

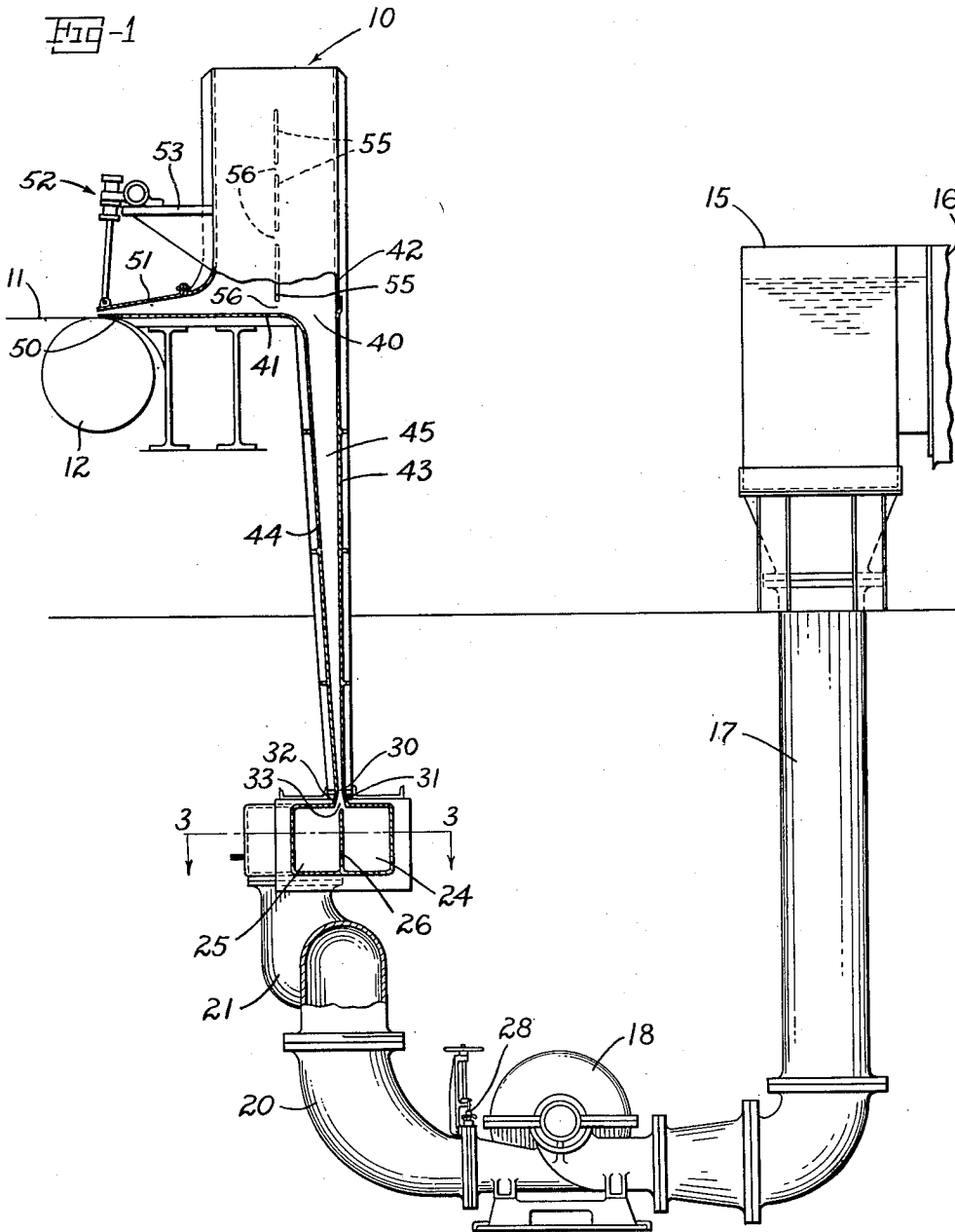
March 18, 1952

S. A. STAEGE
PAPER MACHINERY

2,589,639

Filed Oct. 17, 1947

2 SHEETS—SHEET 1



INVENTOR.
Stephen A. Staeger
BY *Marshall B. Babel*
ATTORNEYS

March 18, 1952

S. A. STAEGE
PAPER MACHINERY

2,589,639

Filed Oct. 17, 1947

2 SHEETS—SHEET 2

Fig-4

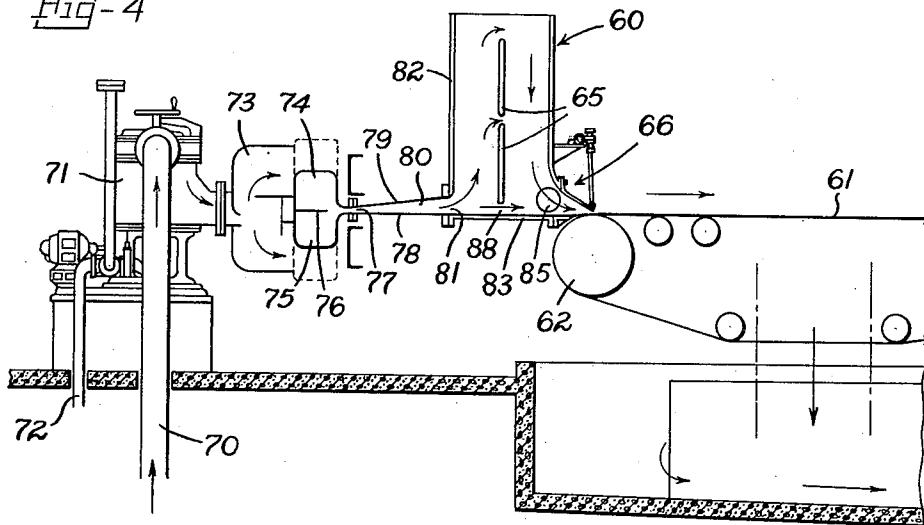


Fig-3

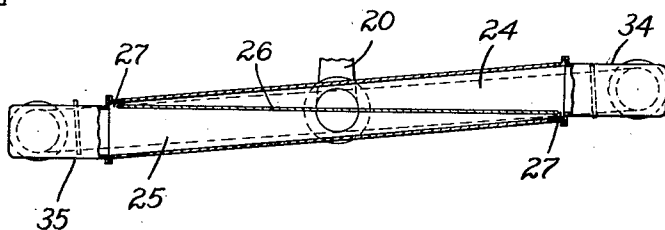
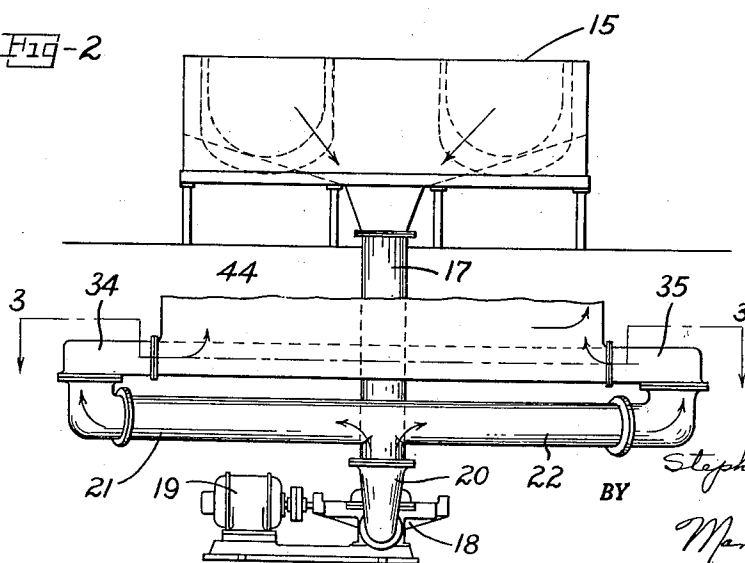


Fig-2



INVENTOR.
Stephen A. Staege
BY
Marshall & Bisbel
ATTORNEYS

UNITED STATES PATENT OFFICE

2,589,639

PAPER MACHINERY

Stephen A. Staeger, Hamilton, Ohio, assignor to
The Black-Clawson Company, Hamilton, Ohio,
a corporation of Ohio

Application October 17, 1947, Serial No. 780,456

6 Claims. (Cl. 92-44)

1

This invention relates to paper making, and more particularly to stock supply means for paper making machines.

One of the principal objects of the invention is to provide an inlet for supplying paper making stock to a Fourdrinier paper machine having an open head box under controlled conditions of substantially uniform velocity flow and distribution of fiber across the width of the machine to give a high degree of uniformity of weight and fiber distribution in the web or sheet.

Another object is to provide a stock inlet for a Fourdrinier paper machine having an open head box which is adapted to discharge stock through a slot orifice at relatively high and substantially uniform velocity across its lateral extent to effect uniform fiber distribution across the width of the machine and which delivers such stock to the head box at a sufficiently reduced velocity with respect to the velocity of flow through the slot orifice to avoid turbulence and large eddy currents while maintaining desired uniformity of flow conditions across the machine from the slot orifice to the forming wire.

