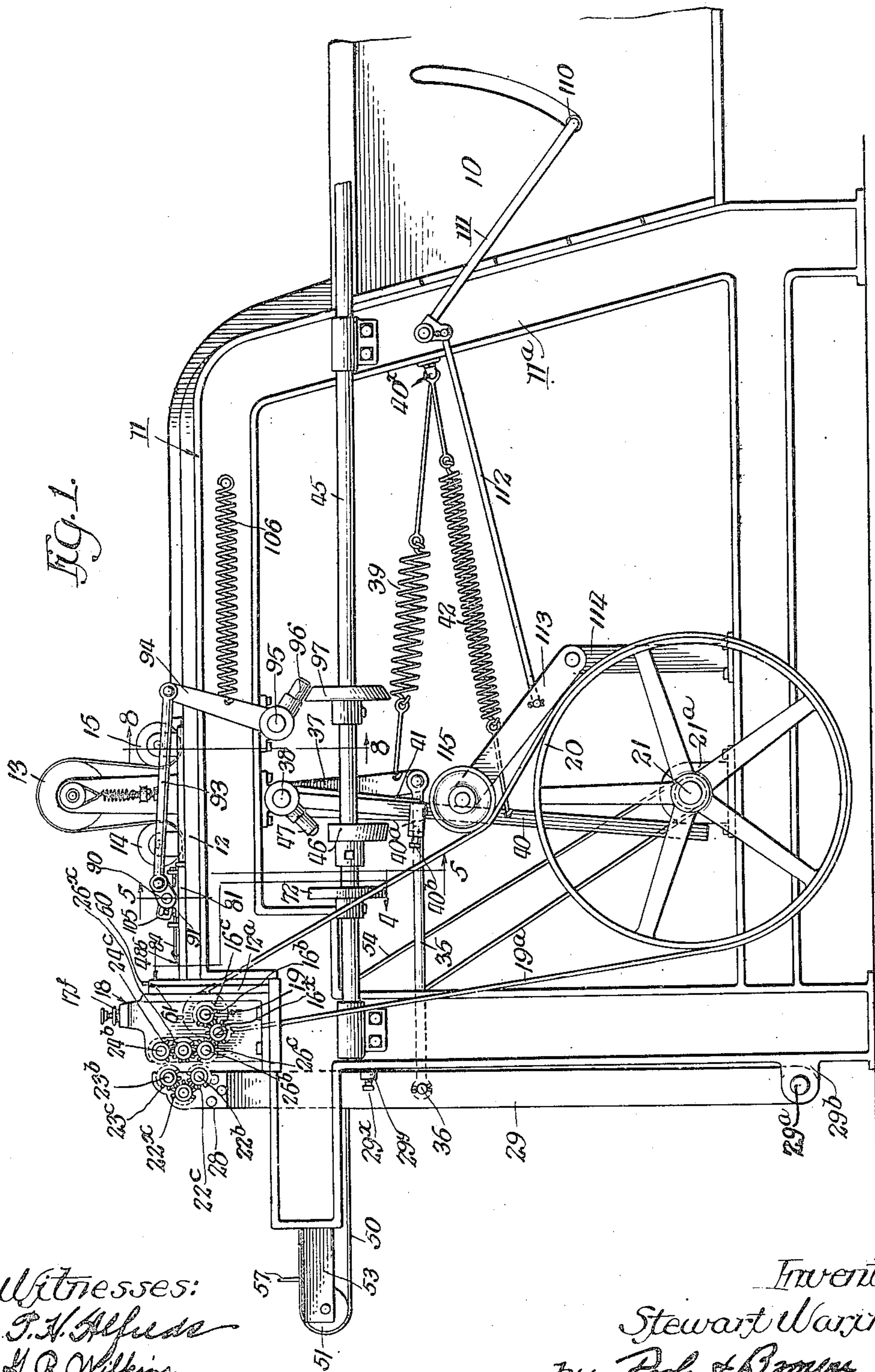


S. WARING.
PAPER WINDING MACHINE.
APPLICATION FILED MAR. 20, 1911.

Patented Aug. 1, 1911.

4 SHEETS—SHEET 1.

999,352.



Witnesses:
P. H. Alfens
H. R. Wilkins

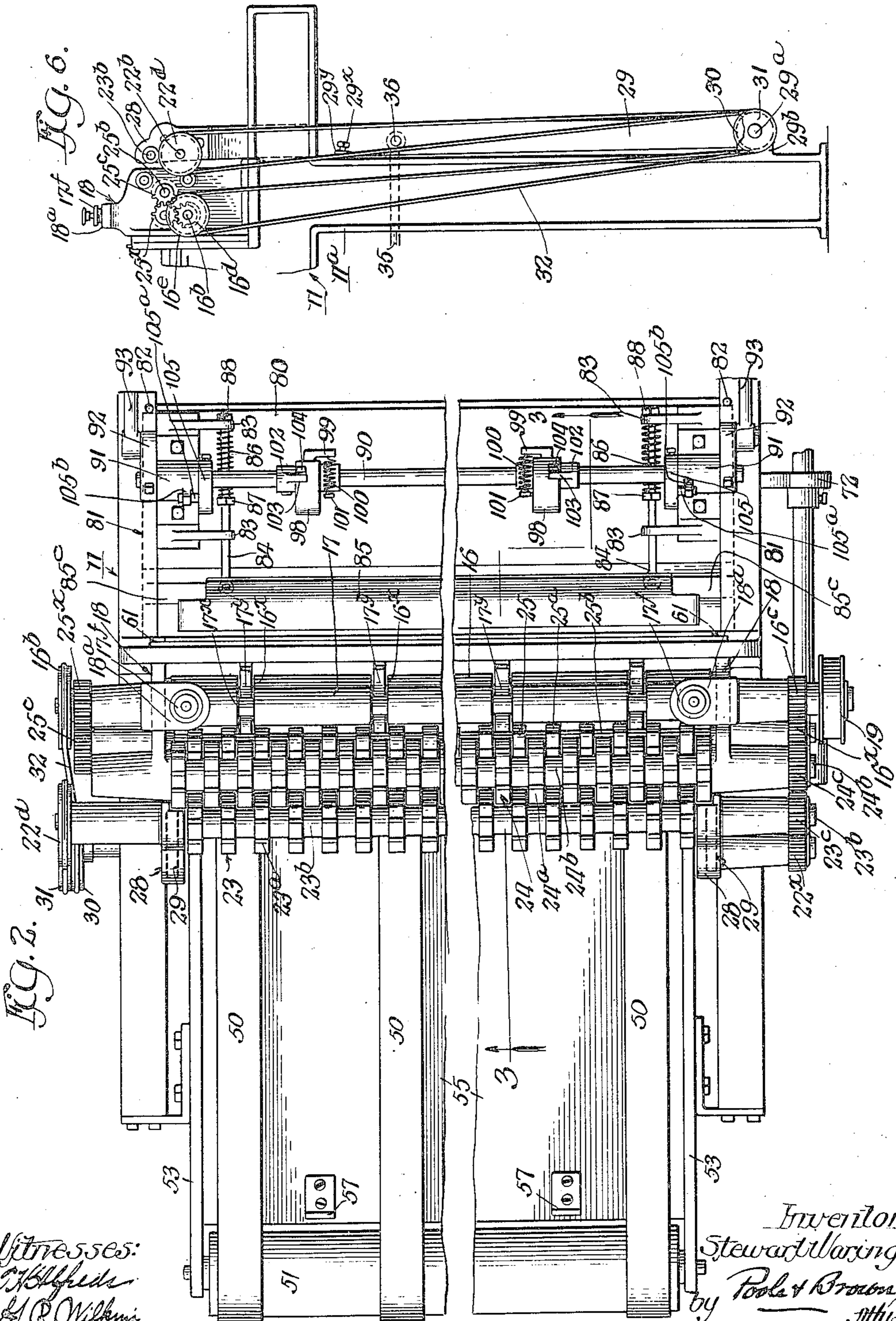
Inventor:
Stewart Waring
by Pool & Brown Attys

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4 SHEETS—SHEET 2.



