Sheet 1, 2 Sheets.

T. R. Williams.

Making Felting Material.

No. 1,559. Patented Apr. 24, 1840.

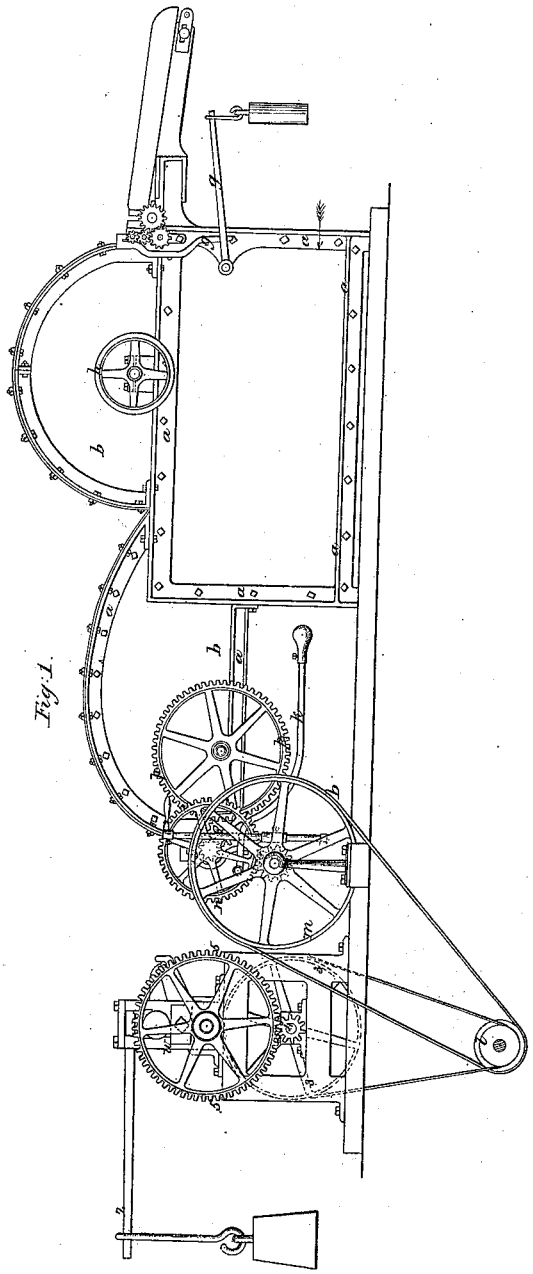

Fig. 1.

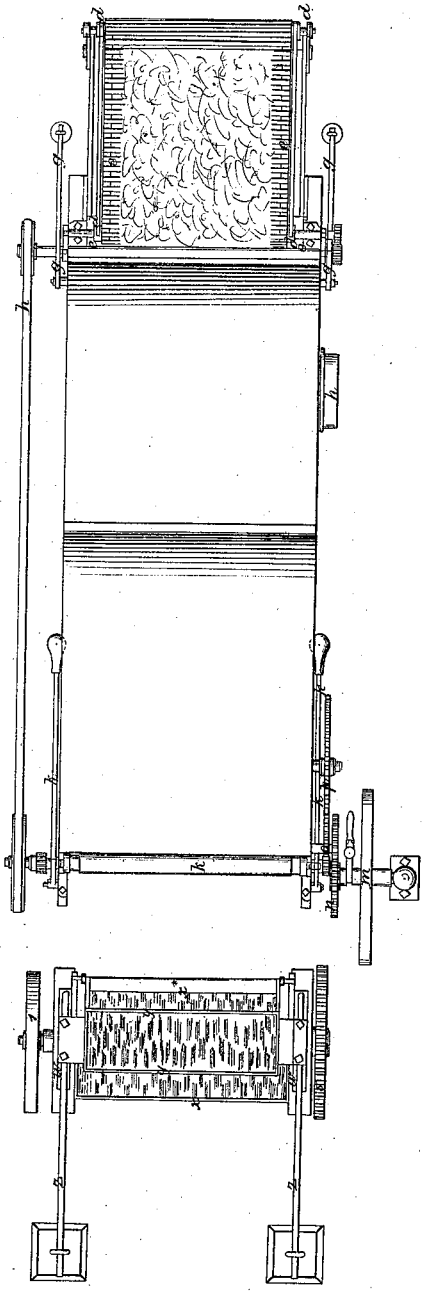

Fig. 3.

