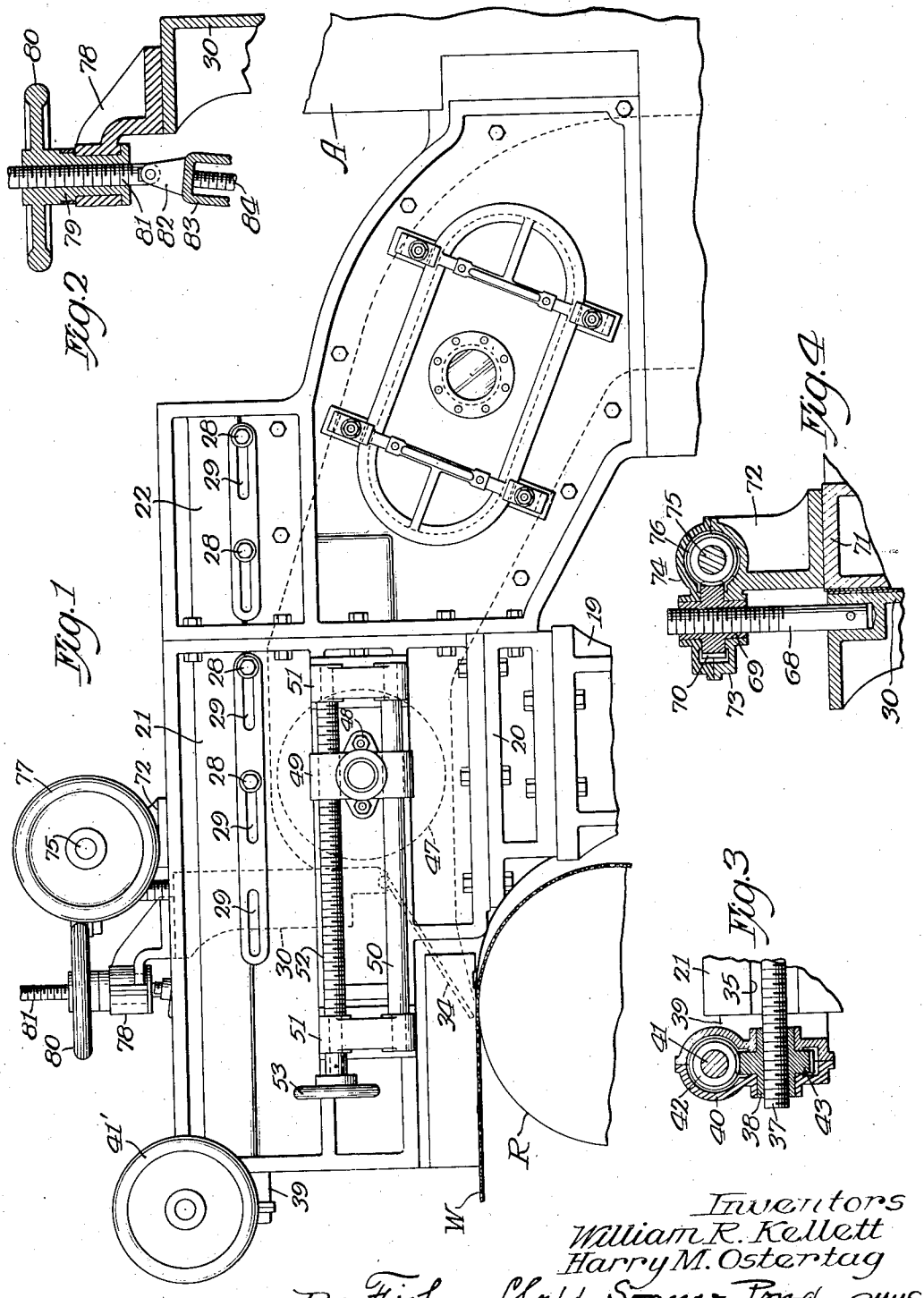
Nov. 17, 1936. W. R. KELLETT ET AL 2,060,808

