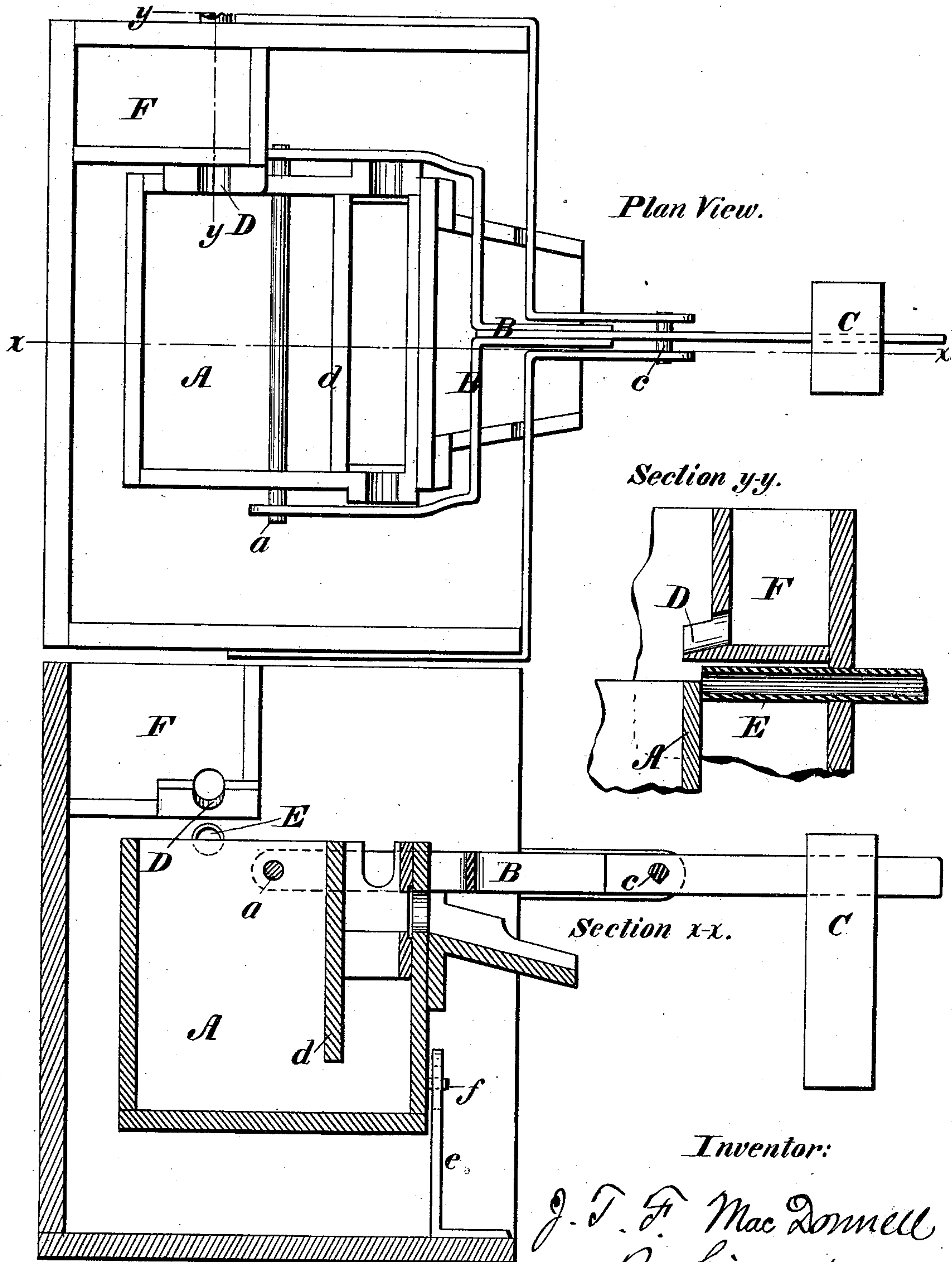


J. T. F. MacDONNELL.
Automatic Feed for Paper-Machines.

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IMPROVEMENT IN AUTOMATIC FEED FOR PAPER-MACHINES.

Specification forming part of Letters Patent No. **215,946**, dated May 27, 1879; application filed May 27, 1878.

To all whom it may concern:

Be it known that I, JOHN T. F. MAC DONNELL, of Holyoke, in the county of Hampden and State of Massachusetts, have invented certain Improvements in Automatic Feed for Paper-Machines, of which the following is a specification.

The object of my invention is to secure the delivery of the pulp or stuff in a paper-machine of a uniform consistency, in order to insure a uniform thickness of the paper produced; and to this end the invention consists in a method and apparatus in which the varying specific gravity of the stuff is caused to control the admission of the water used to reduce it.

My invention is capable of application to both the Fourdrinier and the cylinder machines, and is susceptible of being embodied in various different arrangements of mechanism, the invention consisting, broadly, in making use of the specific gravity of the stuff to control it consistently in any manner and by any means, substantially the same as those hereinafter described.

