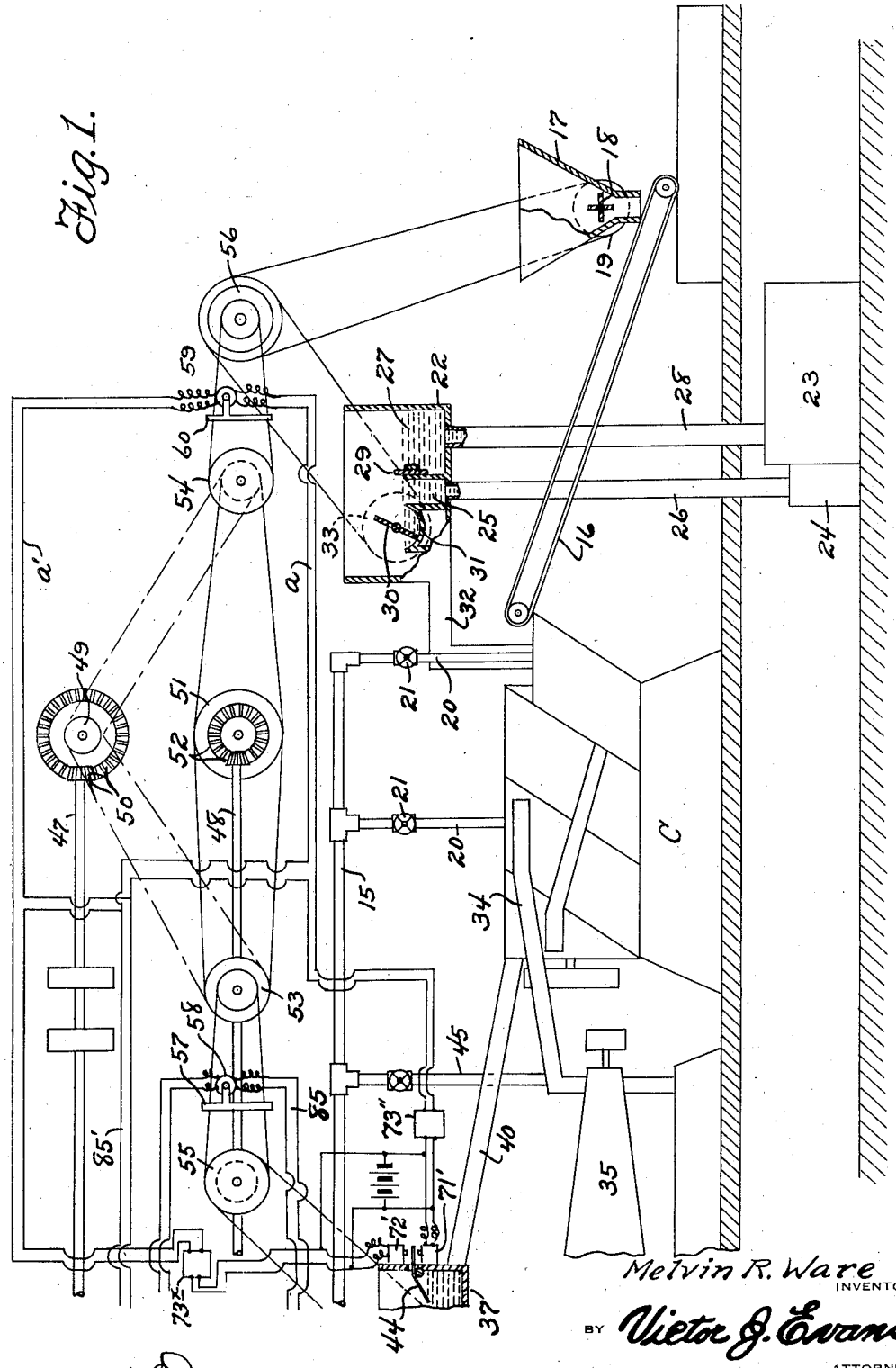
Aug. 26, 1930. M. R. WARE 1,773,832

AUTOMATIC PAPER MAKING PROCESS AND APPARATUS

Original Filed July 30, 1928 3 Sheets-Sheet 1

Fig. 1.




