

June 25, 1940.

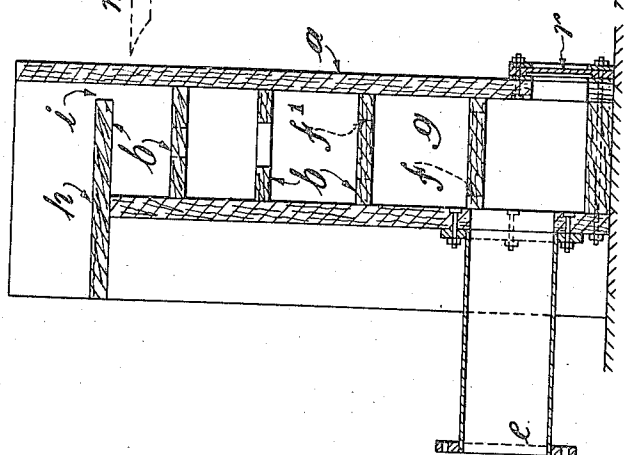
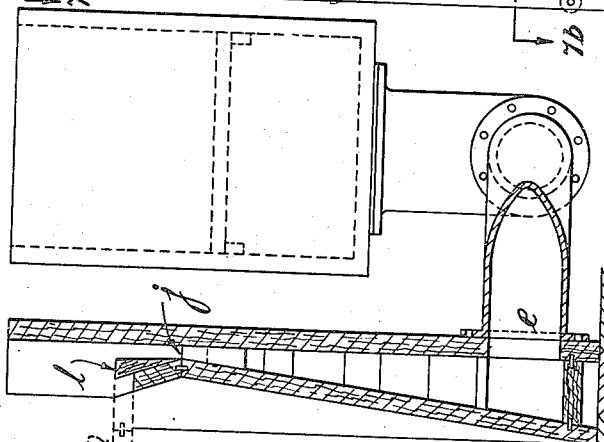
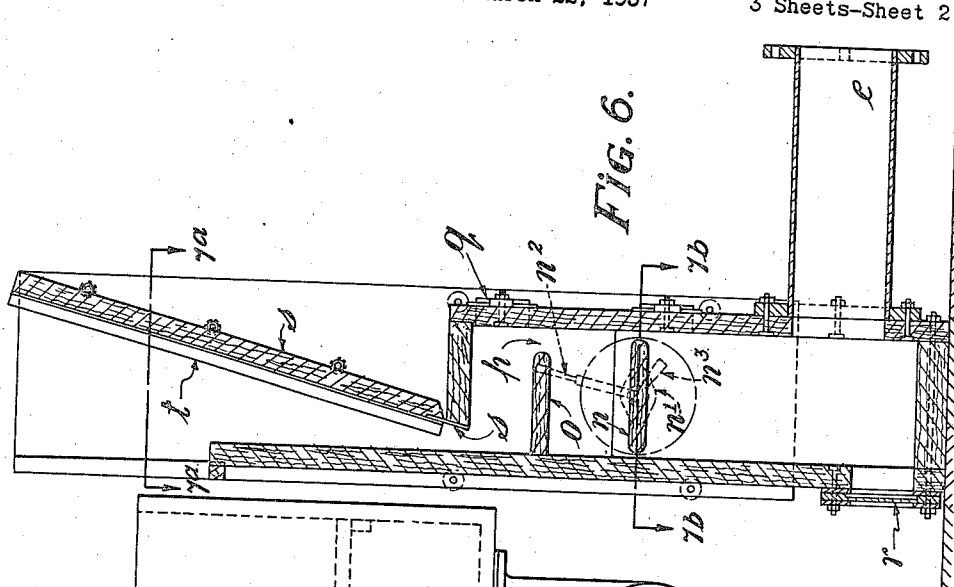
S. MILNE

