J. M. MURRAY.

METHOD OF AND APPARATUS FOR FEEDING PULP TO THE FORMING WIRES OF PAPER MAKING MACHINES.

APPLICATION FILED AUG. 16, 1918.

1,421,981.

Patented July 4, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

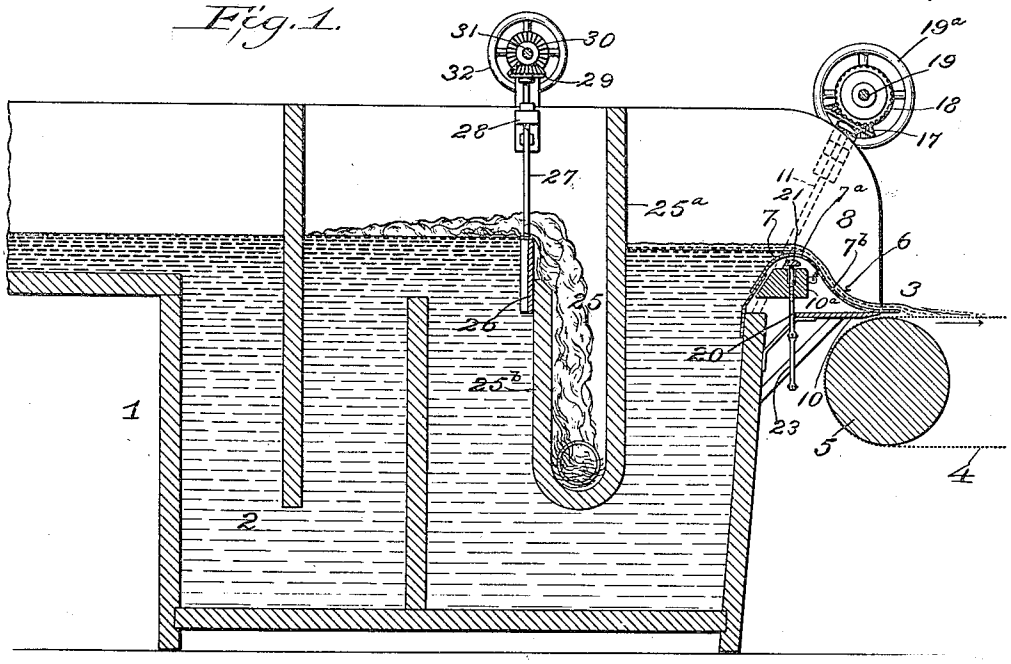

Fig. 2.

