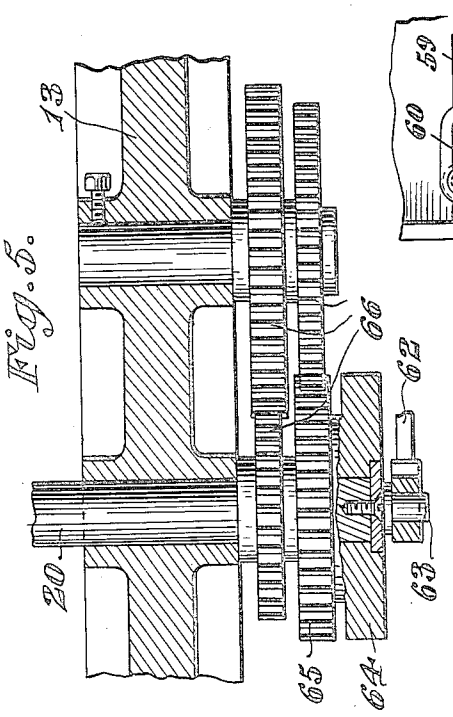


Fig. 5.

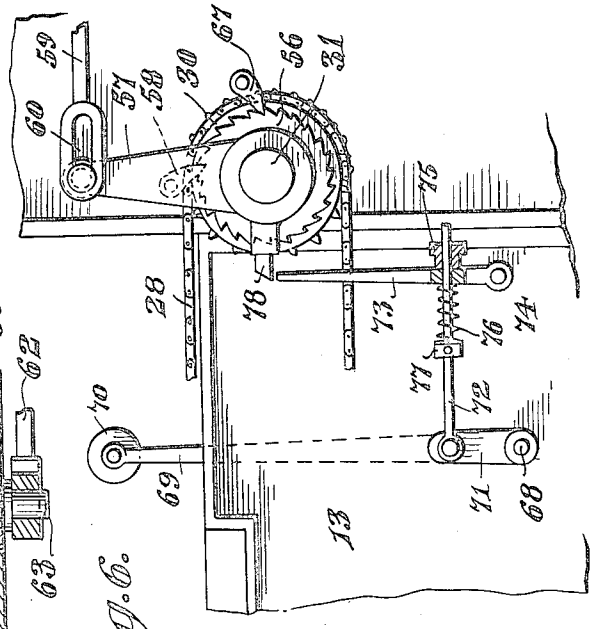


Fig. 6.

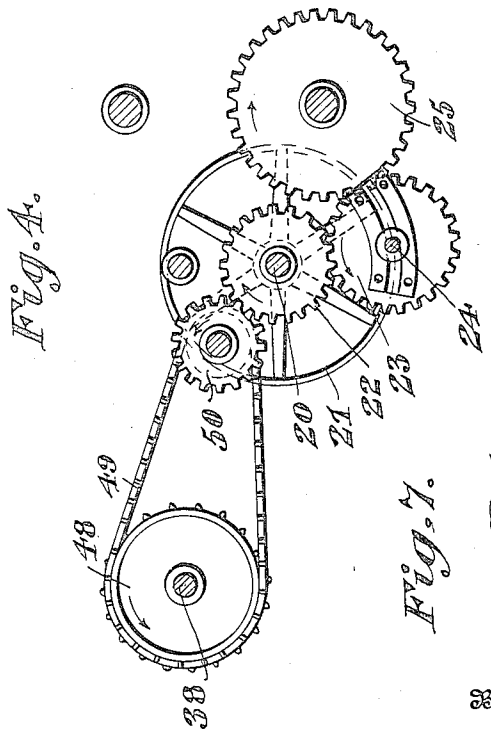


Fig. 4.

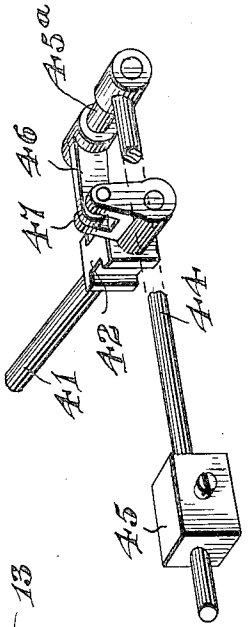


Fig. 8.