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AUTOMATIC PAPER MAKING PROCESS AND APPARATUS

Original Filed July 30, 1928 3 Sheets-Sheet 2

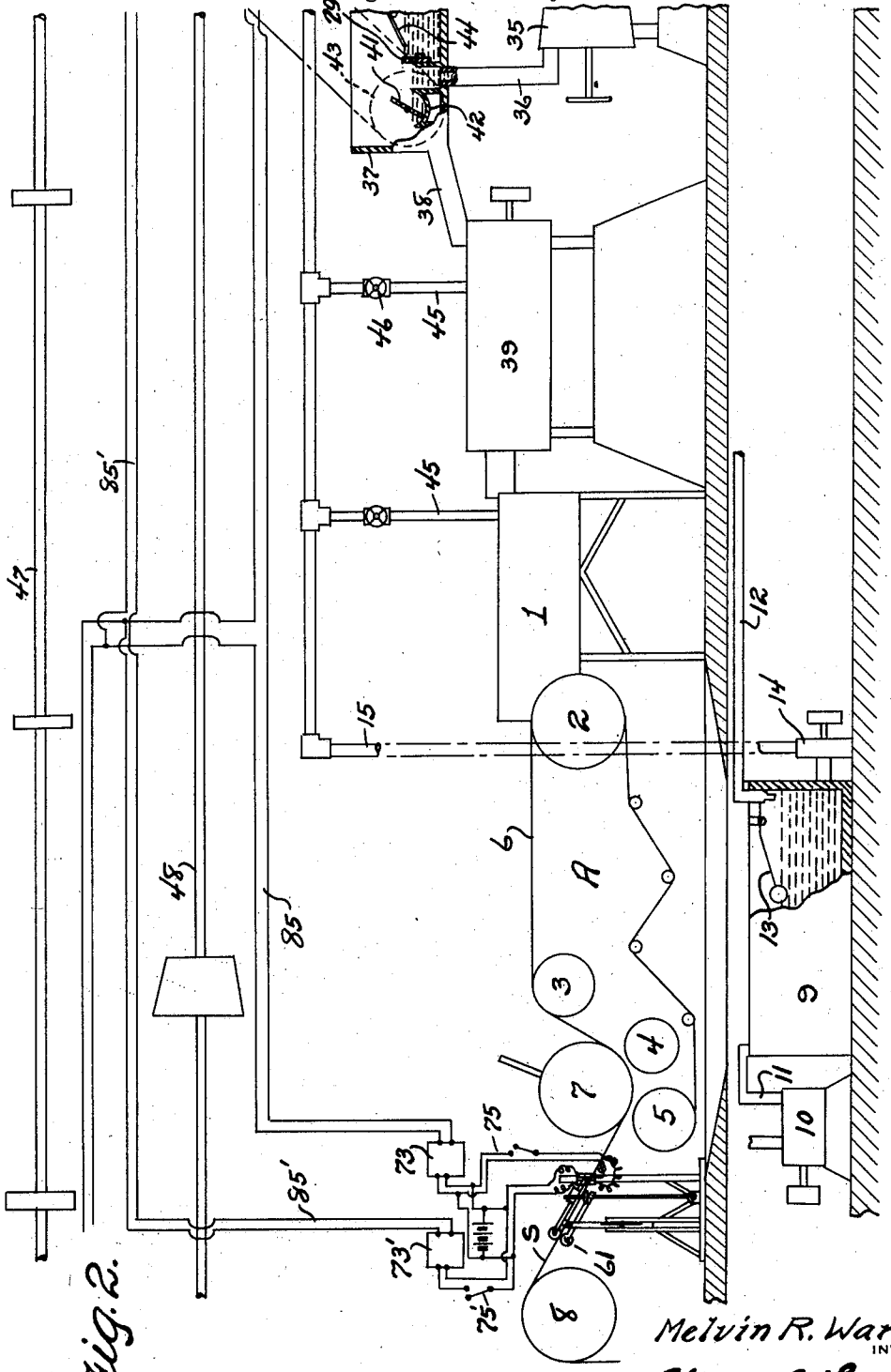



Fig. 2.

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AUTOMATIC PAPER MAKING PROCESS AND APPARATUS

Original Filed July 30, 1928 3 Sheets-Sheet 3

Fig. 4.

