

July 2, 1935.

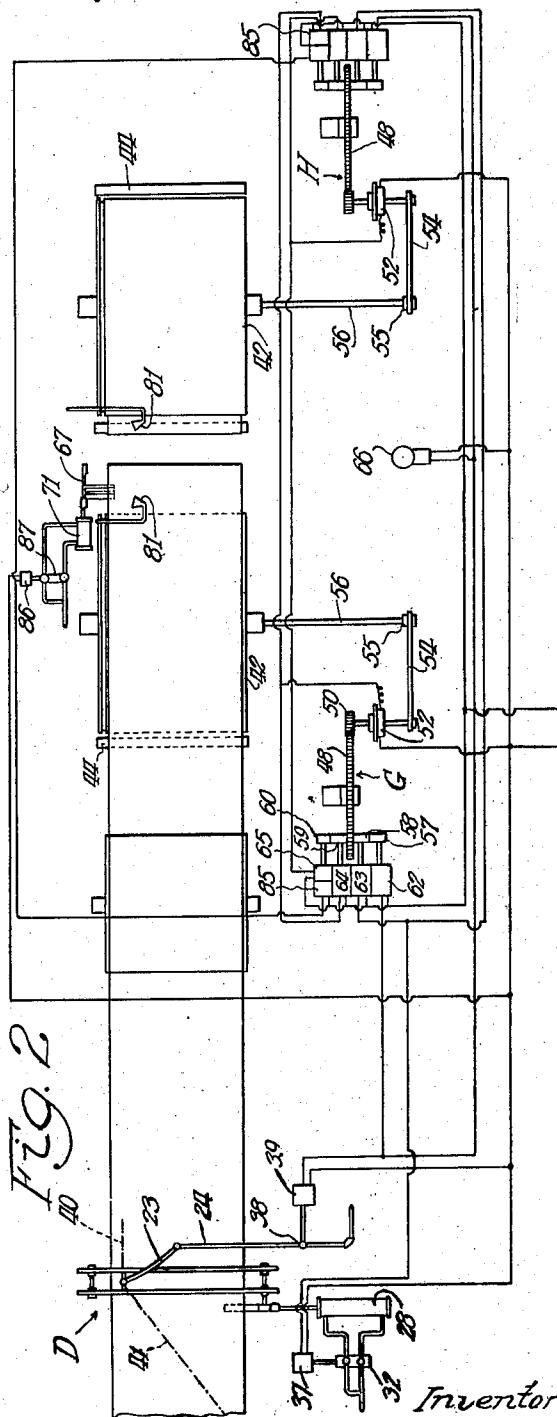
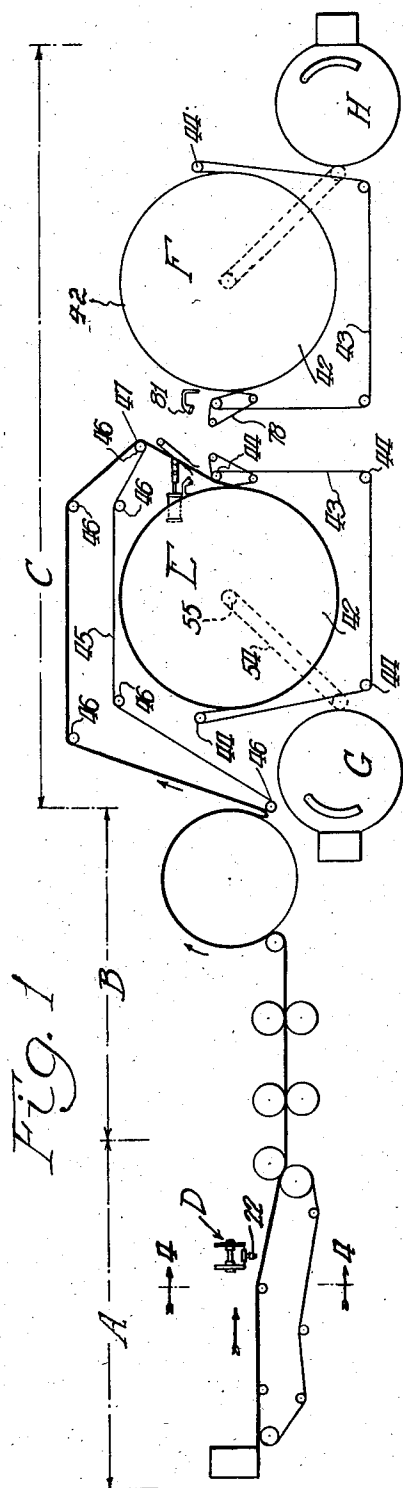
C. A. FOURNESS ET AL

2,006,499

PAPER METERING, CUTTING AND REELING

Filed May 22, 1933

5 Sheets-Sheet 1



Inventors
Charles A. Fourness and
Charles M. Pearson
By Fisher, Clapp, Soane & Pond Attys

July 2, 1935.