HYDRAULIC INLET FOR PAPER MAKING MACHINES

Filed Nov. 19, 1934 7 Sheets-Sheet 1



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Fig. 5

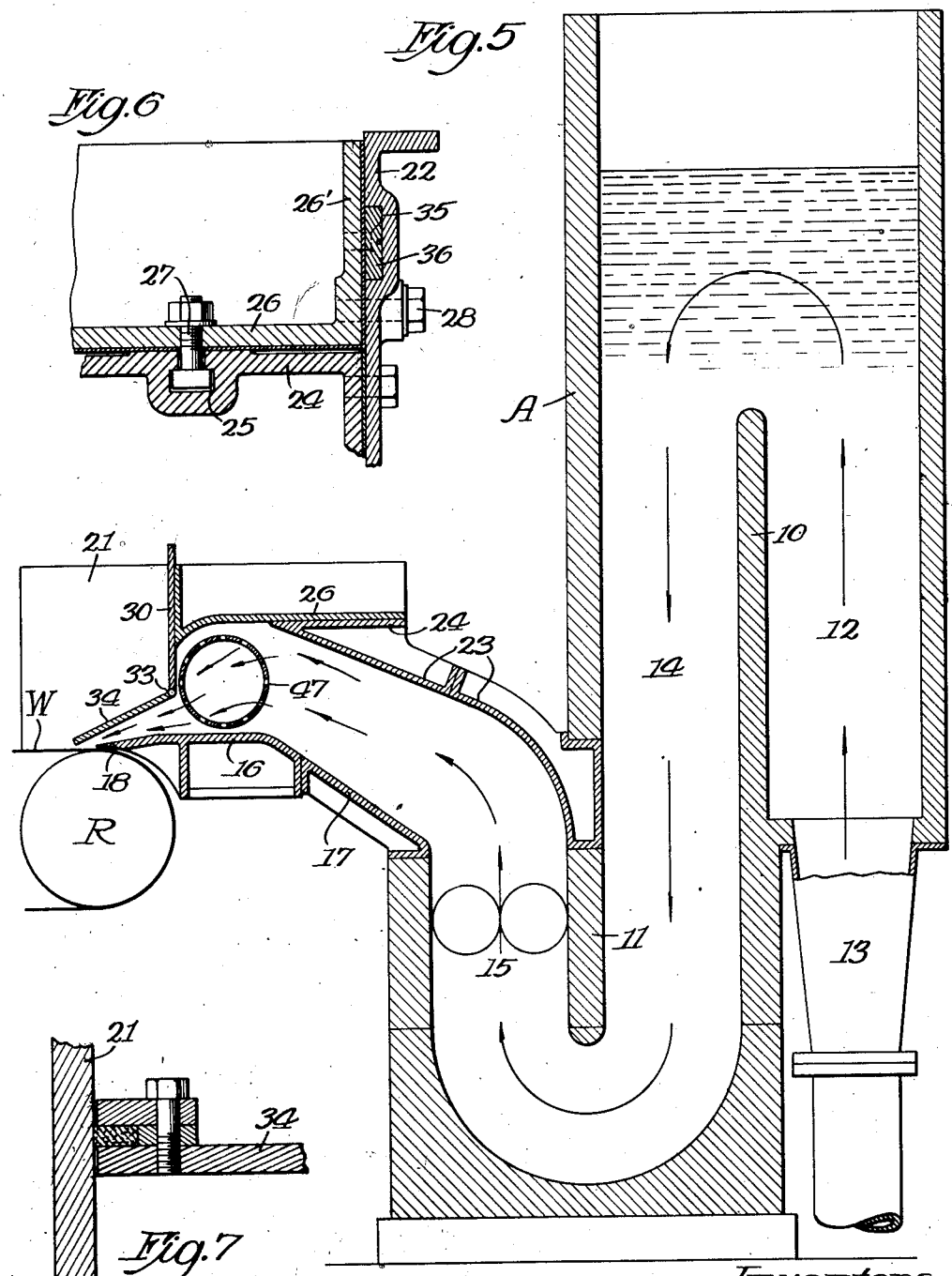


Fig. 6

Fig. 7

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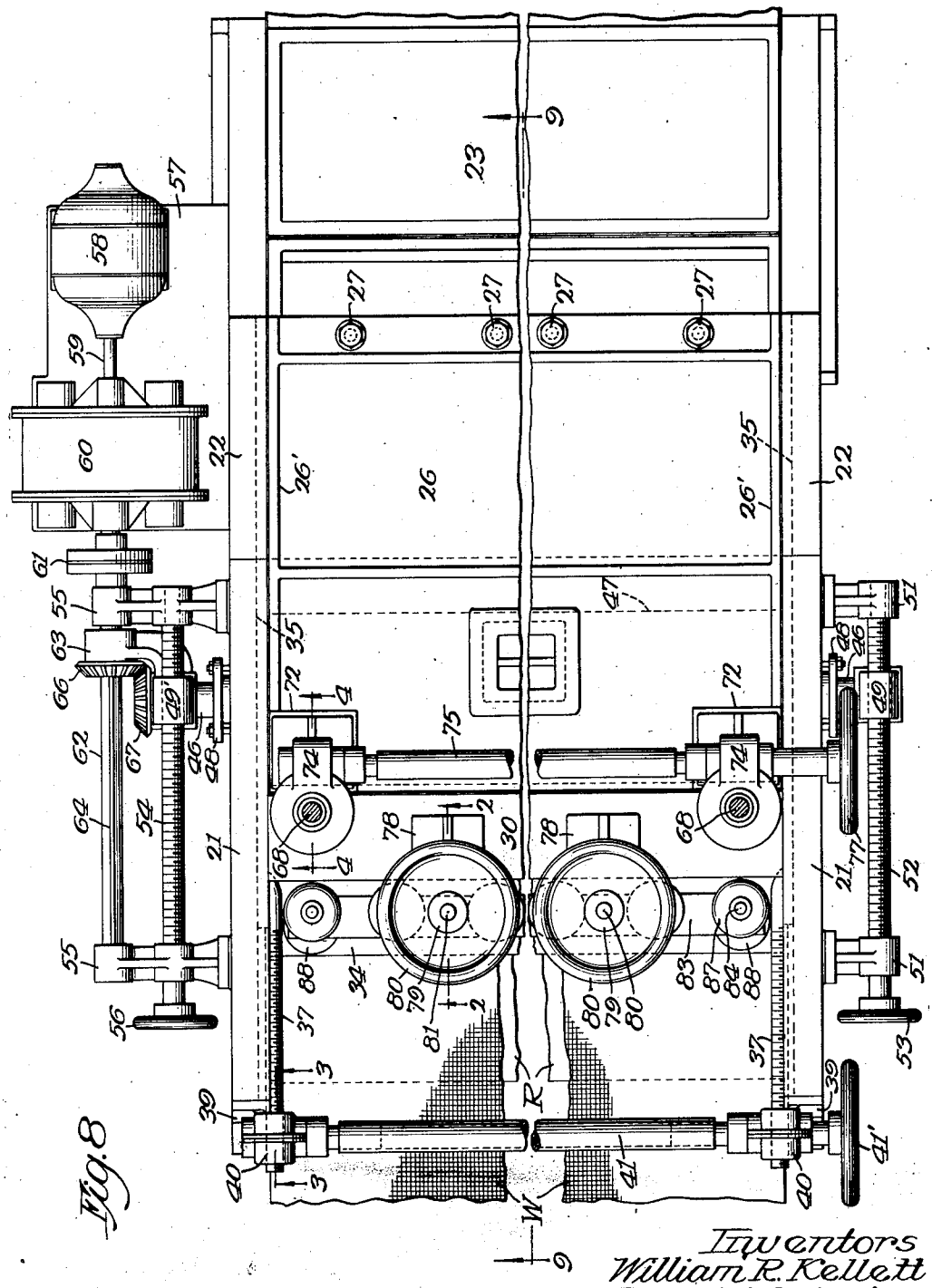