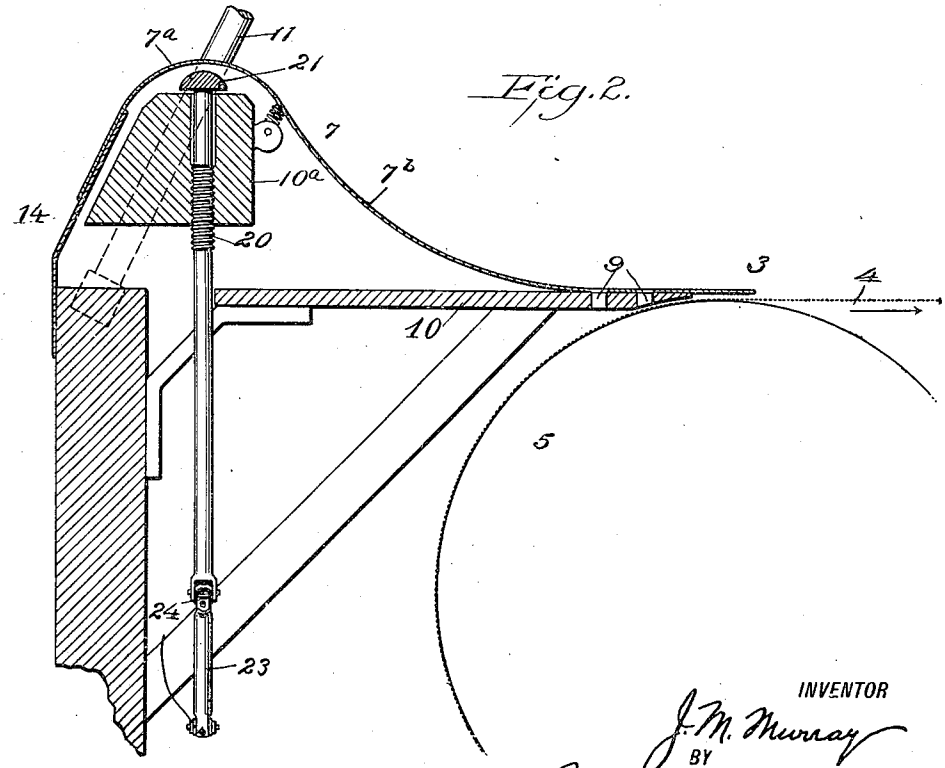

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Fig. 3.

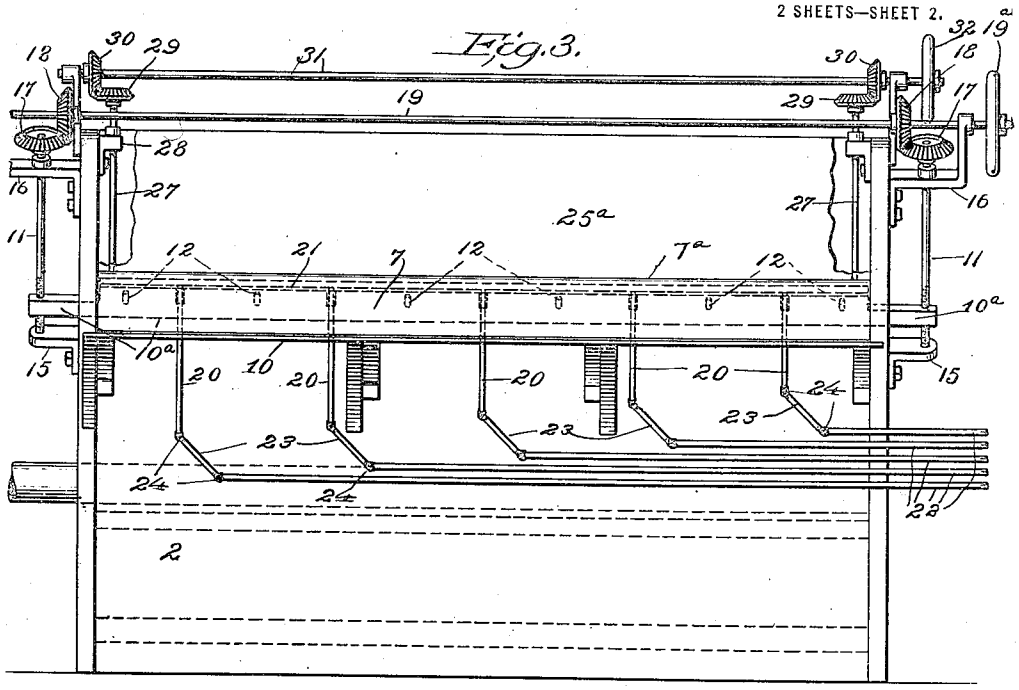

Fig. 4.