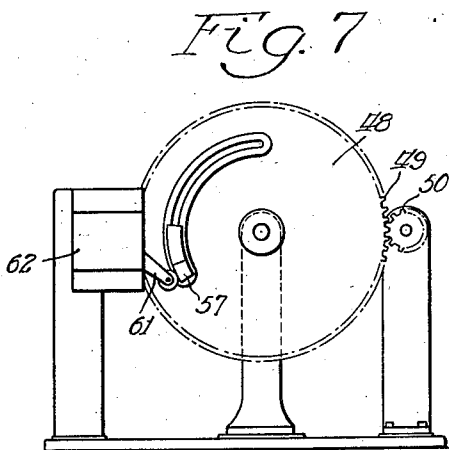
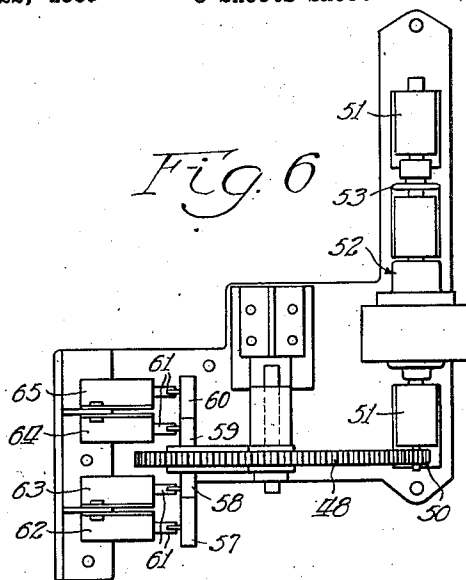
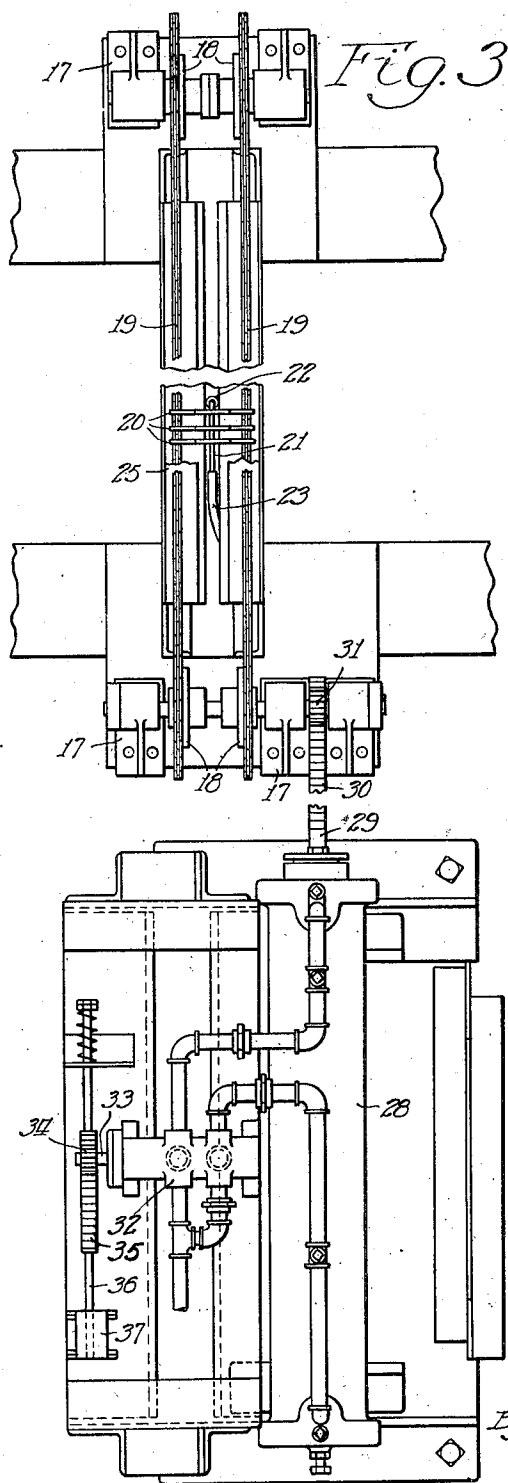
C. A. FOURNESS ET AL

2,006,499

PAPER METERING, CUTTING AND REELING

Filed May 22, 1933

5 Sheets-Sheet 2



Inventors
 Charles A. Fourness and
 Charles M. Pearson
 By: Fisher, Clapp, Soans & Pond
 Attys

July 2, 1935.