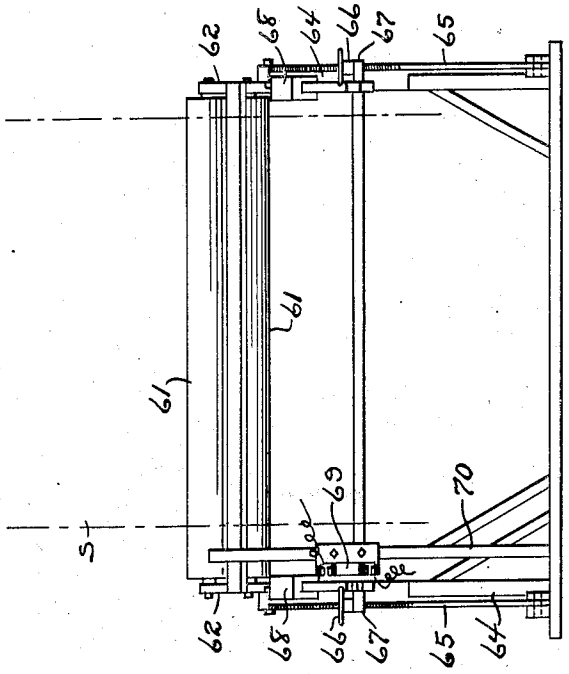



Fig. 6.

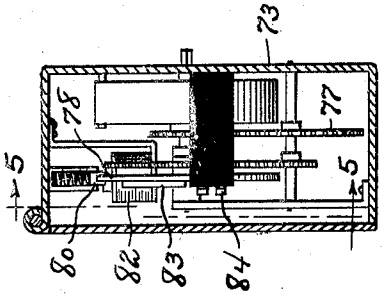



Fig. 3.

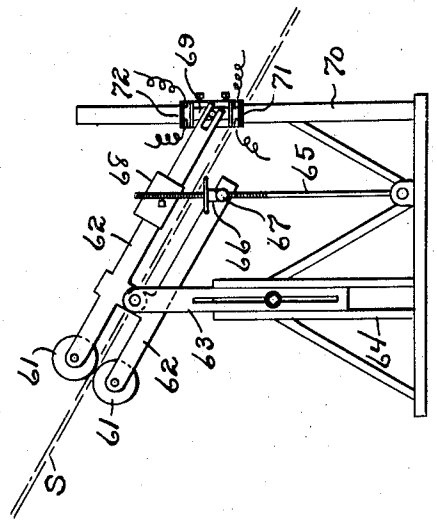
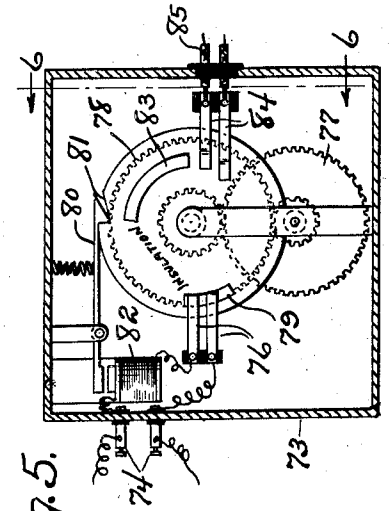



Fig. 5.




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Patented Aug. 26, 1930 1,773,832

# UNITED STATES PATENT OFFICE

MELVIN R. WARE, OF PLAINFIELD, NEW JERSEY

## AUTOMATIC PAPER-MAKING PROCESS AND APPARATUS

Application filed July 30, 1928, Serial No. 296,172. Renewed May 1, 1930.

This invention relates to a process and apparatus for making paper, the general object of the invention being to combine the stock preparation or beating and refining units with the sheet or web forming unit in such a manner that the various means for treating and handling the materials from the weighing or measuring means to the drying means for the sheet or web constitute a single unit and thereby makes it possible to automatically control the operation of the entire paper making process from the weighing or measuring of the raw materials to the delivering of the formed and pressed sheet or web to the drying means.

Another object of the invention is to provide means whereby a predetermined quantity of raw materials and water is automatically and continuously furnished to the system, thus eliminating guesswork in the supplying of raw materials and water to the system, and to provide means whereby the different units will work in harmony as a single unit, which, with the automatic furnishing of the raw materials and water, will cause a uniform consistency of stock and thus produce a uniform sheet or web of paper.

A further object of the invention is to provide automatic electrical controlling means which operate to so control the feeding means that the sheet or web being formed will be of a uniform thickness.

A still further object of the invention is to so arrange the system that all the parts thereof may be placed on one floor, thus eliminating basements and also rendering it unnecessary to place the system in a specially designed building.