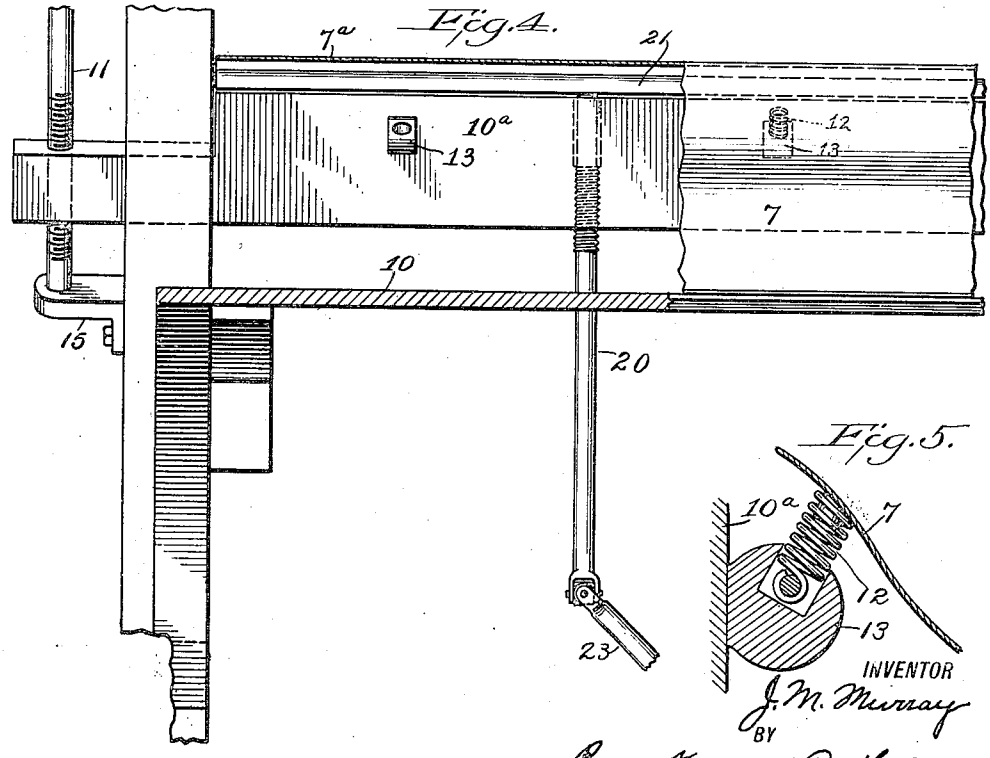

Fig. 5.

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METHOD OF AND APPARATUS FOR FEEDING PULP TO THE FORMING WIRES OF PAPER-MAKING MACHINES.

1,421,981. Specification of Letters Patent. Patented July 4, 1922.

Application filed August 16, 1918. Serial No. 250,101.

To all whom it may concern:

Be it known that I, JAMES M. MURRAY, a citizen of the United States, residing at Berlin, in the county of Coos and State of New Hampshire, have invented certain new and useful Improvements in Method of and Apparatus for Feeding Pulp to the Forming Wires of Paper-Making Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to paper making machines, and has reference more particularly to the means for and method of feeding the stock or pulp to the forming wire.

In paper making machines, more particularly of the Fourdrinier type as now universally constructed and operated, the paper pulp or stock from the screens enters a receptacle or tank known as the "head box," through which it flows around baffle boards, and leaving the box it passes onto a substantially horizontal board usually covered with an oilcloth apron and known as the "apron board" which extends to the upper receiving surface of the endless forming wire, the pulp in its passage over the apron board, passing beneath a bar overlying the apron and known as the "slice." It is found in the practical operation of the machine, that the stock passing under the slice is retarded somewhat thereby and bubbles or boils and tends to partake of a rolling motion as it escapes beneath the bar and overlies the surface of the wire. This action tends to arrange the fibres lengthwise of the wire or in the direction in which the pulp is traveling, so that the resulting paper has the proper longitudinal strength but is lacking in strength transversely. Also it is found that the foam collecting on the surface of the stock in the box, if allowed to go onto the wire, forms holes or slime spots in the paper sheet.