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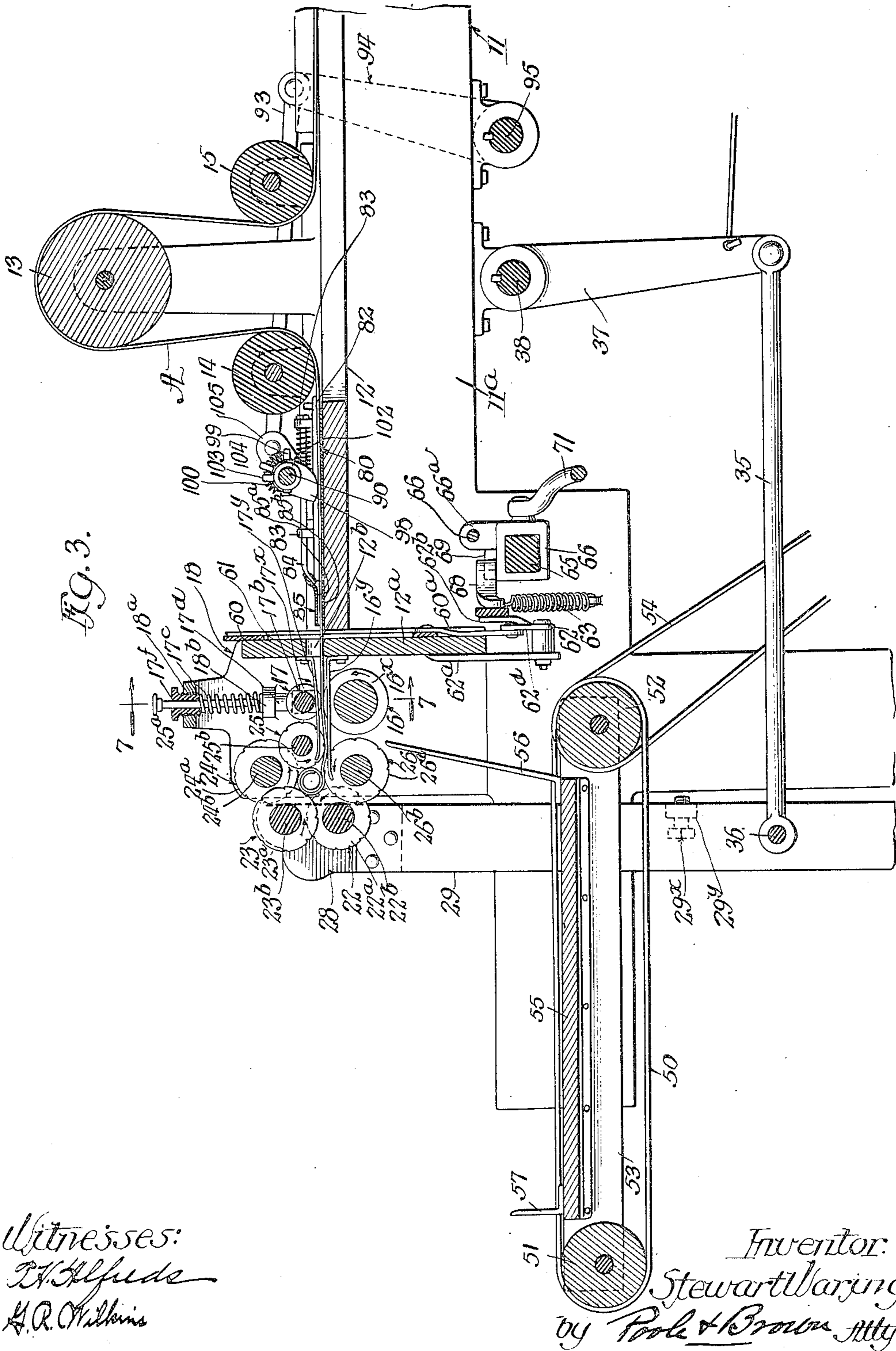
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4 SHEETS—SHEET 3.

999,352.



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4 SHEETS—SHEET 4.

Fig. 4.

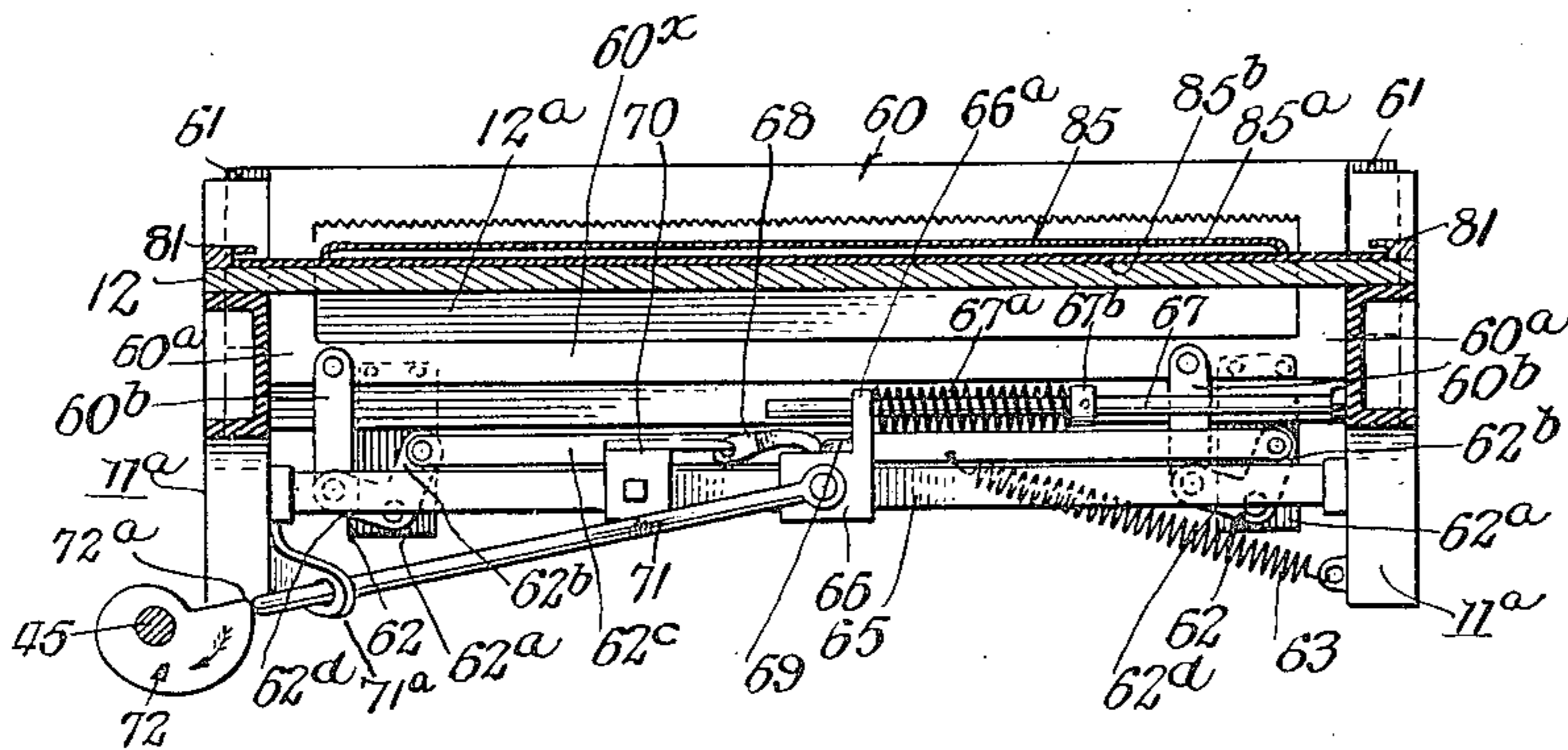


Fig. 5.