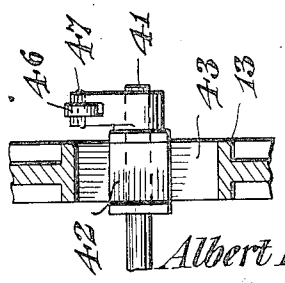


Fig. 7.

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APPARATUS FOR OPERATING ON WOUND WEBS

Filed July 29, 1930 5 Sheets-Sheet 5

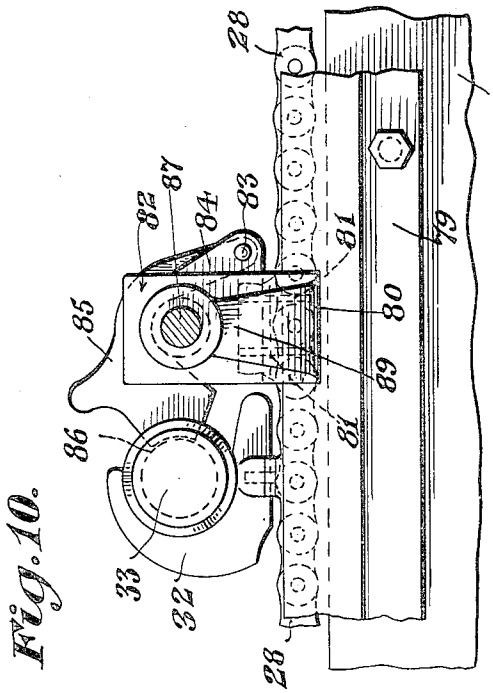


Fig. 10.

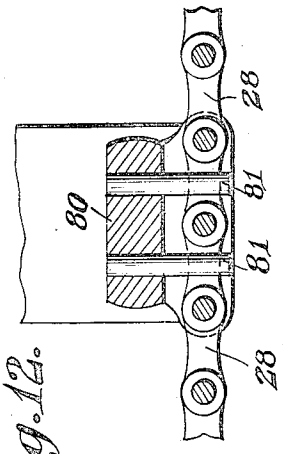


Fig. 12.

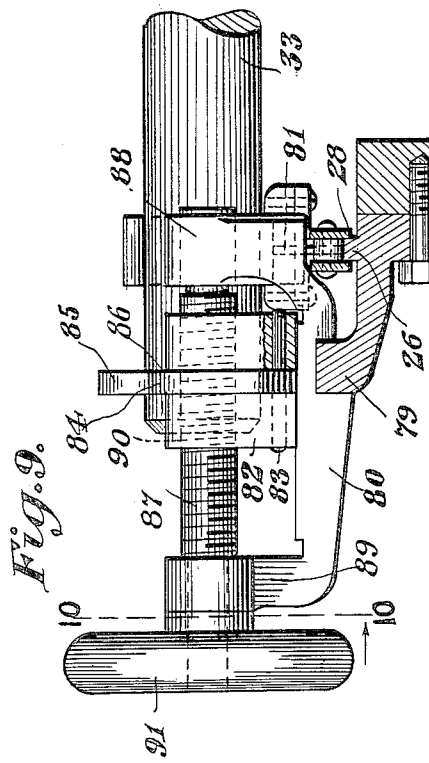


Fig. 9.

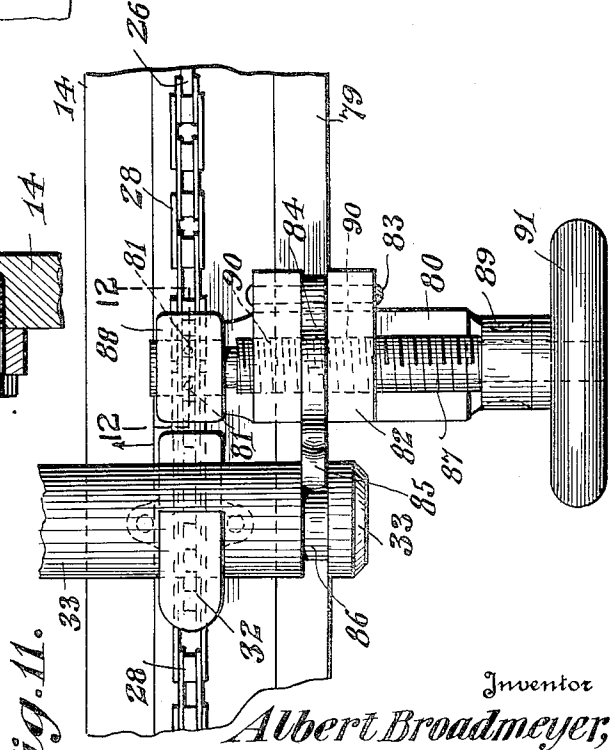


Fig. 11.