It is also an object of the invention to provide a stock supply system for a Fourdrinier paper machine having an open head box which includes a pair of oppositely tapered conduits having a common discharge orifice of restricted dimensions to receive stock under pressure and to discharge the stock at a substantially uniform and relatively high velocity across the width of the machine and which also includes a stock inlet passage arranged to deliver the stock from the discharge orifice to the head box and diverging in the direction of flow of the stock therethrough at such an angle as to form with the discharge orifice a Venturi passage for dissipating the velocity energy of the stock with minimum turbulence as the stock flows from the discharge orifice to the head box while maintaining substantial uniformity of fiber distribution across the width of the machine.

A further object is to provide a stock inlet having the above characteristics which is readily adapted for attachment to the existing open head box of a Fourdrinier paper machine to effect improved conditions of uniform fiber distribution throughout the stock in the head box without producing undesirable turbulence and large eddy currents in the stock as delivered to the forming wire and without requiring replacement or expensive rebuilding of the existing head box and slice.

Other objects and advantages of the invention

2

will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:

Fig. 1 is a more or less diagrammatic view in side elevation, partly broken away to show details of internal construction, illustrating a portion of a Fourdrinier paper machine having an open head box and a portion of the stock supply system leading to the head box;

Fig. 2 is an elevational view looking from left to right in Fig. 1, with the head box and a part of the inlet passage removed;

Fig. 3 is a sectional view on the line 3-3 of Fig. 1 and also of Fig. 2; and

Fig. 4 is a diagrammatic view showing another arrangement of stock inlet with a Fourdrinier machine having an open head box.

In the drawings, which illustrate preferred embodiments of the invention, Fig. 1 shows a portion of a Fourdrinier paper machine having an open head box indicated generally at 10 for supplying stock to a forming wire 11 traveling over a breast roll 12. The stock is initially conveyed to the machine from the collecting box 15 of one or more screens indicated fragmentarily at 16. The stock from the collecting box 15 passes through conduit 17 to a pump 18 driven by a motor 19, and this pump in turn supplies the stock to a main conduit 20 which is branched at 21 and 22 to lead to a pair of counterflow inlet conduits 24 and 25 shown as of the type of construction disclosed in U. S. Patent 2,347,717, assigned to the same assignee as this application. As shown in Fig. 3, the conduits 24 and 25 extend generally transversely of the forming wire 11 and are separated by a baffle 26 except for limited communication around the ends of this baffle as indicated at 27. The supply of stock to the conduits 24 and 25 may be regulated by means of a variable speed drive for pump 18 or by a valve such as a gate valve 28 positioned adjacent the discharge side of the pump as shown in Fig. 1.

The baffle 26 is positioned adjacent and parallel to a discharge orifice 30 common to the two conduits 24 and 25 and formed by a pair of walls 31 and 32, which converge from conduits 24 and 25 to define a short tapering passage 33 leading into the orifice 30. The baffle 26 extends diagonally of conduits 24 and 25, as shown in Fig. 3, and thus provides a cross-sectional taper in these conduits, the taper being such that the axial rate of travel of stock through the tapered conduits is approximately uniform throughout their length for any given volume of flow. The orifice

30 is in the form of a slot of substantially the same lateral extent as the web or sheet to be formed on wire 11, and it is of restricted dimensions and hence of restricted cross-sectional area with respect to the conduits 24 and 25, thus providing a throttling effect and a constant pressure differential across the slot orifice 30 throughout its entire lateral extent with resulting uniform volume discharge of stock through the entire lateral extent of the slot at a uniform velocity, which will be substantially higher than the velocity of flow through conduits 24 and 25.

It will be noted that the direction of flow through orifice 30 is substantially at right angles to the direction of flow of the stock through conduits 24 and 25, and in order to minimize possible non-uniform velocity flow conditions because of the flow component perpendicular to this desired direction of flow through the orifice, the respective cross-sectional areas of the tapered conduits and the slot orifice are controlled to provide a substantial difference in the velocity of flow through the orifice as compared with the corresponding velocity through the conduits 24 and 25. Satisfactory results have been obtained with these velocities at a ratio of not less than about 4 or 5 to 1, and with this ratio still higher it is possible to hold the velocity in conduits 24 and 25 to a low value, for example from 0.5 to 2.5 feet per second, such that the undesired angular flow component is kept to a minimum, while still obtaining desired high velocity rates of flow through the orifice 30. At such accelerated velocities, fiber flocs tend to be broken up and the fiber is dispersed in passing through the slot orifice. In addition, since all of the stock is subjected to the same hydraulic conditions, there is minimum tendency to stratification or separation of light and heavy fibers due to inertia or centrifugal force.