The object of my invention is to overcome these objections, more particularly the tendency of the fibres to arrange themselves lengthwise of the wire in the delivery of the pulp thereto, and in accordance with my invention I so deliver the pulp onto the forming wire, that as the water escapes through the wire, the fibres will lie across each other in various directions and will felt or knit together and thus give the sheet strength in all directions. My invention therefore consists of an improved method of delivering the pulp to the forming wire, and an improved apparatus for carrying said method into effect, the pulp in accordance with my invention being caused to flow in an uninterrupted stream downwardly directly onto the wire over a sloping surface or dam, thereby dispensing with the usual apron board and overlying bar or slice, and avoiding the tendency of the fibres to arrange themselves lengthwise of the forming wire. It is found that when the pulp is so delivered, the fibres will arrange themselves on the wire indiscriminately and in all directions and will felt or knit together and thus produce a sheet possessing strength in all directions.

The invention consists also in the provision of an internal over-flow chamber in the head box, which chamber is open to the entrance of the pulp and foam in the passage of the stock to the forming wire; and further the invention consists in the combination with said chamber, of a vertically adjustable plate or weir over which the stock passes in entering the chamber, and by which the foam will be skimmed from the surface of the stock, the adjustability of the plate acting to vary the height of stock passing over the dam.

In the accompanying drawings:

Fig. 1 is a longitudinal section through the head box of a paper making machine and the receiving end of the endless forming wire, showing my improved features of construction suitable for feeding the pulp to the forming wire in accordance with my invention.

Fig. 2 is a similar view on an enlarged scale of the dam over which the stock flows from the box to the wire.

Fig. 3 is an end elevation as viewed in the direction of the arrow in Fig. 1.

Fig. 4 is a sectional elevation on an enlarged scale of a portion of the apparatus shown in Fig. 3.

Fig. 5 is a sectional view of a detail showing particularly how the dam plate is yieldingly supported.

Referring to the drawings:

1 indicates the head box of a paper making machine which receives the pulp or stock 2 from the screens (not shown) and from

which box the stock flows onto the receiving end 3 of the endless forming wire 4 which passes at its receiving end around the usual breast roll 5. One part of my invention relates to the method of delivering the pulp to the forming wire, and in accordance with my improved method, the stock or pulp is caused to flow from the box in a stream 6 directly onto the wire, over a downwardly sloping surface constituting a dam 7, the said stream being free and unobstructed in its flow, particularly as to any overlying obstructions such as the usual slice which would tend to cause the fibres to arrange themselves lengthwise. By this method of feeding the pulp, the stream flowing downwardly onto the wire unobstructedly over the downwardly sloping guiding surface of the dam, causes the fibres as the pulp passes onto the wire and spreads out, to distribute themselves indiscriminately and become felted and interlaced so that the resulting sheet will possess strength both longitudinally and transversely and in all directions.

In carrying my improved method into effect by the preferred form of apparatus I provide in the discharge mouth 8 of the head box, the transverse dam 7 before alluded to which consists in the present instance of a comparatively thin sheet metal plate possessing some flexibility, and having a convex longitudinal surface 7^a constituting the crest of the dam, and a slightly concave surface 7^b sloping down to the forming wire. As the dam is thus arranged, the pulp is caused to pass onto the forming wire at the desired velocity in a downward flowing stream free from disturbing influences, it being noted that there are no overlying obstructions of any kind to interfere with the free passage of the stream. The dam plate extends transversely across the mouth of the box and is firmly fastened near its lower end, as by the rivets 9, to the outer end of a shelf or bracket 10 projecting horizontally outward from the head box and terminating over the breast roll so that the pulp from the box flowing over the crest of the dam will pass down the sloping surface in a stream and will be directed onto the forming wire as above described. The extremity of the dam plate projects slightly beyond the end of the shelf so as to closely overlie the upper receiving surface of the wire to the end that the delivery of the pulp to the wire will be effected in an even and smooth manner. The crest portion 7^a of the dam is fastened on its inner side at intervals to a bar 10^a extending longitudinally along the interior of the crest and projecting at its opposite ends beyond the sides of the box, at which points the bar is provided with threaded openings through which extend upright threaded adjusting shafts 11 for adjusting the dam vertically; whereby the velocity of the flowing stream may be controlled as desired. The connection of the dam plate with the bar 10^a is preferably effected by the devices shown in Fig. 5 where it will be seen that the plate has fastened to its inner side at intervals, the upper ends of a number of spiral springs 12 whose lower ends are fastened to lugs 13 on the bar, the tendency of the springs being to hold the dam plate down yieldingly. The free edge of the dam plate where it extends downwardly from the crest of the dam into the box, overlaps the upper end of a fixed plate or shield 14 which is fastened at its lower edge to the front wall of the box at the mouth of the same, the overlapping portions of the two plates forming conjointly an upward continuation of the wall of the box and permitting the dam plate to be adjusted vertically while preventing the escape of the stock between the plates. The adjusting shafts 11 are stepped at their lower ends in supporting brackets 15 fixed to the side framing of the box, and are mounted near their upper ends in bearings in brackets 16 projecting outwardly from the box framing, the upper ends of the shafts having fixed thereto bevel gears 17 engaged by bevel pinions 18 carried by a horizontal operating shaft 19 mounted in bearings on the box framing at the top of the same, the said operating shaft being provided with a hand wheel 19^a for turning it.

