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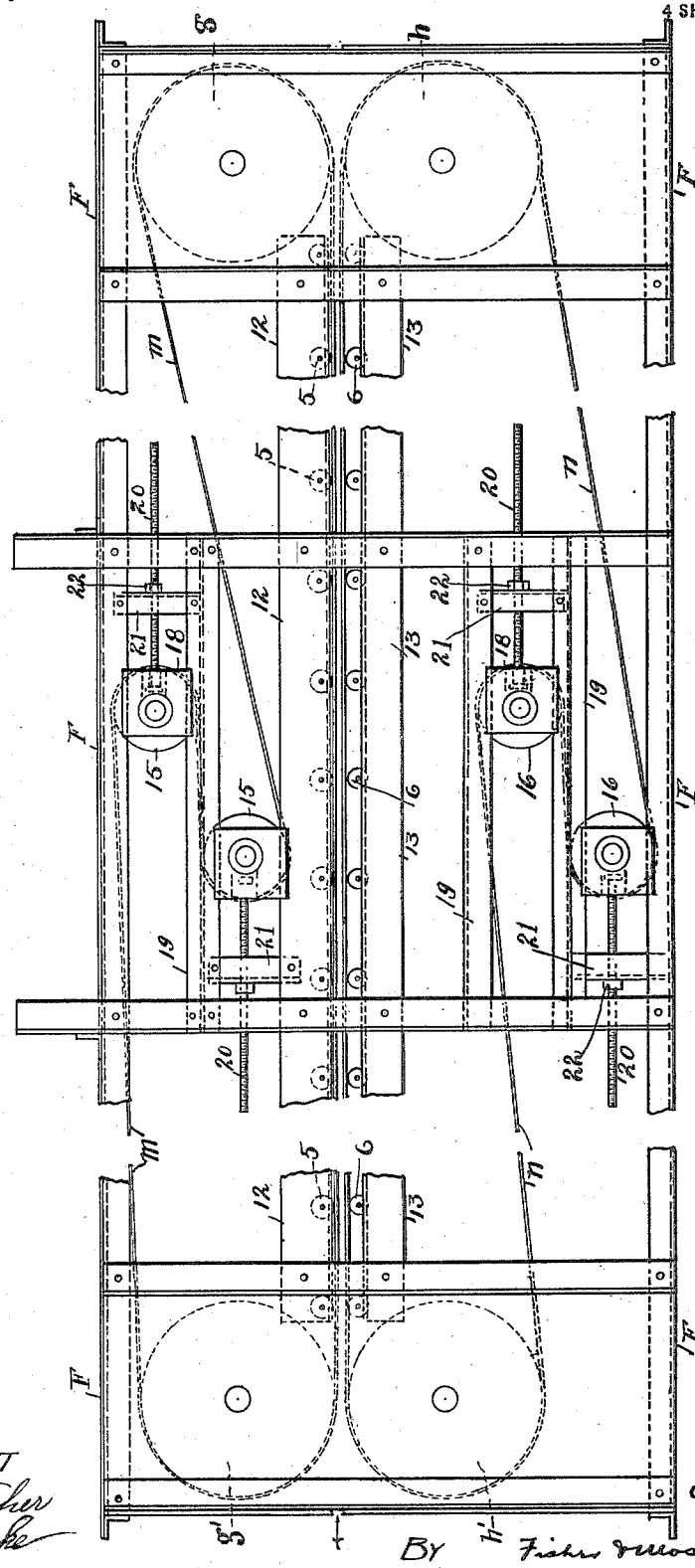
DUAL FACING MACHINE FOR CORRUGATED PAPER BOARD.

APPLICATION FILED JUNE 27, 1913. RENEWED APR. 19, 1917.

1,228,430. Patented June 5, 1917.