Fig. 8

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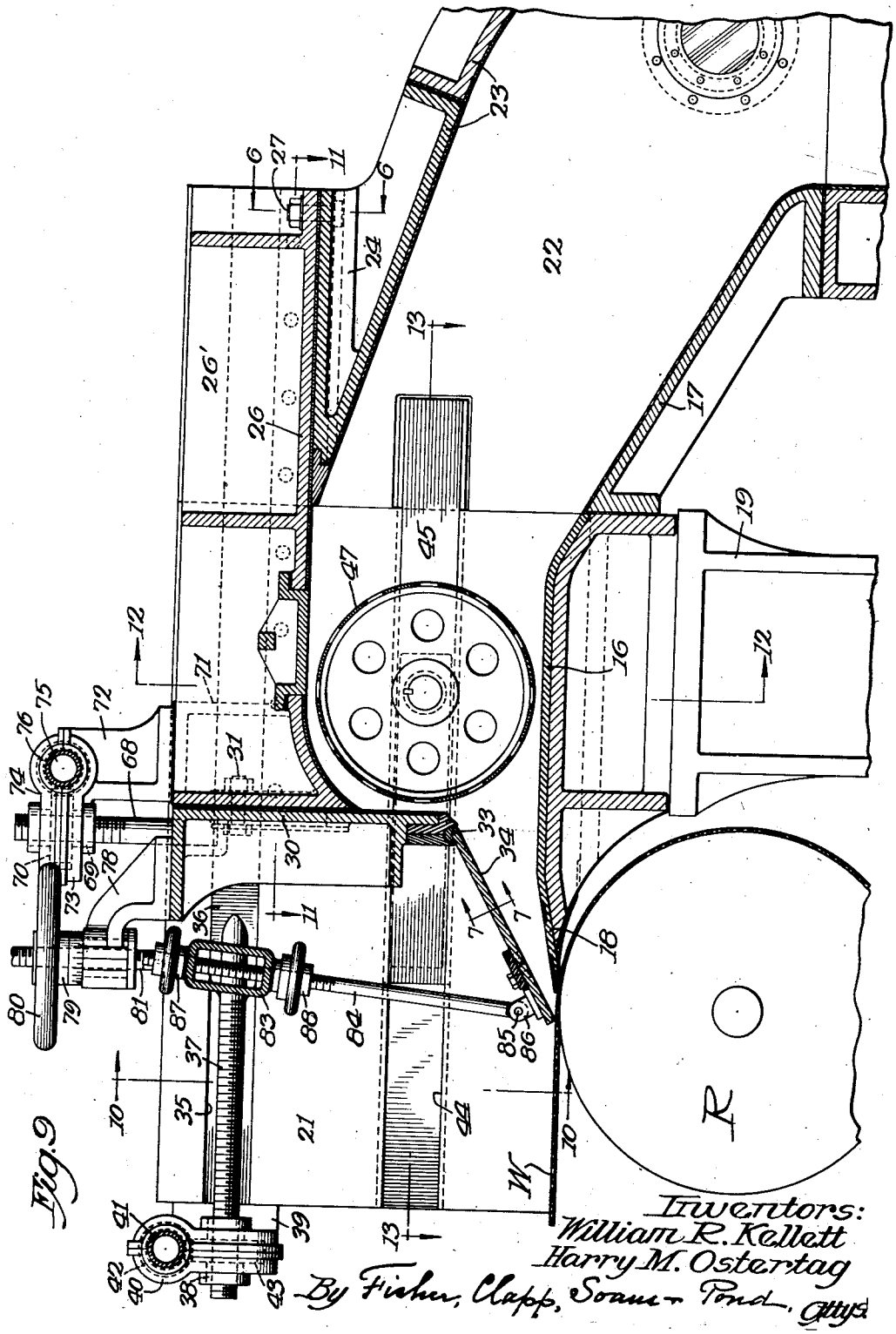


Fig. 9

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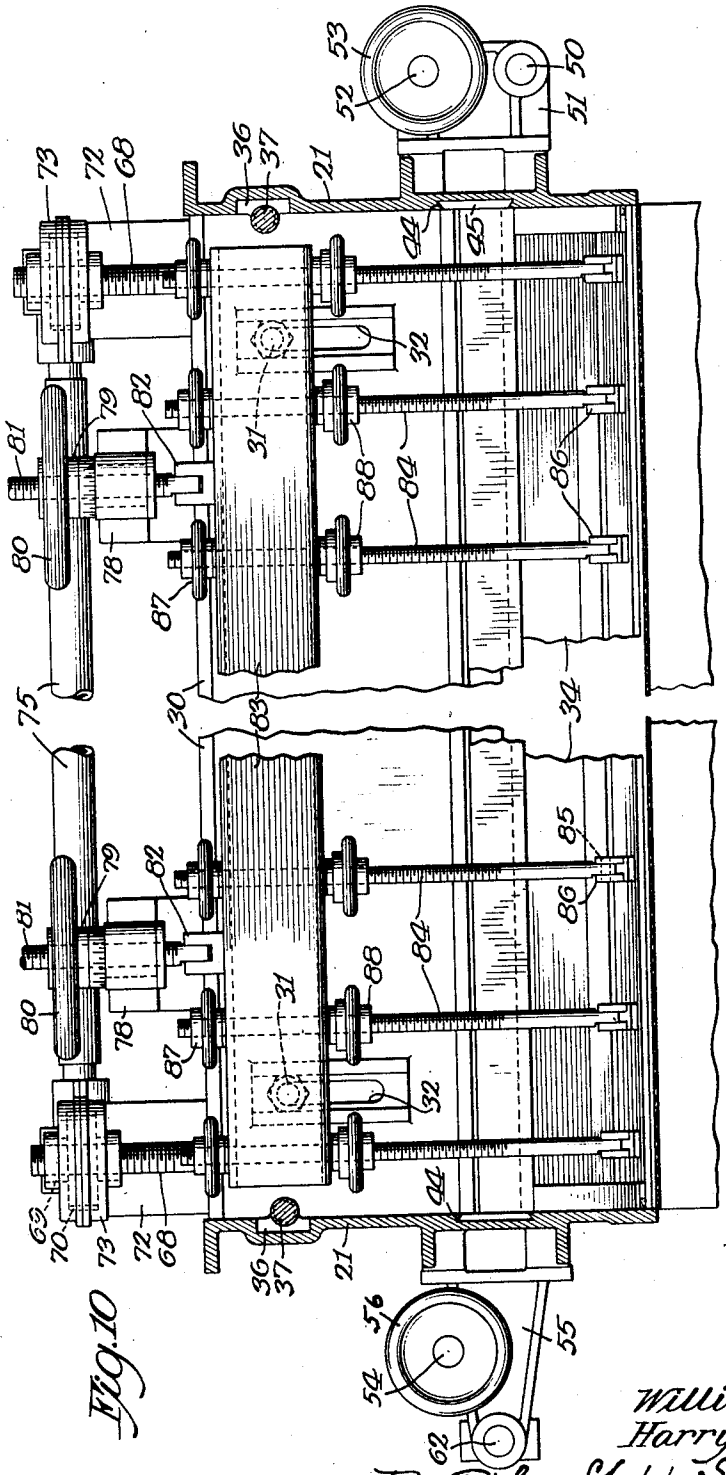


