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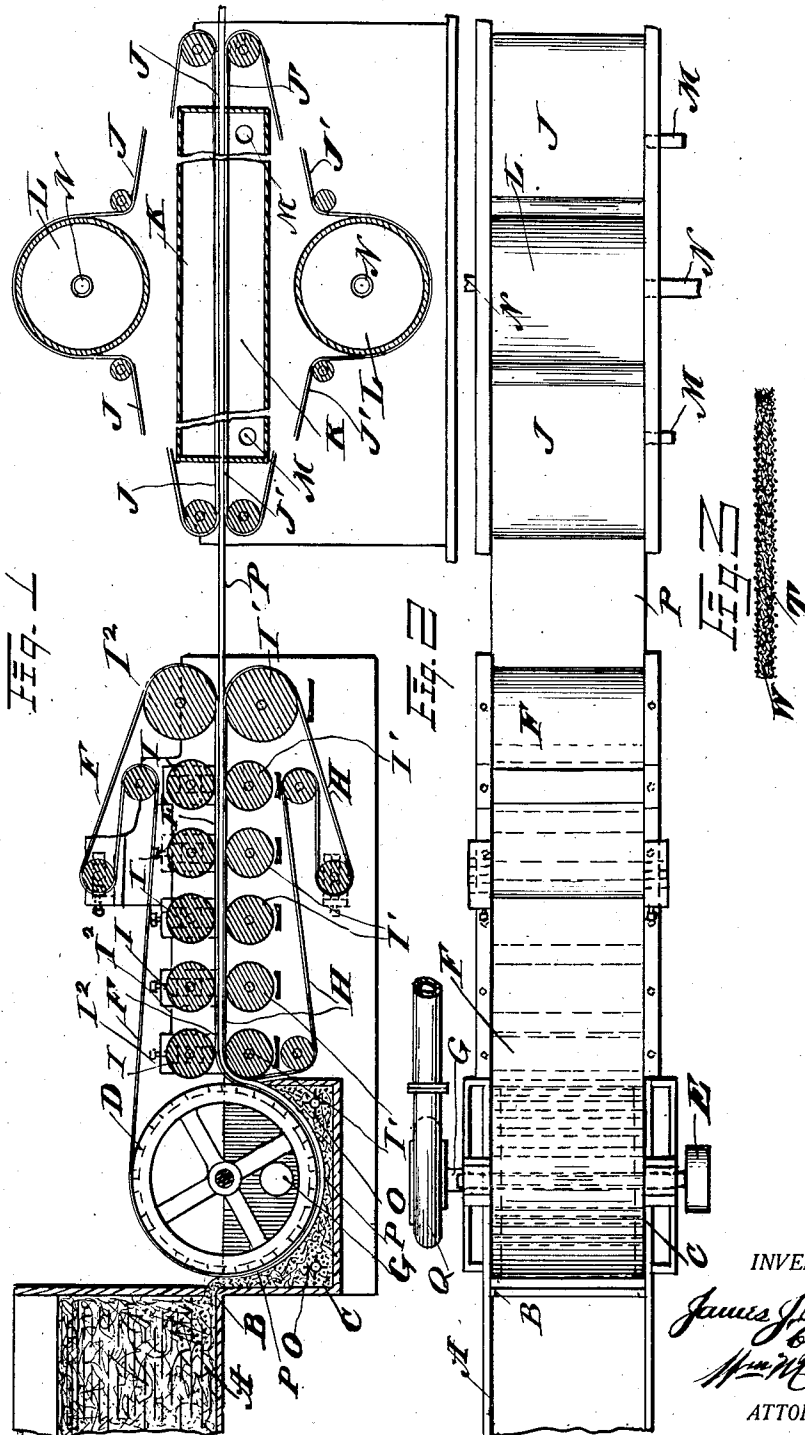
J. J. HINDE

1,748,224

APPARATUS FOR MANUFACTURING FIBER BOARD OR ANALOGOUS MATERIAL

Filed July 17, 1926

2 Sheets-Sheet 1



INVENTOR.