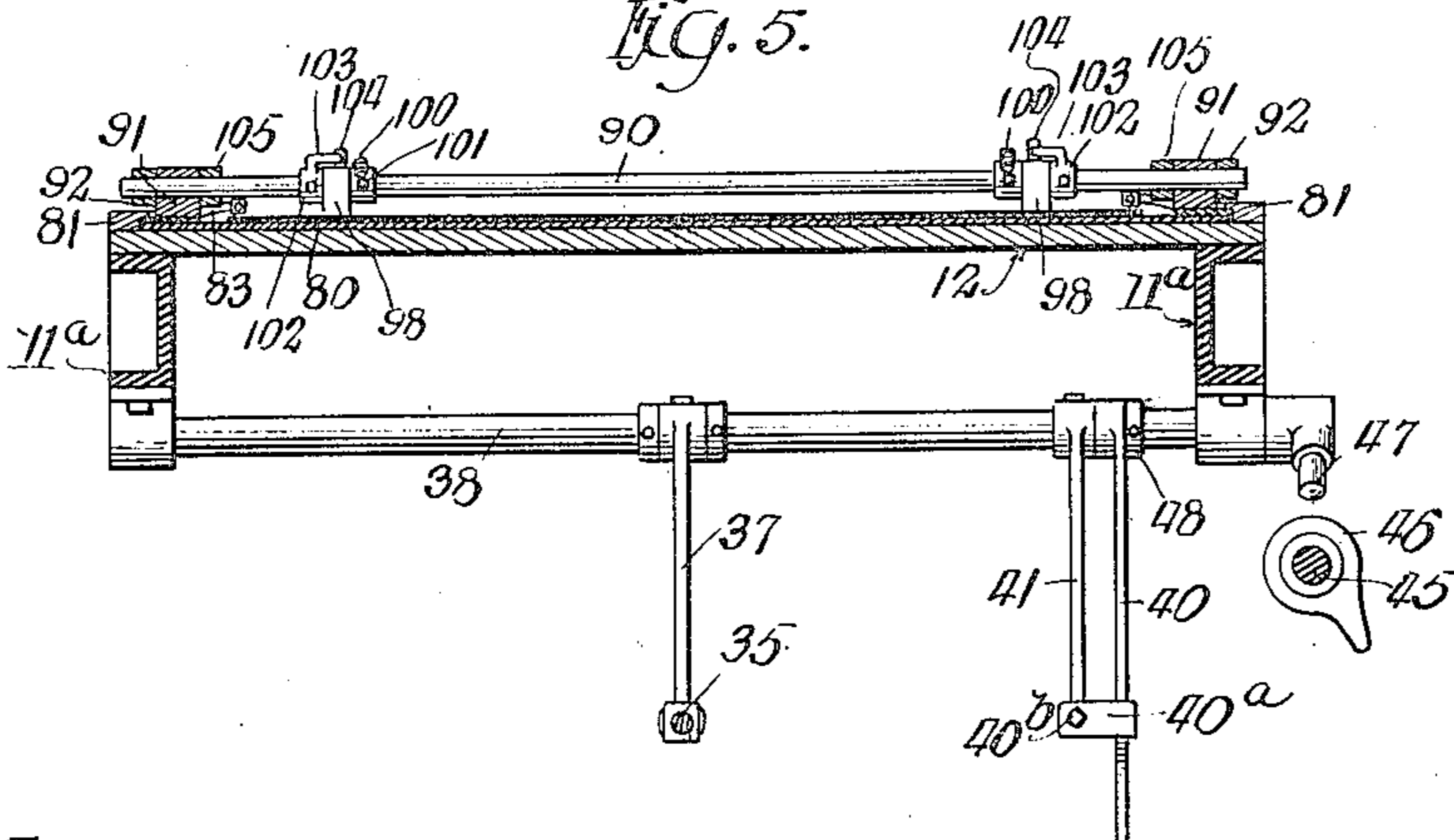


Fig. 7.