By the use of this invention, the personal element is practically eliminated, and it increases production, reduces equipment and floor space, as well as labor, produces paper of uniform thickness and better quality, with uniform shrinkage in the finished product and with uniform colors and sizings. There is less shrinkage in raw materials, greater retention of chemicals, no white water waste and permits a standardization of furnishings, costs and product. As there is an automatic control of all elements, the personal element and guesswork are practically eliminated.

This invention also consists in certain other features of construction and in the combination and arrangement of the several parts, to be hereinafter fully described, illustrated in the accompanying drawings and specifically pointed out in the appended claims.

In describing the invention in detail, reference will be had to the accompanying drawings wherein like characters denote like or corresponding parts throughout the several views, and in which:—

Figures 1 and 2 illustrate the invention diagrammatically.

Figure 3 is a side view showing the circuit closing means actuated by the thickness of the sheet or web of paper.

Figure 4 is a front view of Figure 3.

Figure 5 is a section on line 5—5 of Figure 6, showing the automatic timing means.

Figure 6 is a section on line 6—6 of Figure 5.

In these drawings, A indicates a paper making machine of the type forming the subject matter of my application, Serial No. 204,002, filed July 7, 1927, and which includes the vat or head box 1, the vacuum roller 2, the rollers 3, 4 and 5, the endless wire belt 6 which passes over the rollers 2, 3, 4 and 5, and the roller 7 under which the belt passes and from which the formed sheet or web of paper passes to the reel 8 or this member 8 may form part of the drying means for the sheet. The sheet is shown at S.

A tank 9 is placed below the machine A so that the white water from said machine will drain into said tank and the vacuum pump 10, which is connected with the vacuum parts of the machine A, discharges into the tank 9 through means of the pipe 11. Fresh water is supplied to the tank 9 through the pipe 12, this flow of water being controlled by the float operated valve 13, so that the level of water in the tank 9 remains constant. A pump 14 draws water from the tank 9 and discharges it into the line 15, and while the drawings show the tank 9 and the pumps 10 and 14 arranged in a basement, it will, of course, be understood that these parts can be arranged

in a sink formed in the floor or they may be placed on the floor and the machine A elevated so that the tank 9 and its associated parts may be placed under the same.

A pulping machine C, which forms the subject matter of my application, Serial No. 239,169, filed December 10, 1927, and which consists of a cylinder and a plurality of rolls therein, with means associated with these parts whereby the revolving of the rolls will disintegrate the stock fed into the cylinder, is spaced from the paper making machine A. Paper forming material is fed into the machine C by a conveyor 16 from a hopper 17 which contains a combined agitator and feeder 18 to the shaft of which a pulley 19 is attached. Thus by rotating this feeder 18 at certain speeds, predetermined quantities of material will be fed by the conveyor into the machine C. Similar hoppers may be used for feeding the other ingredients on to the conveyor, such as size, alum, starch, colors, etc.

Of course, other means may be used for feeding the paper making materials in predetermined quantities to the pulping machine. For instance, weighing means may be used instead of the measuring means.

Predetermined quantities of water are also fed into the pulping machine C through means of the branch pipes 20 which are connected with the pump line 15 so that white water from the tank 9 is mixed with the materials in the machine C. The flow of water through these pipes 20 is controlled by the valves 21.

Where decker stock from a pulp mill or other stock in slush form is to be used, a measuring tank 22 is provided for delivering this stock to the machine C in predetermined quantities. A stock chest 23 is provided for holding the stock and the stock in said chest is pumped therefrom into the tank 22 by a pump 24 which is connected with a chamber 25 in tank 22 by a pipe 26. An overflow chamber 27 in the tank 22 is connected by a pipe 28 with the chest 23. An adjustable level board 29 controls the flow of stock from the chamber 25 into the chamber 27 and a rotatable member 30, operating over a concave 31, feeds the stock in predetermined quantities from the chamber 25 through a pipe 32 to the machine C. By rotating the pulley 33, which is connected with the member 30 at certain speeds, the rate of feed of the stock from the tank 22 into the machine C can be controlled.

From the machine C, the thoroughly pulped mass passes through the pipe 34 to the Jordan 35, and from the Jordan the mass passes through the pipe 36 into the measuring box 37 and from the measuring box, the mass passes through the pipe 38 into the screen 39 which delivers the material to the head box 1. If the Jordan is not to be used, the material can be pumped from the machine C into the measuring box 37 or the machine C can be elevated so that the material will pass therefrom into the measuring box by gravity. The surplus stock in the measuring box 37 returns to the machine C through the pipe 40.

