

UNITED STATES PATENT OFFICE.

FRANCIS E. HEATH, OF WATERVILLE, ASSIGNOR TO THE KENNEBEC FIBRE COMPANY, OF BENTON, MAINE.

MANUFACTURE OF PAPER-BOARD COMPOSED OF WOOD PULP.

SPECIFICATION forming part of Letters Patent No. 260,680, dated July 4, 1882.

Application filed January 18, 1882. (Specimens.)

To all whom it may concern:

Be it known that I, FRANCIS E. HEATH, a citizen of the United States, residing at Waterville, in the county of Kennebec and State of Maine, have invented certain Improvements in the Manufacture of Paper-Box Board Composed of Wood Pulp; and I hereby declare that the following is a full, clear, and exact description of the same.

Ordinary paper-box boards composed of ground wood pulp and used in the manufacture of paper boxes and for other purposes do not possess the requisite degree of strength or toughness, and are consequently extremely liable to break when bent. The fibers of wood chemically prepared, and known as "chemical fiber," are free from this objection; but this material is too expensive to admit of boards being made wholly thereof, while its dark color renders it unsuitable for many purposes.

My invention has for its object to greatly increase the strength and toughness of wood-pulp boards for paper boxes without materially adding to their cost; and it consists in a board composed of combined layers of chemical fiber and ground wood pulp, known as "mechanical fiber," whereby the desired result is attained, the several layers of pulp being properly united in their passage through the ordinary cylinder-machine employed in the manufacture, so as to produce a web or sheet of the desired thickness, which can be given a hard smooth finish and may be colored, if desired, on one or both sides.

In carrying my invention into effect I take a suitable quantity of what is known as "chemical fiber" and brush it out in an ordinary beating-engine. This chemical fiber is produced in a well-known manner by boiling wood in the form of chips *in vacuo* with a strong solution of caustic soda in order to eliminate or remove all the amylaceous, glutinous, and silicious matters therefrom and leave the fiber of the wood in a comparatively pure state, about one pound only of the fiber being produced from three pounds of wood. This chemical fiber, which is generally obtained in the form of sheets, after being brushed out in the beating-engine and brought thereby into the state of wet pulp, is run onto four or six cylinders of

an eight-cylinder machine, and at the same time a suitable quantity of ordinary ground wood pulp, known as "mechanical pulp," is run onto the outside cylinder of the same machine, whereby as the web is formed on the felt it will consist of an interior layer or stratum of chemical fiber possessing great strength and toughness on account of its length, covered on both sides with a layer or stratum of ordinary ground wood pulp, which gives the necessary body or thickness to the board, and is well adapted for the exterior surface of boards, as it is susceptible of a hard smooth finish, produced by the ordinary calendering process, and can be given any desired color.

I have referred above to an eight-cylinder machine; but machines having a less number of cylinders may be employed, if desired.

The web, after being formed, is run over suitable driers and then taken off, either in rolls or sheets, as required.

For mechanical pulp I prefer to use that made of poplar wood, on account of its whiteness, which renders the product more desirable, as it can be used to print on and for a variety of purposes for which dark-colored board would be unsuitable; but, if desired, ground pulp made from other kinds of wood may be employed.

It will be seen that the inner or central layer of chemical fiber does not add materially to the cost of the board, while it renders it tough and strong and not liable to break when bent—advantages of great importance not heretofore attained in low-cost boards—while the objection to the dark color of the chemical fiber is overcome by covering it with white or light colored ground wood pulp, which is comparatively an inexpensive material. Furthermore, a very superior finish can be given to my improved board, for the reason that the chemical fiber is longer, stronger, and lies better in the web, and forms a hard backing for the mechanical pulp, which is consequently susceptible of a harder, smoother finish than can be given where the entire board is composed of mechanical pulp.

I do not limit myself to the precise number or arrangement of the combined layers of chemical fiber and mechanical pulp, as above

described, as these may be varied without departing from the spirit of my invention. For instance, the board may be composed of a central or inner layer or stratum of mechanical pulp covered on each side with a thin layer of chemical fiber, which would be found desirable for many purposes, such as boxes which are to be covered with fancy papers, in which case the original dark color of the board, caused by the employment of chemical fiber for the outside, would form no objection to its use, as it would possess the much-desired advantages of freedom from liability to break when bent; or my improved board can be made of two layers only, one of chemical fiber and the other of mechanical pulp, the same combination of strength and toughness with a white or light colored and hard-finished surface of a cheaper material being thus secured.

I am aware that a composite paper has been made with the center of some soft spongy material covered with a thin tough layer. It will be seen, however, that my invention does not conflict with it at all, for in making boxes all boards have to be partially cut through in order to turn up the sides. In this case the strong part would be cut away, leaving nothing but the spongy substance, which would not be of sufficient strength.

I am also aware that it is not new to make a paper of strong fiber, as manila or hemp, for

a center covered with layers of linen or cotton. Such material is too expensive to enter into production of box-boards.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, board for paper boxes composed of combined layers of chemical fiber and ground wood pulp, united substantially in the manner and for the purpose set forth.

2. In the manufacture of board for paper boxes composed of wood pulp, the combination of one or more layers of chemical fiber with one or more layers of ground wood or mechanical pulp, united to form a web or sheet, substantially in the manner and for the purpose described.

3. The herein-described process of making board for paper boxes, the same consisting in uniting in a cylinder paper-board machine separate layers of chemical fiber and ground wood pulp to form a combined web or sheet of the said two materials or substances, and subsequently drying and calendering the same, substantially as set forth.

Witness my hand this 16th day of January, A. D. 1882.

FRANCIS E. HEATH.

In presence of—

W. B. ARNOLD,
W. S. DUNHAM.