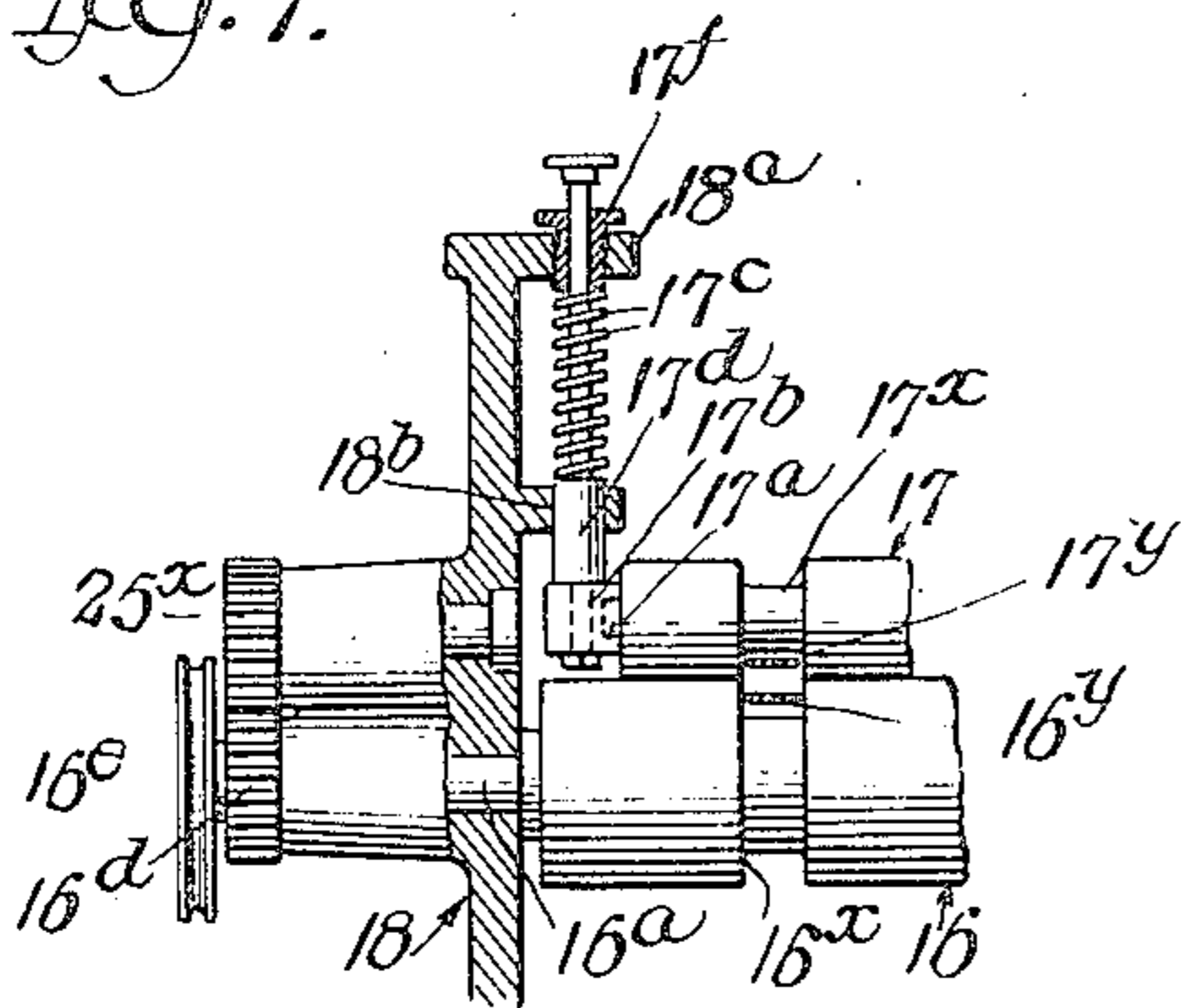
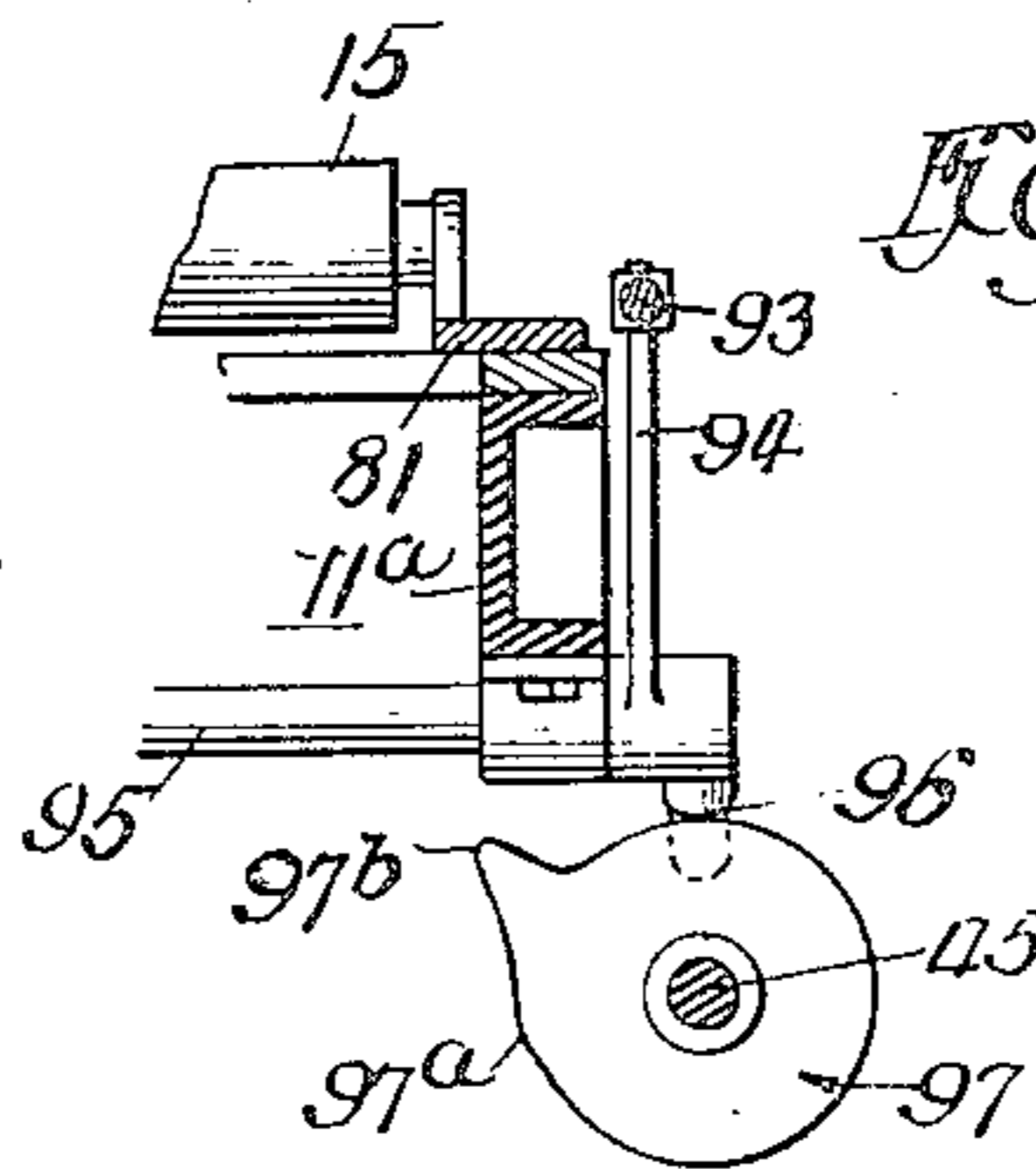


Fig. 8.



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UNITED STATES PATENT OFFICE.

STEWART WARING, OF EVANSTON, ILLINOIS, ASSIGNOR TO SEARS, ROEBUCK & COMPANY, A CORPORATION OF NEW YORK.

PAPER-WINDING MACHINE.

999,352.

Specification of Letters Patent.

Patented Aug. 1, 1911.

Application filed March 20, 1911. Serial No. 615,712.

To all whom it may concern:

Be it known that I, STEWART WARING, a citizen of the United States, and a resident of Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Paper-Winding Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a machine for cutting from a long or continuous web of wall paper or the like, pieces of a desired predetermined length, and rolling the severed pieces successively and in the order as they are severed in separate rolls; the machine being intended mainly for the purpose of preparing wall paper for the market in the form in which it is generally sold, that is to say, in rolls each of which contains the same quantity of paper.

The invention consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The machine to which the invention relates is of that general type illustrated and described in Letters Patent No. 885,114, granted to me on April 21, 1908. In the machine of said patent an intermittently rotating mandrel was provided upon which the paper was wound in forming the rolls and from which the rolls were removed endwise by mechanism provided for the purpose. This construction is objectionable for the reason that the mechanism for removing the roll from the mandrel will sometimes fail of its intended purpose, and the object of the present invention is to do away with the mandrel entirely and to provide a machine in which the paper strip is rolled upon itself.

My invention also includes other novel features to be more particularly referred to later, by means of which the construction and operation of the machine is improved and simplified.

A machine embodying my invention embraces as its main or principal features, a cutting device having a reciprocating cutting blade by which the web is severed transversely to form the pieces or lengths of paper, each of sufficient length to form a single roll; a plurality of continuously ro-

tating roll-forming members arranged annularly about a central space occupied by the paper roll while it is being formed and adapted to engage the paper strip at circumferentially spaced points and roll or curl the same upon itself somewhat in the same manner that a strip of paper may be curled or rolled upon itself between the thumb and fingers; means by which the said roll-forming members may be separated to enlarge the central roll-occupying space between them to release the roll which falls upon an endless traveling delivery belt; and continuously rotating primary feed rolls by which the continuous strip or web of paper is advanced continuously toward the cutting device and roll-forming members and continuously rotating auxiliary feed rolls which feed the severed end of the strip or web of paper directly to said roll-forming members. An open topped receptacle is located between the said primary feed rolls and the cutting device in position to receive the paper from the continuously rotating feed rolls, and within which the paper accumulates during the intervals between the completion of one roll and the beginning of the formation of the next roll.