*James J. Hinde*  
by  
*Wm. W. Moore*

ATTORNEY.

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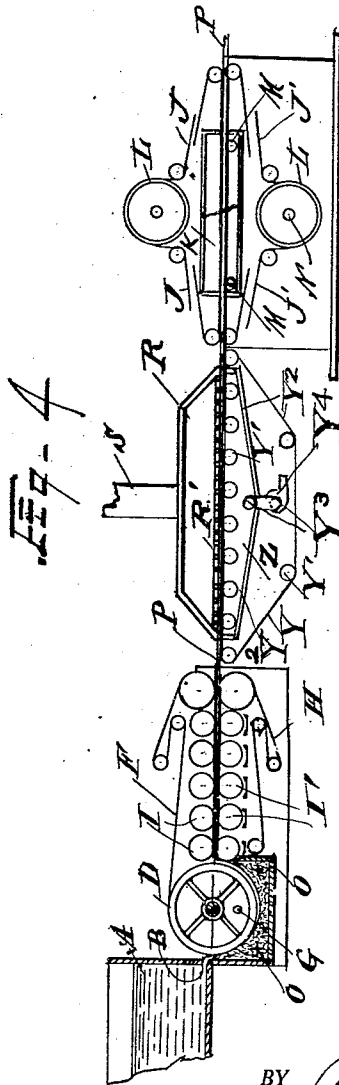


Fig. 4

INVENTOR  
BY *J. J. Hinde*  
*Wm. M. Houser*  
ATTORNEY.

# UNITED STATES PATENT OFFICE

JAMES J. HINDE, OF SANDUSKY, OHIO

## APPARATUS FOR MANUFACTURING FIBER BOARD OR ANALOGOUS MATERIAL

Application filed July 17, 1926. Serial No. 123,112.

The invention relates to an improved method and mechanism for manufacturing paper or pulp board from the integral substance of corn stalks or analogous fibrous material, and particularly to mechanical method and mechanism for producing sheets or board of varying thickness from pulp previously prepared according to the process clearly pointed out in my previous application for pulp board filed Nov. 17, 1924, and bearing Serial Number 750,479 in which the fibrous materials composing the pulp were caused to adhere together by means of the saccharine or glutinous matter or cementing material included in its composition of the stalks.

The objects of this invention are: first, to provide continuously acting means to collect the pulp in a moist and flowing condition and feed it in the form of a continuous sheet of given thickness to a conveyor, upon each side of which are stationed pressure means by the action of which the moisture is squeezed from the sheet, and it is reduced to a predetermined amount of thickness.

Following this treatment drying means are provided which operate upon the board as it passes beyond the moisture extracting means and which is adapted to remove the remaining moisture and deliver the board in marketable condition.

In accomplishing this process the fibrous material is first carefully shredded, maintaining a proper proportion between the long and short and coarse and fine fibers and carefully intermingling the same. Afterward the pulpy mass is fed to a tank in which it is stirred constantly to interweave the fibers with each other and properly compressed and dried to form a sheet of strong fibrous board in one ply formation varying from one-eighth of an inch in thickness to the thickness of lumber for buildings, such as plaster board, with such a surface that it can be plastered upon without the use of lathing, and for insulating board of any desired thickness.

After the material has been shredded, preserving the proper proportion of long and short and thin and thick fibers, a sufficient amount of water is added to float the fibers

and the mass is agitated to get the various sorts of fibers thoroughly intermingled, and by the even distribution of the flowing stream of pulp, the various fibers are interwoven to produce a substance of great tensile strength and also possessed of unusual insulating qualities against heat or cold or sound.

In treating pulp of this character it is extremely difficult to transfer the pulp mass from one container or cylinder to another in the usual manner, hence this difficulty is disposed of by providing only one cylinder operated as a screen and revolving it in the container, the immersed area of the surface of the cylinder being sufficiently large to enable it to take up the desired thickness of the pulp and transfer it directly to forming and compressing rolls, the pulp first adhering to the surface of a conveyor which passes over the cylinder and then passing between the rolls or series of rolls, by means of which it is compacted into a sheet or band and the excess of water expelled therefrom.