Fig. 10

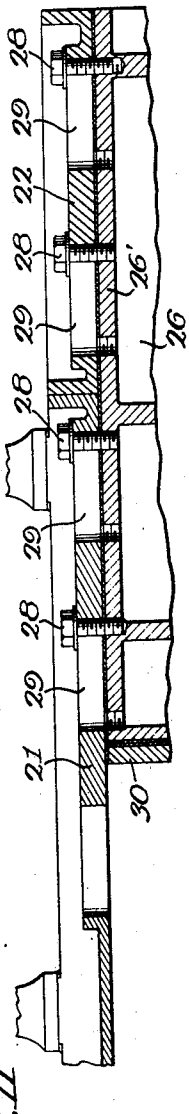


Fig. 11

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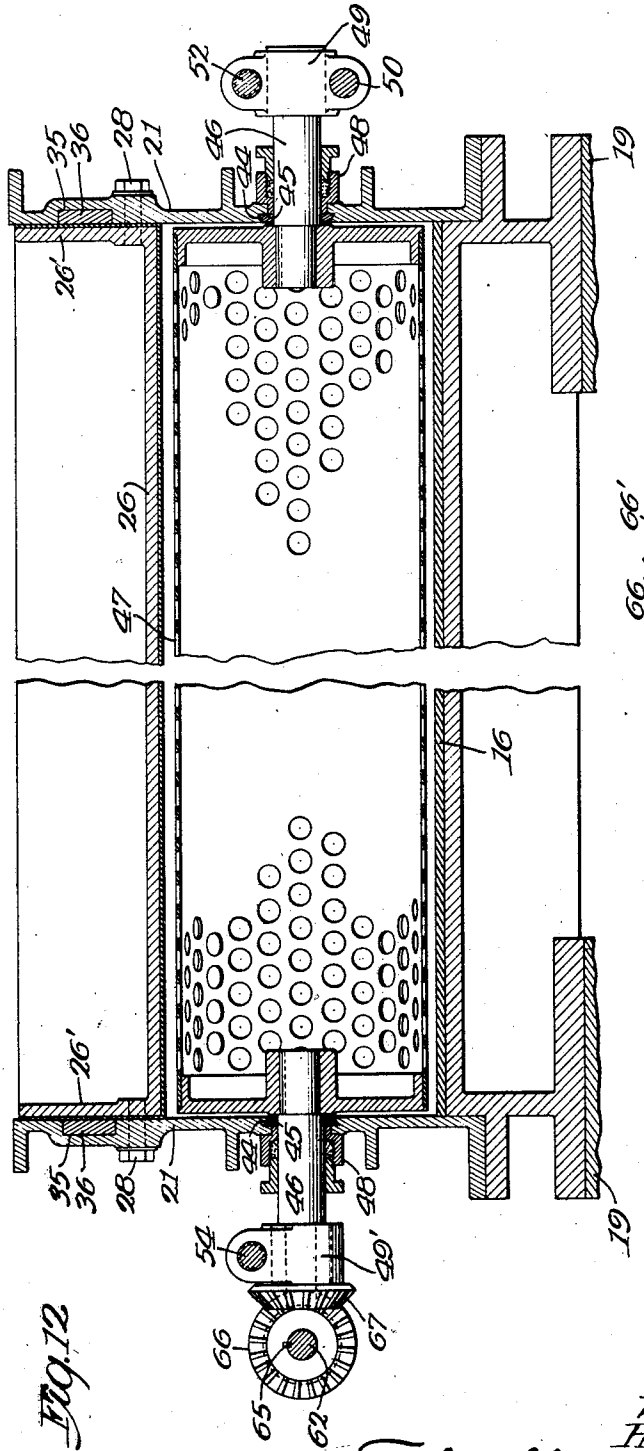