4 SHEETS—SHEET 1.

Fig. 1



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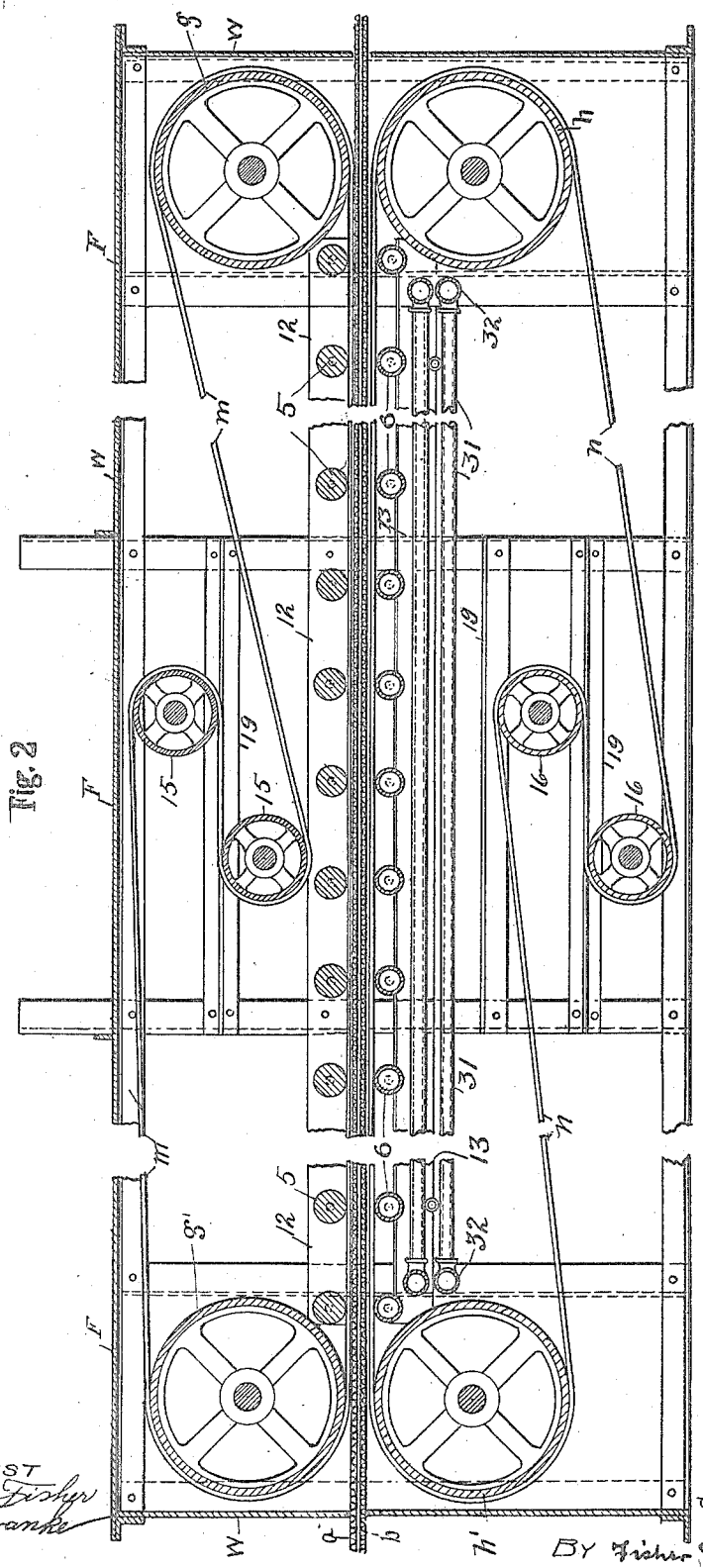

Fig. 2

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Fig. 4.

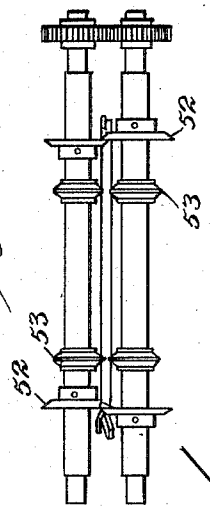

Fig. 3.