In order to compensate for any irregularity in the flow of the pulp over the crest of the dam, due to unevenness in the level of the box or to other causes, I propose to provide for adjusting the crest of the dam locally or at different points in its length. This is accomplished by flexing or bending the dam plate, preferably by means of a number of vertical adjusting rods 20 threaded near their upper ends in and extending through the bar 10^a and bearing at their upper extremities loosely against the under side of a flexible rod 21 extending between the upper side of the bar 10 and the crest of the dam plate. By rotating the adjusting rods 20 independently of each other, the rod 21 will be bent at the point where it is engaged by the particular rod 20 rotated, and the bent portion engaging the dam plate, the latter will be correspondingly bent or flexed and the dam thus raised at this point. By this means therefore the level of the crest of the dam may be preserved, irrespective of the level of the box, and the stock caused to flow thereover evenly and uniformly throughout the length of the dam. The rotation of the adjusting rods 20 is in the present instance effected by means of a number of horizontal operating rods 22 (Fig. 3) which extend at their outer ends beyond the sides of the box so as to be readily accessible, and whose inner ends are connected

with the respective rods 20 by inclined connecting links 23 connected with the rods 20 and operating rods by universal or gimbal joints 24, the provision of these universal joints permitting the dam to be raised as a whole by the adjustment of the bar 10, notwithstanding the threaded connection of the operating rods 20 therewith.

Extending transversely across the interior of the box, is an overflow chamber 25 formed by a front wall or plate 25^a and a rear wall or plate 25^b spaced from the front plate and extending across the interior of the box from side to side. These walls are connected together at their lower ends at a point somewhat above the bottom of the box so that the pulp can flow beneath the chamber in its passage through the box. The rear wall 25^b terminates at its upper edge some distance below the normal level of the pulp in the box, so that the pulp may overflow into the chamber, and associated with the edge of the wall 25^b is a transversely extending vertical plate or weir 26 which lies flatly against the wall and forms an upward continuation of the same, and is vertically adjustable by the means presently to be described, the pulp in entering the chamber being compelled to flow over the upper edge of the plate. This plate or weir subserves two functions; first by its vertical adjustment the level of the pulp flowing over the dam is controlled, and second, its upper edge serves to skim the foam from the surface of the pulp, the foam being held back until accumulating, it will flow into the chamber whence it may be returned to the mixing box. The foam is thus prevented from passing onto the forming wire and consequently the formation of holes and slime spots in the paper is avoided. The plate or weir is adjusted vertically by means of vertical adjusting rods 27 whose lower ends are screwed in threaded openings in the weir. These rods at their upper ends are mounted in bearings 28 projecting inwardly from the box framing at the top, and the rods have fixed to their upper ends bevel gears 29 engaged by bevel pinions 30 on a horizontal operating shaft 31 mounted in bearings on the box framing. At one end the shaft is provided with a hand wheel 32 by which it may be turned and the plate in this manner adjusted vertically.