The box 37 is provided with a rotary member 41 and concave 42 which are similar to those in the tank 22 and the pulley 43 of the member 41 is also adapted to be driven at various speeds to control the amount of material fed from the box 37.

An adjustable board or gate 29′ is arranged in the box 37 which is similar to the board or gate 29 in box 22 and controls the flow of stock from the measuring chamber of said box 37 to the overflow chamber thereof, the same as the gate 29 does in box 22. By lowering said board or gate 29′ and the chamber to box 37, all the stock in said chamber will return to the machine C through pipe 40 so that this box 37 not only acts as means for feeding predetermined quantities of stock to the screen through means of the feeding member 41, but it also acts as a quick shut-off in event of trouble which makes it desirable to shut down the paper making parts of the system on short notice, for by lowering the gate or board 29′, all the stock will flow back to the machine C and none of it will pass to the paper making machine A.

A flow board 44 is pivotally arranged on the rear wall of the chamber 37 and has its rear end passing through a hole formed in said rear wall and its front end is arranged to be acted on by stock passing over the gate or board 29′ from the measuring chamber to the overflow chamber of said box 37, so that this surplus stock will tend to tilt the board 44. The purpose of this board is explained hereinafter.

Branch pipes 45, containing valves 46, are provided for supplying water from the line 15 to the screen, the head box and to the Jordan, so that predetermined quantities of water can be supplied to these parts.

A constant speed shaft 47 and a variable speed shaft 48 are provided for actuating the various parts of the system, it being understood that either one of these shafts may be used, as desired. The drawings only show the connections between each shaft and the measuring devices 17, 22 and 37, as my invention includes automatic means for controlling the application of power to these devices and it is, therefore, necessary to show such application. The other parts of the system can be connected to either shaft in any suitable manner. A pulley 49 is driven from the constant speed shaft 47 by the gears 50 and a pulley 51 is driven from the variable speed shaft 48 by the gears 52. A cone pulley 53 is adapted to be belted to either the pulley 49 or the pulley 51 and a similar pulley 54 is

adapted to be belted to either the pulley 49 or the pulley 51. The pulley 53 is adapted to be belted to a cone pulley 55 which in turn is belted to the pulley 43 which drives the rotary member 41 in the box 37 and the cone pulley 56 is belted to the cone pulley 54 and this pulley 56 is belted to the pulley 33 of the rotary member 30 in the measuring device 22. This pulley 56 is also belted to the pulley 19 of the feeder 18 in the hopper 17. It will, of course, be understood that other means may be provided for actuating the members 18, 30 and 41 at variable speeds.

The belt shifter 57 for the belt which connects the pulleys 53 and 55 together, is actuated by a reversible motor 58 and a reversible motor 59 actuates the belt shifter 60 for the belt which connects the pulleys 54 and 56 together. If desired, two motors may be provided for each belt shifter instead of the reversing motor, for moving the shifter in either direction.

The motor 58 has its circuits controlled in accordance with the variation of the thickness of the sheet S leaving the paper forming machine A through means of a pair of rollers 61 between which the sheet passes, each roller being carried by a pair of levers 62. The levers are pivotally connected intermediate their ends to the uprights 63 adjustably connected to the support 64 so that the levers can be adjusted to the sheet and the inclination of the lower levers can be adjusted through means of the threaded upright rods 65 carrying the nut members 66 which engage projections 67 on the tail ends of the levers. A weight 68 is adjustably connected with each upper lever and one of these upper levers has its tail part forked to engage a projection on a sliding switch member 69 carried by a post 70 which also carries two pairs of contacts 71 and 72. This switch arrangement is adjustably mounted on the post. As will be seen, the weights act as counterbalances for the levers so that the upper roller 61 will always contact the sheet, and if the sheet should become too thin, the tail end of the upper levers would move upwardly and thereby the member 69 of the switch would bridge the upper contacts 72, but if the sheet became too thick, the switch member 69 would be moved downwardly, thus bridging the lower contacts 71.