Witnesses
Jno. Tudor Hadley
Signature lost

Inventor
Thos. R. Williams

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

Sheet 2, 2 Sheets.

T. R. Williams.

Making Felting Material.

No. 1,559. Patented Apr. 24, 1840.

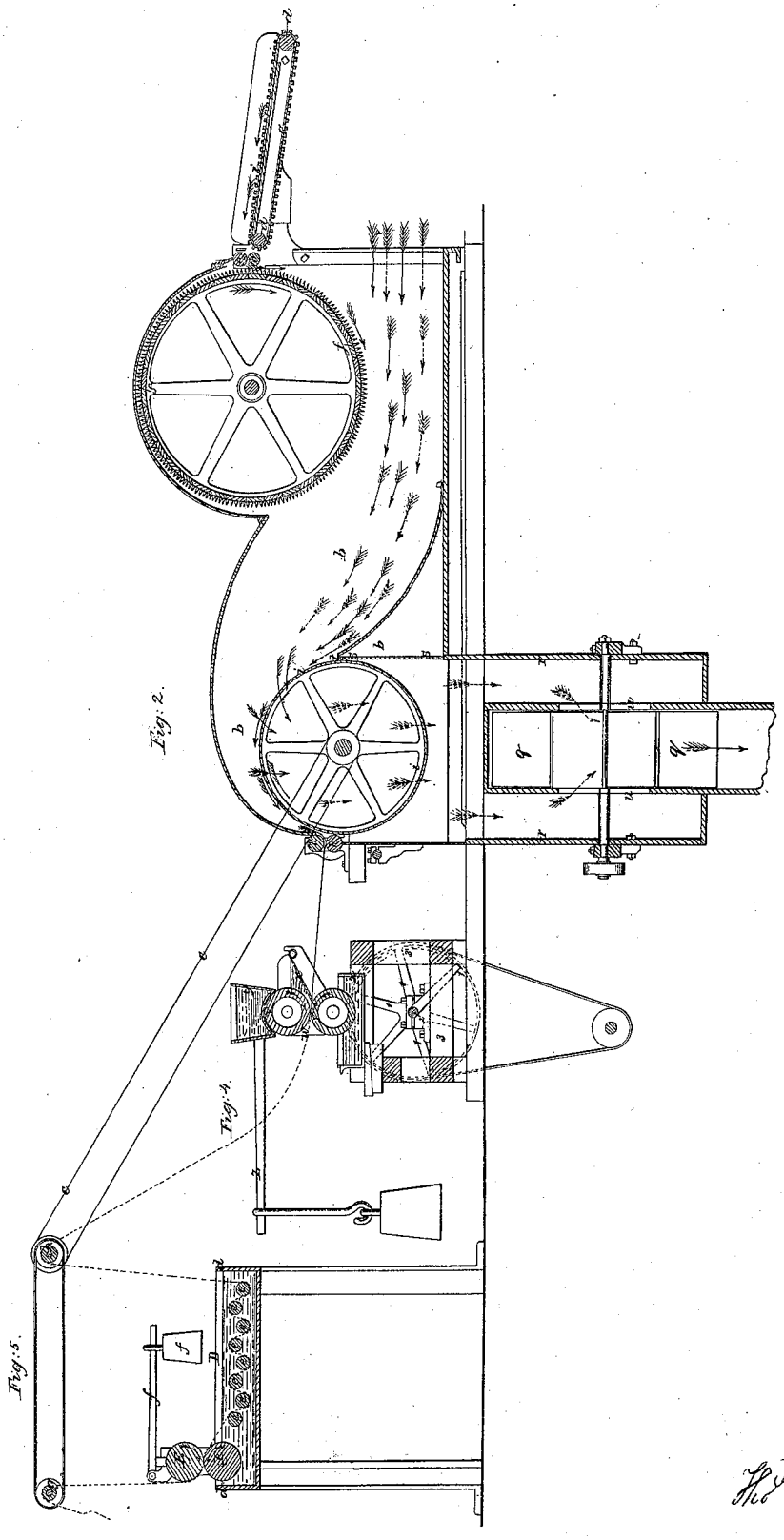

Fig. 2.