In the manufacture of paper the stock, after going through all the preliminary processes of reduction to pulp, reaches what is termed the "stuff-chest," which is a large tank or receptacle containing agitators to keep the contents of uniform consistency and prevent the separation and settling of the heavier portion. From this stuff-chest the contents are pumped, by a pump connected with the machine, into what is called the "stuff-box," a stream of pure water being allowed to flow into the box when desired, and dilute the stuff before it passes to the machine proper and to the wire-cloth, where the water is removed and the pulp left in the sheet form.

It is obvious that with a given quantity of stuff passing out in a given time to the machine the paper resulting will vary in thickness as the stuff pumped into the stuff-box from the stuff-chest is thicker or thinner in consistency.

In practice it would be impossible for the attendant to preserve a uniform consistency of stuff by his own observation and tests with such accuracy as to insure a uniform thickness

of the paper, for the reason that the consistency of the stuff in the main stuff-chest varies constantly as the contents of different beating-engines are emptied into it, and consequently the stuff pumped from this stuff-chest to the stuff-box also varies in consistency from this cause, which is, of course, not under the control of the machine-tender, so that, were he to test its consistency in the stuff-box and find it wrong, the flowing mixture has been and is still going out to the machine, and consequently the sheet rendered too thick or too thin, while he has been testing and before he can remedy the difficulty.

Various attempts have been made to control automatically the flow of the stuff from the stuff-box, such as the use of self-regulating valves, &c., and thus to control the thickness of the sheet; but in practice the attempts have all resulted in failure.

In order to secure the desired result, I avail myself of the varying weight of the contents of the stuff-box due to the changes which occur in the specific gravity of the stuff according as it contains more or less pulp or water in proportion to each other.

The stuff-box in my invention is always full to a certain height, the required amount passing from it to the machine, and the residue flowing back into the stuff-chest.

In practice we find that the specific gravity of the stuff or stock is greater than that of the water used to dilute it, and, consequently, that the weight of the contents of the stuff-box, although remaining the same in volume, will be greater or less, according as the proportion of water therein is increased or diminished. In order to make use of this fact, I mount the stuff-box on a scale-beam, or otherwise support it so that it is nicely balanced when filled with stuff of the exact consistency desired, and so arrange a water-supply pipe and other parts that whenever the material becomes too thin, and consequently lighter, the counter-weight will elevate the box and cause the flow of water to be diminished, while at the same time the inward flow of stuff continues, so as to bring the contents of the box to the proper consistency. If, on the other hand, the material in the stuff-box should become too thick,

and so much heavier than if of the proper consistency, the box and contents will overbalance the counter-weight and cause the flow of water to be increased, and thus restore the proper consistency.

The accompanying drawings represent one form of apparatus which may be employed for carrying out my invention.

A represents the stuff-box, provided on its sides with trunnions *a*, supported in the arms of a forked scale-beam, B, which is pivoted at the point *c* and provided with a sliding weight, C, which is so adjusted as to counterbalance the weight of the box A and its contents when the latter is of the desired consistency. D represents the spout through which the stuff is discharged into the stuff-box A to dilute its contents, the pipe E, in the present case, being arranged directly below the stuff-spout D, with its end in line with the side of the box A, so that the latter may traverse vertically past its mouth.

During the proper operation of the machine the stuff or pulp is discharged through the spout D in a continuous stream into the box A, and a continuous stream of water also discharged through the pipe E into the box A to reduce or dilute the stock to a proper degree of fluidity, the reduced mass flowing under the partition *d* and up into the narrow space between the partition *d* and the end of the stuff-box, from which space the proper quantity is allowed to flow out to the machine through an opening controlled by a gate or gage, while any surplus over and above the normal volume of contents flows over the ends of the said narrow space and finds its way back to the stuff-chest.

The use of the partition is important and advantageous in that it insures an even mixture of the water and stock, and that it secures the delivery of the stock of constant consistency from the box, although that in the body of the box separated by the partition may have a slight temporary variation.

It is to be understood that when the box and its contents are in equilibrium with the counterpoise—*i. e.*, where the stuff in the stuff-box is of just the right consistency—the adjustment of parts will be such that about one-half of the full flow of the water-pipe E will enter the box.

Whenever the contents of the box A become diluted beyond the extent desired the specific gravity and weight of the mass are lessened, whereupon the weight C, preponderating over the weight of the box, causes the latter to ascend and diminish the inflow of water from the water-pipe E, the flow of pulp meanwhile continuing. As the mass attains the proper consistency again the increased weight causes the box to descend, and the inflow of water will be increased. In like manner, if the stuff in the box becomes too thick, the resulting downward movement of the box will produce a larger inflow of water, thus diluting, and consequently lightening, the contents of the box,

which will again rise to its normal height when the proper consistency is attained.

In practice the box is to be so accurately counterpoised that it will at once be actuated by any change in the weight of its contents, and respond so readily that any variation in the consistency of the stuff will at once be corrected.

Thus it will be seen the admission of the water and the consistency of the pulp are regulated automatically and with great nicety, and the stuff delivered from the box of a uniform consistency.