The machine includes in connection with the cutting device, means for gripping the end of the web at the point at which it is severed and advancing the same past the cutting device to the auxiliary feed rolls. The machine also includes means for automatically controlling or timing the operations of the cutting and gripping devices, including a shaft carrying a series of cams, and which is adapted to make one complete rotation in order to effect the performance of the complete cycle of operation by which such roll is formed, said shaft being connected with the feed rolls by positively acting gearing, and the peripheral speed of the feed rolls being so adjusted with respect to the rotation of the said shaft, that the desired length of paper will be fed to the machine by said feed rolls during each complete rotation of the shaft. The machine also includes a movable part or trip member located in position to be acted upon by the tightening of the paper web against it, in the part of said web between the two sets of feed rolls, when the portion of the web fed into said receptacle by the feed rollers has been withdrawn therefrom by being wound

into a roll; said trip member being connected with and operating to temporarily release a belt tightener which normally acts to tighten a belt connecting the auxiliary feed rolls and roll-forming members with their driving mechanism; these parts being so arranged that when all of the paper at one time accumulated in the said receptacle is withdrawn therefrom and the slack between the two sets of feed rolls has been taken up, so as to draw the web taut against said trip member, the latter will be shifted by the pressure thereon of the web with the effect of so decreasing the effect of said belt tightener that the auxiliary feed rolls and roll-forming members will be rotated by the belt no faster than is necessary to take up the paper as it is fed to the machine by the primary feed rolls.

In the drawings—Figure 1 is a view representing a side elevation of the forward or delivery end of a machine of the kind described provided with the novel features of my invention, the rear end of the machine including the primary feed rolls being omitted. Fig. 2 is a view representing a top plan of the left-hand end of the part of the machine shown in Fig. 1, the scale of Fig. 2 being greater than that of Fig. 1; Fig. 3 is a view representing a longitudinal section on the line 3—3 of Fig. 2; Fig. 4 is a view representing a partial vertical section through Fig. 1 on the line 4—4 thereof; Fig. 5 is a view representing a partial vertical section through Fig. 1 on the line 5—5 thereof; Fig. 6 is a view representing a side elevation of the delivery end of the machine looked at from the side opposite to that shown in Fig. 1; Fig. 7 is a view representing a partial vertical section through Fig. 3 on line 7—7 thereof; and Fig. 8 is a view representing a partial vertical section through Fig. 1 on line 8—8 thereof.

In that embodiment of my invention illustrated in the drawings, 10 indicates the usual receptacle or boat as it is called, which receives the web of paper as it is fed from the primary feed rolls and 11 indicates the frame carrying the parts comprising the forward delivery end of the machine and upon which is supported the strip severing device, the auxiliary feed rolls, the roll-forming members, the feed mechanism for delivering the severed end of the strip to the roll-forming members, the endless traveling platform for receiving the rolls when they are completed and the actuating mechanism by means of which the various parts above referred to are driven and operated.

11^a, 11^a indicate upright longitudinally extending side frame members which are suitably braced apart, and upon which is supported a table member 12 over which the web of paper passes from the receptacle

or boat 10 on its way to the roll-forming and severing devices.

13, 14 and 15 indicate transversely arranged idle rolls supported above the table 12 on standards attached to the side frame members 11^a, 11^a and about which the web of paper A passes, as indicated in Fig. 3, said rolls serving to maintain the proper tension in said web.

From the roll 14 the web A passes between transversely arranged auxiliary feed rolls 16, 17, to which the severed end of the strip is delivered in the first instance by mechanism presently to be described. The feed roll 16 has a shaft 16^a rotatively mounted in journals preferably made integral with upright plates 18, 18 which are rigidly secured to the side frame members. At one end of said shaft is secured a pulley 19 (see Figs. 1 and 2) which is driven by a belt 19^a from a large driving pulley 20 keyed to a power shaft 21 mounted transversely in the machine frame and supported in bearing 21^a, 21^a secured to the side frame members. The upper feed roll 17 is an idle tension roll having a shaft 17^a which is mounted in vertically movable journal boxes 17^b, 17^b secured to the ends of vertical guide rods 17^c, 17^c. A sleeve 17^d on each of said rods engages the top of the associated journal box 17^b and a coiled spring 17^e on said rod engages at its lower end against the sleeve 17^d and at its upper end against an apertured thimble 17^f which is threaded into a shoulder 18^a on the plate 18. The rod 17^c extends through the aperture in the thimble 17^f and the sleeve 17^d extends through an aperture in a flange 18^b of the plate 18. By this construction the roll 17 is held yieldingly against the roll 16.

The feed rolls 16 and 17 are provided with a plurality of longitudinally spaced annular grooves or slots 16^x, 17^x, forming channels between said rolls in which are located upper and lower horizontal guide bars 16^y, 17^y, adapted for guiding the severed end of the paper strip to and beyond said feed rolls. Said guide bars 16^y, 17^y, are secured to an upright plate 12^a extending transversely between the plates 18, 18, and rigidly secured thereto, said plate being spaced from the forward end of the table 12 and having a horizontal slot 12^b the lower side of which is on a level with said table thus forming an extension thereof. From the feed rolls 16, 17, the web passes to the roll-forming members.

22, 23, 24, 25, 26 indicate said roll-forming members which extend transversely of the machine with their longitudinal central axes parallel to each other. Each of said members, as shown herein, consists of a rotative shaft provided with a plurality of longitudinally spaced, annular ribs or flanges made rigid therewith, the ribs or flanges being

each provided on their peripheries with circumferentially spaced, transverse notches adapted to cause the peripheries of the disks to frictionally engage or grip the surface of the paper strip.

22^a, 23^a, 24^a, 25^a, 26^a, indicate the annular ribs or flanges of the respective roll-forming members, and 22^b, 23^b, 24^b, 25^b, 26^b, their respective shafts. The ribs of the roll-forming members are spaced longitudinally on their respective shafts with reference to the ribs of the adjacent roll-forming members so that said ribs intermesh, the ribs of one member extending into the space between the ribs of the two adjacent members. In order, however, for the web to pass into the roll-forming space, two adjacent roll-forming members on the side of the entrance of said web have the peripheries of their annular ribs tangential to the common plane in which the web passes as it enters the roll-forming space. As shown herein, the ribs of the roll-forming member 25 are made of smaller diameter than those of the other roll-forming members and intermesh with the ribs of the roll-forming member 24 but not with those of the roll-forming member 26. The gearing is so proportioned, however, that the peripheral speed of the roll-forming member 25 is the same as that of the others. The several shafts of the roll-forming members 24, 25, 26 are rotatively mounted in bearings preferably made integral with the plates 18, 18, while the shafts of the roll-forming members 23, 23, are mounted in bearings made integral with plates 28, 28 secured at the upper ends of upright swinging arms 29, 29, which are hinged on a transverse rod or shaft 29^a supported by lugs 29^b, 29^b on the side frame members near their lower front ends.

At the adjacent ends of the shafts 24^b and 26^b, on the same side of the machine as the pulley 19 (see Figs. 1 and 2), are respectively secured gears 24^c, 26^c, which each intermesh with an idle gear 26^x journaled on the adjacent plate 18. At the end of the shaft 16^b of the feed roll 16 adjacent to the driven pulley 19 is keyed a gear 16^c from which movement is imparted to the gear 26^c by an idle gear 16^x journaled on the plate 18 and meshing with each of the gears 16^c and 26^c. Thus the roll-forming members 26 and 24 are continuously rotated from the feed roll shaft and in the same direction as the feed roll.

Rotative movement is communicated to the shaft 25^b of the roll-forming member 25 by the following mechanism: At the end of the feed roll shaft 16^b opposite to the end on which the pulley 19 is located (see Figs. 2 and 6) is keyed a gear 16^d which imparts movement to a gear 25^c keyed to the adjacent end of the shaft 25^b of the roll-forming member 25 through an idle gear 25^x jour-

naled on the adjacent plate 18 and intermeshing with each of the gears 25^c and 16^d.