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UNITED STATES PATENT OFFICE

1,949,238

APPARATUS FOR OPERATING ON WOUND WEBS

Albert Broadmeyer, Harrisburg, Pa., assignor to W. O. Hickok Manufacturing Company, Harrisburg, Pa., a corporation of Pennsylvania

Application July 29, 1930. Serial No. 471,519

16 Claims. (Cl. 242—58)

In the operation of apparatus in whch wound webs or continuous sheets of paper or like material are used, it is the common arrangement to unwind the roll by drawing upon the web or sheet. This obviously puts a strain on the web, resulting at times in it becoming torn. Moreover where the roll is relatively large and heavy there is a tendency for it to overrun and cause a slack in the unwound web.

One of the objects of the present invention is to provide in a sheet delivering or feeding mechanism a novel and practicable means for unwinding the sheet or web from a roll without the necessity of imparting undue strain upon such sheet or web, the unwinding mechanism always maintaining the same surface speed on the roll, irrespective of the diameter of the same, so that a constant even delivery is maintained, irrespective of the diameter of the roll or its variation due to the removal of the web.

A further and important object is to provide means by which the proper contact between the unwinding apparatus and the roll is maintained irrespective of the variation in diameter—a mechanism which may be employed either in unwinding or winding apparatus.

A still further and important object is to provide in connection with sheet severing mechanism, roll unwinding means that will remove the web from the roll in properly timed relation to the severing mechanism, irrespective of the decreasing diameter of the roll.

Another and important object is to provide means by which successive rolls are being brought into position while one is being unwound so that when a web has been exhausted, another roll is substantially in position to be started.

A still further object is to provide means by which the roll can be properly centered or positioned with respect to the web removing and severing or other mechanism that operates thereon.

In the accompanying drawings:

Figure 1 is a side elevation of one embodiment of the invention.

Figure 2 is a plan view of the same.

Figure 3 is a vertical longitudinal sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a vertical sectional view on the line 4—4 of Figure 2 and showing the drive gearing for the cutter roll and the roll unwinding means.

Figure 5 is a sectional view on the line 5—5 of Figure 1 and showing the driving gear for the ratchet mechanism that advances the roll.

Figure 6 is a detail view in elevation of the ratchet mechanism and its controlling means.

Figure 7 is a detail sectional view on the line 7—7 of Figure 1, and showing the tensioning means for the unwinding belt.

Figure 8 is a perspective view of such tensioning means.

Figure 9 is a cross sectional view on the line 9—9 of Figure 1 and illustrating one of the roll supports and carriers with the means for shifting the roll longitudinally.

Figure 10 is a sectional view on the line 10—10 of Figure 9.

Figure 11 is a plan view.

Figure 12 is a detail sectional view on the line 12—12 of Figure 11.

The disclosure shows an apparatus for cutting sheets from a continuous web of paper and intended for feeding them to a ruling machine, or other apparatus that operates on the cut sheets. A suitable frame is employed, involving side members consisting of main portions 13 having elongated extensions 14 of less height than said main portions. In the main portions or bodies 13 of the side frames are journaled a pair of coacting web severing rolls 15 and 16 that may be of any well-known construction. For example, one of these rolls may be provided with a cutting knife 17, the other having a slotted member 18 to receive the cutting knife as the rolls are rotated.

These rolls, as usual, are geared together, as illustrated at 19, so that they operate in timed relation. A driving shaft 20 extends across the main portion of the frame and is provided with a suitable driving pulley 21. This shaft carries a main driving gear 22, with which meshes a gear 23 having an adjustable mounting 24 (see Figure 4). A removable gear 25 on the lower cutter roll, meshes with the gear 23. The cutting rolls are thus driven from the shaft 20, and it will be evident that by using gears 25 of different diameters, the cutting rolls may be driven at different speeds. In other words, the gears 22, 23 and 25 constitute a well-known form of change speed gearing.