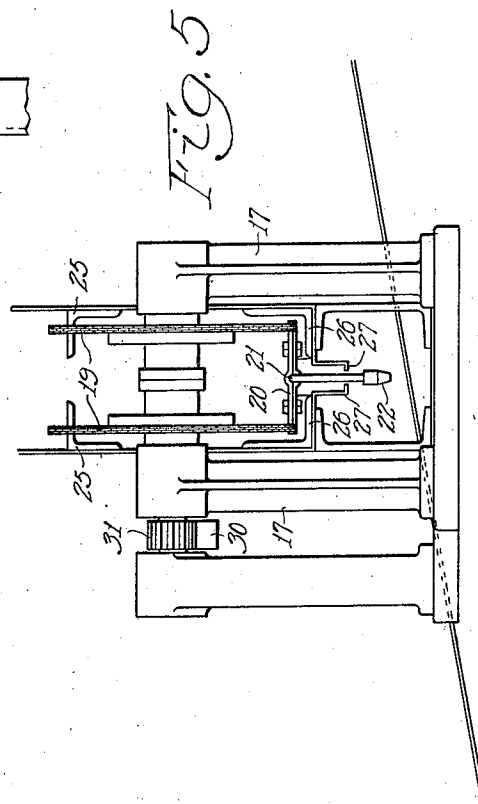
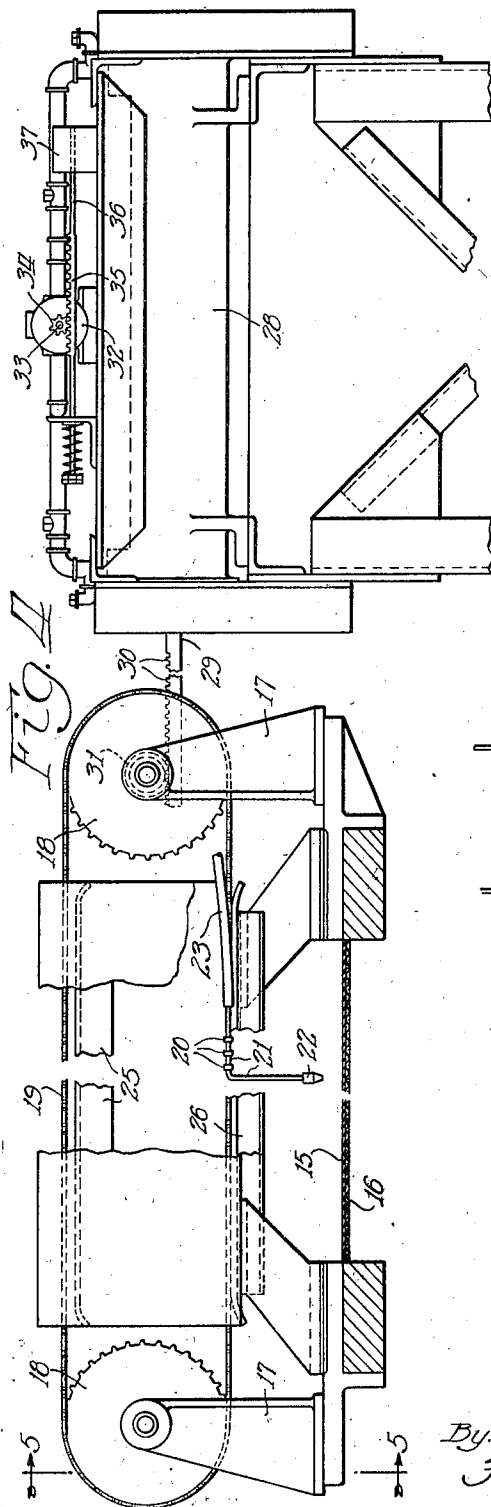
C. A. FOURNESS ET AL

2,006,499

PAPER METERING, CUTTING AND REELING

Filed May 22, 1933

5 Sheets-Sheet 3



Inventors
Charles A. Fourness and
Charles M. Pearson
By: Fisher, Clapp, Soames & Pond Attys

July 2, 1935.

