Feb. 14, 1933. H. D. WELLS 1,897,157

PAPER STUFF HYDRATOR

Filed Feb. 13, 1932 2 Sheets-Sheet 1

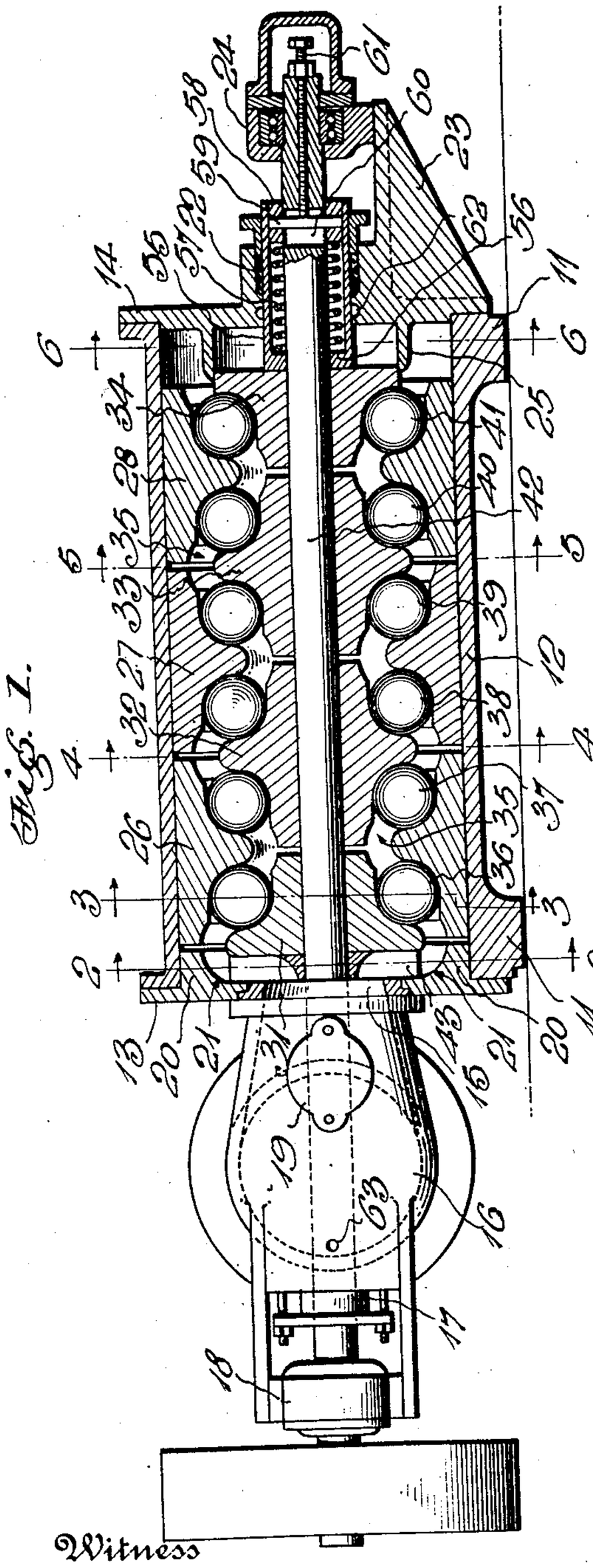

Fig. 1.