Fig. 4.

Fig. 5.

Witnesses
Wm. Judson Nobbs
Signature test

Inventor
Thos. R. Williams

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C

UNITED STATES PATENT OFFICE.

THOS. R. WILLIAMS, OF LONDON, ENGLAND.

MACHINERY FOR THE MANUFACTURE OF STUFFS IN WHICH THE FIBERS OF VARIOUS MATERIALS ARE UNITED WITH ADHESIVE MIXTURES.

Specification of Letters Patent No. 1,559, dated April 24, 1840.

To all whom it may concern:

Be it known that I, THOMAS ROBINSON WILLIAMS, a citizen of the United States of America, late of Newport, Rhode Island, in the said United States, but now residing at No. 14 Lambs Buildings, Bunhill Row, in the city of London and Kingdom of England, gentleman, have invented or discovered a new and useful invention of a new method of combining, by means of machinery and adhesive compositions, all kinds of fibrous materials—such as cotton, silk, flax, hemp, tow, fur, wool, hair, &c.—into manufactured articles, which may be applied to the purposes for which paper, pasteboard, millboard, papier mâché, parchment, vellum, leather, woven fabrics, felt, floorcloth, tarpaulin, and the skins of animals are used; and I do hereby declare that the following is a full and exact description thereof.

This invention consists in a new method process or manner of combining fibrous materials so as to form sheets or pieces of material commonly called or known by the name of artificial skins or other articles as hat bodies, forms or foundations of tea trays, boxes and various other articles which are or may be constructed of such materials by means of machinery and adhesive mixtures.

The fibrous materials are first partially separated or opened and suspended in the air and are then drawn upon, deposited or laid on woven wire gauze or perforated cylinders or sheets or forms of metal or wood or woven cloth of an open fabric or net work, such wire gauze or perforated plates or forms being of the requisite shape to suit the articles intended to be manufactured and which operation is effected by means of a partial exhaustion of the air underneath or on the opposite side of the said woven wire gauze or other fabric or perforated plates or shapes, the fibrous materials being drawn upon and caused to be deposited over the same by the currents of air passing through the said wire gauze or perforated plates or forms which arrest the fibers and thereby form a bat or sheet or other shape of the said fibrous material (generally upon its upper surface) according to the shape or form of the woven wire gauze or perforated plates or forms wherein or underneath which the exhaustion takes place. The so laid fibrous materials are afterward saturated in adhesive compositions whereby the combination of the fibrous materials with the assistance of pressure is completed, the fibers being principally held together by the said compositions. In effecting these operations some machinery which is well known may be made use of and machinery consisting of parts and modifications of different machines well known may be combined and connected together for effecting these purposes and I therefore wish it to be understood that I do not intend to confine myself to the precise arrangement and construction herein shown and I shall therefore refer in the present description to such machinery as I have found to answer well for making the materials as above stated into sheets or lengths or pieces and then allude to the further modifications of this novel method of combining fibrous materials in the process of making hat bodies or other articles; and it may render the subject of this invention more clearly understood by observing that this new method or process of combining fibrous materials is in contra-distinction to the present mode of reducing fibrous materials into a state of pulp suspended in water, as is done in the manufacture of paper, also to the process of spinning and weaving, as in woven fabrics, and also to the ordinary process of felting, as furs, wools, hairs and other animal substances are usually felted together; and I shall now proceed to describe the manner in which the said invention is performed or carried into effect, referring to the annexed drawings, which are different views of machinery or apparatus now in operation for making the said materials first in sheets or lengths.