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Fig. 8.

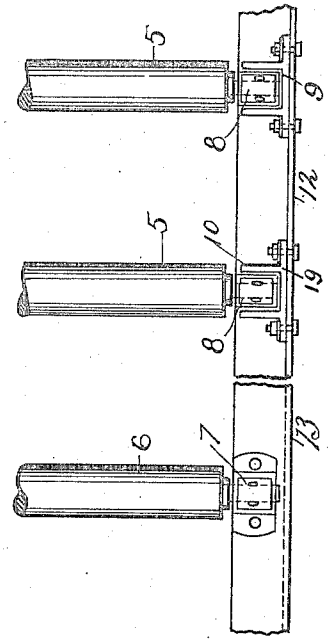


Fig. 10.

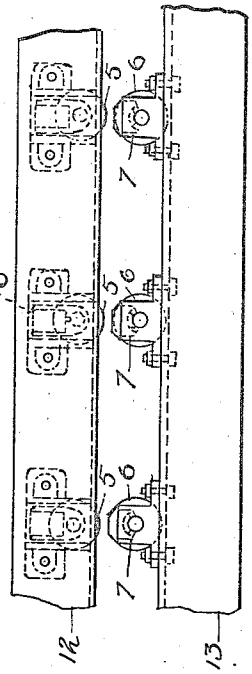


Fig. 7.

Fig. 5.

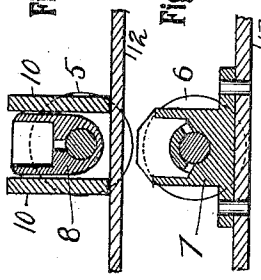
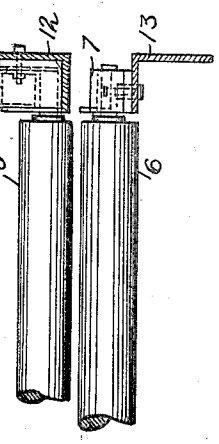


Fig. 6

Fig. 9.



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DUAL-FACING MACHINE FOR CORRUGATED PAPER-BOARD.

1,228,430. Specification of Letters Patent. Patented June 5, 1917.

Application filed June 27, 1913, Serial No. 776,118. Renewed April 19, 1917. Serial No. 163,312.

To all whom it may concern:

Be it known that I, JOHN N. HAHN, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Dual-Facing Machines for Corrugated Paper-Board, of which the following is a specification.

This invention has reference to a dual facing machine for corrugated paper-board, all substantially as shown and described and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of the machine but broken out between its ends as the machine is of considerable length.

Fig. 2 is a longitudinal sectional elevation of the machine. Fig. 3 is a cross section of the machine with the heater at the right. Fig. 4 is an elevation of the scoring and slitting rolls.

Figs. 5 and 6 are cross sections of the bearings for the upper and lower carrying and pressing roll respectively, seen also in cross section Fig. 2 and intervening the drums at the respective ends which carry the endless aprons. Fig. 7 is a plan of a portion of a lower roll and its bearing, and Fig. 8 is a plan of two upper rolls and their bearings. Fig. 9 is a side elevation of sections of upper and lower rolls and their bearings, and Fig. 10 is a side elevation of a portion of the upper and lower frames and the rollers and bearings therefor in said frames.

The object of the machine as disclosed in the foregoing views is to make two independent corrugated paper boards in one and the same operation and to complete said boards for the market.