Movement is imparted to the roll-forming members carried by the swinging arms 29 as follows: On the shaft 16^b adjacent to the gear 16^d (see Figs. 2 and 6) is a pulley 16^e. On the rod or shaft 29^a on which the arms 29 are hinged and located in a vertical plane below the pulley 16^e, are rotatively mounted two adjacent pulleys 30, 31. On the shaft 22^b of the roll-forming member 22 and in the vertical plane of the pulley 16^e is keyed a pulley 22^d. 32 indicates an endless band (see Fig. 6) looped respectively about the pulleys 16^e and 22^d and having its intermediate parts extending side by side in the same direction about the adjacent pulleys 30, 31, said band or belt being adapted to communicate movement from the pulley 16^e to the pulley 22^d so as to rotate the shaft 22^b of the roll-forming member 22 in the same direction as that of the feed roll 16. At that end of the shaft 22^b opposite the end on which the pulley 22^d is mounted there is keyed a gear 22^c (see Fig. 1) which communicates movement to a gear 23^c keyed to the shaft 23^b of the roll-forming member 23 by means of an intermediate idle gear 22^x journaled on the adjacent plate 18 and which meshes with each of the gears 22^c and 23^c. From this description, it is apparent that rotative movement in the same direction will be imparted to each of the roll-forming members, as indicated by the arrows shown in Fig. 3, and the several gears and pulleys are so proportioned that the peripheral speed of the said roll-forming members and of said feed roll 16 will be the same. It is also apparent that by reason of the mounting of the roll-forming members 22 and 23 on the hinged arms 29 said roll-forming members may be withdrawn laterally in a forward direction away from the other roll-forming members 24, 25 and 26 while continuing to rotate in the same direction and at the same speed.

As the end of the paper web enters the space between the roll-forming members 22 to 26 inclusive, the peripheries of the annular ribs or flanges of said members engage the surface of said web, and as the web is continuously fed toward them, cause the end of said web to curl over on itself, as shown in Fig. 3. This curling or rolling of the paper web upon itself is facilitated by the transverse grooves or notches in the peripheries of said annular ribs, said grooves or notches aiding to grip the surface of the paper and to drag or pull it forward. As the paper continues to be fed to the roll-forming members, the curl is made tighter and tighter forming a compact roll.

In order to make a closely wound roll and at the same time to provide the necessary yielding of the movable rolls 22, 23 when

the paper roll has attained the proper degree of compression, the following mechanism is provided to hold the movable rolls 22, 23 in yielding engagement with the paper roll. 35 indicates a link which has one end pivotally connected to a rod 36 extending between and rigidly secured to the arms 29, 29 and the other end pivotally connected to a depending rock-arm 37, which is keyed to a transverse shaft 38 rotatively mounted in the frame 11. A coiled spring 39 connects the arm 37 with a transverse rod 40^x secured to the rear side members of the frame 11. Said spring is a comparatively weak spring and is capable of yielding to permit the arms 29, 29 to swing forwardly and withdraw the roll-forming members 22, 23 away from the other roll-forming members 24, 25, 26, as the size of the paper roll increases. A depending arm 40, pivotally mounted on the rock-shaft 38, carries a laterally extending lug or plate 40^a provided with an adjustable member in the form of a set-screw 40^b which is adapted to be engaged by the end of a second rock-arm 41 rigidly secured to the rock-shaft 38 when said rock-arm 41 has been swung forwardly through a certain angle. (See Figs. 1 and 5). The arm 40 extends downwardly and at its lower end engages a fixed stop, in this case one of the bearings 21^a of the shaft 21 which limits its rearward swing. Said arm 40 is held in its position on the shaft 38 adjacent the arm 41, by a collar 48 fixed to said shaft. 42 indicates a coiled tensile spring attached at one end to the arm 40 and at the other end to the rod 40^x to which the spring 39 is attached. The tension of the spring 42 is greater than that of the spring 39. The rearward movement of the arms 29 is limited by set screws 29^x carried by lugs 29^y on the arms 29, the ends of said set screws engaging the front faces of the front upright frame members. The rear limit of movement of said arms 29 may thus be adjusted by means of the said set screws.

When the paper roll first begins to form it is curled around upon itself so as to fill the roll-forming space and as the spring 39, acting through the rock-arm 37 and the link 35, holds the arms 29 in their rearwardmost position, thus maintaining the paper roll space at its smallest diameter, the paper is rolled more closely upon itself to take care of the length of the web fed continuously to the roll-forming members. After the paper roll has assumed a certain compactness or rigidity, the arms 29 yield, against the action of the spring 39, thus gradually enlarging the roll-forming space. This spring is comparatively light in its action, so as not to exert too great a force on the paper roll, which in the early part of the roll-forming period would tend to crush the roll. As the roll gets larger in diameter and capable of

resisting a greater compressive force, the forward swing of the arms 29, through the link 35, finally rocks the shaft 38 forward until the arm 41 strikes the adjustable set-screw 40^b carried by the spring controlled arm 40, when the further forward swing of the arms 29 is resisted by the stronger spring 42. Thus during the final stages of the roll-forming period, the roll is subjected to greater compression due to the action of this stronger spring, thus forming a tightly wound roll.

When the predetermined length of paper is wound upon the roll, it is released by the following mechanism: 45 indicates a timing shaft, operated by the primary feed rolls (not shown) as in the machine of the patent above referred to, said timing shaft being adapted to make one revolution while said primary feed rolls are feeding the predetermined length of the web constituting the length contained in one roll. The shaft 45 carries a cam 46 which is constructed and arranged to strike an arm 47 keyed to the end of the rock-shaft 38 once each revolution, and actuate said arm to rotate the rock-shaft 38, swing the rock-arm 37 forwardly, and through the link 35 swing the arms 29 forwardly so as to withdraw the roll-forming member 22 and 23 away from the paper roll, which, relieved of the support of said roll-forming members, drops from the roll-forming space. Below the roll-forming members and in position to receive the roll of paper when it falls, is located an endless traveling platform in the form of laterally spaced, longitudinally extending belts 50 mounted on drums or spindles 51, 52 journaled in plates 53, 53 (see Figs. 2 and 3) secured to the machine frame. The rear drum 52 is driven by a belt 54 from the drive-shaft 21 so that the upper member of the belt which receives the paper rolls travels in a forward direction. 55 indicates a transverse table attached to the plates 53, 53 and located below the upper members of the belts and provided at its rear end with upwardly and rearwardly extending guide-plates 56 located between the belts and at its forward end with laterally spaced upright plates 57, also located between the belts and acting as stops against which the roll comes to rest in its forward travel on the belt and against which the forwardly traveling belt causes the roll to rotate in the same direction as it was rotated during its formation, thus preventing the roll from unwinding. The paper web is severed by a vertically reciprocable transverse knife or blade 60 mounted in suitable guideways 61, 61, formed at the rear of the vertical plate 12^a. 60^a, 60^a indicate end bars made rigid with the knife and extending below the table 12 at each side of the path of the web and connected at their lower ends

by a transverse bar 60^x. The table 12 terminates short of the vertical plate 12^a to permit the descent of the blade. 62, 62 indicate bell crank levers pivotally connected to bars 62^a, 62^a secured to the vertical plate 12^a. The upright arms 62^b, 62^b of said levers are connected together by a link 62^c (see Fig. 4). The other arms 62^d, 62^d of said levers are pivotally connected to links 60^b, 60^b which have pivotal connection with the cross bar 60^x of the knife. A tensile spring 63 connected at one end to the link 62^c and at the other end to one of the side frame members 11^a acts to normally hold the knife in raised position. A transverse bar 65 arranged parallel to the link 62^c is secured at the rear of the plane of the knife 60 below the table 12, said bar being rigidly secured to the side frame member 11^a. On said bar is mounted a sliding block 66 having an upright lug 66^a through which extends one end of a rod 67, the other end of which is rigidly supported by one of the side frame members 11^a. A coiled compression spring 67^a on said rod bears between said upright lug 66^a of the block 66 and a collar 67^b fixed to the rod 67. 68 indicates a pawl pivoted to the link 62^c and extending into the path of a cam lug 69 on the sliding block 66. A cam 70 is rigidly secured to the bar 65 said cam projecting into the path of the end of the pawl 68 as it moves with the link 62^c in the manner presently to be described, and is adapted to lift said pawl from its engagement with the cam lug 69. 71 indicates a rod pivotally connected to the sliding block 66 at one end and having its other end supported by an apertured bracket 71^a in position to engage a cam 72 which is mounted on the timing shaft 45.