2,205,693

PAPER-MAKING MACHINE

Filed March 22, 1937

3 Sheets-Sheet 2



Inventor:-

Samuel Gilue

By his Attorney. *Walter Lunn*

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3 Sheets-Sheet 3

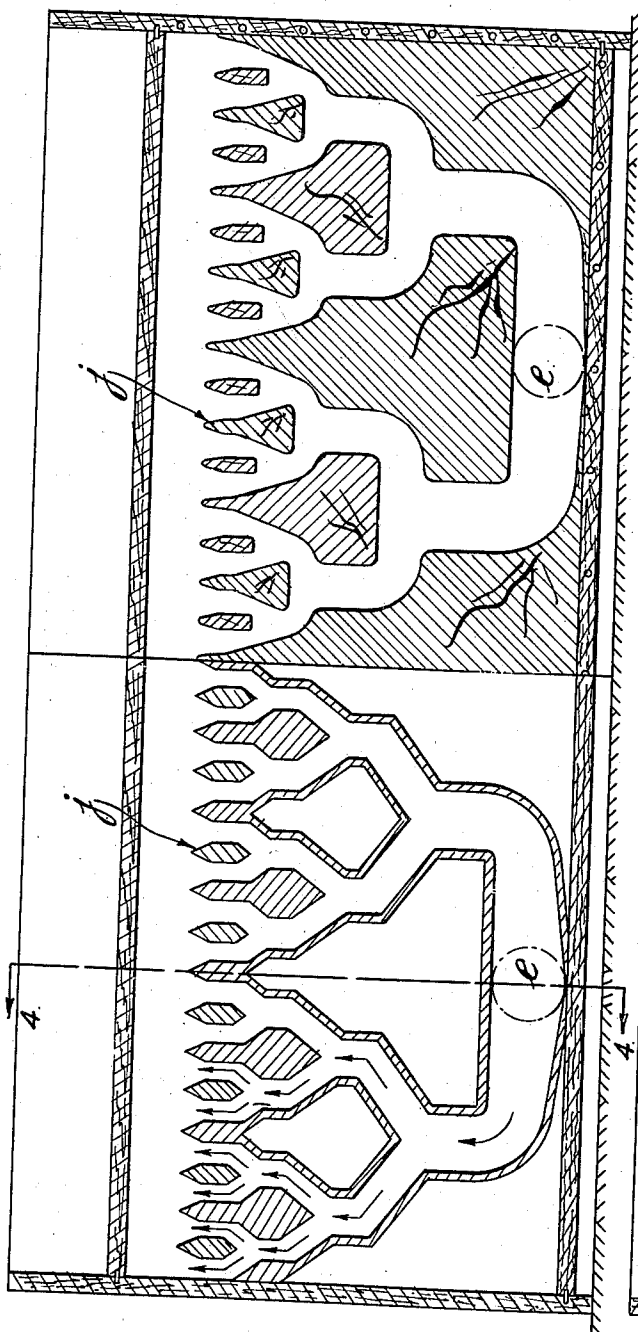


Fig. 3.

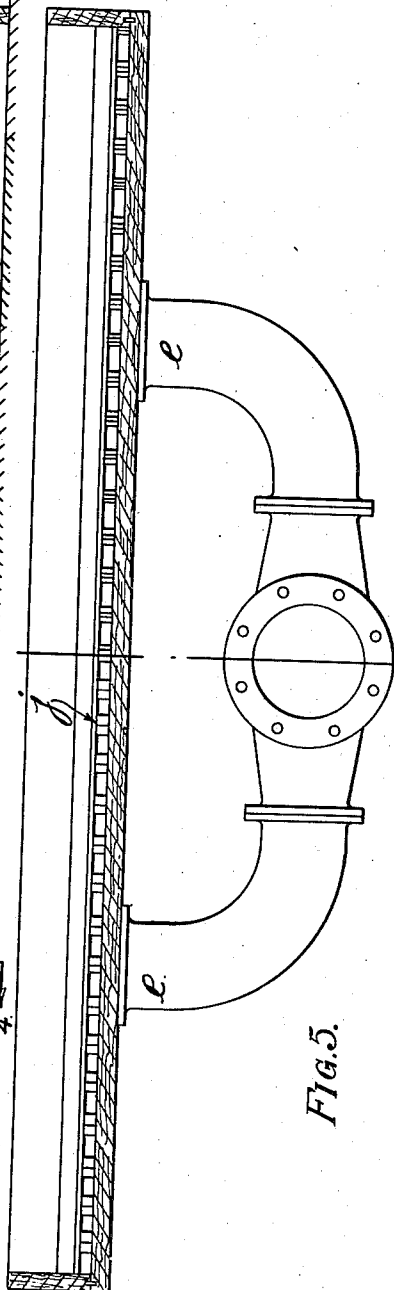


Fig. 5.