Figure 1 is a side elevation of the machinery or apparatus complete. Fig. 2 is a vertical section taken longitudinally through the same. Fig. 3 is a plan or horizontal view, the red arrows in all these figures indicating the passage of the air through the apparatus, and the blue arrows that of the material under operation, and the black arrows the direction in which the various straps or bands and wheels or cylinders revolve or travel.

a, *a*, is the frame-work of the machinery, which in this instance is formed of cast iron closely cased or paneled airtight or nearly

so with wood *b*, *b* on all sides excepting the end underneath the feeding apparatus, which is open for the admission of the atmosphere.

c, *c*, is the endless feeding belt upon which the fibrous material, as hemp, tow, flax, refuse, silk, cotton, &c., is spread evenly by hand in the ordinary manner. The feeding belt in this instance is composed of two endless leather straps one at each side passing over the rollers *d*, *d*. The leather straps are connected together by rods or bars of wood having spaces between them for the purpose of allowing any dirt or other extraneous matters mixed with the materials falling through the same without being carried into the machine.

e, *e*, are a pair of feeding rollers which take the fibrous material from the feeding belt and present it to the action of the teeth of the opening cylinder *f* (commonly called the "devil cylinder"). The upper feeding roller is pressed upon the lower one by weighted levers and rods at *g*, *g*, and these rollers are made to revolve by means of toothed pinions on their ends, as shown in the drawings, which is set in motion by a strap or band *h* passed over a pulley on the axle of the lower roller from any convenient part of the machinery. From one of these pinions an intermediate toothed wheel gives motion to another wheel on the end of the roller *d*, thereby causing that roller to revolve and with it the endless feeding belt. The axle of the devil cylinder *f* is mounted, turning in proper bearings in the framework and the cylinder is constructed of iron arms and rims covered with blocks or staves of wood, through which are driven a great number of iron or steel spikes or teeth, which project from the periphery of the cylinder very near to the feeding rollers *e*, *e*. This cylinder has a very rapid rotatory motion given to it by means of a band passed from the main driving shaft over the pulley or rigger *h* on its axis. The feeding rollers bring the material into the machine and the teeth of the cylinder separate or open the fibers, throwing the material into the air, as shown by the blue arrows, where meeting with the current of air caused by the partial vacuum produced within and under the receiving cylinder *i* the loosened fibers are drawn onto and deposited upon the periphery of this cylinder in the form of a thin layer, sheet, or bat of fibrous material, from whence it is taken by the receiving rollers *k*, *k*, as hereafter described.

The cylinder *i* is formed of iron arms or rims covered with an endless cloth of woven wire gauze, perforated zinc or iron or tin plates or other material or fabric which will allow of the passage of the air through it but at the same time stop or arrest the fibrous substances mixed with or suspended in the air.

The cylinder *i* and the receiving rollers *k*, *k*, have a slow uniform rotatory motion given to them by means of a band passed from a rigger *l* upon the auxiliary shaft to the rigger *m*, upon the axle of which is a toothed pinion taking into gear with a toothed wheel *n* mounted upon the axle of the lower receiving roller *k*, and upon this axle is a pinion taking into an intermediate wheel *o*, the teeth of which take into gear with another wheel *p* mounted upon the end of the axle of the cylinder *i* and thereby give it a slow rotatory motion in unison with that of the receiving rollers *k*, *k*.

The partial vacuum or exhaustion of the air is produced within and under the cylinder *i* by means of the rotatory fan or exhauster at *q* (or any other exhausting apparatus); but which in this instance for simplicity of application is shown placed under and in direct action with the cylinder *i* within an air-tight box or casing *r*. The fan is made to revolve rapidly by bands passed over riggers in any convenient manner; but when several of these machines are placed in a row on one floor of a building I prefer connecting the exhauster with an air-tight trunk situated underneath the floor extending the whole length of the machines and exhaust the air therein by means of a large fan or blower situate at one end of the trunk or in any other convenient part of the building, a space around its center as shown in the drawing at *u*, *u*, being open to the trunk, and its periphery open to the atmosphere.

The extent of surface of the periphery of the cylinder *i* through which the air is allowed to pass is determined by the shield or partition *s*, *s*, which is placed as a guide for the current of air therein and is packed against the cylinder *i* at *t* by means of leather or other suitable substance in order to prevent the air and fibrous materials passing between it and the cylinder. The lower receiving roller is placed nearly in contact with the opposite side of the cylinder and does not require packing.