It will be noted, as shown in Fig. 2, that the tapered conduits 24 and 25 are provided with extension portions 34 and 35, respectively, which extend outwardly on opposite sides of the machine and are connected adjacent their outer ends with the branch conduits 21 and 22. The connections between the conduits 21 and 22 and the conduit extension portions 34 and 35 are thus located at a sufficient distance laterally of the machine from the ends of the slot orifice 30 to effect adequate guiding and straightening of the flow of stock into parallel lines of flow before reaching the slot orifice, satisfactory results having been obtained with distances from each end of the slot to the center line of the adjacent branch conduit of 2 feet or more, depending upon the size of the machine. Furthermore, since the stock is brought into the conduit extensions 34 and 35 in directions substantially perpendicular to their lengths, as shown in Fig. 2, the velocity of that component of the flow which is perpendicular to the length of the tapered conduits is largely overcome or practically extinguished, and the stock has an opportunity to increase that component of flow which is in a direction at right angles to its entering direction and to establish substantially parallel lines of flow crosswise of the forming wire before reaching the tapered conduits and the slot orifice 30. There is thus provided a cross flow of stock through orifice 30 at a substantially higher velocity than the velocity of flow in the tapered conduits, in accordance with the supply pressure and the ratio of the respective areas of the orifice and the tapered conduits as described, and

this velocity and the distribution of fiber and flow in the stock will be substantially uniform across the width of the machine.

It is desirable to maintain such uniformity of flow conditions in the stock as it passes from the orifice and is delivered to the forming wire, in order to obtain corresponding uniformity of sheet formation. However, under most operating conditions with a Fourdrinier machine having an open head box, the velocity of flow through orifice 30 is so high that if the stock were allowed to enter the head box at the same velocity, excessive turbulence and objectionable eddy currents would result. If the stock were permitted to enter the head box vertically at such high velocities, it would tend to spurt above the level of liquid therein and even above the top of the box itself. Accordingly, the present invention provides means for conveying the high velocity stock from the orifice 30 to the head box 10 while at the same time dissipating its velocity energy with minimum turbulence and delivering the stock to the head box at a substantially lower velocity of flow but with substantially maintained uniformity of both velocity and distribution of fiber across the width of the machine for uniform sheet formation.

Referring to Fig. 1, an opening 40 is formed in the bottom wall 41 of the head box to receive stock for delivery to the forming wire 11. This opening 40 is substantially wider than the slot orifice 30, as shown in Fig. 1, and extends across the lateral extent of the head box adjacent the lower edge of the vertical wall 42. For example, satisfactory results have been obtained in a head box 33 inches in height with this opening 40 about 6 inches in width as compared with a width of the order of $\frac{1}{2}$ inch for the slot orifice 30. Walls 43 and 44 are arranged to form an inlet passage 45 leading from the slot orifice 30 to the opening 40 in the bottom of the head box. As shown in Fig. 1, the passage wall 43 is substantially parallel with the wall 42 of the head box and extends vertically upwardly from the orifice wall 31. The wall 44, however, is inclined from the vertical and diverges from wall 43 in the direction of flow of stock from orifice 30 to opening 40.

The degree of divergence between the passage walls 43 and 44 is controlled to a sufficiently small angle to provide a Venturi action between the passage 45 and orifice 30 and thus to provide for gradual absorption and dissipation of the velocity energy of the stock as it flows upwardly in passage 45 while maintaining the substantial uniformity of fiber distribution crosswise of the passage which is imparted to the flow of stock at the orifice 30. The angular relation of the passage walls 43 and 44 is of critical importance in obtaining preferred results from the standpoint of this maintenance of uniform flow conditions, and if this angle is too large, there is a tendency for some of the stock to slow down relatively abruptly along the outer parts of the passage while the major part shoots through at relatively high velocity, thus creating a high degree of turbulence and preventing the desired uniform deceleration of the entire cross-section of the flow. Tests indicate that the total included angle between passage walls 43 and 44 should be not more than about 10° and preferably somewhat less, for example an angle of the order of $7\frac{1}{2}^\circ$ or an increase of approximately $\frac{1}{8}$ inch per inch of travel.