Inventor:-

Samuel Milne

By his Attorney. Walter Gurnea

UNITED STATES PATENT OFFICE

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PAPER-MAKING MACHINE

Samuel Milne, Edinburgh, Scotland

Application March 22, 1937, Serial No. 132,311
In Great Britain March 21, 1936

6 Claims. (Cl. 92-44)

(Granted under the provisions of sec. 14, act of
March 2, 1927; 357 O. G. 5)

This invention relates to paper-making machines, and in particular to the breast boxes or low boxes of wire machines, such as those of the Fourdrinier type, and of cylinder mould machines, by which boxes the prepared pulp from the strainers, etc., is delivered to the wire or mould.

The object of the invention is to provide improved constructions of flow box by which the rate of flow of pulp may be made more even at all points in the width of the box. Hitherto, several proposals have been made for the obtaining of this desired end, but without the required success. The chief difficulty experienced is due to the fact that the various points in the width of the box are not equally distant from the point or points where the pulp enters the box, and since the pulp tends always to take the course of least resistance, which so far has been the shortest course, there has always been a tendency for the pulp to flow on to the wire or mould at a faster rate at the centre than at the ends of the box. The present invention aims at complete avoidance of this difficulty.

According to the invention, the flow box is so constructed interiorly, that between the point of entry of the pulp and any point in the width of the box at the final outlet, the pulp is constrained to flow through one or more apertures, produced by baffles in the box, the apertures being so shaped and positioned and of such a size that there is an equal resistance to flow to all parts of the wire, and a uniform rate of flow results.

The preferred embodiments of the invention are characterised by a plurality of baffle plates within the box to divide and sub-divide the pulp into separate streams, either for the whole distance between the inlet and outlet, or for a part only of that distance.

In other embodiments, however, the box is provided interiorly with a baffle or baffles, preferably adjustable in position, and of a shape such as to leave an aperture of varying width such that where the pulp would normally tend to flow faster (were the aperture of uniform width) the said aperture is smaller. Similarly, where the pulp would normally tend to flow slowly, the said aperture is wider. In consequence, the resistance offered by the baffle counter-acts the normal differences of flow, in the opposite ratio, so as to produce or permit a uniform rate of flow at all points in the width of the box.

In still other cases, the two above features may be combined in a single box.

According to a further and optional feature of the invention, means is provided in the flow box or adjacent thereto for varying the velocity of the pulp flowing into the space or pool before the slice, to suit the velocity of the pulp flowing under the slice, and thus avoid turbulence, and irregularity in the said space. Such means comprises a

movable wall to the passage through which the pulp flows, by which wall the cross-sectional area of the passage may be varied to vary the pulp's velocity.

The invention is illustrated in the accompanying drawing, wherein:

Fig. 1 is a section view of a flow box made according to the first-mentioned example, with the front wall removed so as to show the interior construction, wherein the pulp stream is divided and sub-divided within the box;

Fig. 2 is a cross-sectional elevation on the line 2-2 of Fig. 1;

Fig. 3 is an elevational view partly in section, but of a flow box in which the sub-division is carried out in a somewhat different manner; two types of box are illustrated, one in each half of the view, as hereinafter explained;

Fig. 4 is a cross-sectional elevation on the line 4-4 of Fig. 3;

Fig. 5 is a plan of the flow box shown in Fig. 3;

Fig. 6 is a cross-sectional elevation of a flow box made according to the second-mentioned example, wherein an adjustable baffle of varying shape controls the rate of flow of the pulp, and also incorporating means to vary the velocity of the pulp flowing into the space or pool before the slice; and Figs. 7a and 7b are sectional views on the lines 7a-7a and 7b-7b respectively of Fig. 6.