The portions 14 of the side frames have formed on their upper edges, tracks 26, the outer portions of which incline downwardly, as shown at 27. On these tracks ride the upper stretches of endless draft cables 28 that are in the form of sprocket chains. These chains pass around idler sprocket wheels 29 mounted on the frame extensions 14 and around drive sprocket wheels 30 mounted on a shaft 31 that is located at the juncture of the portions 13 and 14 of the frame. These sprocket chains 28 have mounted thereon carrier hooks 32 adapted to engage the spindles or supporting rods 33 of the rolls 34 that are to be unwound.

Mounted between the side members of the frame is a roll unwinding device in the form of an endless belt 35 having a downwardly moving advance stretch 36 that is located and operates between the rear ends of the tracks 26. This belt passes over an upper drive pulley 37 mounted

on a shaft 38 that is journaled in brackets 39 carried by the portions 13 of the frame. The belt also passes around a lower pulley 40 mounted on a shaft 41 that is vertically movable. To this end the shaft 41 is carried in boxes 42 slidable in vertical guideways 43 formed in the side members of the frame. As shown in detail in Figure 8, the shaft 41 is urged downwardly by means of an arm 44 having an adjustable weight 45 mounted thereon. This arm 44 is carried by a rock shaft 45*a* carrying a crank arm 46 engaged with a bracket 47 mounted on the end of the shaft 41. It will be understood that a tensioning device of this kind is located at each end of the shaft 41, and by reason of the weights 45, the belt 35—36 is placed under tension but can yield. The shaft 38 carrying the drive pulley 37 for said belt 35—36 is provided at its rear end with a sprocket wheel 48 engaged by an endless sprocket chain 49 that is driven from an idler gear 50 in mesh with the drive gear 22 on the main drive shaft 20.

A roll 34 of paper or other continuous web to be unwound, is caused to be brought into contact with the downwardly moving stretch 36 of the belt 35, and is thereby frictionally rotated in a direction to unwind the web. This web 34*a*, as shown particularly in Figure 3, is caused to pass downwardly under the pulley 40 for the belt 35—36, and is directed thereunder by guide rollers 51 and 52. Thence it is brought upwardly in rear of the belt 35—36 and is passed between pressure rolls 53 and 54 to the web severing rolls 15 and 16. Here it is cut into separate sheets by the knife 17, and these sheets are fed on to other instrumentalities by any suitable means, preferably carrier rolls 55.

Obviously it is necessary to maintain proper contact between the periphery of the roll 34 being unwound and the stretch 36 of the belt so as to secure the unwinding operation, and yet it is also essential that too much pressure be not brought between these parts. Mechanism is therefore provided for advancing the roll as its diameter decreases and maintaining the proper contact.

To this end the mechanism shown in Figure 1 and in detail in Figure 6 is employed. The draft cables or chains 28, as already stated, pass around the sprocket wheels 30 fixed to the shaft 31, and this shaft 31 is provided at one end with a ratchet wheel 56. A pawl carrier 57, journaled on the end of the shaft 31, is provided with a pawl 58 that engages the teeth of the ratchet wheel 56 to effect its rotation. The pawl carrier 57 is oscillated through the medium of a reciprocatory link 59 having a loose play connection 60 with the free end of said carrier. This link 59, as shown in Figure 1, is also connected to one arm of a bell crank 61, and the other arm of the bell crank is connected to a link 62 engaged with a crank pin 63 on a crank wheel 64. The crank wheel 64 is journaled on one end of the main drive shaft 20, (see Figure 5), and carries a gear wheel 65 driven from said shaft 20 through a train of gears 66. The pawl carrier 57 is so weighted that its tendency is to gravitate to the left, so that the pawl 58 will ride over one or more of the ratchet teeth of the wheel 56, and this movement is permitted by the reciprocation of the link 59. As said link moves to the right, if the pawl carrier has swung a sufficient distance to the left, it will be evident that it will then pull the carrier to the right causing the pawl 58 to move in a corresponding direction. The pawl 58, engaged behind one of the teeth of the wheel 56, will turn said wheel, and thereby operate the cables to draw the roll up against the stretch 36 of the belt 35. Any retrograde movement of the ratchet wheel is prevented by a holding pawl 67.