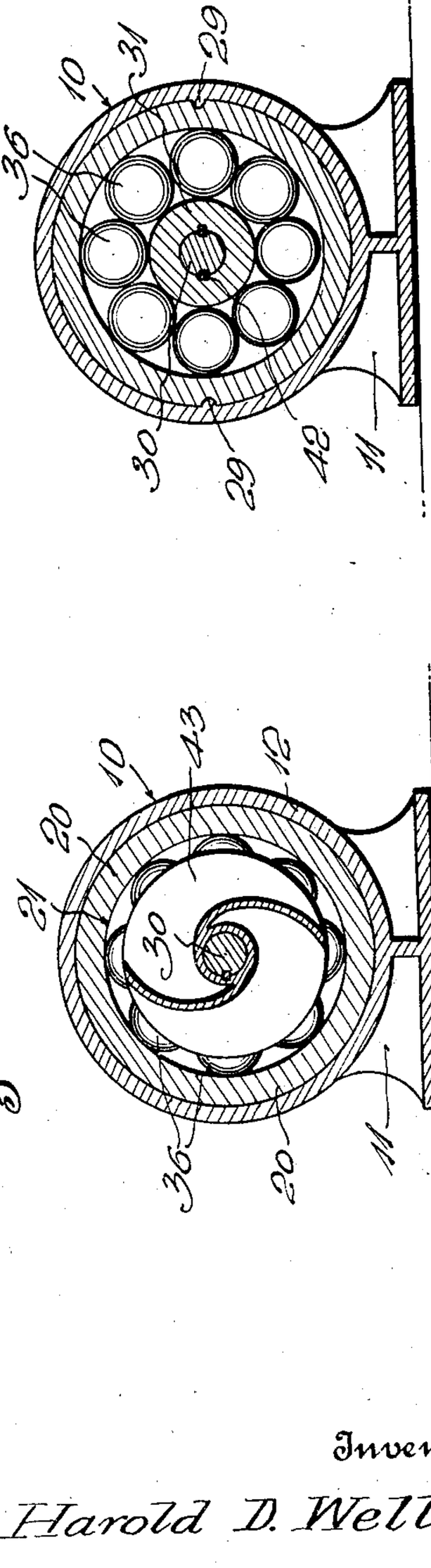

Fig. 3.

Fig. 2.

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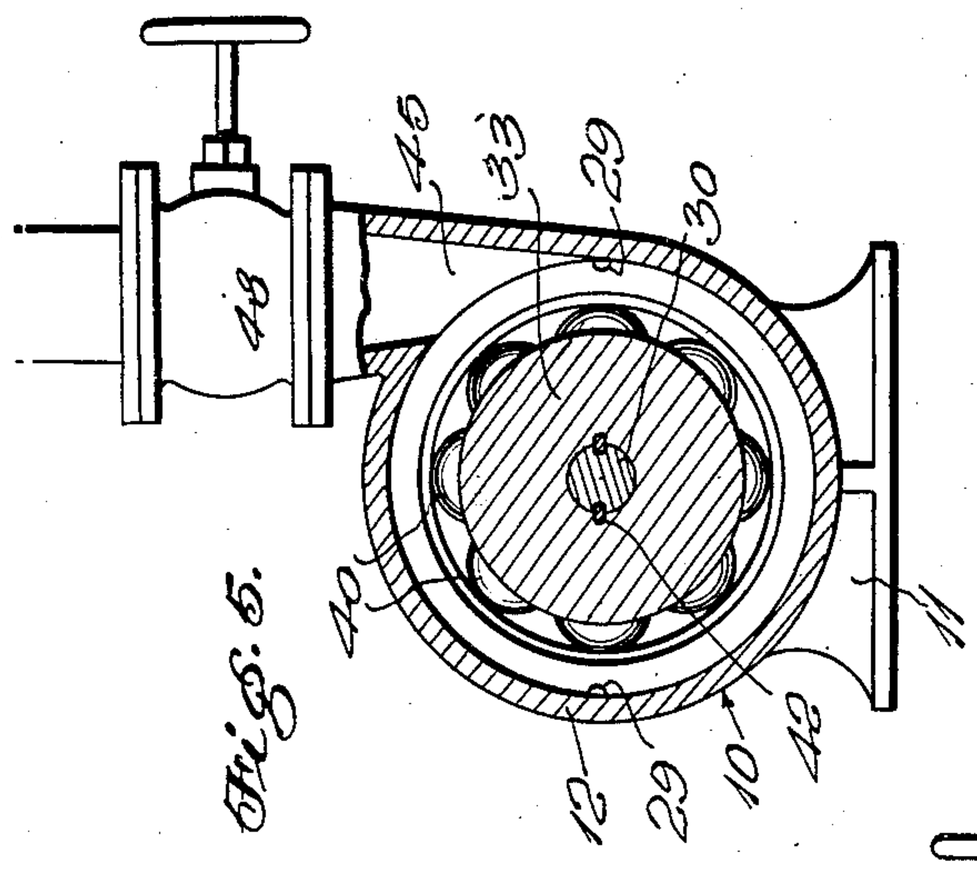

Fig. 5.