Referring to Figs. 1 and 2, the flow box *a* is provided interiorly with a number of horizontal baffles *b* extending from wall to wall and from end to end, and each having perforations or outlets. In order to exclude the lower corners *c* of the box, where no substantial flow would take place, and to avoid the consequent lodgment of pulp in those parts, the sloping walls *d* are provided. If desired, the external form of the flow box may be such as to eliminate the corners which are shown cut off by the sloping walls.

There is a single pulp inlet *e* in this case, arranged central to the width of the box (and therefore central to the width of the wire) and in the first (lowest) baffle *b* are two large openings *f*, arranged equi-distant from the inlet *e*, and spaced from each other a distance equal to one half the width of the wire. As will be seen, the space above the centre of the first baffle is closed off by the short sloping walls *g*. The next baffle *b* has four openings *f'* all equally spaced, two of them being equi-distant from one of the openings in the first baffle, and the other two being equidistant from the other opening in the first baffle. The openings in the second baffle are of smaller size than those in the first.

Two further perforated baffles *b* are provided, as shown, each having twice the number of perforations than the one next below it, the perforations being equally spaced and in staggered relationship to those in the baffle next below, and

the perforations in each case being of smaller size than those in the baffle next below. Further, as the number of openings increases, the baffles are arranged nearer together.

- 5 At the top of the box is a non-perforated baffle or shelf *h* spaced away from the front wall of the box so as to leave a long narrow opening *i* across the full width of the box, which opening serves as the final outlet. The pulp may emerge from the
10 slot *i* directly into the space or pool before the slice, or, as described later, into a preliminary box or passage of adjustable width leading thereto. There may be a second slot *i*, below that shown, but at the other side of the box.

- 15 As will be seen from Fig. 1, the distance from the pulp inlet *e* to any of the final openings, along the direction of flow is equal. This is demonstrated by the broken lines *x*.

- There may be other numbers of baffles than
20 those shown, and the short sloping walls *g* may be repeated between each point of subdivision, thereby providing a series of isolated passages of equal length to each pair of final outlets.

- 25 The baffles *b* and their sloping walls *g* (if used) may be adapted for withdrawal endwise for cleaning purposes, or, if the walls *g* are not used, the baffles may be hingedly carried by one of the walls of the box and be capable of turning up
30 against that wall for cleaning purposes. Hand holes or the like, with removable covers may be provided in the wall of the box to facilitate cleaning out. The baffles may be of copper or bronze or other suitable metal, or be of wood, or rubber,
35 or any suitable combinations of material.

- To assist in preventing settling of the pulp, on the baffles, an agitator may be provided between each pair of baffles, which may take the form of a rotating plate or paddle, longitudinally of the
40 box, its ends projecting through the end walls of the box and the plates being driven by means on such ends outside the box.

- The openings *j* may be of any useful shape in plan, the shape being selected according to its
45 best mixing properties for the usual consistency of pulp to be dealt with in any particular case.

- Referring now to Figs. 3 and 4, several modifications are illustrated. In this construction, there are two pulp inlets *e* in the box, separated
50 by a distance equal to one half the width of the wire, and disposed equidistant from the centre of the wire. Instead of the continuous baffles *b*, the box is provided with shaped filling members *j* forming passages between them, those of
55 the filling members which extend to the top, having knife edges at the top to give a practically continuous final outlet. The filling members *j* are of a shape such that each divides into two branches a stream of pulp issuing through
60 an outlet below it, and such that collectively they provide passages of equal length from an inlet to any one of the outlets supplied by that inlet. The number and position of the elements *j* will vary according to the number of final outlets it is
65 desired to have. In Fig. 3, two forms of filling members *j* are shown, in the right and left hand parts of the view respectively. In the left hand part of the view, the members *j* provide parallel-sided passages, each succeeding passage being of
70 smaller cross section than its predecessor. In the right hand part of the view, however, the passages are each of varying width so as to vary the rate of flow of the pulp and improve the mixing of the pulp. These members *j* may be of
75 wood, cut across the grain.