The machine is necessarily one of exceptional length as it is built to manufacture and dry the boards and to cut the same into commercial sizes in a continuous operation, and comprises a main frame F in which all the working parts except the final creasing and cutting rolls are mounted. The machine receives the two boards from the pasting and combining mechanism in a green or undried state, and the several sheets constituting the board indicated by *a*, *b*, *c* and *d*, respectively, enter the apparatus shown in Figs. 1 and 2 from the tail, in superimposed relations, the sheet *c* being pasted on board *a* and sheet *d* pasted on sheet *b*, it being understood that each board *a* and *b* comes half made or having an inside sheet pasted over the corrugated portion thereof. Board *a* passes its uncovered side over paste roll 1 and board *b* passes in like manner over paste roll 2, dipping in paste receptacles 3 and 4, respectively, while sheets *c* and *d* come over other rolls and are adhered to the said corrugated surfaces by green or undried paste. This of course produces two complete boards faced each upon both sides and ready to be suitably pressed and dried to effectually secure the sheets *c* and *d*.

Now, having the boards thus initially made they are in condition for completion of manufacture and reduction to commercial units, and to this end the said boards, designated as *a* and *b*, enter the drying and pressing machine comprised within the frame F, Figs. 1, 2 and 3 apparently as one board but in fact as two separate boards with green facings on both outsides. Having entered the machine F the said boards are subjected to a mutually and evenly sustained pressure between the two endless aprons or belts *m* and *n* running over the respective drums *g* and *g'* and *h* and *h'* at the ends of the machine and which belts or aprons are under pressure between the two series of rolls 5 and 6. These rolls are more or less disclosed in detail in Figs. 7 to 10, and the lower rolls 6 are in stationary bearings 7 while the upper rolls 5 are in movable bearings 8 confined between the side flanges 10 of brackets 9. The said brackets 9 are bolted to the angle iron side bars 12 constituting a portion of the main frame F and the bearings 7 are bolted to angle iron side bars or rails 13 likewise constituting a portion of the said frame F.

The upper roller bearings 8 have up and down play between the said flanges 10 of brackets 9 according to the thickness of the stock passing through between the same and the bottom rolls 6, and the pressure the upper rolls exert when applied through the endless apron or belt *m* is such as to perfectly adhere the respective sheets *c* and *d* to their boards. Of course no adhesion between the boards themselves occurs, and the original facings of the said boards come inside where they lie flat against each other while the outer corrugations are covered by the sheets *c* and *d* and adhered and dried thereon in transit through the machine.

By providing automatic play for the up-

per rolls I avoid the expense and annoyance of springs or other like means for holding the said rolls down to work and each roll is self accommodating to the work and all are independent and self controlled and of the same size and weight, thus doing uniform work under all conditions.

The endless aprons *m* and *n* run over the drums at the ends of the machine and also over take-up rollers 15 and 16, respectively, located in the middle of the machine, Fig. 1. The said take-up rollers are in pairs, two for each belt or apron, and have bearings 18 slidably mounted upon parallel bars 19 constituting portions of the supporting frame work and controlled by screw rods 20, which pass through fixed cross pieces 21 and have nuts 22 behind said cross pieces to fix the adjustments. Either or both of said rollers for each belt can be adjusted to take up the slack in the belt as may seem desirable, the tension on the said belts being material in connection with the free moving top rollers 5 in determining their joint effect upon the work carried between the said parts and in which the two aprons travel in the same direction and at identically the same rate of speed. Driving mechanism of gears as shown for said rollers is employed in this instance but any equivalent means may be employed to actuate the said drums.

Having reference now to the means for drying the material, it is to be observed that the rolls and endless aprons for carrying the material are inclosed within a chamber having a suitable wall *w* which is co-extensive with the machine frame F and constructed to confine the heat within. A steam heating system is installed with a steam pipe line 30, Fig. 5, which receives live steam from a boiler or other source and delivers the same to the heating coils or pipes 31 and their headers 32, Figs. 2 and 5. The waste or exhaust steam from these pipes is carried by the waste pipe 33 to the air heating chamber 34. Only exhaust steam is employed in this chamber and the air heated thereby is carried by hot air pipe 35 to a longitudinally disposed tube 36 on one side of the machine and which tube is designed to be co-extensive with the machine or about as long as the space between the front and rear drums and including the space occupied by the two sets of rollers 5 and 6. In the present construction however, I show the tube 36 divided at the middle and a supply pipe 35 for each subdivision.