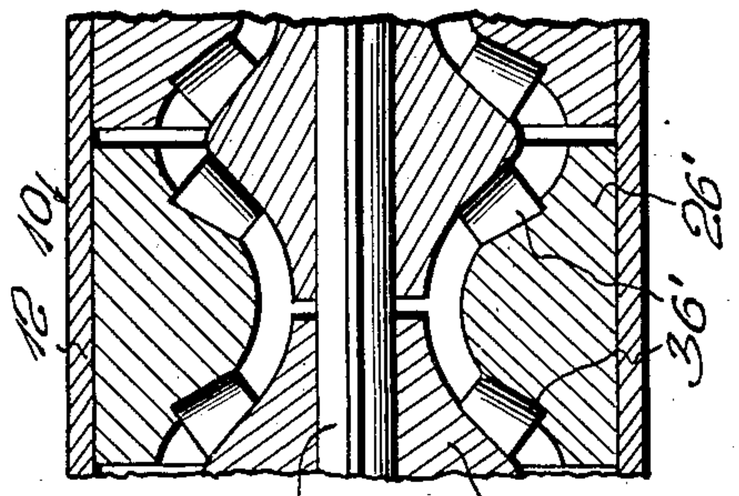

Fig. 7.

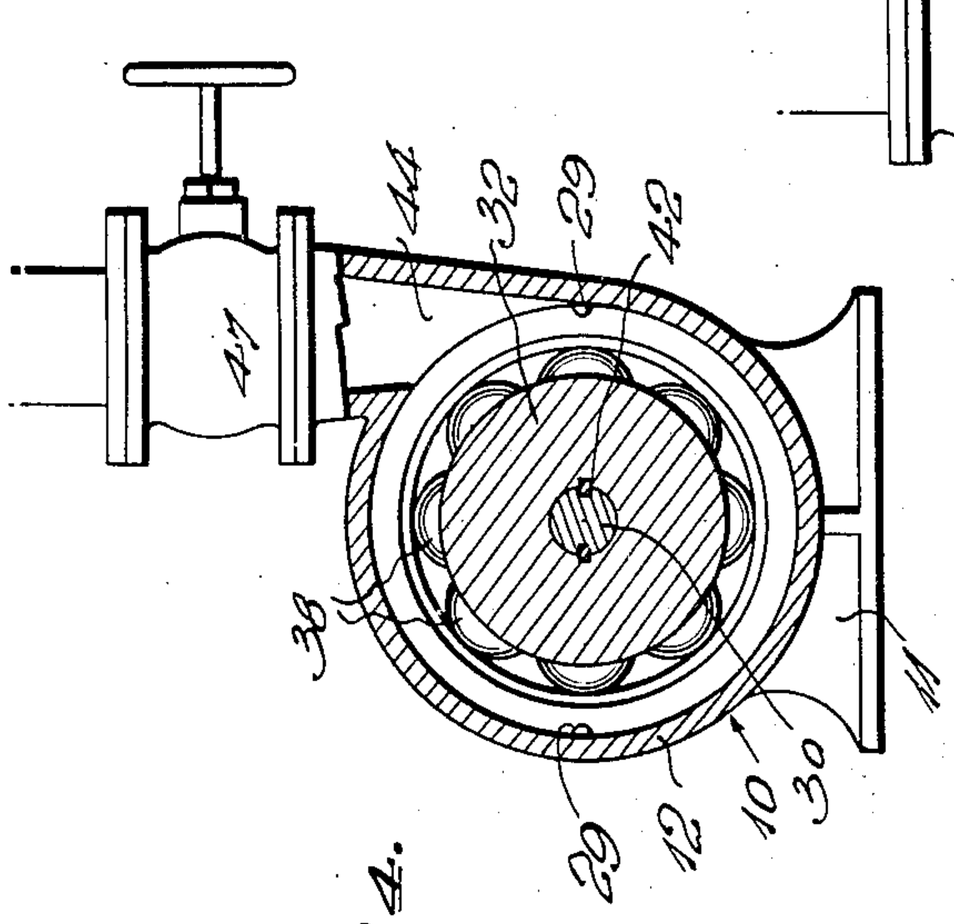

Fig. 4.

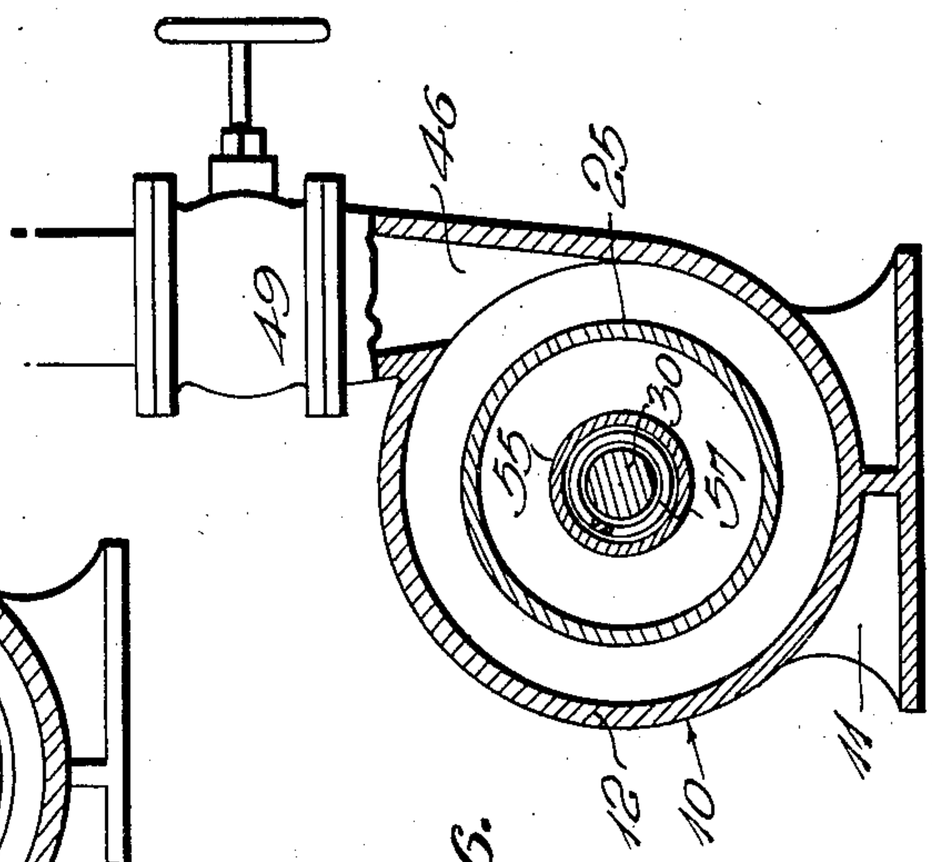

Fig. 6.

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UNITED STATES PATENT OFFICE

HAROLD DONALD WELLS, OF GLENS FALLS, NEW YORK

PAPER STUFF HYDRATOR

Application filed February 13, 1932. Serial No. 592,783.

The principal object of the present invention is to provide a machine which will economically hydrate paper stuff more uniformly and to greater degree than present machines.

