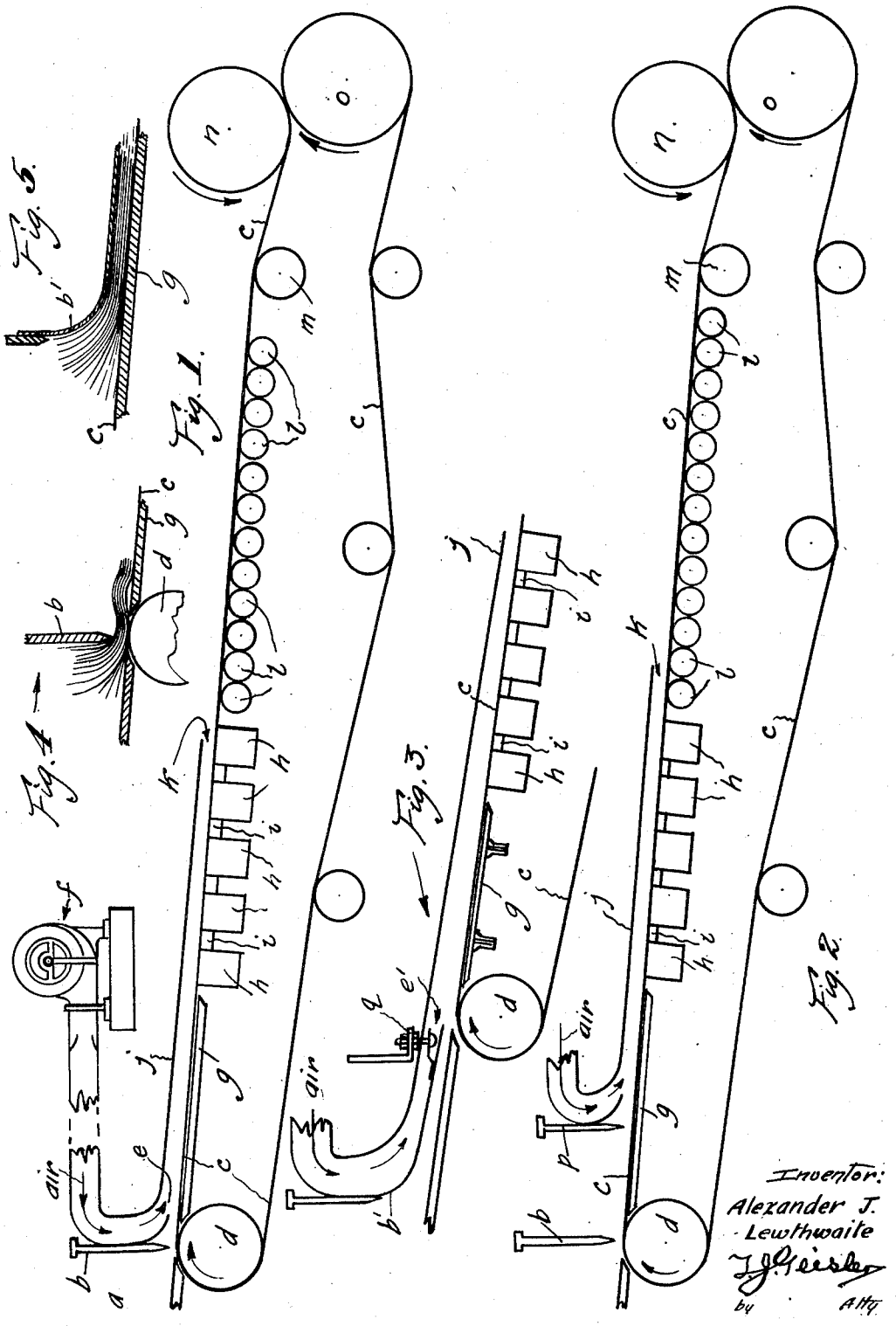
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A. J. LEWTHWAITE

PAPER MAKING MACHINE

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Inventor:
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UNITED STATES PATENT OFFICE.

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PAPER-MAKING MACHINE.

Application filed March 7, 1922. Serial No. 541,689.

To all whom it may concern:

Be it known that I, ALEXANDER J. LEWTHWAITE, a citizen of the United States, and a resident of Portland, county of Multnomah, and State of Oregon, have invented a certain new and useful Improvement in Paper-Making Machines, of which the following is a specification.