The operation of the knife operating devices is as follows: As shown in Fig. 4, the knife is in raised position and the cam 72 is in the position just previous to its position when the knife is operated. With the parts in this relation the coiled spring 67^a is in compression, and when in the continuous movement of the cam 72 in the direction of the arrow, the end of the rod 71 slides off the abutment 72^a in the cam surface, the spring 67^a causes the block 66 to slide on the bar 65 toward the left (as illustrated in Fig. 4), and by reason of the engagement of the cam lug 69 with the pawl 68 causes the link 62^c to move toward the left, thus rocking the bell-crank levers 62, 62, and pulling the knife 60 downward so as to sever the paper web. When in the movement of the sliding block 66 and of the pawl 68 with it, said pawl reaches the cam 70, it is lifted by said cam so as to rise above the cam lug 69 on the sliding block 66, thus breaking the connection between said sliding block and the link 62^c, which will under

the action of the tensile spring 63 be withdrawn to the right, thus raising the knife. The knife then remains in raised position during the rotation of the cam until said cam in approaching the position indicated in Fig. 4 causes the rod 71 to move toward the right and with it the pawl 68, which, by the action of gravity, again falls into position to engage the cam lug 69 when the parts are ready for another descent of the knife.

The severed end of the web is fed to the auxiliary feed rolls by the following mechanism: 80 indicates a reciprocable plate (see Figs. 2 and 3) having its lateral edges mounted in horizontal guideways 81 located at each side of the table 12. Said plate is adapted to have limited forward and rearward movement, its rearward movement being limited by stop pins 82 rigidly secured to the side frame members in the path of the rear edge of said plate and located at each side of the path of the paper web. Disposed at each side of the plate and rising up from the surface thereof are apertured lugs or arms 83, 83, arranged in pairs at each side of said plate and supporting longitudinally extending rods 84, 84 at the forward ends of which is carried a transversely extending, auxiliary guide tube 85, comprising upper and lower, vertically separated members 85^a, 85^b, and which normally stands in advance of the guide plate 80. The paper web extends over the surface of the plate 80 and through the guide tube 85. Said guide tube 85, as will presently appear, is movable with the guide plate 80, but its forward movement is limited by laterally extending bars 85^c, 85^c made rigid with it and which are adapted to strike the end bars 60^a, 60^a of the knife 60 and thus stop its forward movement when said guide tube has advanced into a position to deliver the severed end of the paper web to the secondary feed rolls 16, 17. 86, 86 indicate coiled springs on the rods 84, said springs bearing between the rearmost arms 83, 83 and lugs or nuts 87, 87 fixed to said rods. Nuts 88, 88, are secured to the rear ends of the rods 84, 84, said nuts abutting against the rear arms 83, 83 and preventing a forward movement of the guide tube 85 independently of the guide plate 80. 90 indicates a transverse shaft rotatively mounted in bearings 91, 91 rigidly secured to the guide plate 80. Said shaft is provided at its ends with rock arms 92, 92, each of which is connected by a link 93 to a rock arm 94 secured to the end of a transverse shaft 95. Said shaft 95 carries an arm 96 projecting into the path of a cam 97 mounted on the timing shaft 45. Said cam is shown in detail in Fig. 8. 98, 98 indicate laterally separated fingers or grippers rotatively mounted on the shaft 90 and having laterally projecting arms 99 connected by coiled springs 100 to set screws 101

rigidly secured to the shaft 90. The action of the springs tends to produce a rotative movement of the fingers or grippers to cause said fingers or grippers to engage the paper web on the top surface of the guide plate 80. 102, 102, indicate collars fixed on the shaft 90 each adjacent to one of the fingers or grippers 98 and provided with a lug 103 which is engaged by a lug 104 fixed on the finger 98 when the finger is free to move under the action of its spring 100. The lug 103 thus resists the forward downward pull of the spring 100 to engage the paper in the normal position of the shaft 90, and thus holds said fingers away from the paper.

When in the rotation of the timing shaft the part 97^a of the cam 97 strikes the associated arm 96, which is timed to occur just at or a trifle in advance of the descent of the knife to sever the paper, it rocks the shaft 95 thus swinging the arm 94 forward and through the links 93, the arms 92 are swung forward so as to rotate the shaft 90 through a small angle. This rotates the stops 103 a small distance in advance of the normal position of the lugs 104 on the gripper fingers 98 thus permitting said grippers to engage the paper and hold it forcibly against the guide plate 80 under the action of the springs 100. After the severed end of the paper strip which has been formed into a roll, has passed beyond the knife and has been rolled up, and just as the fully wound roll is released from its position in the roll-occupying space, the part 97^b of the cam 97 is timed to strike the associated arm 96, and to rotate said arm 96 through a larger angle, thus pushing the links 93 forward. At this time arms 105, 105, rigidly connected to the rock shaft 90, engage rigidly with the plate 80, and the forward movement of said links 93, advances the plate 80 and the guide tube 85, thus feeding the severed end of the strip forward. After the guide tube is stopped in its advance by the engagement of its laterally extending arms 85^c with the end bars of the knife frame, the guide plate 80 is advanced still farther (this being made possible by the yielding connection between said plate and said guide tube) so as to deliver the forward end of the web beyond the forward end of the guide tube so that it will be caught between the secondary feed rolls. When the part 97^b of the cam passes the arm 96, the links 93 are withdrawn by the action of the springs 106. This rearward movement of the links first rocks the rock shaft 90 sufficiently to release the fingers or grippers 98 from their engagement with the paper web and then the guide plate and guide tube are withdrawn by reason of the engagement of lugs 105^a carried by the arms 105 (Fig. 2), with lugs 105^b made rigid with the bearings 91 of the shaft 90, which locks the said links to the plate 80.

The construction and operation are substantially like that shown in the patent heretofore referred to. As in the machine of said patent, a trigger comprising a transverse roller 110 and rock arms 111, 111 is arranged to engage the paper web and to be lifted as the surplus of said web, by reason of the taking up of the paper in forming the roll, is diminished in the paper receptacle or boat. One of the arms 111 is connected by link 112 with swinging arm 113 having pivotal connection with a bar 114 rigidly secured to the adjacent side frame member 11^a. The arm 113 carries a small pulley 115 engaging the belt 19^a which drives the auxiliary feed roll 16, said belt being provided with slack which is normally taken up by the action of said pulley 115. As the surplus of the web is used up said web is drawn up against the roller 110, thus lifting said roller and swinging the arms 111 upwardly and this movement being communicated by the link 112 to the arm 113 withdraws the pulley 115 slightly from the belt 19^a thus permitting a slight slackening of said belt so as to cause the same to slip on its connection with the feed roll pulley 19 thus causing the feed of said roll to slow up and at the same time to retard the movement of the roll-forming members to a like amount. This prevents any possibility of the paper web being torn by reason of the fact that the auxiliary feed rolls and the paper forming rolls take up the paper web faster than it is fed to the boat.