With the foregoing in view, other objects are to provide a single machine which will take the place of both beaters and Jordans heretofore used; to provide a machine which may be used to continuously hydrate the paper stuff instead of in batches, providing for greater economy and greater uniformity; to provide a hydrator which will roll the fibre bundles into single fibres without cutting them into short pieces; to provide a hydrator which will centrifugally separate the dirt from the stuff and grind such dirt into fine particles so small that they will be unnoticeable in the paper, or so small that they can be easily washed out of the pulp or bleached therefrom; to provide a hydrator which pumps the pulp therethrough and is capable of discharging it at a high elevation above the outlet of the machine; to provide a machine in which the hydration will be easily and accurately controllable as desired; to provide a hydrator which combines three machines in one or rather produces the same results as now produced by said machines, the machines referred to being the beater, Jordan and pump.

With the foregoing and other beneficial objects in view, the invention resides in the novel subject matter hereinafter described and claimed, description being accomplished by reference to the accompanying drawings.

Fig. 1 is a vertical longitudinal sectional view through a hydrator constructed in accordance with my invention.

Figs. 2, 3, 4, 5 and 6 are vertical transverse sectional views on the correspondingly numbered lines of Fig. 1.

Fig. 7 is a fragmentary sectional view showing a different form of rollers and differently shaped race members co-operable therewith.

A preferred construction has been shown and will be specifically described, with the understanding however, that within the scope of the invention as claimed, numerous variations may be made. Moreover, while the machine is intended primarily for operating upon paper stock or stuff, it obviously is not restricted to this particular field of use.

A horizontally elongated casing 10 is provided having supporting feet 11 adapted to be anchored to a suitable bed or floor. The side wall 12 of the casing 10 is preferably cylindrical and secured suitably to the ends of this side wall, are two end walls 13 and 14. The end wall 13 is provided with a central inlet 15 for the paper stock, said inlet communicating with a supply elbow 16 which carries a stuffing box 17, a shaft bearing 18, and a hand-hole cover 19. This end wall 13 is provided with an inwardly thickened annular portion 20 concentric with and spaced radially from the inlet 15, the inner periphery 21 of said portion 20 being transversely curved and gradually changing its direction from one transverse to the casing 10, to one longitudinally of the latter, for a purpose to appear.

The end wall 14 is provided with a stuffing box 22, with a bracket 23 and with a shaft bearing 24 carried by said bracket in outwardly spaced relation with said stuffing box. This end wall 14 is also by preference provided with an annular inwardly projecting cylindrical flange 25 for a purpose which will be hereinafter described.

I provide a succession of outer roller races in sliding but non-rotating contact with the smooth inner side of the casing wall 12, any suitable number of these race members being employed, which is also true of parts co-operating therewith as will become apparent. In the present showing, there are three of the race members denoted at 26, 27 and 28. To hold these race members against rotation, I provide co-acting keys and key-ways as denoted at 29 in the transverse sectional views.

A single shaft 30 is rotatably supported by the bearings 18 and 24 and passes through the stuffing boxes 17 and 22, and on this shaft I provide a succession of inner roller races, four of these races being here shown denoted by the reference numbers 31, 32, 33 and 34. All of these race members are inwardly

spaced from the outer race members 26, 27 and 28 to provide a more or less tortuous channel 35 through which the stock must flow, and in this channel I provide a succession of annular series of rollers 36, 37, 38, 39, 40 and 41, said rollers being in contact with the outer and inner race members. These rollers are shown in most figures of the drawings, in the form of balls, but from Fig. 7, it will be clear that tapered rollers could be used instead, the outer and inner race rings being correspondingly modified. In this view, 36′ denotes the tapered rollers, 26′ one of the outer race members and 32′ one of the inner race members. It may also be stated that rollers of shapes other than globular or tapered, could be employed.

All of the inner race members 31, 32, 33, 34 rotate bodily with the shaft 30, being slidably keyed thereon as indicated at 42, and it will be observed that the race member 31 is inwardly spaced from the central portion of the end wall 13, a radial-delivery impeller 43 being secured to said shaft 30 in the space between said race member 31 and said central portion of said end wall 13. This impeller operates across the inlet 15 and it is within the confines of the thickened wall portion 20, so that the stock radially delivered by said impeller, will be directed longitudinally of the machine into the channel 35. A number of outlets are provided from this channel at different points along the length thereof, three outlets 44, 45 and 46 being shown, said outlets being provided with individual valves 47, 48 and 49. The impeller 43 forces the stock through the channel 35 and the rolling means act upon said stuff to advantageously hydrate it, and the stuff is moreover discharged under the influence of said impeller, with such force that it may be carried without other aid to a height as high as fifty feet. The extent of hydration is controllable by means of the valves 47, 48 and 49, allowing the stock to be subjected to a relatively few or a relatively great number of rolling operations, as may be required.