The head box 10 may be provided with any

5

suitable slice arrangement, and Fig. 1 shows the slice as formed by a substantially rigid lower wall or lip 50 and a flexible upper plate or lip 51 secured to the front of the head box for vertical adjustment to vary the size of the slice opening. Adjusting means for controlling the position of the upper slice lip 51 are indicated generally at 52 as supported on a suitable plate or bracket 53 welded or otherwise secured to the front of the head box. Within the head box is a baffle 55 comprising a plurality of vertically spaced portions providing a series of apertures or passages 56 through which the stock flows to the slice. Desired results have been obtained in such cases with the total cross-sectional area of the passages 56 substantially equal to the corresponding area of the opening 40, thus providing substantially the same velocity of flow through the passages 56 as the velocity at which the stock enters the head box and causing sufficient agitation of the stock within the head box to prevent stagnation and resulting non-uniform conditions.

In the operation of this apparatus as shown and described, the pump 18 supplies stock from the collecting box 15 to the conduit 20 and tapered conduits 24 and 25 at sufficient pressure to provide a cross flow of stock through the orifice 30 at desired high velocity and volume of flow to effect uniform conditions of velocity and fiber distribution throughout the entire lateral extent of the slot 30. As this stock flows upwardly through the Venturi passage 45, its velocity energy is gradually and smoothly absorbed and dissipated as a result of the divergence between the passage walls 43 and 44. Thus when the stock reaches the opening 40 in the bottom of the head box 10, its velocity has been reduced to a value such that the stock flows into the head box without creating undesirable turbulence or objectionable eddy currents. In addition, all the stock is kept in constant motion toward the head box through the Venturi passage 45 and at a velocity which is substantially constant across the passage, changes in velocity being substantially uniform crosswise of the passage and taking place smoothly and with minimum turbulence. The desired conditions of uniform fiber distribution are thus maintained crosswise of passage 45 throughout its entire length, and the stock is delivered through opening 40 under uniform conditions of velocity and fiber distribution across the entire lateral extent of the head box, thus providing for the desired uniform flow conditions at the slice for effecting uniform sheet formation.

This construction and arrangement of the counterflow inlet and Venturi passage with a Fourdrinier machine having an open head box provide for operating the machine to produce a sheet of high uniformity at any desired wire speed within the range afforded by the maximum pressure head obtainable in a head box of given dimensions. Thus at low speeds, the pressure head within head box 10 may be only 2 or 3 inches, and under such conditions the supply of stock from the opening 40 to the slice may take place entirely through the lowest of the passages 56. On the other hand, speeds as high as 1,600 feet per minute have been obtained with the pressure head of the order of 12 feet to give a spouting velocity at the slice properly correlated with such high wire speeds, and at such speeds the flow through the head box in the direction of wire travel will take place through all of the passages

6

56 as well as over the top of the baffle 55, thus creating sufficient agitation throughout the head box to maintain uniform fiber distribution and avoid stagnation of the stock. Over all this wide range of operating conditions, the counterflow inlet and Venturi passage provide desired uniform conditions of velocity and fiber distribution in the stock across the lateral extent of the head box without undesirable turbulence.

A further advantage of the present invention lies in the fact that the counterflow inlet and Venturi passage arrangement is readily adapted for attachment to the open head box already installed on an existing Fourdrinier machine, thus making it possible to achieve the improved conditions of uniform velocity and fiber distribution without the expense of replacing the existing head box and slice. For such installations, as well as in new machines, the size of the opening into the head box corresponding to opening 40 in Fig. 1 is largely determined by the speed at which the machine is to be run and hence the velocity at which the stock is to be admitted to the head box. Thus for a low speed machine, operating at a wire speed of the order of 200 feet per minute, desired results from the standpoint of uniform flow conditions with minimum turbulence have been obtained with this velocity of the order of $\frac{1}{2}$ foot per second, but for higher speed machines a desirable range for this velocity is approximately 1 to 2 feet per second. The size of the opening 40 is thus properly correlated with the size of the slot orifice 30 to give the desired velocity range, and the total length of the Venturi passage will then be whatever length is required to maintain the total included angle between the passage walls within the desired range of not more than about 10° as already explained.