The said tube 36 is a supply tube for heated air adapted to be blown through the corrugations of the boards *a* and *b* by the force of blower 38, and the said corrugations run transversely of the board and are more or less open from edge to edge of the board, so that with the right conditions being maintained the heated air from tube 36 presumably will be forced through said corrugations.

This particular step in the heating and drying of the said corrugations is of course supplemental to the heating and drying imparted by the steam coils 31, and the said tube 36 has a longitudinal duct 37 along its inside which discharges directly into the space between the edges of belts *m* and *n* and against the corresponding edges of the intervening boards *a* and *b*, Fig. 5.

The rotary blower 38 forces the heated air into and through the said tube 36 at such pressure as to also drive the air through the said slot into the corrugations of boards *a* and *b* to the opposite side, but as a matter of fact this action is only measurably successful, even with a high pressure by the said blower, owing to the comparatively small size of the corrugated passages and the friction encountered, and hence is supplemented by a corresponding suction or exhaust through fan 40 and its pipe 41 connecting with exhaust tube 42. Said tube 42, like its companion tube 36 on the other side of the machine, has a duct 43 open thereinto along its inner side about the edges of the two belts *m* and *n* and open to the edges of the corrugated boards *a* and *b*. The said duct 43 runs lengthwise co-extensively with the said belts and with the air pressure tube 36 on the other side so as to exert an equal and uniform draft on this side of the machine coöperating with the pressure or blast upon the other side and which proceeds initially from blower 38, as described. The exhaust air is drawn off by fan or suction device 40 through pipe or pipes 41. Two or more such pipes or flues may be employed in this instance and go alike to fan 40.

It will thus be seen that the means provided for reaching the boards *a* and *b* with a volume of heated air in addition to their exposure in the drying chamber of the machine to heat from the steam pipes 31 involves both the forcing of the air under a suitable pressure through the tube 36 and its duct 37 into the corrugations of the boards *a* and *b* and the suction or exhaust of the air by the appliances operating from the other side of the machine. That is, a direct travel or movement of the heated air is established through the corrugations of the said boards and when once used is discharged into the open air by the exhaust fan 40. Furthermore, I have found it both advantageous and economical to utilize the exhaust steam as a medium to heat an outside air heating device and a blower installed with this device has the single function of driving the heated air through the boards *m* and *n*. It is to be especially noted that the hot air is not discharged into the drying chamber of the machine as in my patent above referred to, but directly into

the corrugations of the boards, and the duct 37 is purposely provided with flat sides and lapped within the edges of the aprons *m* and *n* to cut off air communication with the drying chamber as such and compel the heated air to traverse the board corrugations. On the other side the suction duct 43 does not lap over the edges of the aprons *m* and *n* and there is room for a measure of suction to take place from within the drying chamber but the main effect and function is to coöperate with the blast driven into the boards and to carry away the moisture laden air.

Returning now to the take-up rollers 15 and 16 it will be seen that the said rollers are carried by the bearings 18 which are slidably mounted in the parallel bars 12, 13 and 19 and the outer bars or rails of the main frame F to top and bottom. The screws 20 in each case have such length as will accommodate the maximum adjustment required in the prolonged use of the belts *m* and *n*. Owing to the length of these machines and the unavoidable stretch of the belt a take-up of from six to ten feet or more has to be provided for, and for this reason the two reversely-adjustable take-up rollers are required for each belt. These rollers are disposed at the middle of the machine and in the return portion of the belt so that the working portion thereof may be duly stretched and run straight over the respective rollers 5 and 6. Adjustment in any case is effected by the nuts 22, and the screws 20 have heads embedded in the bearing blocks 18, Fig. 1.