The receiving rollers *k k*, are connected together by means of pinions on their ends and the upper one is pressed down upon its companion by weighted levers and rods K, K, and as they receive the sheet, layer or bat of fibrous materials from the cylinder *i* they press it into a more compact body and deliver it to the apparatus, where it is to be saturated with pitch and tar or other resinous, gelatinous or adhesive compositions, as shown in the drawings at Fig. 4.

v v are two hollow cast iron cylinders or rollers mounted in proper bearings in the framing *w*, *w*, and are warmed when required by means of hot iron heaters or in any other convenient manner.

x x^* are troughs containing the adhesive mixture or composition, which is kept fluid by the radiant heat from the rollers; y is another trough containing the same composition for the purpose of supplying the lower one x^*. The lower cylinder v being partially immersed in the composition carries up with it a sufficient quantity to saturate the underside of the sheet or bat of fibrous materials and the composition in the trough x^* being in direct contact with the sheet or bat saturates the upper side as it passes under it. The upper heated cylinder is pressed upon the lower one by means of weighted levers at z, z, and as they revolve they not only squeeze or force the composition or adhesive mixture through the sheet or bat but also press out all that may be superfluous which again runs into the lower cistern x. These rollers also press the sheet or bat of fibrous materials so saturated into a thinner or more compact body and the composition immediately cooling retains the fibers in that state and as the sheet of material cools it may be cut into any convenient sizes for the purposes required or continued onward into succeeding operations to be afterward described. I should here remark that the adhesive mixtures generally used in this part of the process is about three parts of pitch or rosin with about one part of tar, to which is added perhaps a thirtieth of oil or tallow, but the proportions necessarily vary for the different purposes for which it may be intended.

The cylinders v, v, are made to revolve by means of a band passed from a rigger on the auxiliary shaft to the pulley 1 placed upon the axle 2 which is mounted in the frame work 3. Upon this shaft is a toothed pinion 4 taking into the wheel 5 upon the end of the axle of the lower roller v, the upper one being turned by a pair of pinions upon the ends of the shafts of the rollers.

Having now described the means of carrying this invention into effect in the making of sheets or lengths of fibrous materials which are applicable to the sheathing of ships, covering the roofs of buildings, floor-cloth, packing for the chairs of rails for railways, tarpaulins and other purposes I will proceed to decide another application of this invention for the manufacture of millboards or boards for bookbinding, making boxes and packing for flanch joints in pipes and joints for tanks and machinery in general. For this purpose I make use of an additional machine, Fig. 5, appended to that last described through which the endless sheet after leaving the pressing rollers v is conducted over the roller b (receiving a motion from the band c) and from this it descends into the cistern D, which is filled to the line d with a composition of weak size mixed with paste and clay in different proportions (according to the material required) through which it is made to pass over and under the rollers e, e, e, by the drawing of the two larger geared rollers E E which are covered with a coarse woolen or hair cloth and gently press out (by means of the weighted levers f, f,) so much of the superfluous composition as may be wished. It is then continued over the roller g and is afterward cut off into various lengths and hung up to dry it, being finished when dry by the usual methods of glazing or finishing millboards or cardboards by rolling or pressing. The rollers E E receive their motion by a band from an auxiliary shaft under the floor or in any convenient situation. The advantage of thus supersaturating the previous sheet with this composition is to prevent the action of heat upon the so manufactured boards.

The forms may be made of any perforated substance of sufficient strength but I prefer them of copper, zinc or wire-gauze.

Having thus fully described my method of combining by means of machinery and adhesive compositions all kinds of fibrous materials for the manufacture of various articles I do hereby declare that I do not claim the forming of a bat or sheet from fibrous materials in the manner set forth; nor do I claim the machinery employed for the saturating of such a bat or sheet of fibrous materials with resinous and other substances; but

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

The so combining and arranging the machinery employed substantially in the manner herein set forth as that the processes of forming the bat and of saturating the same with the different compounds shall be simultaneously and consecutively effected, so as to form sheets or lengths of fibrous materials applicable to various purposes.

In witness whereof I the said THOMAS ROBINSON WILLIAMS have hereunto set my hand and seal this twelfth day of February, in the year of our Lord one thousand eight hundred and forty.

THOS. R. WILLIAMS. [L. S.]

Witnesses:

JOHN CLARKE,

GEORGE HARRIS.