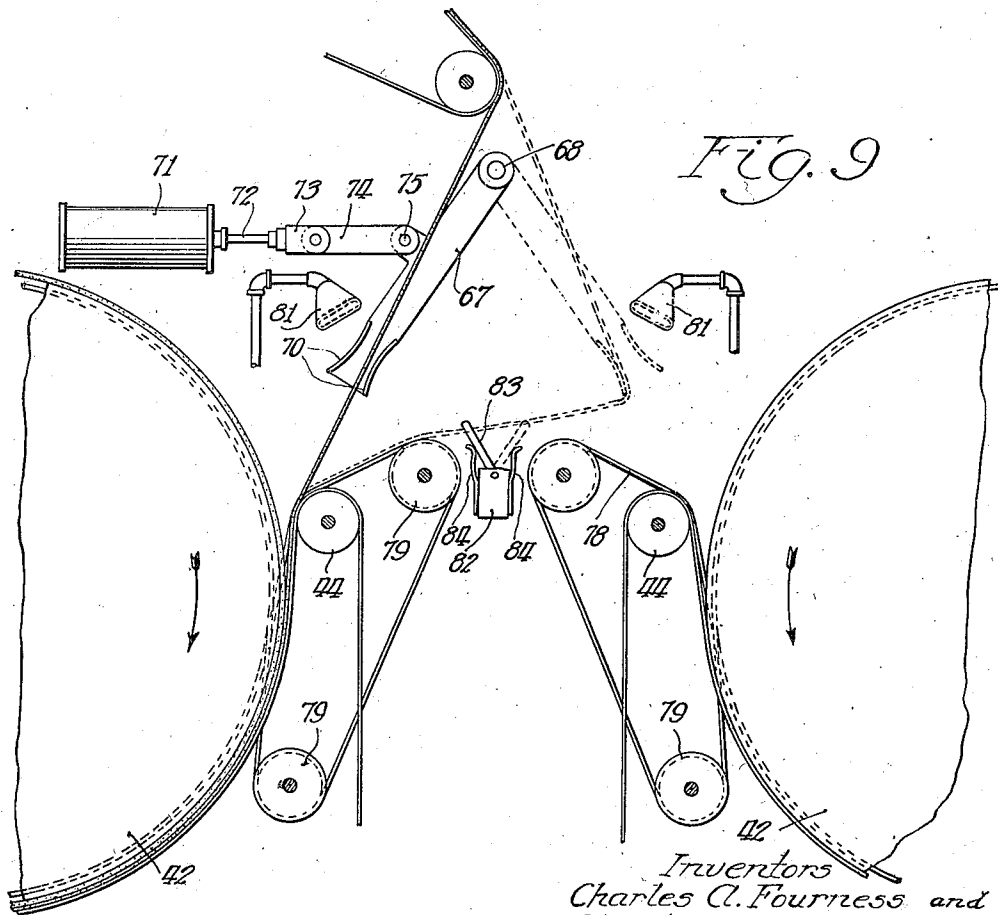
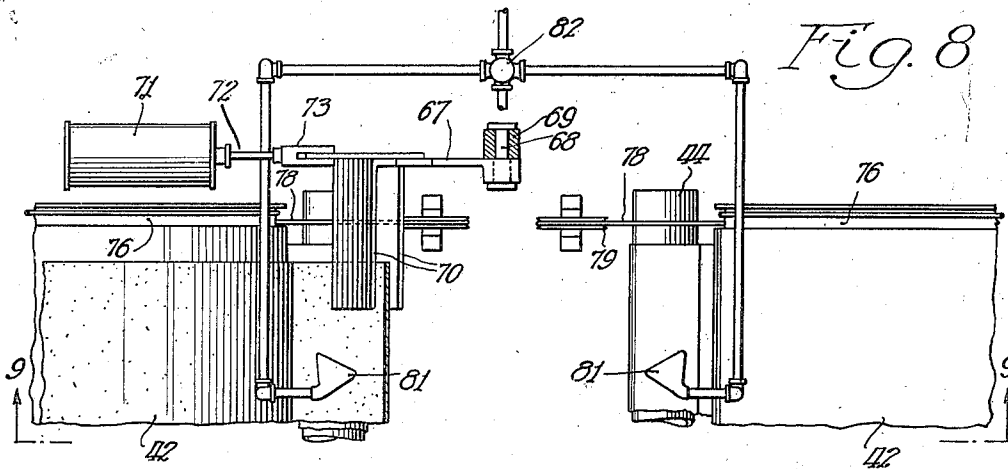
C. A. FOURNESS ET AL

2,006,499

PAPER METERING, CUTTING AND REELING

Filed May 22, 1933

5 Sheets-Sheet 4



Inventors
Charles A. Fourness and
Charles M. Pearson
By: Fisher, Claff, Soana & Bond Attys.

July 2, 1935.

C. A. FOURNESS ET AL

2,006,499

PAPER METERING, CUTTING AND REELING

Filed May 22, 1933

5 Sheets-Sheet 5

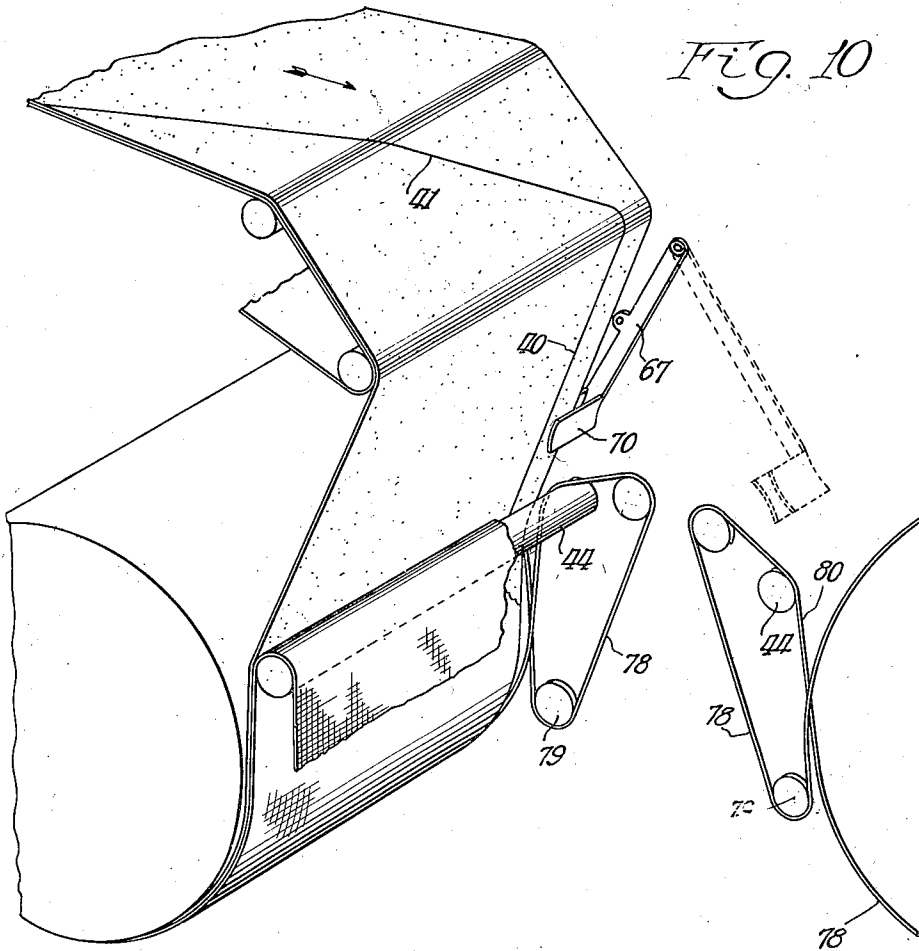
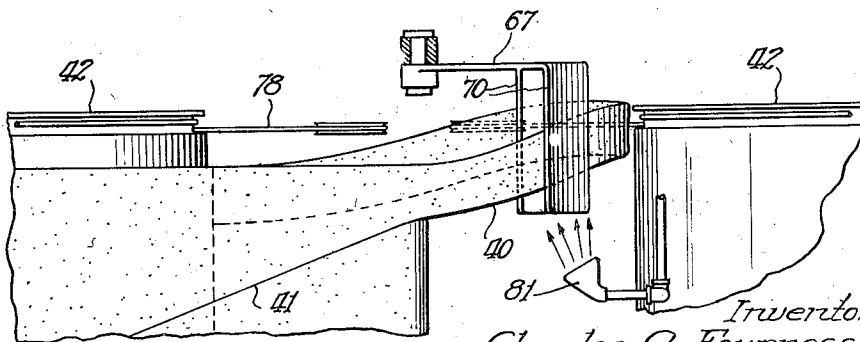