By employing a skeleton cylinder of large diameter the lower part of which is immersed in the vat or container and a pump to drain the water from the interior of the cylinder a certain amount of hydrostatic pressure is produced that tends to collect and bind the pulp mass upon the surface of the conveyor which may be composed of porous felt or coarsely woven material. In this manner the pulp is conveyed to the pressure rolls without crushing it and is protected from disturbance of any kind and the fibers are brought together with much force and the cylinder is not revolved by means of this conveyor, but both travel in unison at the same rate of speed with separate drives; the crushing action most objectionable to paper makers can not be avoided when employing couch rolls on cylinders in the usual manner.

In making use of one cylinder and passing the mass of pulp to the pressure rolls between two open mesh or felt conveyors all danger of the separation of the mass into more than one layer or into laminations is avoided, which might occur with the use of a multiple number of cylinders. It is also advantageous to employ not less than six pairs of pressure

rollers when manufacturing a heavy board, but the number may vary at the choice of the operator. The amount of pressure should also be nicely graduated between the first and last set of rolls to produce the most perfect results. In this manner about 50% of the moisture can be extracted from the pulp mass before it passes to the dryer.

The dryer may consist of two porous heavy endless traveling felt or open mesh conveyors between which the pulp mass is carried in a continuous sheet through a chamber into which dry air is forced. The felt or open mesh conveyors preserve the alignment of the sheet and permit the moisture from its surface to be absorbed by the dry air in said chamber.

After passing between the rolls the felt or open mesh conveyors pass over heated cylinders which dry them before they return into contact with the bank of pulp.

The invention is illustrated in the accompanying drawings and particularly pointed out in the claims.

In the accompanying drawings Fig. 1 is a longitudinal section of the preferred mechanism employed to manufacture the product, Fig. 2 is a plan thereof; Fig. 3 is a transverse section of a band of pulp enclosed between two belts made of open mesh material; Fig. 4 is a longitudinal section of a vacuum press for extracting moisture from the sheet of pulp between the wet press and the dryer.

Here A is a tank or receptacle filled with the prepared pulp mass in a flowing state. The pulp flows by gravity through the lateral opening B in the wall thereof into a shallow tank C. D is a skeleton cylinder open at its ends, the lower portion of which is immersed in the fluid mass of pulp in the tank C.

The cylinder is revolved by any convenient means such as a pulley E, and over its surface an endless open mesh conveyor belt F passes. This belt is made of porous or open mesh material. As the cylinder revolves some of the water in the pulp passes through the conveyor into the cylinder, from which it is sucked through the pipe G which may be in the wall of the tank by a suction pump of good capacity. This action causes the pulp to adhere to the outer surface of the conveyor in gradually increasing thickness in the direction of revolution of the cylinder without disturbance or crushing until it is passed between the conveyor F and a second parallel endless conveyor belt H upon a level plane extending outwardly from the cylinder. These conveyor belts F and H are formed of open mesh material which may be of fabric as mentioned in patent granted to me on Oct. 17, 1911, No. 1,005,836, or may be open wire mesh or may be composed of a layer of felt enclosed between two open mesh layers of any material. Revolving blades O, O, stir

the pulp and keep it thoroughly mixed. On each side of the two conveyors are positioned the upper and lower rolls I, I, and I' I' which are arranged in pairs with the upper rolls vertically adjustable at 1<sup>2</sup> 1<sup>2</sup> to control the thickness of the sheet of pulp passing between the rolls. Between these conveyors the thickness of the sheet of pulp board is determined and by means of the pressure substantially one-half of the contained moisture is pressed out, and the properly formed board is passed between the parallel felt or open mesh conveyor belts J, J', and is completely dried by means of a dry air current passed through the box K. These belts may be similarly constructed to the belts F, H.

The moisture is absorbed from the pulp through the conveyors and in turn from the conveyors by means of the dry current of air and the parallel conveyors preserve the flat shape of the board until it is dried; after passing over the rolls the moisture laden conveyors are passed over the intermediate heated rolls L, L, and are thoroughly dried before they again enter the hot box.