A further advantage resulting from my improved means for feeding the pulp and my improved apparatus, is the omission of the spray of fresh water, which in the operation of paper making machines is constantly thrown down between the slice and receiving end of the forming wire. The purpose of this spray is to kill the foam, but its use is liable to form streaks in the paper, especially in cold weather. By the omission of the spray, the mechanism of the machine is greatly simplified, as it will not be necessary to employ pumping or other mechanism to apply the spray, and a saving is effected in the filtering operation of the stock. By the omission of the spray, the stream of pulp flows to the forming wire without any external disturbing influences, and due to this fact I am enabled to secure the advantages above mentioned.

While in the foregoing description and accompanying drawings, I have set forth my invention in the particular form which I prefer to adopt, it will be manifest to the skilled mechanic that the invention may be variously changed and modified without departing from the spirit of my invention; and further it will be understood that the invention is not limited to any particular form or construction of the parts except in so far as such limitations are specified in the claims.

Having thus described my invention, what I claim is:

1. The method of feeding pulp to the forming wire of paper making machines, which consists in providing a pool of the pulp, delivering the pulp from the pool onto the forming wire in a downwardly flowing stream free from disturbing influences, and permitting the pulp to advance with the wire free from obstruction above.

2. The method of feeding pulp to the forming wire of paper making machines, which consists in providing a pool of the pulp, flowing the pulp from the pool over a downwardly inclined guiding surface, onto the forming wire in a stream free from disturbing influences, and permitting the pulp to advance with the wire free from obstruction above.

3. The method of feeding pulp from the head box to the forming wire of paper making machines, which consists in delivering the pulp from the box onto the forming wire in a downwardly flowing stream free from disturbing influences, and permitting the pulp to advance with the wire free from obstruction above.

4. In a paper making machine, the combination of a box to contain the pulp, a forming wire to receive the pulp from the box, and intermediate means for delivering the pulp from the box to the forming wire in a downwardly flowing stream free from disturbing influences, the said wire being free from overlying obstruction to the advance of the pulp therewith.

5. In a paper making machine, the combination of a box to contain the pulp, a forming wire to receive the pulp from the box, and an intermediate dam having a downwardly sloping guiding surface leading from the box to the wire and presenting no overlying obstructions to the pulp in its passage thereover, the said wire being free from

overlying obstruction to the advance of the pulp therewith.

6. In a paper making machine, the combination of a box to contain the pulp, a forming wire to receive the pulp from the box, and an intermediate dam having a downwardly sloping guiding surface leading from the box to the wire and presenting no overlying obstructions to the pulp in its passage thereover, said dam being adjustable vertically to vary the inclination of the sloping surface.

7. In a paper making machine, the combination of a box to hold the pulp, a forming wire to receive the pulp from the box, and an intermediate concave guiding surface sloping downwardly to the wire in position to direct the pulp onto the wire in a stream, said forming wire arranged to advance the pulp free from external obstruction.

8. In a paper making machine, the combination of a box to hold the pulp, a forming wire to receive the pulp from the box, an intermediate vertically movable dam sustained by the box in position to direct the pulp in a stream thereover downwardly onto the wire, and means for adjusting said dam vertically.

9. In a paper making machine, the combination of a box to hold the pulp, a forming wire to receive the pulp from the box, an intermediate dam in position to direct the pulp in a stream downwardly onto the wire, and means for adjusting the crest of the dam locally at different points to compensate for inequalities in the flow of the stock thereover.

10. In a paper making machine, the combination of a box to contain the pulp, a forming wire to receive the pulp from the box, a dam between the box and wire in position to direct the pulp in a stream downwardly onto the wire, said dam being formed with a flexible crest, and means for flexing said crest locally to compensate for inequalities in the flow of the stock thereover.