My invention relates to the mechanical manufacture of paper by Fourdrinier and similar machines.

In my opinion the best results are produced in paper making machines by inducing a quiescence in the flowing sheet of stock, or paper pulp, directly after it passes onto the wire-cloth; and maintaining this quiescence while the fibres are still held suspended in an ample volume of water, in other words until the major portion of the water has been drained from the stuff; and to induce such quiescence is one of the main objects of my invention.

One cause of turbulence in the sheet of stock carried by the wire cloth from the slice is the frictional resistance imposed by the air on the upper exposed side of the sheet.

The mass at this stage is largely water, and hence the friction of the stratum of air, due to the sheet of material flowing at a relatively greater rate than the air, causes ripples.

Another cause of turbulence in the sheet of stock carried by the wire-cloth is this: The lower edge of the gate or slice, when of the usual construction, has a tendency to retard the flow of the upper section of said sheet, and thus as it passes thru the slice, causes reactions, that is waves, directly in advance of the slice, as diagrammatically illustrated by Fig. 4 of the drawings accompanying this specification as a part thereof.

I have discovered that such turbulence may be prevented by confining the stratum of air overlying the sheet by an enclosure, e. g., a hood or housing and moving such stratum in the same direction, and at substantially the same rate as the movement of such sheet. Such motion of the air is induced by any suitable agency, e. g., a blower, and the confinement of said stratum should take place from the instant the stock is emitted by the slice, and continued until the stock has parted with the major portion of its water content, in other words, while the sheet of stock is passing over those devices effecting such removal, since until then the formation of the felting of the sheet is not sufficiently advanced to be unaffected by the currents of the air of the atmosphere coming in contact with said sheet; said housing protecting the sheet from such currents, and the pressure of said moving stratum of air confined by said housing inducing quiescence during the drainage of the sheet.

The turbulence caused by the slice may be avoided by providing the upper edge of the orifice, thru which the stock is discharged onto the wire cloth, with an extending surface under which the sheet flows onto the wire-cloth; such surface being preferably curved towards the wire cloth, and extending a substantial distance beyond said orifice, in the same direction as the flow of said sheet, as diagrammatically shown by Fig. 5 of said drawings.

Another object of my invention is to delay the diminution of the volume of water in the sheet of stock as carried by the wire cloth some substantial period beyond the slice, since in this way the fibre, being still suspended in a large volume of water, is given ample time to settle and felt properly.

The latter object I attain by running the initial end of the wire-cloth over a leveling board located directly in front of the "breast roll".

A still further object of my invention is to remove the water from the sheet of stock carried by the wire-cloth rapidly directly after the wire cloth passes from the leveling board. Such removal may be accomplished by suction boxes and table rolls, or water draining means placed beyond the leveling board.

The above described objects, and other features incidental thereto, are attained by the methods of procedure hereinafter described, and the devices used in connection therewith, illustrated in the accompanying drawings, in which:

Fig. 1 is a partial diagram of a Fourdrinier paper machine embodying the devices invented by me for causing the stratum of air overlying the sheet of paper making material to travel at the same rate and in the same direction as the wire cloth;

Fig. 2 shows a similar diagram as Fig. 1 modified by providing two slices placed one in front of the other for the purpose hereinafter described;

Fig. 3 is a diagrammatic view of the initial portion of the Fourdrinier paper machine; this view illustrating the lower edge of the slice as made with a restraining surface under which the sheet of stock flows onto the wire cloth; also indicates means for moving the air stratum overlying the upper side of said sheet;

Fig. 4 is a diagrammatic representation of the rippling caused in the sheet of pulp while passing under the sharp-edged slice common in paper making machines; and

Fig. 5 is a diagrammatic representation of one mode of my method for avoiding such rippling, namely, by providing a restraining surface in the form of an extension on the lower edge of said slice, as also illustrated by Fig. 3.

Neither diagram indicates the deckle straps, common to the art, and which are understood to be arranged along both edges of the wire and to travel with it, thus preventing the dilute stock from running off the sides of the wire.