Fig. 11



Inventors
Charles A. Fourness and
Charles M. Pearson
By: Fisher, Clapp, Loane & Ford Attys

UNITED STATES PATENT OFFICE

2,006,499

PAPER METERING, CUTTING, AND REELING

Charles A. Fourness, Appleton, and Charles M. Pearson, Neenah, Wis., assignors to Paper Patents Company, Neenah, Wis., a corporation of Wisconsin

Application May 22, 1933, Serial No. 672,216

9 Claims. (Cl. 242—56)

This invention relates to paper metering, cutting and reeling, and has particular reference to mechanism for continuously measuring and reeling predetermined quantities of paper on relatively independent reels in connection with the continuous production of a paper web, for example on a Fourdrinier paper machine.

The main objects of the invention are to provide means for automatically measuring the lengths of paper web wound on a reel; to provide means for automatically effecting cutting of the web at predetermined intervals to separate the web into predetermined lengths to be wound on relatively independent reels; to provide a twin reeling arrangement for conveniently winding successive lengths of paper web independently of the other; to provide automatic means for effecting transfer of the paper web from one reel to the other; and in general, it is the object of the invention to provide improved mechanism for metering, cutting and reeling a continuous paper web.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawings (5 sheets), in which is illustrated, somewhat diagrammatically, the improved mechanism herein contemplated.

Referring now to the drawings:

Fig. 1 is a diagrammatic side elevation of the mechanism.

Fig. 2 is a diagrammatic plan of the mechanism shown in Fig. 1.

Fig. 3 is a plan of mechanism for cutting the paper web.

Figs. 4 and 5 are, respectively, side and end elevations of the paper cutting mechanism illustrated in Fig. 3.

Figs. 6 and 7 are plan and side elevations, respectively, of the metering apparatus.

Fig. 8 is a plan of a portion of mechanism for automatically transferring the paper web from one reel to another.

Fig. 9 is a section on the line 9—9 of Fig. 8.

Fig. 10 is a perspective of the automatic transfer mechanism, and

Fig. 11 is a plan of the automatic transfer mechanism showing the parts in a changed position with reference to Figs. 8 and 9.

The mechanism diagrammatically illustrated in Figs. 1 and 2, may be said to consist of three sections, the first section being designated A, which represents the paper-making machine, for example a Fourdrinier paper-making machine; section B, which consists of mechanism for con-

ditioning the paper web produced by the paper-making machine, for example, calendering rolls and drying equipment; and section C, which consists of paper reeling apparatus with which is associated metering mechanism for determining the lengths of paper web wound on the reels.

The details and construction of the paper-making machine of section A, may be of conventional form. With this section of the mechanism, paper-cutting apparatus designated D is associated for severing the paper web at predetermined intervals.

The paper severing or cutting mechanism is illustrated more in detail in Figs. 3, 4 and 5, to which reference is directed. In Fig. 4, the web of paper is indicated at 15 as supported by the Fourdrinier conveying wire 16. On opposite sides of the path of the wire and paper web, there are provided upstanding brackets 17—17 which are suitably supported and in the upper ends of each of these brackets there is rotatably mounted a pair of sprocket wheels 18. The pairs of sprocket wheels 18 serve to support endless chains 19—19 which are thus adapted to travel transversely of the paper web.

The lower reaches of the conveyor chains 19—19 are connected together by means of a number of tie members 20, and these tie members 20 are so formed as to support a pipe 21 which has its free end bent downwardly and provided with a nozzle 22 for directing a stream of water or other fluid against the paper web 15 on the wire. The other end of the pipe 21 is connected by means of a flexible hose 23 to a pipe line 24 which is connected to a source of water or other fluid supply.