It should also be noted that the stock inlet of the invention makes possible a substantial reduction in the size of the open head box used therewith as compared with conventional open head boxes. Thus according to prior practice, head boxes of considerable length in the direction of wire travel have been used and equipped with a series of baffles spaced lengthwise of the head box and intended to promote uniform fiber distribution throughout stock entering the head box from a plurality of pipes. With the inlet of the present invention, the stock is already in such highly uniform condition when it enters the head box that such multiple baffles are not necessary and may even tend to decrease rather than to improve its uniformity. It is desirable to provide a single baffle, as shown in Fig. 1, to prevent a direct flow of stock from opening 40 to the slice, with resulting stagnation of the stock in the upper part of the box as stated, but more than one such baffle has been found undesirable. Furthermore, the size of the two compartments into which the baffle divides the head box need only be sufficient to permit ready access for cleaning purposes, satisfactory results having been obtained with each compartment just large enough to allow a man to enter with sufficient room for effective cleaning. It will accordingly be seen that when the stock inlet of the invention is applied to an existing open head box of the multiple baffle type, the head box should be first substantially reduced in size, to approximately the proportions illustrated in Fig. 1, thus affording a substantial saving in space as well as the improved characteristics of uniform flow conditions as already discussed.

It should be understood that it is not necessary

to arrange the counterflow inlet and Venturi passage vertically as shown in Fig. 1. Thus Fig. 4 shows a modified arrangement in accordance with the invention in which these parts are arranged for substantially horizontal flow of stock into the open head box 60 of a Fourdrinier machine including a forming wire 61 traveling over a breast roll 62. The head box 60 is shown as provided with an internal apertured baffle 65 and an adjustable slice lip arrangement indicated generally at 66, as discussed in connection with Fig. 1.

In the arrangement of Fig. 4, the stock is supplied from a suitable pump and white water return, not shown, to a conduit 70 leading to a screen 71 provided with a discharge line 72 for reject material. The stock flows from the screen through the supply conduits indicated generally at 73 to a counterflow inlet constructed as described in connection with Figs. 1 to 3 and including a pair of tapered conduit passages 74 and 75 separated by a baffle 76 and provided with a common discharge orifice 77. Walls 78 and 79 are arranged to form a Venturi passage 80 leading from the slot orifice 77 to the opening 81 in head box 60 to supply stock from orifice 77 to the head box for delivery to the forming wire 61.

The opening 81 is shown as formed in the rear wall 82 of the head box, and it extends laterally across the head box adjacent the edge of the bottom wall 83. The lower wall 78 of the Venturi passage is accordingly shown as lying in substantially the same horizontal plane as the bottom wall 83 of the head box, and the upper passage wall 79 diverges from wall 78 in the direction of flow of stock through the passage, the total included angle between the two walls being shown as of the order of $6\frac{1}{2}^\circ$ to give the desired Venturi effect. A perforated roll 85 may be positioned adjacent the slice opening as shown to assure adequate crossing of the fibers as the stock flows onto the forming wire.

The operation of this system is substantially the same as has already been described in connection with Fig. 1. The stock supplied to the large ends of the tapered conduits 74 and 75 is discharged through the slot orifice 77 at a predetermined substantially uniform velocity of flow producing substantially uniform distribution of fiber across the width of the machine. The passage 80 cooperates with orifice 77 to provide a Venturi action causing the velocity energy of the stock to be dissipated with minimum turbulence as the stock flows from orifice 77 toward the head box and thus causing the stock to be delivered through opening 81 at a substantially reduced velocity of flow while maintaining the desired substantial uniformity of fiber distribution across the entire lateral extent of the head box.

At low wire speeds, the supply of stock to the head box is controlled to a relatively low rate sufficient to maintain the proper low head within the head box, and under such conditions the supply of stock from opening 81 to the slice may take place entirely through the lowest of the passages or apertures 88 through baffle 65. At higher wire speeds, requiring a higher pressure head, the flow through the head box in the direction of wire travel may also take place through the higher of these passages as well as above baffle 65, thus creating sufficient agitation throughout the head box to maintain uniform fiber distribution without undesirable turbulence. Under all such operating conditions, the counter-

flow inlet and Venturi passage coact as described in connection with Figs. 1 to 3 to give highly uniform distribution of fiber and flow across the head box without undesirable turbulence and large eddy currents and thus contribute to the desired uniform sheet formation.