In the drawings the stuff-pipe D is represented as discharging from a small box or chamber, F, into which the stuff is pumped from the stuff-chest, it being thought preferable to pump the stuff into this intermediate chamber F rather than directly into the stuff-box A.

For the purpose of limiting the vertical motion of the stuff-box a slotted standard, *e*, is mounted at one side of the box to receive a stop-pin, *f*, on the latter, as shown.

It is obvious, as above stated, that the arrangement of the details may be modified to any extent desired, provided the principle of operation of the apparatus is not changed. Instead of having the upper edge of the box A arranged to traverse up and down before the mouth of the water-pipe E, it may be connected in any suitable manner with a valve arranged to regulate the discharge from said pipe.

It is further obvious that instead of controlling the consistency by limiting the flow of water into the box, the same result may be accomplished by permitting, and at the same time controlling, a flow of water out of the stuff-box; but this plan is not considered a desirable one for practical use.

While it is preferred to employ the balanced box, to be moved by variations in the specific gravity of the stuff, it is obvious that the box may be made stationary and a properly-adjusted float mounted therein and connected with a valve or other device for regulating the admission of water to the stuff in which the float is mounted, so that as the specific gravity of the stuff is reduced by an excessive dilution the float will sink deeper, and thereby diminish the flow of water, and as the specific gravity is increased again the float will be buoyed higher and caused to increase the flow of water.

It is also obvious that instead of balancing the stuff-box, a special regulating-box may be introduced into the machine and balanced in the same manner, for the purpose of controlling the dilution of the stuff.

I do not confine myself to any particular form of stuff-box or to any special device for controlling the outflow of stuff from it, as my invention is applicable to all the different arrangements in use for those purposes.

I am aware that attempts have been made to regulate the thickness of the web or sheet

in a paper-machine by regulating the flow of stock thereto, the flow being reduced as the stuff increased.

I am also aware that an attempt has been made to secure the same end through the instrumentality of a balanced flexible diaphragm, over which the stock was caused to flow in a thin stream, and upon which the stock accumulated to an increased extent as it became thicker, the diaphragm being connected with a gate to regulate the flow, and with a valve through which water was discharged into that portion of the stock which had passed beyond the diaphragm into a feeding-chamber. This arrangement, besides requiring an expensive and complicated apparatus, and necessitating a constant return of a portion of the stock to the feeding mechanism, was objectionable and inefficient, for the reason that it did not secure a uniform consistency of the material, the water being introduced, not into the thickened portion of the stock upon the diaphragm, but into the stock which had already passed the same, and which was of the proper consistency, the consequence of which was that the stock, as delivered to the machine, varied constantly in consistency, being first too thick and then too thin. Besides, it was found that the variation in the flow, to compensate for variations in the consistency, required a delicacy of adjustment which was in practice impracticable.

Now, my invention differs from the above methods in striking at the cause instead of the effect—that is to say, in controlling the consistency instead of the flow, and in supplying the water to and reducing that portion of the material which governs the flow, instead of to a different portion which has already been tested.

It is to be particularly noted that in the form of apparatus shown by me the quantity of material in the regulator remains unchanged, and that the change in density and specific gravity regulates the action; that the flow and the consistency remain continuous and unchanged, and that the water is added directly to the stock being weighed or tested.

Having thus described the nature of my invention, and one form of the apparatus which may be employed, what I claim is—

1. An apparatus for controlling the consistency of paper stock, consisting of a balanced

vertically-moving receiver, arranged so that the pulp passes through the same, and a water-supply arranged to discharge into the receiver, and to be controlled in its rate of discharge by the movement of the receiver, substantially as shown.

2. The combination of the receiver A, balancing devices B C, with a stock-feeder, F, and water-feeder E, both arranged to deliver into the receiver, and the latter arranged to be controlled by the vertical movement of the receiver.

3. In a feed-regulator for paper-machines, a balanced regulating-receiver, A, arranged to rise and fall past the mouth of a water-pipe, E, as and for the purpose described and shown.

4. In a feed-regulator for paper-machines, a balanced regulating-receiver, A, provided with a vertical partition, *d*, and a passage thereunder, said receiver being arranged to receive the stock on one side of the partition, cause its passage thereunder, and then discharge it upon the opposite side, as described and shown, whereby the stock is delivered of a uniform consistency.

5. The herein-described method of securing a uniform consistency of the stock or stuff while being fed to paper-machines, consisting in the employment of a fixed volume of stock or stuff, in connection with a counter-balance, and causing variations in the specific gravity of said pulp to control the addition of water thereto, in the manner and by means substantially such as described and shown.

6. In a feed-regulating device for paper-machines, the combination of a balanced vertically-moving vessel of fixed capacity and a water-supply controlled by the movements of the balanced vessel, substantially as described and shown.

7. The herein-described method of controlling the consistency of the stock in its passage to paper-machines, consisting in applying the specific gravity of each part or portion of the stock to control the addition of water to that particular part or portion, in the manner and by means substantially such as described and shown.

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