As best shown in Figs. 4 and 5, suitable supports 25 and 26 are provided for supporting the upper and lower reaches of the chains intermediate the opposite sprockets to prevent undue sagging of the respective reaches. For steadying the travel of the nozzle 22 crosswise of the web, guide members such as 27—27 are provided and secured to the supporting frame work, as clearly shown in Fig. 5.

The conveyor chains 19 and nozzle 22 are caused to reciprocate across the paper web by means of a pneumatic cylinder 28 which has a piston therein connected by means of a piston rod 29 to a rack 30. The rack 30 meshes with a gear 31 on the shaft supporting the adjacent sprockets 18 and it will be understood that the said sprockets 18 and gear 31 are keyed to a shaft or otherwise connected so that rotation imparted to the gear 31 will also be imparted to the sprockets 18.

The operation of the piston in the cylinder 28 is controlled by a valve 32 (see Figs. 2 and 3) which is in turn electrically actuated. As best shown in Fig. 3, the valve 32 has a controlling stem 33 projecting from the valve housing and a pinion gear 34 is secured to the free end of the said stem. A rack 35 meshing with the pinion 34 is connected to the plunger shaft 36 of a solenoid 37. This arrangement is only diagrammatically illustrated in Fig. 2. When the solenoid 37 is energized, the valve 32 is so adjusted that air will be permitted to pass through the valve into the proper end of the cylinder 28 to cause the paper cutting nozzle 22 to move transversely of the paper web from the initial position illustrated in Fig. 2, to a position beyond the far edge of the paper web. The flow of water through the nozzle 22 is preferably controlled by a valve 38 which is in turn controlled by a solenoid 39. Inasmuch as electrically controlled valves are well known to those skilled in the art, detail illustration or explanation thereof is not necessary. When the paper web is to be cut, the solenoid 39 is first actuated to start the flow of water through the nozzle and then the solenoid 37 is actuated to start the travel of the nozzle crosswise of the paper web.

The cutting of the paper web is, of course, accomplished while the paper web continues to travel on the Fourdrinier wire. Accordingly it will be understood that because of the sequence of operation just explained, the paper web will be cut first along a line indicated at 40 which extends parallel with one edge of the paper web at a short distance from such edge, say about five inches, and that the line of severance will come as a result of the combined movement of the nozzle and paper, extend diagonally across the paper web as indicated at 41, it being understood that the paper web travels from left to right in Figs. 1 and 2.

The present invention is not particularly concerned with the mechanism embodied in section B, and hence no explanation thereof appears necessary. Such mechanism may be of any conventional type and is well known to those skilled in the art.

The paper reeling mechanism of section C embodies two relatively independent reels arranged axially parallel and in endwise alignment. The two reels may be of the same construction, but one is arranged left hand and the other right hand, as will be evident from an inspection of Fig. 1. For convenience in this specification, one reel will be designated E and the other F, and the following explanation with respect to one will apply to both, due regard being had for the right and left hand arrangement of each.

Each reel consists of a drum 42 which is rotatably mounted in suitable bearings (not shown). With each reel there is associated an endless belt 43 which extends around four guide pulleys 44 which are arranged as indicated so as to cause the upper reach of the belt 43 to engage the lower (approximately one-half) portion of the drum. As indicated, the belt is of substantially the same width as the reel.

For delivering the paper web to one or the other of the reels E and F, an endless conveyor 45 is provided and supported by a plurality of guide rolls 46. The arrangement of the guide rolls 46 may be varied to suit surrounding conditions and the arrangement illustrated in Fig. 1 is a typical arrangement which serves to carry the paper web upwardly from the delivery end

of the paper conditioning mechanism, over the first reel E and downwardly approximately midway between the reels to the discharge point 47. From the discharge point 47 of the conveyor 45, the paper web extends unsupported into the bight between one of the drums 42 and its cooperating belt 43.

When a predetermined amount of paper is wound on the reel, E for example, the paper cutting mechanism is actuated to produce the line of severance already explained. When the line of severance appears at the delivery point, an attendant breaks the narrow web of paper between the starting portion 40 of the cut and the adjacent edge and delivers such narrow web or leader portion into the bight between the drum 42 and belt 43 of the reel F. The reel F being previously set into operation will then cause the oncoming paper web to be wound on the reel F, while the reel E receives the gradually narrowing tail portion of the web wound thereon. Thereafter the paper on the reel E may be handled in accordance with the usual practice.

The actuation of the cutting mechanism may be accomplished manually, but it is preferred that automatic means be provided for causing its operation at the proper time, i. e., when the desired amount of paper is wound on the reel then receiving the web. Such mechanism may conveniently be associated with the respective reels and in this instance it is shown as comprising metering devices G and H which are respectively associated with the reels E and F.