Fig. 12

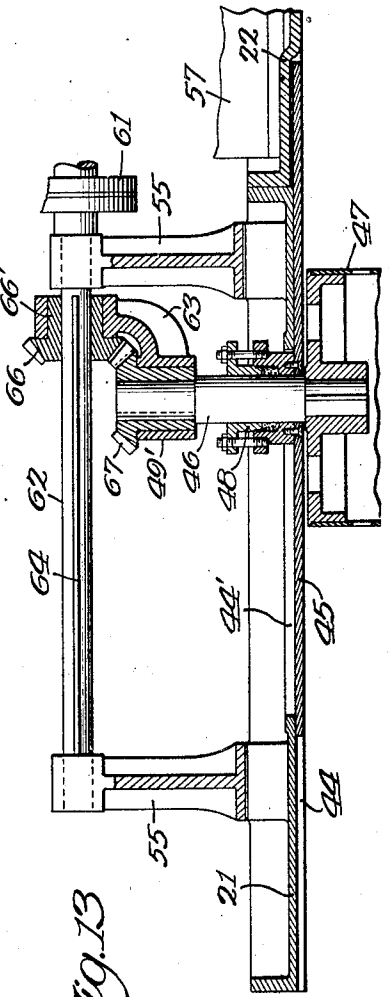


Fig. 13

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Fig. 15

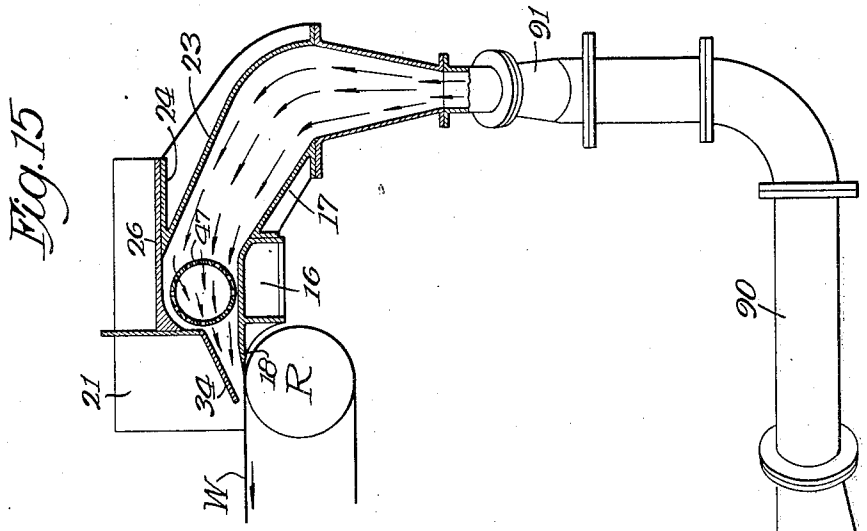
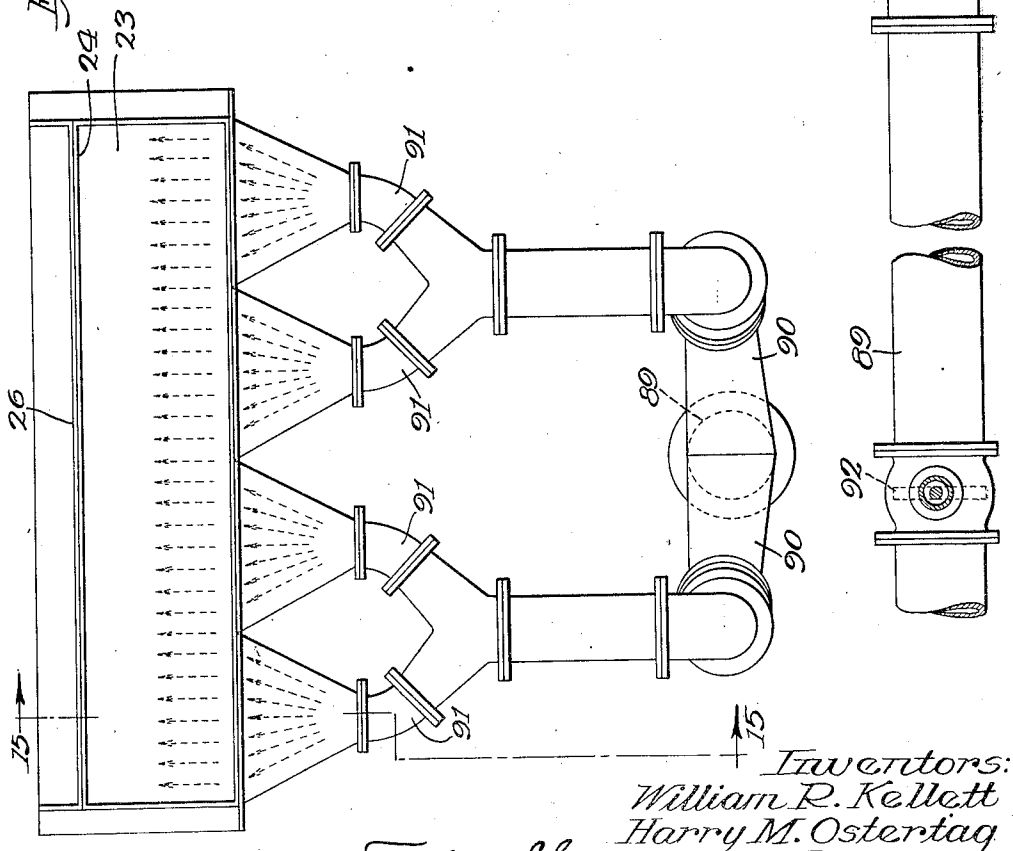


Fig. 14



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UNITED STATES PATENT OFFICE

2,060,808

HYDRAULIC INLET FOR PAPER MAKING MACHINES

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Application November 19, 1934, Serial No. 753,636

22 Claims. (Cl. 92—44)

This invention relates to improvements in hydraulic inlets or slices for paper making machines, being designed more especially for use on machines of the well known Fourdrinier type, and for the manufacture of light weight paper sheets.

In forming a light weight sheet of paper on a Fourdrinier paper machine it has been found necessary to maintain as nearly as possible a spouting velocity onto the Fourdrinier wire equivalent to the speed of the wire. To obtain this velocity it has been found that the head or height of stock above the wire is very close to the head as determined by the formula for velocity and pressure in flowing water necessary to produce the required spouting velocity. For instance, a machine running 1200 feet per minute on the wire requires a head of stock in the slice or stock inlet about 74 inches high.

A common practice has been to connect an open top high slice or stock inlet to a flow box which is so baffled vertically as to provide passages for the stock upward and downward between the baffles to obtain a method to eliminate turbulence, and to even out the flow of stock in a manner to provide even distribution across the entire width of the Fourdrinier wire. In this practice the last passage in the flow box provides for a vertical travel of stock upwards, and the pond formed between the last baffle and the front wall of the inlet over the breast roll reaches a size of considerable dimensions. This pond is of such large dimensions that the velocity of the stock is so greatly reduced in the pond that an opportunity is provided for fibers to rise or sink in the water to the extent that a uniform discharge of a uniform consistency stock onto the wire is difficult to obtain. The fibers may settle to the bottom or float to the top of the pond formed by the inlet and the flow box. This depends largely upon the nature of the stock going into the machine.

Also, the weight of this large volume of water in the pond above mentioned makes the construction of the inlet difficult to prevent deflection of the top or bottom lips of the inlet. To provide an inlet or slice with close tolerances between the top and bottom lips and the breast roll uniformly across the entire face of the machine is very difficult due to the deflection caused by the weight of this large volume of water in the pond. And if the top or bottom lip deflects due to the weight of the water, it is impossible to obtain a uniform weight sheet across the width of the wire.

Still again, in running various weights and kinds of paper on a machine it is desirable to remove the maximum amount of water at the breast roll. The extent to which this can be done varies greatly for different speeds of wire travel, and different weights of paper, also different furnishes of stock. With the ordinary slice or inlet it is difficult to get the correct setting of the top lip of the inlet to best take care of the conditions that exist, since the lip cannot be moved forward or backward to get the desired correct setting.

In the designing of the inlet forming the subject matter of the present invention, our objects have been to obtain a structure that will satisfactorily eliminate the above noted faults and defects of the known structures, and will enable the machine to produce a light weight paper of substantially uniform and even texture.

An approved embodiment of the invention is illustrated in the accompanying drawings, in which:—

Fig. 1 is a side elevation of the inlet spout and a fraction of the flow box to which the lower rear end of the spout is connected.

Fig. 2 is a sectional detail on the line 2—2 of Fig. 8.

Fig. 3 is a sectional detail on the line 3—3 of Fig. 8.

Fig. 4 is a sectional detail on the line 4—4 of Fig. 8.

Fig. 5 is a diagrammatic vertical longitudinal section through the flow box and spout.

Fig. 6 is an enlarged sectional detail on the line 6—6 of Fig. 9.

Fig. 7 is an enlarged sectional detail of an edge portion of the upper lip of the spout and a portion of a side wall, on the line 7—7 of Fig. 9.