A casing 73 carries a pair of terminals 74 and a circuit 75 connects these terminals with the pair of contacts 71. A pair of spring contacts 76 is arranged in the casing and a spring motor 77 is arranged in the casing, which drives a train of gearing, one gear 78 of which carries a contact 79 bridging the contacts 76 when a spring dog 80 in the casing engages a notch 81 formed in said gear 78, this dog acting to hold the gear stationary. A magnet 82 is arranged in the casing and is adapted to move the dog to releasing position when the magnet is energized so that the spring motor can rotate the gear. The magnet is electrically connected with one of the terminals 74 and one of the spring contacts 76 so that when the contacts 76 are bridged by the contacts 79 and the switch member 69 is bridging the contacts 71, the circuit to the magnet will be closed and thus the magnet will move the dog 80 to releasing position so that the motor can rotate the gear 78. This gear also carries a contact strip 83 which will bridge the spring contacts 84 in the casing when the gear is rotated so as to close one circuit 85 of the reversing motor 58. After the gear 78 has been moved a short distance, the contact 79 will move off the contacts 76 and thus break the circuit of the magnet 82 so that the dog will move downwardly and slide on the periphery of the gear 78 until the notch 81 again comes opposite the dog, when the dog will engage said notch and thus stop further movement of the gear. As shown, the contact 83 is of considerable length so that the circuit 85 of the reversing motor will remain closed for a part of the revolution of the gear, after which the contact 83 passes off the contacts 84 and the circuit to the reversing motor is broken.

A similar arrangement, placed in a casing 73′, has the circuit of its magnet closed when the switch member 69 bridges the contacts 72, thereby closing the circuit 75′ of the magnet and causing the timing means in said casing 73′ to close the circuit 85′ of the reversing motor 58 so that said motor will rotate in an opposite direction. As before stated, the movement of this reversing motor will actuate the belt shifter 57 so as to adjust the belt on the cone pulleys 53 and 55, which will either increase or decrease the speed of the feeding member 41 in the measuring box 37. For instance, if the sheet is too thick, the roller 61, carried by the upper levers, will be moved upwardly, thus causing the downward movement of the switch member 69, which will bridge the contacts 71 and thus close the circuit to the magnet 72, which releases the dog 80 and permits the timing means in the casing to begin to actuate. As soon as the contact 83 bridges the contacts 84, the circuit of the reversing motor will be closed so that this motor will move the belt shifter on to smaller portions of the cone pulleys and thus the feeder member 41 will be rotated at a slower speed, thereby feeding less stock to the screen and the paper forming machine A, so that the sheet being formed by the machine A will be reduced in thickness. As soon as the contact 78 rides off the contacts 84, the circuit of the reversing motor will be broken and thus the belt will remain in its adjusted position and the quantity of stock fed to the machine A will remain at its reduced amount. The timing mechanism should be so set as to give the reduced amount of material time to pass through the machine

A and reach the rollers 61 before the contact 79 again bridges the contacts 76. If the sheet is then properly reduced in thickness, the magnetic circuit will be broken at the contacts 71, but if the sheet is still too thick, the contacts 71 are still bridged by the member 69, and as soon as the contact 79 bridges the contacts 76, the circuit of the magnet 82 is again closed, thus raising the dog 80 and permitting the gear 78 to make another revolution so as to close the circuit 85 of the reversing motor to cause said motor to shift the belt again and thus further reduce the speed of the member 41 and thus supply a less amount of stock to the paper forming machine. This will keep up until the paper is of the proper thickness. If the sheet is too thin, the downward movements of the roller 61, carried by the upper levers, will cause one of the levers to move the switch member 69 upwardly to bridge the contacts 72 and thus close the circuit to the magnet in the casing 73′ which in turn causes the timing mechanism to close the circuit 85′ and thus cause the reversing motor to operate the belt shifter in an opposite direction so that the member 41 will be driven at a greater speed and thus increase the supply of stock to the paper forming machine.

Thus it will be seen that I have provided means for automatically controlling the feed of stock to the paper making machine by the thickness of the paper sheet leaving the machine, with means for adjusting the parts so that the sheet can be made of any desired thickness. It will, of course, be understood that other means than those described may be used for automatically controlling the feeding of the material to the paper making machine by the thickness of the sheet.

An arrangement, similar to that just described, is used for automatically controlling the feeding of the materials from the hopper 17 or tank 22 to the pulping machine C from the flow board 44, which controls the circuit of the motor 59 which actuates the belt shifter 60. The movement of this board 44 acts to close the circuits of the devices 73″ and 73× by bridging either the lower contacts 71′ or the upper contacts 72′ and these timing devices 73″ and 73× control the circuits *a* and *a′* of the motor 59. Thus the automatic control of the flow of pulped material from the box 37 to the paper making machine by means of the variations in the thickness of the sheet S and the resultant movement of the board 44 will automatically regulate the feeding of the materials to the pulping machine C.