The two inlets *e* will preferably be fed by two branches of a single pipe from the pulp supply, the branching taking place outside the flow box as shown in Fig. 3, but if desired they may be fed by two independent supplies.

As will be seen from Fig. 4, the improved flow box is of less width towards the top. A removable distance piece *l* is inserted in the top of the box, leaving a parallel-sided outlet, but by removing such distance piece, the outlet may be widened. The front wall of the box extends upwards to form the wall of the usual pool before the slice, the bread-board *m* extending from the top edge of the shorter wall of the box.

Instead of the pulp inlets *e* being in a vertical wall of the box, they may be in the bottom. This applies also to the form shown in Figs. 1 and 2.

Referring now to Figs. 6, 7a and 7b, instead of there being a number of fixed apertured baffles *b*, there is a single baffle *n* with a shaped edge such that between itself and the walls of the box there are apertures of varying width. The shape of the baffle is such that pulp will flow through the apertures at a uniform rate at all points. As will be seen, the apertures are smaller at
2 the centre of the box where the distance from inlet to outlet is least, and they gradually widen as the distance to the outlets increases, being of the maximum width at the ends of the box. The baffle *n* is adjustably carried on trunnions *n*¹
3 journaled in the box ends, and is positioned by the hand lever *n*² and locking lever *n*³.

If desired, more than one such baffle may be provided in the same box. Also, a baffle of this description might be incorporated in a box embodying the features of Figs. 1 and 2 or Figs. 3 and 4.

Where there are more than one pulp inlet to the box, the baffle *n* will be correspondingly shaped so as to have a wider part opposite each
4 inlet where the flow would normally be faster, the baffle diminishing in width away from each inlet.

Instead of the baffle *n* being pivoted centrally of the box and providing two shaped apertures, as shown, it may be pivoted along one of its edges to one wall of the box, and provide only one shaped aperture.

The flow box has a fixed baffle *o* near the top extending from one side and leaving a long narrow slot *p* across the box, equivalent to the slot *i* in the construction shown in Figs. 1 and 2. Cleaning doors *q* are provided where necessary, and a sluice gate or valve *r*.

Figs. 6, 7a and 7b also illustrate a further feature of the invention, which is also applicable to the forms shown in Figs. 1 and 2 or 3 and 4. This consists of the hinged wall *s* which extends from the top of the flow box upwards and also forms the back wall of the space or pool before the
6 slice. This wall is carried by a hinge-plate *s*¹ of copper or the like and has a rubber angle element *t* at each end to make a joint with the side walls of the pool.

By varying the angular position of the wall *s*, the cross-sectional area of the box at the level of the breast-board is varied, and consequently the velocity (as distinct from the volumetric rate of flow) varies. Such velocity may thus be varied when that of the pulp flowing
7 under the slice is varied, but not necessarily to the same extent.

The flow box with its adjustable baffles, and the channel with pivoted wall, may be vertically one above the other, as shown, forming together

a complete flow box; or that part which has the adjustable baffles may be horizontal; whilst the channel with the pivoted wall is vertical, rising from the wire-ward end of the horizontal part.

In both cases, at the junction between the two parts there will usually be a long narrow opening as above described, to assist in making the flow of pulp uniform.

What I claim is:

1. A unitary breast box construction for a paper making machine comprising in combination, a box having front, rear, bottom and side walls and provided with an inlet in the lower portion thereof, parallel sided baffles extending between said front and rear walls having their upper ends terminating in substantially the same plane providing substantially rectangular outlets spaced apart between the side walls of the box, certain of said baffles having enlarged lower portions disposed below lower portions of adjacent baffles, certain other of said baffles extending downwardly past the enlarged lower portions of said certain baffles having enlarged lower portions disposed below the enlarged lower portion thereof, all adapted and arranged whereby rectangular passageways to said outlets are provided with a passageway successively reduced in size by said baffles from wide to relatively narrow passageways.