Reference is made to my copending applications, assigned to the same assignee as this application, Serial No. 607,820 filed July 30, 1945, now Patent Number 2,540,301, and Serial No. 684,980 filed July 19, 1946 as a continuation in part of application Serial No. 607,820.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In combination with a Fourdrinier paper machine having an open head box, a stock inlet for supplying paper making stock to said head box under controlled conditions of uniform velocity and distribution of fiber across the width of said machine without creating turbulence and objectionable eddy currents in said head box which comprises a pair of oppositely tapered conduits arranged transversely across said machine and each adapted to be supplied at the larger end thereof with stock under pressure, means forming a slot orifice common to said pair of conduits and extending across the full width of said machine through which said stock is discharged from said conduits at a predetermined velocity of flow with substantially uniform distribution of fiber across the width of said machine, said orifice being of restricted cross-sectional area relative to said conduits to maintain said predetermined velocity substantially higher than the velocity of flow of said stock in said conduits and substantially uniform across the width of said machine, walls forming an inlet passage of substantially the same width as said orifice and said head box for conducting said stock from said orifice to said head box, said walls diverging in the direction of flow from said orifice to said head box at a predetermined small angle of not more than 10° to form with said orifice a Venturi passage for maintaining said stock between said orifice and said head box in continuous motion towards said head box at a decelerating velocity which is substantially constant across each cross-sectional area of said passage to dissipate the velocity energy of said stock with minimum turbulence as said stock flows from said orifice to said head box while maintaining substantial uniformity of flow conditions in said stock crosswise of said passage and throughout substantially the entire length thereof, and means forming an open connection of substantially the same cross-sectional area as the larger end of said Venturi passage between said passage and said head box to admit stock from said passage to said head box at a velocity substantially lower than said predetermined velocity and with maintained uniformity of flow and fiber distribution across the width of said machine.

2. A stock inlet for delivering paper making stock to a Fourdrinier paper machine having an open head box which comprises a pair of oppositely tapered conduits arranged transversely across said machine and each adapted to be supplied at the larger end thereof with stock

9

under pressure, means forming a slot orifice common to said pair of conduits and extending across the full width of said machine through which said stock is discharged from said conduits at a predetermined velocity of flow with substantially uniform distribution of fiber across the width of said machine, said orifice being of restricted cross-sectional area relative to said conduits to maintain said predetermined velocity substantially higher than the velocity of flow of stock in said conduits and substantially uniform across the width of said machine, walls forming an inlet passage of substantially the same width as said orifice and said head box for conducting stock from said orifice to said head box, said walls diverging in the direction of flow from said orifice to said head box at a predetermined total included angle of not more than 10° to maintain said stock between said orifice and said head box in continuous motion towards said head box at a decelerating velocity which is substantially constant across each cross-sectional area of said passage, said passage continuing from said orifice to said head box with substantially undiminished effective flow area to dissipate the velocity energy of said stock with minimum turbulence as said stock flows from said orifice to said head box while maintaining substantial uniformity of flow conditions in said stock crosswise of said passage and throughout substantially the entire length thereof, and means forming an open connection between the larger end of said passage and said head box for admitting stock from said passage to said head box with minimum turbulence across the entire width of said head box.

3. A stock inlet for delivering paper making stock to a Fourdrinier paper machine having an open head box which comprises means forming an opening in said head box extending across the width of said machine to receive stock for delivery to the forming member of said machine, walls forming a passage leading to said opening and of substantially the same width as said head box throughout the entire length thereof, the end of said passage adjacent said head box being of substantially the same cross-sectional dimensions as said opening, said walls diverging at a predetermined small angle in the direction of flow through said passage towards said opening to provide undiminished effective flow area into said head box, means forming a slot orifice adjacent the smaller end of said passage of substantially smaller cross-sectional area than said opening extending across the width of said machine, and means for supplying stock to said orifice at a substantially uniform pressure across the width of said machine for discharge through said orifice at a predetermined substantially uniform velocity of flow with substantially uniform distribution of fiber across the width of said machine, the total included angle between said diverging passage walls being not more than 10° to maintain said stock between said orifice and said head box in continuous motion towards said head box at a decelerating velocity which is substantially constant across each cross-sectional area of said passage while dissipating the velocity energy of said stock with minimum turbulence as said stock flows from said orifice to said head box and to deliver said stock through said opening at a substantially lower velocity of flow than said predetermined velocity while maintaining substantial uniformity of flow conditions in said stock across the entire lateral extent of said opening.