The race member 34 is slidable within the flange 25 above described and the inner end of a sleeve 55 abuts the outer end of said race member. This sleeve surrounds the shaft 30 and enters the casing 10 through the stuffing box 25. Near its inner end, sleeve 55 is provided with an internal shoulder 56, and a coiled compression spring 57 which surrounds shaft 30 within said sleeve, abuts said shoulder at its inner end. The outer end of spring 57 abuts a collar 58 which is slidable upon the shaft 30 within the outer portion of the sleeve 55. A radial key or the like 59 is connected with the collar 58 and passes through a slot 60 in the shaft 30, and an adjusting screw 61 is threaded longitudinally in one end portion of said shaft for the purpose of adjusting said key 59 and collar 58 to vary the strength of the spring 57. This spring exerts its strength to slide the various race members toward the receiving end of the machine, thereby holding them in yieldable contact with the rollers 36, 37, etc. While I have stated that the race members and rollers are held in yieldable contact, there is of course always a quantity of material between said race members and rollers, and due to the provision of the spring 57 and associated parts, any requisite yieldability of race members and rollers, may take place.

The flange 25 guards the stuffing box 22 to a large extent against entrance of paper stock, and as a further precaution, I may provide a channel 62 and means for inwardly forcing water to this channel, the water discharging inwardly into the machine serving to prevent the stock from leaking out into and through the stuffing box. A similar arrangement can be employed for the stuffing box 17, and the opening 63 in Fig. 1 may be considered as the water inlet.

Any preferred means may be employed for driving the machine, and for illustrative purposes, I have merely shown a pulley 64 upon the shaft 30. This pulley is by preference belted to a variable speed electric motor so that the machine may be driven at the most advantageous speed, consistent with the character of the stock, the extent to which it is to be hydrated, etc.

From the foregoing, taken in connection with the accompanying drawings, it will be seen that novel and advantageous provision has been made for carrying out the various objects of the invention. While only preferred features have been shown, attention is again invited to the fact that within the scope of the invention as claimed, numerous variations may be made.

I claim:—

1. In a machine of the class described, a fixed casing and a driven shaft extending longitudinally therethrough, an outer succession of race members slidably and non-rotatably mounted in said casing in concentric relation with said shaft, an inner succession of race members slidable on and rotatable bodily with said shaft, said inner race members being spaced from said outer race memers to provide a material channel, all of said race members having combined end and radial thrust surfaces, a succession of annular series of rollers in said channel contacting with said combined end and radial thrust surfaces of said race members, yieldable means exerting a force on at least one succession of said race members to hold all of said race members and said rollers in yielding contact, a material inlet into the aforesaid channel, and a material outlet from said channel.

2. In a machine of the class described, a fixed elongated casing having an internally smooth side wall, a driven shaft extending

longitudinally through said casing, an outer succession of race members within said casing in concentric relation with said shaft, said outer race members having smooth peripheries contacting slidably but non-rotatably with the smooth interior face of said casing side wall, an inner succession of race members slidable on and rotatable bodily with said shaft, said inner race members being spaced from said outer race members to provide a material channel, all of said race members having combined end and radial thrust surfaces, a succession of annular series of rollers in said channel contacting with said combined end and radial thrust surfaces of said race members, yieldable means exerting a force on at least one succession of said race members to hold all of said race members, and said rollers in yielding contact, a material inlet into the aforesaid channel, and a material outlet from said channel.