A constant feed of this kind would ordinarily be too great, and therefore means are provided for controlling the movement of the ratchet mechanism in accordance with the varying diameter of the roll as the web is unwound therefrom. A rock shaft 68 is journaled in the frame and carries at one end an upstanding governor arm 69 having a roller 70 journaled thereon, this roller bearing against the periphery of the roll 34 alongside the stretch 36 of the belt 35 (see Figure 2). At one end the rock shaft 68 is provided with a crank arm 71 to which is pivoted a link 72 that is connected to an upstanding detent 73 pivoted at its lower end, as shown at 74. A nut 75, threaded on the link 72, bears against the rear side of the detent 73, while its front side is borne against by a spring 76, backed by a collar 77 on the link 72. The upper end of this detent is adapted to move into and out of a position beneath a stop dog 78 mounted on the hub of the pawl carrier 57. When the roll 34 is in proper contact with the stretch 36 of the unwinding belt, the lever 57 has been pushed rearwardly a sufficient distance to cause the detent 73 to be beneath the holding dog 78. Obviously therefore the pawl carrier 57 cannot gravitate to the left and the pawl 58 will not ride over any of the teeth of the ratchet wheel. Consequently the draft cables 28 will be idle, and the roll support will maintain its fixed position. As the web is unwound however, and the diameter of the roll decreases, the roller 70 on the lever 69 will permit said lever to gradually swing to the left, and as the rock shaft 68 turns, the link 72 will move in a corresponding direction until the detent 73 is out of the path of the dog 78. When this occurs, the pawl carrier 57 can swing sufficiently to allow the pawl 58 to ride over the teeth of the ratchet wheel until the link 59 moves to the right and pulls the pawl backwardly, thereby turning the shaft 31 and again advancing the roll. This operation continues until the proper maximum contact pressure is obtained and the governor lever or arm 69 is swung to the right so that the detent is again in position to hold the pawl carrier against movement.

It is very desirable that the roll being unwound, should be properly centered or positioned, so that the web will pass through the mechanism in correct relation to the parts that operate on it. For this purpose, means are provided for shifting the roll longitudinally of its axis.

This means is shown in detail in Figures 9—12 inclusive. On the outer side of one of the tracks 26 is a longitudinally disposed rail 79, and slidably mounted on this rail is a transversely disposed and removable bracket 80 having a pair of depending pins 81 that pass downwardly into the links of the sprocket chain 28. Slidable on this bracket, transversely of the tracks 26 and 79, and consequently longitudinally of the roll, is a carriage 82 having pivoted thereon, as shown at 83, a dog 84 provided with a tongue 85 adapted to engage in an annular groove 86 formed in the end of the roll supporting spindle 33. An adjusting screw 87, journaled in upstanding ears 88 and 89 of the bracket 80, has a threaded engagement 90 with the carriage 83. A hand wheel 91 is fixed to the outer end of the screw. It will

be evident therefore that if this bracket is mounted on the rail 79 and chain 28 alongside the spindle 33 of the roll being unwound, and the dog 84 is engaged in the groove 86 of said spindle, while rotating the screw 87, the spindle and therefore the roll supported on it can be shifted longitudinally, so that the roll can be desirably positioned. Moreover there is no cramping action by reason of the pressure, or by reason of the advancement of the roll as it is unwound because there is a double bearing, one, of the dog 84 against the spindle 33, and the other, of the pins 81 in the sprocket chain 28.

The operation of the apparatus generally considered, is as follows: For example, a roll of paper 34, to be unwound, is rolled between the portions 14 of the side frame until its spindle 33 overlies the downwardly inclined portions 27 of the tracks.