2. A unitary breast box construction for a paper making machine comprising in combination, a box having front, rear, bottom and side walls and provided with an inlet in the lower portion thereof, parallel sided baffles extending between said front and rear walls having their upper ends terminating in substantially the same plane providing substantially rectangular outlets spaced apart between the side walls of the box, certain of said baffles having enlarged lower portions disposed below lower portions of adjacent baffles, certain other of said baffles extending downwardly past the enlarged lower portions of said certain baffles having enlarged lower portions disposed below the enlarged lower portion thereof, the said front and rear walls inclining towards one another from said inlet, all adapted and arranged whereby generally tapering rectangular passageways to said outlets from said inlet are provided that are successively reduced in size by said baffles from wide to relatively narrow passageways.

3. A unitary breast box construction for a paper making machine comprising in combination, a box having front, rear, bottom and side walls and provided with an inlet in the lower portion thereof, upper, intermediate and lower sets of parallel sided baffles extending between said front and rear walls having their upper portions terminating in substantial alignment providing substantially rectangular outlets spaced apart between said side walls, the baffles of the intermediate set thereof having relatively wide lower portions spaced from and disposed below the lower portions of the baffles of the upper set, and the baffles of the lower set having intermediate portions spaced from the lower portions of the intermediate baffles and lower portions spaced from and disposed below said lower portions, all adapted and arranged whereby rectangular passageways from said inlet to said outlets are provided that are divided and reduced in size successively by the baffles of the sets from wide to relatively narrow passageways.

4. A unitary breast box construction for a paper making machine comprising in combination, a box having front, rear, bottom and side walls and provided with an inlet in the lower portion thereof, upper, intermediate and lower sets of parallel sided baffles extending between said front and rear walls having their upper portions terminating in substantial alignment providing substantially rectangular outlets spaced apart between said side walls, the baffles of the intermediate set thereof having relatively wide lower portions spaced from and disposed below the lower portions of the baffles of the upper set, and the baffles of the lower set having intermediate portions spaced from the lower portions of the intermediate baffles and lower portions spaced from and disposed below said lower portions, the said front and rear walls inclining towards one another from said inlet, all adapted and arranged whereby generally tapering rectangular passageways from said inlet to said outlets are provided that are successively reduced from wide to relatively narrow passageways by said baffles of sets.

5. A unitary breast box construction for a paper making machine comprising in combination, a box having front, rear, bottom and side walls and provided with an inlet in the lower portion thereof, parallel-sided baffles extending between said front and rear walls having upper portions in substantial alignment and cooperating with said walls and forming rectangular passageways leading upwardly from said inlet and terminating in rectangular outlets spaced apart between the side walls of said box, certain of said baffles having relatively wide lower portions spaced from and disposed below baffles adjacent thereto, and other certain baffles having intermediate portions spaced from and disposed between the wide portions of the certain baffles and provided with relatively wider lower portions spaced from and disposed below the wide portions of said certain baffles, the said lower portions of the baffles in conjunction with adjacent baffles dividing a passageway thereunder into separate passageways at opposite sides thereof.

6. A unitary breast box construction for a paper making machine comprising in combination, a box having front, rear, bottom and side walls and provided with an inlet in the lower portion thereof, a set of baffles extending between said front and rear walls having lower portions above said inlet and sides tapering generally upwardly therefrom, a second set of baffles extending between said front and rear walls having lower portions spaced from and disposed above the lower portions of the baffles of the first named row, a third set of baffles extending between said front and rear walls spaced from and disposed between adjacent baffles of said first and second named sets of baffles, the upper portions of the baffles of said sets terminating in substantial alignment and being parallel sided providing a plurality of spaced rectangular outlets extending between said side walls, all adapted and arranged whereby said baffles provide rectangular passageways leading upwardly from said inlet to said outlets, a passageway as it extends upwardly from said inlet being divided successively into adjacent passageways by the lower portions of the baffles of successive sets.

SAMUEL MILNE.