Fig. 8 is a top plan view, broken out between two sides.

Fig. 9 is a vertical longitudinal section.

Fig. 10 is a vertical transverse section on the line 10—10 of Fig. 9.

Fig. 11 is a fragmentary horizontal section through adjacent portions of a side wall, the top or cover plate, and the front plate of the spout, on the line 11—11 of Fig. 9.

Fig. 12 is a vertical transverse section on the line 12—12 of Fig. 9, broken out.

Fig. 13 is a horizontal section through the distributor roll drive, on the line 13—13 of Fig. 9.

Fig. 14 is a rear elevation of a structure which omits the high head open top flow box of Fig. 5, and employs, in lieu thereof, direct pipe connections from the supply pump.

Fig. 15 is a side elevation, partly in vertical section, on the line 15—15 of Fig. 14.

Referring first to the diagrammatic view Fig. 5, A designates as an entirety a flow box especially designed in association with our improved inlet or slice. This box is formed with a substantially central vertical baffle 10 and, in line with its front wall, a short depending baffle 11, dividing it into an upward flow passage 12 that receives the stock from a pipe 13 communicating with its lower end, a downward flow passage 14, and an upward flow passage 15 that communicates with the lower rear end of a novel form of spout, which has been designed with a view to eliminating the presence of the high pond over the breast roll hereinabove referred to. This spout flows the stock through an adjustable lip structure directly onto the Fourdrinier wire W above the usual breast roll R.

Describing now the spout structure, and referring to Figs. 5 and 9, 16 and 17 designate connected sections of a bottom plate, the forward horizontal section 16 terminating at its forward end in a downwardly and forwardly inclined fixed lip 18. The plate section 16 is supported on a suitable pedestal 19 and the two sides thereof are formed with ledges or shoulders 20 on which are mounted and securely bolted the forward sections 21 of a pair of side plates, the rear sections 22 of said side plates being bolted to the rear ends of the forward sections 21 and to the rear section 17 of the bottom plate. Extending between the side plates is a top wall 23 at its lower rear end secured to the front wall of the flow box A and at its upper end formed with a cover supporting plate 24, the top surface of which, as best shown in Fig. 6, is formed with a number of longitudinal T slots 25 for a purpose later described.

Resting on the top wall 24 is a longitudinally adjustable cover plate 26 formed with side walls 26'; said cover plate lying between the upper portions of the side plates and forming, when secured to the top wall and side plates, water tight joints therewith. For permitting adjustment of the top plate 26 forwardly and rearwardly, securing bolts 27 (Fig. 6) extend through the cover plate 26 with their heads occupying the T slots 25, and cap screws 28 (Figs. 1 and 11) extend through longitudinal slots 29 in the side plate sections 21 and 22 into the side walls 26' of the cover plate.

The side plate sections 21 extend some distance forwardly of the lip of the bottom plate, as clearly shown in Figs. 1 and 9, and secured to the front end of the cover plate 26 between said side plates and with capacity for vertical adjustment thereon is a front plate 30 spanning the upper portion of the flow passage and suitably lined or packed to form a water tight joint. The attaching means herein shown consist of bolts 31 (Fig. 10) extending through vertical slots 32 in the front plate and through registering holes in the front wall of the cover plate 26.

To the lower edge of the cover plate 30 is hinged, by a water tight roll joint 33, an angularly adjustable upper lip 34 that, in association with the fixed lower lip 18, constitutes a variable volume nozzle for the inlet.

Describing next a means for adjusting the cover plate 26 forwardly and rearwardly, and referring to Figs. 8, 9 and 12, the inner surfaces of the side plates are formed, near their top, with longitudinal grooves 35 in which are slidably fitted cover plate adjusting bars 36 that are secured to the side walls 26' of the cover plate. These bars extend forwardly of the cover and front plates, their forward end portions being formed as threaded rods 37, and on these threaded rods are mounted sleeve nuts 38. A pair of brackets 39 attached to the forward ends of the side plates carry gear casings 40 in and between which is journaled a cross shaft 41 having a hand wheel 41' on one end. Fast on shaft 41 are spiral gears 42 meshing with spiral gears 43 formed integrally with the sleeve nuts 38; the lower portions of the gear casings 40 forming bearings for the sleeve nuts 38, all as clearly shown in Fig. 3.

When the cover and front plates are to be adjusted forwardly or rearwardly, the bolts 27 and cap screws 28 are loosened, the hand wheel 41' is turned in one direction or the other, and the bolts and cap screws are again tightened.

Describing next a distributor roll and its mounting, adjusting and driving means, the inner surfaces of the side walls of the trough are formed with longitudinal dove-tailed grooves 44, best shown in Fig. 12, in which are slidably mounted guide bars 45. These guide bars cover longitudinal slots 44' (Fig. 13) in the side plates 21 and are apertured to receive the journals 46 of a perforated distributor roll 47 disposed crosswise of the trough; the joints being made water proof by packing boxes 48. Beyond the packing boxes the journals 46 are received in journal bearings 49 on the front side of the machine and 49' on the rear side. Referring to Figs. 1, 8 and 12, the journal bearing 49 is slidably engaged with, and supported by, a guide rod 50 mounted in and between a pair of brackets 51 mounted on the front side plate 21. A hole in the upper end of the bearing 49 is tapped and engaged by an adjusting screw 52 journaled in the brackets 51 parallel with the guide rod 50. On one end of the screw 52 is a hand wheel 53 for operating the same. The bearing 49' on the rear side of the machine is formed in its upper end with a tapped hole engaged by an adjusting screw 54 journaled in a pair of brackets 55 mounted on the rear side wall 21, the screw 54 being equipped with a hand wheel 56. Manifestly, by manipulating the hand wheels 53 and 56, the distributor roll can be bodily adjusted lengthwise of the trough.

Referring to Figs. 8, 12 and 13, the distributor roll is driven from a motor through shiftable gearing that remains constantly in mesh during adjustment of the position of the roll. This is best shown in Figs. 8 and 13, wherein 57 designates a bracket mounted on the rear side plate and supporting an electric motor 58, the armature shaft 59 of which is connected through a speed reducer conventionally shown at 60 and a flexible coupling 61, to a shaft 62 journaled in the brackets 55 parallel with the screw 54. The bearing 49' is formed integral with an L-shaped bracket 63, one limb of which embraces the shaft 62. The shaft 62 is formed with a long keyway 64 slidably engaged by a key 65 (Fig. 12) carried by a miter gear 66, the hub 66' of which is journaled in the bracket 63, and this miter gear engages with and drives a similar miter gear 67, keyed on the end of the roll journal 46. With this construction, the roll-driving gears 66 and 67 remain constantly in mesh during bodily adjustment of the roll.