11. In a paper making machine, the combination of a box to contain the pulp, a forming wire to receive the pulp from the box, an intermediate dam in position to direct the pulp in a stream downwardly onto the wire, said dam being provided with a hollow flexible crest, a flexible rod extending along the interior of the crest of the dam, and means for flexing said rod locally and thereby correspondingly adjusting the crest to compensate for inequalities in the flow of the pulp thereover.

12. In a paper making machine, the combination of a forming wire, a box to contain the pulp located in position to discharge the same onto the wire, said box being provided with an overflow chamber extending transversely thereof and open at its rear end to the entrance of the pulp as it flows forward toward the forming wire, and a skimming member at the rear entrance end of the box in position to skim the foam from the surface of the pulp in its forward flow into the overflow chamber.

13. In a paper making machine, the combination of a forming wire, a box to contain the pulp located in position to discharge the same onto the wire, said box being provided with an overflow chamber extending transverselv thereof and open at its rear end to the entrance of the pulp as it flows forward toward the forming wire, a skimming member at the rear entrance end of the box in position to skim the foam from the surface of the pulp in its forward flow into the overflow chamber, and means for adjusting said skimming member vertically to vary the amount of pulp entering the overflow chamber.

14. In a paper making machine, the combination of a forming wire, and a box to contain the pulp located in position to discharge the same onto the wire, said box being provided in its interior with an overflow chamber extending transversely thereof, and formed by a fixed front wall and a fixed rear wall, said walls connected at their lower ends, and said rear walls terminating at its upper end below the level of the upper end of the front wall to permit the pulp to overflow into the chamber in its passage toward the forming wire.

15. In a paper making machine, the combination of a forming wire, and a box to contain the pulp located in position to discharge the same onto the forming wire, said box being provided in its interior with a transversely extending overflow chamber formed by front and rear walls spaced from each other and connected together at their lower ends at a point above the bottom of the box, to permit the pulp to flow beneath the chamber in its passage through the box to the forming wire.

16. In a paper making machine, the combination of a box to contain the pulp, a forming wire in position to receive pulp from the box, said box being provided with an interior transversely extending fixed overflow chamber terminating at its lower end above the bottom of the box to permit the pulp to flow under the chamber in its passage to the forming wire, and said chamber being open at its upper end to the entrance of pulp therein.

17. In a paper making machine, the combination of a box to contain the pulp, a forming wire in position to receive the pulp from the box, said box being provided interiorly with an over-flow chamber open only at its rear to the entrance of the pulp in its passage through the box toward the forming wire, and a vertically adjustable

weir at the entrance to the over-flow chamber to control the flow of the pulp thereinto.

18. In a paper making machine, the combination of a forming wire, a box to contain the pulp located in position to direct the same onto the forming wire, said box being provided with a transversely extending overflow chamber formed by front and rear spaced walls, the latter terminating at its upper end below the upper end of the front wall, a plate applied to the upper end of said rear wall and forming an upward continuation of the same, and means for adjusting said plate vertically to vary the height of the rear wall and thereby vary the amount of pulp flowing into the chamber.

19. In a paper making machine, the combination of a forming wire, a box to contain the pulp, a vertically adjustable dam over which the pulp flows from the box directly onto the forming wire, said box being provided with a transversely extending overflow chamber into which the pulp flows at its surface, and means for varying the amount of surface pulp entering the overflow chamber.

20. The method of feeding pulp to the forming wire of paper making machines, which consists in delivering said pulp from a suitable supply of the same, onto the forming wire in a downwardly flowing stream free from disturbing influences, and permitting the pulp to advance with the wire free from obstruction above.

21. The method of feeding pulp to the forming wire of paper making machines, which consists in delivering the pulp in a downwardly flowing stream undisturbed by external influences, from the head box of the machine onto the forming wire, and permitting the pulp to advance with the wire free from obstruction above.

In testimony whereof, I have affixed my signature hereto.

JAMES M. MURRAY.