The sprocket chains 28 are then moved until a pair of carrier hooks 32 are engaged with the ends of said spindle. This movement of the chains can be accomplished by any means, but in the present embodiment, a hand wheel 92 is preferably mounted on the shaft 31 and constitutes a convenient means for manually moving the chains. This movement of the chains is continued and the roll of paper is carried forwardly until its periphery is brought into contact with the unwinding stretch 36 of the belt 35. The web of paper is then fed around the guide rollers 51 and 52 and between the rollers 53 and 54, the severing rolls 15 and 16 and the offtake rolls 55. If now the mechanism is put into operation, it will be evident that the roll will be unwound by the downwardly moving stretch 36 of the belt 35, and the web as it is taken off, is removed by the rolls 53 and 54 and delivered to the cutting rolls 15 and 16, where it is severed into sheets. The parts are of course driven in timed relation, so that the web is delivered always at the proper speed to cut a sheet of predetermined length. If the length of this sheet is to be varied, it is only necessary to change the diameter of the gear 25 (see Figure 4), to increase or decrease the speed of the cutting rolls, it being understood that the web can pass through said roll freely. Moreover the operation of unwinding is in no manner disturbed by the reduction of the diameter of the roll because the surface speed of the roll increases under the driving action of the belt as the diameter decreases. The delivery of the web therefore remains constant. As already explained, whenever the diameter decreases to a certain degree when the minimum amount of frictional contact between the driving belt and the roll occurs, the governor arm or lever 69 is so adjusted that it will permit the ratchet mechanism to operate and again advance the roll. This driving contact with the roll is furthermore accommodated by the tensioning means of Figure 8, which allows the stretch 36 to "bow" more or less when the roll is brought up to it. And not only is there a positive drive in the unwinding operation, but this frictional contact of the driving belt with the periphery of the roll acts as a brake to prevent the roll obtaining a speed or momentum that will run it faster so as to cause slack in the web.

While one roll is thus being unwound, another roll can be brought over the declined portions 27 of the tracks and will be engaged by the next series of carrier hooks 32, as shown in Figure 1. Consequently by the time one roll has been exhausted, another roll is substantially in position for operation. Therefore much loss of time is prevented, an important factor in high speed machines. Obviously when a second roll is thus brought into position, the shifting device of Figures 9—12 inclusive can be readily removed along with the empty spindle 33 and the shifting device applied to the next roll.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:

1. In apparatus for varying the diameter of a wound body of material, the combination with means for rotatably mounting said body, of means that operates on the surface of the body to rotate it, and mechanism governed by the variation in the diameter of the body for permitting the relative movement of the mounting means and rotating means to maintain contact between the latter and the body as the diameter of the body varies, said mechanism including a governing device that engages the surface of the body and is moved as the diameter of the body varies.

2. In apparatus for varying the diameter of a wound body of material, the combination with an endless belt forming a stretch that engages a roll to unwind it, of means for rotatably supporting the roll to be unwound, and means including a controlling device that operates against the periphery of the body and moves as the diameter of the body changes, for advancing the roll support toward the belt to maintain contact of the periphery of the roll with the same and effect the unwinding operation as the diameter of the roll decreases.

3. In apparatus for varying the diameter of a wound body of material, the combination with means for rotatably supporting a body of wound material, of means that engages the body to rotate it, and means for varying the distance between the rotatable support and the rotating means to accommodate the changing diameter of the body, said latter means including a governing device that bears against the body and is moved as its diameter varies.

4. In apparatus for varying the diameter of a wound body of material, the combination with means for rotatably supporting a body of wound material, of means that engages the body to rotate it and a pawl and ratchet mechanism that operates on one of said means to vary the distance between the two means in order to accommodate the changing diameter of the body, said mechanism including a ratchet controlling means and a governor therefor that bears against the body and is moved by the same as its diameter varies.

5. In apparatus for varying the diameter of a wound body of material, the combination with a device for rotating a wound roll of material, of a carrier for the roll movable toward said device to cause the periphery of the roll to contact with said device, a mechanism for advancing the roll carrier, and means for controlling the operation of the advancing carrier including a device that bears against the periphery of the roll and is moved thereby.

6. In apparatus for varying the diameter of a wound body of material, the combination with a device for rotating a wound roll of material, of a carrier for the roll movable toward said device

to cause the periphery of the roll to contact with said device, a pawl and ratchet mechanism for advancing the roll carrier, a detent for controlling the operation of the pawl and ratchet mechanism, and an operating device for the detent that bears against the periphery of the roll and is moved on the variation in the diameter of the roll.