Referring first to Fig. 1: The stock is held at a predetermined pressure in the head-box *a*. The slice *b* forms one side of this head box and is adjustable vertically and horizontally, so that the flow of stock may be regulated. The stock flows under the slice *b* onto the conveyor wire *c* directly after the wire is passed over the breast roll *d*. The stock passes to the conveyor wire at the same speed as the wire is moved. A current of air passing at the same speed is forced out of the opening *e* by the fan *f*. Adjacent the breast roll is the leveling board *g*. Next in sequence are the suction boxes *h* which are spaced apart by the fillers *i*. An inclosed hood *j* covers the leveling board and suction boxes and thus the stratum of air forced out by the fan *f* is contained in this enclosed hood and passes from under the hood thru the outlet *k*. The stock on the conveyor *c* then passes over a series of table rolls *l* and the supporting rolls *m*. It then passes between the top roll *n* and the couch roll *o* which revolve in the directions indicated by the arrows.

In Fig. 2 the slice *b* is aided by a second slice *p* which also helps to quiet the stock before the water is drained from the same. All other parts shown in this figure are the same as those shown in Fig. 1.

In Fig. 3 I have shown a third way in which stock may be quieted and the waves and turbulence eliminated. The slice *b'* is not the usual form of knife like slice but is a flat surface which is preferably a standard type of a stream like orifice. Air is introduced thru the outlet *e'* immediately above it and so the stock passes to the conveyor *c* in an even ribbon-like flow with the resistance of the air. This improved slice *b'* is adjusted by the bolt and fork mechanism *q*. It is to be noted that these bolts are spaced across the entire width of the slice and do not materially interrupt the passage of air around them. It can readily be seen from the above description of my invention that the sheet of paper is more quickly formed on the wire and thus the water can be removed more quickly. As a result of this it is possible to shorten the entire Fourdrinier part of the paper machine. As these wires have to be replaced frequently a considerable saving is therefore made by shortening the wire, and thus decreasing the cost of replacement.

The formation of a sheet of paper is accomplished by my invention as follows:

The supply of stock, held at any desired pressure in the head box *a*, is forced thru the orifice under the slice and onto the conveyor *c*. The velocity with which the stock flows thru the orifice to the Fourdrinier wire is regulated by the head at which the stock is maintained in the head box. It is desirable that the paper stock which is in a very dilute mixture in water should pass thru the orifice onto the Fourdrinier wire *c* at relatively the same speed at which the Fourdrinier wire and the current of air travel.

When my improved slice is used the stock flows in an even ribbon like stream. Placing the leveling boards adjacent the breast roll the unperforated surface prevents the water in the stock from draining thru the wire until the proper formation of the stock has been attained. This formation is further aided because the leveling board surface is much more rigid and therefore less subject to vibration than are the ordinary table rolls. The current of air passing under the aforementioned hood also maintains a slight pressure on the stock which not only eliminates the air friction but also creates a slight pressure on the stock which aids the action of the suction boxes. The outlet *e* is so positioned that the current of air does not strike directly on the paper stock but it passes directly above the stock on the wire at approximately the same speed and in the same general direction. Thus the frictional resistance of the air immediately above the paper stock is made negligible.

I claim:

1. The herein described method of inducing quiescence in the sheet of stock as emitted by the slice in paper making, consisting in directing a confined stratum of air to overlie the sheet and travel therewith at substantially the same rate of speed and in the same direction during the length of travel of such sheet necessary for the drainage of the major portion of the water therefrom.

2. The herein described method of inducing quiescence in the sheet of stock as emitted by the slice in paper making, consisting in directing a stratum of air to overlie the sheet and travel therewith at substantially

the same rate of speed and in the same direction, the said stratum of air being confined in its relation to the sheet throughout that length in which the sheet is in a sufficiently fluid condition to be affected by the frictional resistance of an unconfined air contact.

3. The herein described method of preventing turbulence in a sheet of paper stock as emitted by the slice, consisting in preventing frictional contact of the air with the surface of such sheet during that travel of the sheet necessary to remove the greater portion of the water content therefrom.

4. In a paper making machine of the character described, a wire-cloth carrier, a slice controlling the deposit of the sheet of stock on the carrier, suction boxes for draining the water content from the stock, a housing overlying the path of travel of the stock substantially to the limit of the suction boxes, and means for directing an air current through said housing in contact with the surface of the sheet of stock and at a speed substantially equalling the rate of travel of the stock.

ALEXANDER J. LEWTHWAITE.