Respecting the use of air pressure and exhaust as provided for herein to carry a drying current of air through the corrugations of the boards *a* it is important to state that the means employed for this purpose as set forth in my patent above cited were found utterly inadequate and inoperative because the air became so heavily laden with moisture that it ceased to be effective for evaporating purposes. In fact the entire scheme was found impracticable and hence the present arrangement which provides for a constant intake of fresh air heated to a fairly high temperature and a suction and exhaust line for the used air entirely independent of the air pressure, whereby the heated air is used only once and discharged. This method of handling the air is highly satisfactory and efficient.

In Figs. 6 to 10 inclusive I show constructions following after the board making mechanism hereinbefore described and comprising the end drums *g'* and *h'* between which the boards are carried forward, first, to the spiral cutting knives 50 and then to the intermediate friction rolls 51 and next to the trimming and creasing disk or devices 52 and 53 respectively mounted on the same shaft 54, and from which point the board goes to the receiving table 55.

What I claim is:

1. In a machine for facing corrugated paper board, a main frame and a set of parallel bars within each side thereof and one above the other, a series of carrying rolls having fixed bearings in the lower set of said bars, and a series of presser rolls having independent vertically slidable bearings for said rolls and side guides for said bearings fixed on the upper set of said bars, in combination with two endless aprons mounted to travel in the same direction between said rolls.

2. In a machine for facing corrugated paper boards, a drying chamber and two endless aprons mounted therein one above the other and carrying rolls and presser rolls in series having said aprons running between them, in combination with steam heating coils in said chamber, a hot air supply tube along one side of the machine having a duct lengthwise discharging between said aprons and an exhaust tube having a duct lengthwise open to the edge of said aprons on the other side, whereby a direct through draft is provided for the air through the corrugations of said board.

3. In a machine for facing corrugated paper board, a pair of endless aprons and two series of rollers between which said aprons are stretched, in combination with hot air pressure devices comprising a tube lengthwise on the side of the machine having a duct lengthwise arranged to discharge between the adjacent edges of said aprons and means to force heated air through said tube and duct.

4. A machine for facing corrugated paper board having two endless aprons and means to carry the same in parallel relations, in combination with a hot air supply system comprising a tube lengthwise substantially opposite the said aprons, a duct through which the air is discharged between said aprons and a blower and pipes leading to said tube to provide hot air pressure therein.

5. A machine for facing corrugated paper board having a drying chamber, a pair of board actuating belts in said chamber and rollers between which said belts are adapted to travel and engage said boards, in combination with steam heating coils in said chamber beneath said aprons, a tube lengthwise of the machine outside thereof and a duct leading therefrom into the space between the adjacent edge of said aprons.

6. A machine for facing corrugated paper board having a drying chamber and two endless aprons stretched therein to carry the boards between them, in combination with a series of live steam pipes in said chamber and an air heater outside said chamber and an air heater outside said chamber hav-

ing heating pipes adapted to utilize the exhaust steam from said live steam pipes, a tube lengthwise outside said drying chamber coupled up with said air heater to receive hot air therefrom, a blower to force the air forward into said tube and a duct from said tube discharging into the space between the said aprons next within said tube.

7. A machine for facing corrugated paper board having a drying chamber and a pair of endless aprons arranged to receive the board between them, in combination with a hot air supply source and a blower to force the air forward, a receiving tube along the side of said chamber and a duct its full length discharging the air therefrom between said aprons and an exhaust on the opposite side of the machine comprising a longitudinal tube having a duct entering the chamber relatively between said aprons and an exhaust fan in suction relations with said longitudinal tube.

8. A machine for facing corrugated paper board having two endless aprons adapted to receive the boards between them, drums carrying the said aprons and a pair of take-up rollers for each apron adapted to be adjusted in opposite directions to take up the slack therein.

9. A machine for facing corrugated paper board having endless aprons and a pair of take-up rollers for each apron arranged to be oppositely adjusted, a frame in which the bearings for said rollers are slidably mounted and screw rods on said bearings to adjust the same.

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Witnesses:
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