4. In combination with a Fourdrinier paper

10

machine having an open head box provided with an opening in one wall thereof and extending across the lateral extent of said head box adjacent an edge of a second wall thereof to receive stock for delivery to the forming member of the machine, walls forming a passage leading to said opening and of substantially the same width as said head box throughout the entire length thereof, the end of said passage adjacent said head box being of substantially the same cross-sectional dimensions as said opening and connecting directly with said head box through said opening with undiminished effective flow area, one of said walls being substantially parallel to said second wall of said head box, said walls diverging at a predetermined angle in the direction of flow through said passage towards said opening, means forming a slot orifice of substantially smaller cross-sectional area than said opening extending across the width of said machine at the smaller end of said passage, and means for supplying stock to said orifice at a substantially uniform pressure across the width of said machine for discharge through said orifice into said passage at a predetermined substantially uniform velocity of flow with substantially uniform distribution of fiber across the width of said machine, the total included angle between said diverging passage walls being of not more than 10° to provide a Venturi action in said passage causing the velocity energy of said stock to be dissipated with minimum turbulence as said stock flows from said orifice to said head box, said angle between said passage walls being below a predetermined critical angle to maintain said stock between said orifice and said opening in continuous motion towards said head box at a decelerating velocity which is substantially constant across each cross-sectional area of said passage and to effect delivery of said stock through said opening at a substantially lower velocity of flow than said predetermined velocity while maintaining substantial uniformity of flow conditions in said stock across the entire lateral extent of said opening.

5. A stock inlet for delivering paper making stock to a Fourdrinier paper machine having an open head box provided with an opening extending across the width of said machine to receive stock for delivery to the forming member of said machine, comprising walls forming a passage adapted for connection with said opening and of substantially the same width as said head box throughout the entire length thereof, the end of said passage adjacent said head box being of substantially the same cross-sectional dimensions as said opening connecting directly with said head box through said opening with undiminished effective flow area, said walls diverging at a predetermined small angle in the direction of flow through said passage towards said opening, means forming a slot orifice of substantially smaller cross-sectional area than said opening extending across the width of said machine at the smaller end of said passage, a pair of oppositely tapered conduits arranged transversely across said machine and each adapted to be supplied at the larger end thereof with stock under pressure, and means providing a direct connection from each of said tapered conduits to said orifice to effect discharge of said stock through said orifice into said passage at a predetermined substantially uniform velocity of flow with substantially uniform distribution of fiber across the width of said machine, the total included angle between said diverging passage walls being not

11

more than 10° to maintain said stock between said orifice and said opening in continuous motion towards said head box at a decelerating velocity which is substantially constant across each cross-sectional area of said passage and to provide for dissipating the velocity energy of said stock with minimum turbulence as said stock flows from said orifice to said head box and delivery of said stock through said opening at a substantially lower velocity of flow than said predetermined velocity while maintaining substantial uniformity of flow conditions in said stock across the entire lateral extent of said opening.

6. In a stock supply system for a Fourdrinier paper machine including a forming member and having an open headbox for supplying stock directly to said forming member, the combination of a pair of oppositely tapered conduits arranged transversely across said machine and each adapted to be supplied at the larger end thereof with stock under pressure, means forming a slot orifice common to said pair of conduits and extending across the full width of said machine through which said stock is discharged through said conduits at a predetermined velocity of flow and with substantially uniform distribution of fiber across the width of said machine, said orifice being of restricted cross-sectional area relative to said conduits to maintain said predetermined velocity substantially higher than the velocity of flow of said stock in said conduits and substantially uniform across the width of said machine, walls forming a totally enclosed inlet passage of substantially the same width as said orifice and said forming member for conducting stock from said orifice to said headbox, said headbox having an opening therein for connection with said pas-

12

sage, said passage being of substantially the same cross-sectional area as said opening at the point of connection thereof, and said walls being arranged to diverge at a predetermined total included angle of not more than 10° in the direction of flow of said stock from said orifice to said opening to maintain said stock between said orifice and said opening in continuous motion towards said forming member at a decelerating velocity which is substantially constant across each cross-sectional area of said passage and to dissipate with minimum turbulence the velocity energy of said stock as said stock flows from said orifice to said opening while maintaining substantial uniformity of flow conditions in said stock across the width of said passage over substantially the entire length thereof.

STEPHEN A. STAEGE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,775,905	Lang	Sept. 16, 1930
1,964,291	Kutter	June 26, 1934
2,243,773	Randell	May 27, 1941
2,249,128	Goldsmith	July 15, 1941
2,339,711	Lowe et al.	Jan. 18, 1944
2,347,850	Staeger	May 2, 1944
2,381,286	Hornbostel et al.	Aug. 7, 1945

OTHER REFERENCES

"Paper Trade Journal," April 4, 1946, pages 43 and 44, Staeger.