From the foregoing it will be seen that I have provided a continuous and automatic process for making paper and an apparatus for carrying out the process and one in which the materials and water are continuously supplied in predetermined quantities, thus causing a uniform consistency of stock and water and thereby effecting a uniform sheet of paper being made. The entire system practically forms one unit and the process is an automatic one.

The arrangement of the automatic control of the feeding means enables the feeding of the materials to be regulated without affecting the speed of the other equipment, and by operating all the parts from one source of power, the slowing down of the paper machine, caused by power house troubles, etc., will automatically act to diminish the flow of stock and thereby maintain a uniform basis weight or thickness of paper sheet.

As before stated, means other than those shown may be used for transmitting the power from either drive shaft to the feeding means and other means may be provided for the automatic control of the feeding means.

What I claim is:—

1. The herein described process, consisting in feeding paper making material and water in predetermined quantities and in a continuous manner to a pulping machine, then passing the pulped mass to a measuring box which feeds the mass in predetermined quantities to a paper making machine and returning the white water from the paper making machine to the pulping machine and to the measuring box direct.

2. The herein described process, consisting in delivering paper making material and water continuously and in predetermined quantities to a pulping or mixing machine, then passing the pulped mass to a measuring device, then passing the material from the measuring device to a paper making machine and controlling the feeding of the material through the system automatically by the variations in the thickness of the sheet formed by the paper making machine.

3. The herein described process, consisting in delivering paper making material continuously and in predetermined quantities to a pulping or mixing machine and supplying water continuously and in predetermined quantities to said machine from a paper making machine, then passing the pulped mass to a measuring device, then passing the mass to a paper making machine and automatically controlling the feeding of the material through the system by the variations in the thickness of the sheet formed by the paper making machine.

4. The herein described process, consisting in delivering paper making material and water containing fibers from a paper making machine continuously and in predetermined quantities to a pulping or mixing machine, then passing the pulped mass to a measuring device, then passing the material from the measuring device to a paper making machine, automatically controlling the operation of the feeding device by the variations in the thickness of the sheet formed by the

paper making machine and automatically controlling the feeding of the materials to the pulping machine by the variation in levels of the material in the measuring device.

5. The herein described process, consisting in delivering paper making materials and water continuously and in predetermined quantities to a pulping or mixing machine, then passing the pulped mass to a measuring device, then passing the material from the measuring device to a paper making machine, automatically controlling the operation of the measuring device by the variations in the thickness of the sheet formed by the paper making machine, automatically controlling the feeding of the materials to the pulping machine by the variation in levels of the materials in the measuring device and operating the various parts from a single source of power.

6. An apparatus of the class described, comprising a pulping and mixing machine, means for delivering a predetermined quantity of paper making materials into the same, a measuring device, means for passing the pulped material from the machine to said device, a paper making machine, means for passing the material from the device to said machine, means for automatically controlling the operation of said device by the variation in thickness of the sheet formed by the paper making machine and means for automatically controlling the operation of the means for delivering material to the pulping machine by the variation in levels of the material in the measuring device.

7. An apparatus of the class described comprising a pulping and mixing machine, means for delivering a predetermined quantity of paper making materials to the same, a measuring device, means for passing the pulped material from the machine to said device, a paper making machine, means for passing the material from the device to said machine, means for using the white water from the paper making machine in other parts of the apparatus, means for regulating the action of the measuring device by the variations in thickness of the sheet formed by the paper making machine, means for regulating the action of the means for delivering materials into the pulping machine by the variation in levels of the material in the measuring device and means for operating all parts of the device from a single source of power.

8. An apparatus of the class described comprising a pulping and mixing machine, a device for delivering predetermined quantities of paper making materials, means for passing said materials to the pulping machine, a measuring device for feeding predetermined quantities of pulped material to the pulping machine, a second measuring device, means for passing the material from the pulping machine to said device, a paper making machine, means for passing the material from the second device thereto, means for catching the white water from the paper making machine, means for delivering said water in predetermined quantities to the other parts of the apparatus, means for automatically regulating the operation of the second device by the variation in thickness of the sheet formed by the paper making machine and means for automatically regulating the operation of the feeding means to the pulping machine by the variation in levels of the material in the second measuring device.

In testimony whereof I affix my signature.

MELVIN R. WARE.