Each metering device G and H includes a rotatably mounted disk 48 which is rotated by means of a connection to the reel with which it is associated. In this instance, the disk 48 is illustrated as being provided with gear teeth 49 on its periphery for meshing with a pinion gear 50 which is mounted on a suitable shaft rotatably supported in bearings provided in supports such as 51-51. The shaft just referred to is preferably composed of two sections which are connected together by means of a magnetic clutch 52. On the shaft section opposite the section on which the pinion 50 is mounted, there is secured a sprocket 53 which is rotated by means of a driving chain 54 which is in turn driven by means of a sprocket 55 carried by the extension 56 of the reel shaft. Assuming that the magnetic clutch 52 is engaged, it will be seen that when the reel drum is rotated (by means of any suitable driving arrangement, not shown), the meter disk member 48 will be driven at a predetermined related, preferably reduced speed.

The disk 48 is provided with a series of cams designated 57, 58, 59 and 60. These cams may be in the form of shoes adjustably connected to each other and adjustably connected to the disk 48, for example, by means of an arcuate slot arrangement as illustrated in Fig. 7. The said cam shoes are designed to engage arms such as 61 which project from electric switches 62, 63, 64 and 65.

The switch 62 has a normally open switch which serves to break the circuit controlling the solenoid 39 which adjusts the water valve 38. When the proper amount of paper is wound on the reel E, the cam 57 engages the arm of the switch 62 to close the switch and complete the circuit to the solenoid 39. Thereupon the valve 38 is opened and water permitted to flow through the pipe 24 and to be discharged through the nozzle 22 thereby starting the line of severance

40. At approximately the same time or shortly thereafter, the cam 58 closes the normally open switch 63 to complete an electric circuit to the solenoid 37, which thereupon adjusts the air valve 32 to cause the nozzle 22 of the cutting mechanism to move transversely of the paper web to complete the line of severance diagonally across the paper web, as indicated at 41.

When the nozzle has completed its stroke across the web, to complete the line of severance 41, the cam 57 disengages the arm 61 of switch 62, breaking the circuit to solenoid 38 and valve 39, causing valve to close and water to be shut off from nozzle 22. Shortly thereafter cam 58 disengages arm 61 of switch 63, breaking the circuit to solenoid 37, which is a spring return solenoid; the spring rotates the valve 32 through the rack 35 and gear 34, opening the pressure end of cylinder 28 to exhaust and the opposite end to pressure, whereby the piston is returned to original position in the cylinder and the nozzle to its original position, which is at line 40 in Fig. 2. It is now in a position to start another cycle.

For a purpose which will presently appear, the cam 60 is preferably made a two-step cam, the second step of which controls the switch 65. The switch 65 is normally open and controls a circuit to the magnetic clutch 52 of the meter H. When the switch 65 is closed, the circuit of the magnetic clutch 52 of the meter H is completed and the disk 48 of the meter H thereupon caused to rotate, it being understood that the reel F has, in the meantime, been set into operation either manually or by suitable automatic means. The starting of the meter H is timed to occur when the full width of the paper web begins to be wound on the reel F.

The cam 59 of the meter G next engages the arm of the switch 64 which is a normally closed switch and which controls the circuit to the magnetic clutch 52 of the meter G. When the switch 64 is opened, the clutch 52 of the meter G is de-energized, thereby causing the meter G to come to rest, although the reel E continues to turn to receive the tapering tail portion of the web wound thereon.

The operations of the meter G with respect to the reel E, typify those of the meter H with respect to the reel F. When the reel F has received its allotted length of paper web, the cams of the meter H actuate switches which control the cutting mechanism and the meter G and its own magnetic clutch in the same manner as the meter G. A wiring diagram illustrating the various electrical connections is embodied in Fig. 2, and is believed to be entirely clear to those skilled in the art and not to require detail explanation. For some purposes, it is desirable to connect an electric bell 66 in the circuit to the solenoid 39, so that an attendant of the mechanism will receive an audible warning when the predetermined length of paper is nearly wound on the reel. This alarm gives the operator ample time to reach the place in the mechanism for transferring the paper web from one reel to the other, or to any other stages where his presence is advantageous.

Instead of transferring the paper web from one reel to the other by hand as above explained, automatic means may be provided for so doing. In the present instance, such automatic means is illustrated as including an arm 67 pivoted at its upper end on a pivot pin 68 supported by any suitable bracket means indicated at 69 (Fig. 8). At its lower end, the arm 67 is provided with shoes

70 which straddle the marginal portion of the web to a width approximately equal to the width of the narrow front portion of the leader defined by the portion 40 of the line of severance.

The arm 67 is actuated through the agency of a pneumatic cylinder 71 which contains a suitable piston connected to a piston rod 72 and which piston rod has a forked end 73 straddling and pivoted to one end of a link 74, the other end of which link is pivoted as indicated at 75, to the arm 67 at a point intermediate its length.

Each reel drum 42 is provided at one end with a recessed or grooved portion 76 which receives a suitable belt 78, preferably in the form of a rope. The belt rope 78 extends around the recessed reel portion and, as most clearly illustrated in Fig. 10, extends around guide pulleys 79 which are so arranged as to position a portion 80 of the rope relative to the drum to form a mouth through which the paper web may be introduced between the belt rope and the reel drum. A pair of air blast nozzles indicated at 81, are connected to an air supply through the agency of a valve 82. The valve 82 has a control lever 83 projecting therefrom and arranged to be engaged by the lower end of the arm 67 in its swinging movement. As indicated in Fig. 9, the lever 83 is normally held in position to be engaged by the arm 67 by means of yieldable members such as 84, which will permit the lever to be moved beyond the position illustrated to permit the arm 67 to pass and to restore the valve lever to operative position.