7. In apparatus for varying the diameter of a wound body of material, the combination with a device for rotating a wound roll of material, of a carrier for the roll movable toward said device to cause the periphery of the roll to contact with said device, a pawl and ratchet mechanism for advancing the roll carrier, a detent for controlling the operation of the pawl and ratchet mechanism, and an operating device for the detent that bears against the periphery of the roll and is moved in one direction by the movement of the roll and roll carrier with respect to the rotating means and is moved in the other direction as the diameter of the roll varies.

8. In apparatus for varying the diameter of a wound body of material, the combination with a roll unwinding device, of a roll carrier movable toward the unwinding device to cause the periphery of the roll to be engaged by the device and unwound thereby, a ratchet mechanism for causing the same to be advanced toward the unwinding device, and means for governing the operation of the ratchet mechanism including a device that bears against the periphery of the roll and moves as the position of said periphery varies with respect to the unwinding device.

9. In apparatus for varying the diameter of a wound body of material, the combination with an endless belt for unwinding a roll by engaging its periphery, of a pair of tracks leading to said belt, draft carrier cables that operate along the tracks and have roll-spindle engaging members to carry a roll into operative engagement with the belt, a pawl and ratchet mechanism for operating the cables, a detent for holding the pawl and ratchet mechanism inoperative, and a governing device connected to the detent and located in the path of the roll carried by the draft cables.

10. In apparatus for varying the diameter of a wound body of material, the combination with web-severing rolls, of a movable carrier for a wound roll of web to be severed, an endless belt that engages the periphery of the roll to rotate it, means for directing the web from the roll to the severing rolls, mechanism controlled by the varying diameter of the roll for moving the carrier toward the belt to maintain driving engagement between the roll and belt as the diameter of the roll decreases, and means engaged by the periphery of the roll for governing its advancing movement.

11. In apparatus for varying the diameter of a wound body of material, the combination with mechanism for operating on a web, of a movable carrier spindle for a wound roll of such web, means that engages the roll to unwind the web therefrom for operation on by the said mechanism, mechanism for advancing the roll toward the unwinding means as the diameter of the roll decreases, including a sprocket chain, a bracket carried by the sprocket chain adjacent the spindle, a carriage mounted on the bracket and movable longitudinally of the spindle, and a pawl mounted on the carriage and detachably engaging the spindle to cause its movement and the movement of the roll longitudinally of the axis of the latter.

12. In apparatus for varying the diameter of a wound body of material, the combination with a device for operating on the periphery of such body to rotate the same, of a carrier for the body, said device and carrier being relatively movable one toward the other to maintain contact between the body and said body rotating device, means for effecting said relative movement, and mechanism governed by the variation in diameter of the body for throwing said means into and out of operation in order to maintain proper contact between the body and the rotating device.

13. In apparatus for varying the diameter of a wound body of material, the combination with a device for operating on the periphery of such body to rotate the same, of a carrier for the body, said device and carrier being relatively movable one toward the other to maintain contact between the body and said body rotating device, intermittently operable means for effecting said relative movement, a device for governing the operation of said means, and actuating mechanism for the governing device that bears against the periphery of the wound body and moves as its diameter varies, said mechanism when it moves, actuating the governing device to cause the moving means to be operated.

14. In apparatus for varying the diameter of a wound body of material, the combination with spaced tracks having roll-directing means, of endless flexible members operating along the tracks past the roll-directing means, roll carrying devices on the members movable therewith, a roll rotating device located between the tracks and flexible members and in the path of a roll carried thereby, and means for automatically effecting the movement of the flexible members in one direction to cause the roll to maintain contact with the roll rotating device until exhausted and then permit the roll-carrying devices to continue to the roll-directing means for replacement.

15. In apparatus for varying the diameter of a wound body of material, the combination with spaced tracks, of endless flexible members operating along the tracks, roll carrying devices on the members movable therewith, a roll rotating device located between the tracks and flexible members and in the path of a roll carried thereby, and means for effecting an automatic intermittent advance of the endless members to maintain contact of the roll and device as the diameter of the roll decreases.

16. In apparatus for varying the diameter of a wound body of material, the combination with spaced tracks, of endless flexible members operating along the tracks, roll carrying devices on the members movable therewith, a roll rotating device located between the tracks and flexible members and in the path of a roll carried thereby, normally inactive means for operating the endless members, and mechanism for throwing said means into operation including a governing device that engages the periphery of the roll and is moved as the diameter of said roll decreases.

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