Referring now to the means for bodily adjusting the front plate up and down, and referring to Figs. 4, 8 and 9, the upper edge of the front plate 30 is socketed to receive the lower ends of

a pair of vertical screw threaded rods 68, on which are a pair of sleeve nuts 69 formed integral with spiral gears 70. The cover plate 26 is formed at its front corners with a pair of pads 71 on which are mounted brackets 72 supporting gear casings, the lower section 73 of each gear casing being conveniently cast integral with the bracket 72 and the upper section 74 being secured to the lower section. In and between the two gear casings is journaled a cross shaft 75, fast on which are spiral gears 76 that drive the spiral gears 70 on the sleeve nuts 69, the latter being journaled in the gear casing as clearly shown in Fig. 4. On the front end of the shaft 75 is a hand wheel 77 (Figs. 1 and 8), by manipulating which the front plate, after the bolts 31 have been loosened, may be adjusted upwardly and downwardly to the desired extent.

For effecting coarse and fine adjustments of the upper lip 34 we have adopted an adjusting mechanism broadly old and known in hydraulic inlets which employ an angularly adjustable upper lip. Briefly describing this mechanism, mounted on the top of the front plate 30 are a pair of brackets 78 (Figs. 2, 8, 9 and 10), in which are journaled the tapped hubs 79 of hand wheels 80; the hubs 79 being confined by their bearings against endwise movement, as clearly shown in Fig. 2. Engaged with the tapped hubs 79 are threaded rods 81, the lower ends of which are pivoted to ears 82 on the top edge of a hollow horizontally extending bar 83. Extending crosswise through the bar 83 are a plurality of depending rods 84, the lower ends of which are pivoted at 85 to ears 86 on the lower end of the lip 34. The upper portions of the rods 84 are threaded, as best shown in Fig. 9, to receive upper and lower adjusting and clamping nuts 87 and 88, by manipulation of which each rod 84 may be adjusted up or down as required. A considerable number of these adjusting rods 84, quite closely spaced, are employed, so that, after a coarse adjustment has been effected by raising or lowering the adjusting rods 81, fine adjustments may be effected so as to insure a true, straight edge on the lip 34, by individual manipulation of the adjusting means of the rods 84.

In Fig. 5 we have shown the adjustable spout structure hereinabove described associated with a flow box generally similar to the known flow box except that, by the employment of the described spout structure, the customary high pond directly over the breast roll of the machine is avoided. We have found that the action of the described spout structure, especially when employing the perforated distributor roll, is so effective to maintain a uniform mix of the fiber and water in the inflow stock that the flow box may be omitted, and the lower end of the spout may be directly connected to the discharge line from the pump. A desirable embodiment of the last described connection is illustrated in Figs. 14 and 15, wherein 89 designates a pipe line from the discharge side of the pump formed with a pair of main branches 90, the upturned ends of which latter are also branched as shown at 91, the flaring discharge ends of the branches 91 communicating directly with the lower rear end of the spout. This gives a uniform distribution of stock across the entire width of the inlet. When the stock inlet is used in conjunction with a flow box such as is shown in Fig. 5, a uniform pressure is attained in the inlet from a uniform head in the connection flow box. This uniformity is obtained from a constant supply of stock from the supply pump. By piping the supply pump direct to the inlet, as shown in Figs. 14 and 15, the same constant supply is available and the required pressure head in the inlet is obtained direct from the supply pump.

A valve, indicated at 92 in the pipe 89, is provided to make it possible to adjust for the various pressures desired, depending upon the speed of the paper machine and the type of stock being used. This valve must be rotated a considerable distance from the Y in the pipe line to avoid turbulence and to insure a uniform distribution in all outlets where connection is made to a high pressure inlet such as we have shown.

It is believed that the foregoing description, in connection with the accompanying drawings will make clear to persons skilled in the art the novel design of our high pressure inlet and the advantages flowing from its use, chief of which is the greater uniformity obtainable in the texture of the finished paper sheet. The invention may be developed within the scope of the following claims without departing from its essential features, and the specification and drawings are to be read as merely illustrative and not in a limited sense, except as necessitated by the prior art.

We claim:

1. A hydraulic inlet for a paper making machine, including a spout having a forwardly and rearwardly adjustable cover plate, and a front plate secured to said cover plate.

2. A hydraulic inlet for a paper making machine, including a spout having a forwardly and rearwardly adjustable cover plate, and a vertically adjustable front plate secured to the forward end of said cover plate.

3. A hydraulic inlet for a paper making machine, including a spout having parallel side walls and a forwardly and rearwardly adjustable cover plate located between said side walls, and a vertically adjustable front plate secured to the forward end of said cover plate.

4. A hydraulic inlet for a paper making machine, including a spout having parallel side walls and a forwardly and rearwardly adjustable cover plate located between said side walls, a vertically adjustable front plate secured to the forward end of said cover plate, a lip hinged to the lower edge of said front plate, and means for angularly adjusting said lip.

5. A hydraulic inlet for a paper making machine, comprising, in combination, a bottom plate having a lip on its forward edge, side plates, and a cover plate, said plates forming an inlet spout, a vertically adjustable front plate, an upper lip hinged to the lower edge of said front plate, and means for angularly adjusting said upper lip.

6. A hydraulic inlet for a paper making machine, comprising, in combination, a bottom plate having a lip on its forward edge, side plates extending forwardly of said lip, and a longitudinally adjustable cover plate, said plates forming an inlet spout, a front plate mounted on the front end of said cover plate, an upper lip hinged to the lower edge of said front plate, and means for angularly adjusting said upper lip.

7. A hydraulic inlet for a paper making machine, comprising, in combination, a bottom plate having a lip on its forward edge, side plates secured to opposite edges of said bottom plate and extending forwardly of said lip and a longitudinally adjustable cover plate between the upper portions of said side plates, a vertically adjust-

able front plate secured to the front end of said cover plate between said side plates, an upper lip hinged to the lower edge of said front plate, and means for angularly adjusting said upper lip.