3. In a machine of the class described, a fixed casing and a driven shaft extending longitudinally therethrough, an outer succession of race members slidably and non-rotatably mounted in said casing in concentric relation with said shaft, an inner succession of race members slidable on and rotatable bodily with said shaft, said inner race members being spaced from said outer race members to provide a material channel, all of said race members having combined end and radial thrust surfaces, a succession of annular series of rollers in said channel contacting with said combined end and radial thrust surfaces of said race members, a stop on said shaft abutting one of the endmost inner race members, spring means on said shaft exerting a force on the other endmost inner race member toward said stop, whereby to hold all of the race members and rollers in yielding contact, a material inlet into the aforesaid channel, and a material outlet from said channel.

4. In a machine of the class described, a casing having a material channel, a succession of crushing means in said channel, a material inlet at one end of said channel, a plurality of material outlets at different points along the length of said channel, and individual valves for said outlets, whereby the material may be subjected to the required number of crushing operations during passage through the machine.

5. In a machine of the class described, a fixed casing and a driven shaft extending longitudinally therethrough, a succession of outer non-rotatable race members in said casing around said shaft, a succession of rotatable inner race members carried by said shaft, said inner race members being spaced from said outer race members to provide a material channel, a succession of annular series of rollers in said channel contacting with said outer and inner race members, an inlet into one end of said channel, a plurality of outlets at different points along the length of said channel, and individual valves for said outlets, whereby the material may be subjected to the required number of rolling operations during passage through the machine.

6. In a machine of the class described, a channel for the material to be acted upon, means in said channel for rolling the material, an impeller for feeding the material through said channel, and driving means for said rolling means embodying a shaft carrying said impeller.

7. In a machine of the class described, a channel for the material to be acted upon, means in said channel for rolling the material, said means embodying inner and outer race members and rollers in contact with said race members, an impeller for feeding the material through said channel, and driving means for said rolling means embodying a shaft which carries both said impeller and said inner race member.

8. In a machine of the class described, a casing having a material inlet at one end, a driven shaft extending into said casing through said inlet, a non-rotatable outer race member in the casing at said one end thereof, a rotatable inner race member on said shaft spaced inwardly from said casing end and spaced inwardly from said outer race member to provide a material channel, an annular series of rollers in said channel contacting with said inner and outer race members, and a radial-delivery impeller rotatable bodily with said shaft and disposed in the space between said casing end and said inner race member.

9. In a machine of the class described, a casing having an end wall provided with a material inlet, said end wall having an inwardly thickened annular portion concentric with and spaced radially outward from said inlet, a shaft extending into the casing through said inlet, a radial-delivery impeller rotatable bodily with said shaft and disposed at the inner side of said end wall, said impeller being within the confines of said inwardly thickened end wall portion and the inner periphery of the latter being transversely curved to direct the radially delivered material longitudinally within the casing, an outer non-rotatable race member and an inner rotatable race member spaced apart in the casing to provide a receiving channel for the longitudinally directed material, and rollers in said channel in contact with said race members.

10. In a machine of the class described, a casing having an end wall provided with an outwardly projecting stuffing box, rollers and race members therefor disposed within the casing near said end wall, a sleeve entering said casing through said stuffing box

and abutting one of said race members, the inner end of said sleeve being provided with an internal shoulder, a compression spring in said sleeve and at its inner end abutting said shoulder, a driven shaft extending through said spring and sleeve and slidably carrying the latter and said one race member, and means on said shaft abutting the outer end of said spring.

11. In a machine of the class described, a casing having an end wall provided with an outwardly projecting stuffing box, rollers and race members therefor disposed within the casing near said end wall, a sleeve entering said casing through said stuffing box and abutting one of said race members, the inner end of said sleeve being provided with an internal shoulder, a compression spring in said sleeve and at its inner end abutting said shoulder, a driven shaft extending through said spring and sleeve and slidably carrying the latter and said one race member, a slidable abutment carried by said shaft and abutting the outer end of said spring, and means for adjusting said abutment to different positions.

In testimony whereof I affix my signature.

HAROLD DONALD WELLS.