One of the particular advantages of the improved machine described herein arises from the fact that the roll-forming members all take the same rate of peripheral speed and the paper web in forming the roll is advanced at a uniform rate of speed, not only when the roll is small, but also when it is large as toward the end of the formation—the present machine being in this respect quite different from the former machine in which the paper was wound on a mandrel and wherein the rate at which the paper was taken up in forming the roll rapidly increased toward the end of the roll formation owing to the rapidly increasing length of the circumference of the roll as the same increased in diameter. The result of such rapidly increasing travel of the paper from the boat to the roll forming device was to frequently tear the web. This objection is entirely eliminated in the present machine.

Another important feature of the present machine is the advancing platform and the forward stops associated therewith which receive the roll after it has been formed and prevent it from unrolling.

While in describing one embodiment of my invention I have referred to certain details of mechanical construction and arrangement, it is to be understood that my

invention is not limited thereby except in so far as pointed out in the appended claims.

I claim as my invention:—

1. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means for winding said lengths of paper to form separate rolls comprising a plurality of roll-forming members constructed to inclose a roll-forming space and adapted to act upon the paper to curl the same upon itself, said roll-forming members rotating normally at a higher speed than the speed of said feed rolls to take up the slack which accumulates between the periods of finishing one roll and beginning a new one.

2. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon the paper to curl the same upon itself, a part of the number of said roll-forming members having their axes of rotation fixed, movable means for supporting the other part of the number of said roll-forming members, and means for withdrawing said movable supporting means to separate the said roll-forming members to release the paper roll.

3. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon the paper to curl the same upon itself, a part of the number of said roll-forming members being separable from the other part, and means for separating the two parts of the number of said roll-forming members to release the paper roll.

4. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon each strip of paper to curl the same upon itself, said roll-forming members comprising separable sets, and yielding means acting to oppose the separation of said roll-forming members.

5. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon each strip of paper to curl the same upon itself, said roll-forming members comprising separable sets, yielding means acting to oppose the separation of said roll-forming members, and automatic means for separating said sets of roll-forming members to release the paper roll when finished.

6. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon the paper to curl the same upon itself, said roll-forming members comprising two sets, a fixed support for one set and a movable support for the other set of said roll-forming members, yielding means acting to oppose the movement of said movable support to separate the roll-forming members, a second yielding means of greater tension adapted to increase the resistance to the movement of said movable member at a predetermined point in the movement of said movable support, and means for overcoming the action of the second-named yielding means and for releasing the paper roll when finished.

7. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon the paper to curl the same upon itself, said roll-forming members comprising two sets, the one set being movable with reference to the other, yielding means adapted to oppose a relative movement apart of said sets, means for increasing the opposing force of said yielding means to the separation of said two sets of roll-forming members at a certain point in their relative movement apart, and means for separating said sets a distance sufficient to release the paper roll when finished.

8. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing

lengths of paper from said web, and means for winding said lengths of paper to form separate rolls comprising a plurality of roll-forming members constructed to inclose a

5 roll-forming space and adapted to act upon the paper to curl the same upon itself, each roll-forming member consisting of a shaft having a plurality of longitudinally spaced annular ribs, the ribs of one roll-forming

10 member projecting into the spaces between the ribs of the adjacent member, said roll-forming members consisting of sets normally having a fixed relation to one another but capable of relative movement apart,

15 yielding means adapted to oppose the relative movement apart of said sets of roll-forming members, and means for relatively moving said sets of roll-forming members to release the paper roll when finished.

20 9. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means

25 for winding said lengths of paper to form separate rolls comprising a plurality of roll-forming members constructed to inclose a roll-forming space and adapted to act upon the paper to curl the same upon itself, each

30 roll-forming member consisting of a shaft having a plurality of longitudinally spaced annular ribs, the ribs of each roll-forming member being provided with notches in their peripheries and projecting into the spaces

35 between the ribs of the adjacent roll-forming members, said roll-forming members consisting of sets normally having a fixed relation to one another but capable of relative movement apart, yielding means

40 adapted to oppose the relative movement apart of said sets of roll-forming members, and means for relatively moving said sets of roll-forming members to release the paper roll when finished.

45 10. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, and means

50 for winding said lengths of paper to form separate rolls comprising a plurality of roll-forming members constructed to inclose a roll-forming space and adapted to act upon the paper to curl the same upon itself, each

55 roll-forming member consisting of a shaft having a plurality of longitudinally spaced annular ribs, the ribs of each roll-forming member being provided with notches in their peripheries and projecting into the spaces

60 between the ribs of the adjacent member, said roll-forming members comprising sets normally having a fixed relation to one another, but capable of relative movement apart, yielding means adapted to oppose the

65 relative movement apart of said sets of roll-

forming members, means for increasing the force of said yielding means at a certain point in the relative movement apart of said roll-forming members, and means for moving said sets of roll-forming members apart

70 to release the paper roll when finished.

11. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing

75 lengths of paper from said web, and means for winding said lengths of paper to form separate rolls and for releasing said rolls when completed, a traveling platform adapted to receive said rolls when released, said plat-

80 form traveling in the direction of the feed of said web of paper, and an upright stop in the path of said platform and against which said roll is caused to rotate by a continuous advance of said platform.

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12. A machine of the class described comprising continuously rotating feed rolls adapted for feeding a web of paper continuously to the machine, means for severing

90 lengths of paper from said web, and means for winding said lengths of paper to form separate rolls and for releasing the same when completed, and a traveling platform located vertically below said roll-forming

95 members and adapted to receive the rolls when completed, said platform comprising laterally spaced belts traveling in the same direction as the feed of said paper web, and upright bars located between the said belts

100 near the end of their forward travel and against which said paper rolls are caused to rotate by the continuous movement of said belts.

13. A machine of the class described comprising continuously rotating primary feed

105 rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, secondary feed rolls adapted to receive the severed end of said web, means for deliver-

110 ing the severed end of said web to said secondary feed rolls, and means adapted to receive the severed end of said web from said secondary rolls for winding said lengths

115 of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon each strip of paper to curl the same upon itself, said roll-form-

120 ing members comprising separable sets, and yielding means acting to oppose the separation of said roll-forming members.

14. A machine of the class described comprising continuously rotating primary feed

125 rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, secondary feed rolls adapted to receive the severed end of said web, means for delivering

130 the severed end of said web to said second-

ary feed rolls, and means adapted to receive the severed end of said web from said secondary rolls for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon each strip of paper to curl the same upon itself, said roll-forming members comprising separable sets, yielding means acting to oppose the separation of said roll-forming members, and automatic means for separating said sets of roll-forming members to release the paper roll when finished.

15 15. A machine of the class described comprising continuously rotating primary feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, secondary feed rolls adapted to receive the severed end of said web, means for delivering the severed end of said web to said secondary feed rolls, tension rolls located between said primary and secondary feed rolls, and means adapted to receive the severed end of said web from said secondary rolls for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon each strip of paper to curl the same upon itself, said roll-forming members comprising separable sets, and yielding means acting

ing to oppose the separation of said roll-forming members.

16. A machine of the class described comprising continuously rotating primary feed rolls adapted for feeding a web of paper continuously to the machine, means for severing lengths of paper from said web, means for delivering the severed end of said web to said secondary feed rolls, tension rolls located between said primary and secondary feed rolls, and means adapted to receive the severed end of said web from said secondary rolls for winding said lengths of paper to form separate rolls comprising a plurality of rotative roll-forming members constructed to inclose a roll-forming space and adapted to act upon each strip of paper to curl the same upon itself, said roll-forming members comprising separable sets, yielding means acting to oppose the separation of said roll-forming members, and automatic means for separating said sets of roll-forming members to release the paper roll when finished.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 24th day of February A. D. 1911.

STEWART WARING.

Witnesses:

GEORGE R. WILKINS,
T. H. ALFREDS.