Any convenient means as a blower may be employed to circulate hot or dry air or steam through the hot box and drying cylinders through pipe or hollow trunnions M and N respectively.

The advantages of the above described process and mechanism are obvious in its simplicity and in the speed of production and in the improved quality of the product obtained thereby and in the cheapness of production and installation. Also the moisture is extracted without danger of overheating it and without disturbing the texture of the mats and the board will be flat without danger of subsequent warping, and a large amount of board can be produced with a minimum amount of labor and without shrinkage in the weight of the material employed.

The heated or open mesh conveyors J, J', employed for absorbing the moisture from the partially dried board, may be constructed as shown in Fig. 3 of a central body portion W composed of a very loose absorbent felt or open mesh conveyor of any suitable material and may be reinforced by means of a loose fabric covering T, secured upon each side thereof.

These cover sheets may be attached to the felt body and to each other by means of stitching as at W, or by any suitable method, or open mesh wire conveyors may be used.

It is understood that this process is equally well adapted for the manufacture of heavy paper such as wrapping papers, or of fine paper made of any pulpy material.

In Fig. 4 a vacuum suction dryer is shown intermediate of the wet press and heated dryer shown in Fig. 1. In this view R represents a vertically movable hollow pressure head having a perforated base R' and an

inlet passage S and Z represents an exhaust chamber closed on the upper side by means of an endless open mesh carrier Y passing over rollers Y' and having inclined sides Y<sup>2</sup> and suction outlet Y<sup>3</sup>. A suitable suction pump Y<sup>4</sup> draws hot air through these chambers and through the mass of pulp upon the carrier.

Having described the invention, what I claim as new and desire to secure by Letters-Patent is:

1. In a device of the character set forth, an open receptacle for pulp having a raised inlet opening and a rotatable hollow perforated cylinder immersed in said receptacle, and a perforated conveyor passing through said pulp in said receptacle in contact with the surface of said cylinder, said receptacle being provided with an outlet opening communicating with the interior of said cylinder, and an endless conveyor inserted in the wall of said receptacle opposite said inlet opening and at a lower level, and adapted to receive the pulp layer from the surface of said perforated conveyor.

2. In a device of the character described, the combination with a receptacle for pulp, said receptacle having an elevated inlet opening, of a perforated cylinder revolvable therein, the pivotal bearings therefor being below the level of said inlet opening, an endless screen conveyor passing around said cylinder in said receptacle, a set of horizontal pressure rolls under which said screen conveyor passes on the side of said receptacle opposite said inlet opening, and a second endless screen conveyor and a set pressure rolls therefor adjacent to the aforesaid rolls and underneath the same, said screen conveyors being positioned to receive the layer of pulp as it rises upon the side of the cylinder between them, and convey the same between said sets of pressure rolls.

3. In a device of the character described, the combination with a receptacle for pulp, said receptacle having an elevated inlet opening, of a perforated cylinder revolvable therein, the pivotal bearings therefor being below the level of said cylinder in said receptacle, a set of horizontal pressure rolls under which said screen conveyor passes on the side of said receptacle opposite said inlet opening, and a second endless screen conveyor and a set pressure rolls therefor adjacent to the aforesaid rolls and underneath the same, said screen conveyors being positioned to receive the layer of pulp as it rises upon the side of the cylinder between them and convey the same between said sets of pressure rolls, said receptacle having an outlet opening at a lower level than said inlet opening.

4. In a device of the character described, in combination a receptacle, a perforated cylinder rotatable therein, an endless screen conveyor passing over said cylinder, sets of upper and lower horizontal pressure rolls

positioned to receive said screen conveyor between them and a lower endless screen conveyor passing over said lower set of rolls, said endless screen conveyors being positioned to receive a layer of pulp deposited on said first named conveyor as it passes from said cylinder.

In testimony whereof, I hereunto set my hand this 17th day of March, 1926.

JAMES J. HINDE.

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