8. A hydraulic inlet for a paper making machine, comprising, in combination, a bottom plate having a lip on its forward edge, side plates and a cover plate, said plates forming an inlet spout, a front plate, an upper lip hinged to the lower edge of said front plate, means for angularly adjusting said upper lip, and a perforated distributor roll mounted in and crosswise of said spout.

9. A hydraulic inlet for a paper making machine, comprising, in combination, a bottom plate having a lip on its forward edge, side plates, and a cover plate, said plates forming an inlet spout, a front plate, an upper lip hinged to the lower edge of said front plate, means for angularly adjusting said upper lip, and a bodily adjustable perforated distributor roll mounted in and crosswise of said spout.

10. A hydraulic inlet for a paper making machine, comprising, in combination, a bottom plate having a lip on its forward edge, side plates, and a cover plate, said plates forming an inlet spout, a front plate, an upper lip hinged to the lower edge of said front plate, means for angularly adjusting said upper lip, a bodily adjustable perforated distributor roll journalled in and between said side plates crosswise of said spout, and means for driving said roll in any adjusted position thereof.

11. In a hydraulic inlet for a paper making machine, the combination of a spout including a bottom plate, side plates extending forwardly of said bottom plate, a supporting plate secured to and between said side plates, and a cover plate secured to and adjustable lengthwise on said supporting plate, a front plate mounted on the front end of said cover plate, a lip hinged to the lower edge of said front plate, and means for angularly adjusting said lip.

12. In a hydraulic inlet for a paper making machine, the combination of a spout including a bottom plate, side plates extending forwardly of said bottom plate, a supporting plate secured to and between said side plates, and a cover plate secured to and adjustable lengthwise on said supporting plate, a vertically adjustable front plate mounted on the front end of said cover plate between said side plates, a lip hinged to the lower edge of said front plate, and means for angularly adjusting said lip.

13. In a hydraulic inlet for a paper making machine, the combination of a spout including a bottom plate, side plates extending forwardly of said bottom plate, a supporting plate secured to and between said side plates and formed with longitudinal T slots in its upper surface, and a cover plate resting on said supporting plate, bolts engaged with said T slots and said cover plate, a front plate mounted on the front end of said cover plate between said side plates, and a lip on the lower edge of said front plate.

14. In a hydraulic inlet for a paper making machine, the combination of a spout including a bottom plate, longitudinally slotted side plates extending forwardly of said bottom plate, a supporting plate secured to and between said side plates and formed with longitudinal T slots in its upper surface, and a cover plate resting on said supporting plate, cap screws engaged with the slots of said side plates and the longitudinal edges of said cover plate, bolts engaged with said T slots and said cover plate, a front plate mounted on the front end of said cover plate between said side plates, and a lip on the lower edge of said front plate.

15. A spout structure for the hydraulic inlet of a paper making machine, the combination of a bottom plate, side plates extending forwardly of said bottom plate, a supporting plate secured to and between the rear portions of said side plates, a cover plate between said side plates slidable on said supporting plate, and means for adjusting said cover plate forwardly and rearwardly comprising adjusting bars secured and extending forwardly of said cover plate and having threaded forward end portions, a cross shaft journaled on said side plates, nuts on the threaded end portions of said bars, means confining said nuts against sidewise movement, gearing between said cross shaft and said nuts, and means for rotating said shaft.

16. A spout structure for the hydraulic inlet of a paper making machine, the combination of a bottom plate, side plates extending forwardly of said bottom plate, a supporting plate secured to and between the rear portions of said side plates, a cover plate between said side plates slidable on said supporting plate, a front plate secured to the forward end of said cover plate with capacity of vertical adjustment thereon, means for adjusting said cover plate forwardly and rearwardly, and means for adjusting said front plate comprising threaded rods secured at their lower ends to said front plate, brackets on said cover plate, a cross shaft journaled in said brackets, nuts on said threaded rods, means confining said nuts against sidewise movement, gearing between said cross shaft and said nuts, and means for rotating said shaft.

17. In a hydraulic inlet for a paper making machine, the combination with a spout structure having bottom, top and longitudinally slotted side walls, of a distributor roll disposed crosswise of said spout, and means for bodily adjusting said roll forwardly and rearwardly of said spout comprising guide bars mounted on and slidable lengthwise of said side walls and covering the slots thereof, said guide bars having apertures and stuffing boxes engaged with the journals of said rolls, and manually operable means for shifting said roll and guide bars lengthwise of said side walls.

18. In a hydraulic inlet for a paper making machine, the combination with a spout structure having bottom, top and longitudinally slotted side walls, of a distributor roll disposed crosswise of said spout, and means for bodily adjusting said roll forwardly and rearwardly of said spout comprising guide bars mounted on and slidable lengthwise of said side walls and covering the slots thereof, said guide bars having apertures and stuffing boxes engaged with the journals of said rolls, bearings for said journals mounted on the outer sides of said side walls, manually operable means for shifting said bearings lengthwise of said side walls, a motor, and driving connections from said motor to one of said journals.

19. In a head box structure for a Fourdrinier paper making machine, the combination of a closed-top spout adapted to be completely filled with a flowing charge of stock and having a delivery mouth, a pump discharge pipe formed with branches communicating with the rear end of said spout, and means for regulating pressure of stock in said pipe.

20. In a Fourdrinier paper machine, the combination with the wire and the breast roll, of an adjustable inlet spout extending across the wire, a stock supply provided with means for distributing the stock across the width of the machine, a conduit connecting said spout with the distributing means and of limited but substantially uniform cross-sectional dimensions throughout its length so as to insure against any substantial irregularities in the flow of stock through said conduit, and means for developing in said conduit sufficient pressure to cause the stock to leave the spout at a speed approximating the speed of the wire.

21. A hydraulic inlet for a paper making machine, comprising, in combination, a bottom plate having a horizontal portion, a downwardly and forwardly inclined lip on the forward edge of said horizontal portion, side plates, and a cover plate, said plates forming an inlet spout, a vertical front plate spanning the upper portion of the flow passage of the spout, an upper lip hinged to the lower edge of said front plate, and means for angularly adjusting said upper lip.

22. In a Fourdrinier paper machine, the combination with the wire and the breast roll, of a closed-top spout adapted to be completely filled with a flowing charge of stock and having a delivery mouth extending across the wire, a stock supply pipe and conduit means interposed between said pipe and the spout for evenly distributing the stock from said pipe across the width of the spout and providing for a substantially uniform velocity flow throughout all parts of the cross-sectional opening of said conduit means substantially throughout its length.

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