When the automatic transfer equipment is included in the mechanism, the first step of the cam 60 actuates a switch 85 which controls a solenoid 86, the latter being operatively connected to a valve 87 which controls the air supply to the pneumatic cylinder 71. When the switch 85 is actuated to complete a circuit to the solenoid 86, the valve 87 is so adjusted as to admit air to the proper end of the cylinder 71 to move the arm 67 from its position at that time to the opposite position (see Fig. 9). When the arm 67 is so swung, it carries with it the marginal portion of the paper web, as most clearly illustrated in Fig. 11. When the arm passes a central position, the air controlling valve 82 is actuated to cause a blast of air to issue from the appropriate air nozzle 81 which serves to blow the paper web carried by the arm downwardly and outwardly into engagement with the belt rope 78, which then carries the paper web into the nip between itself and the reel 42 where it is ultimately gripped to attach the leading end of the paper web to that reel. The mechanism disclosed is particularly designed for use in connection with the production of paper which is capable of a high degree of stretching, for example, crepe paper, which permits stretching under the force of the air blast. The ability to stretch also permits the marginal portion of the paper web to be separated from the web by the arm 67.

Inasmuch as the electrical connections between the various switches and solenoids herein referred to, are well within the skill of the ordinary electrician, it is deemed unnecessary to describe such connections which are, however, diagrammatically illustrated in connection with Fig. 2.

The described structure facilitates the separation of the product of the paper machine into batches of predetermined lengths. The production of paper on the machine need not be interrupted and the paper web is separated into

batches in the course of its production, instead of an entirely independent step and hence eliminates considerable handling of the paper. The arrangement disclosed is also such that the

5 amount of waste paper incident to the separation of the web into the separate batches is of a negligible amount. In fact the only waste is that which may be incident to the diagonal cut of the web and in some cases even this may not
10 constitute waste.

Changes in the described construction may be made without departing from the spirit of the invention, the scope of which should be determined by reference to the following claims, the same being construed as broadly as possible consistent with the state of the art.

We claim as our invention:

1. In mechanism of the class described, the combination of means for conveying a paper web, a pair of reeling devices adapted to alternately receive and reel the paper discharged from said conveying means, a pair of metering devices respectively associated with said reeling devices, and means connecting said metering devices for controlling the operation thereof in accordance with the reeling of the web on the respective reels.

2. In mechanism of the class described, the combination of means for conveying a paper web, a pair of reeling devices adapted to alternately receive and reel the paper discharged from said conveying means, a pair of metering devices respectively driven by said reeling devices, and electrically actuated means, controlled by each metering device for controlling the operation of the other metering device.

3. In mechanism of the class described, the combination of means for conveying a paper web, cutting mechanism associated with said conveying means, a pair of reels for alternately receiving the paper web, a pair of metering devices respectively associated with said reels for measuring the amount of paper wound on the reels, means controlled by each of said metering devices for actuating said cutting mechanism, and means controlled by each of said metering devices for controlling the operation of the other metering device.

4. In mechanism of the class described, the combination of means for conveying a paper web, a pair of reeling devices adapted to alternately receive and reel the paper discharged from said conveying means, a pair of metering devices respectively associated with said reeling devices, means for automatically transferring the web

from one reel to the other and means controlled by said metering devices for actuating said transferring means.

5. In mechanism of the class described, the combination of means for conveying a paper web, a pair of reeling devices adapted to alternately receive and reel the paper discharged from said conveying means, a pair of metering devices respectively associated with said reeling devices, means for automatically transferring the web from one reel to the other, means controlled by said metering devices for actuating said transferring means, and means controlled by each metering device for controlling the operation of the other metering device.

6. In mechanism of the class described, the combination of means for forming a paper web, cutting mechanism associated with said forming means for cutting the web transversely, apparatus for measuring the amount of paper delivered by said paper forming means and controlling the operation of said cutting mechanism.

7. In mechanism of the class described, the combination of Fourdrinier type paper making mechanism, metering apparatus for measuring the amount of paper delivered by said mechanism, and means controlled by said metering apparatus and acting on the paper web while on the wire of said paper making mechanism for cutting said web transversely.

8. In mechanism of the class described, the combination of Fourdrinier type paper making mechanism, metering apparatus for measuring the amount of paper delivered by said mechanism, and means controlled by said metering apparatus and acting on the paper web while on the wire of said paper making mechanism for cutting said web transversely, said cutting means comprising a nozzle for directing a fluid stream against the web, and means for moving said nozzle transversely of the web.

9. In mechanism of the class described, the combination of Fourdrinier type paper making mechanism, means for reeling the paper web formed on said mechanism, metering apparatus for measuring the amount of paper wound on said reeling means, and means controlled by said metering apparatus acting on the paper web while on the wire of said paper making mechanism for cutting said web transversely, said cutting means comprising a nozzle for directing a fluid stream against the web, and means for moving said nozzle transversely of the web.

CHARLES A. FOURNESS.

CHARLES M. PEARSON.