Sheet 1-2 Sheets.

T. R. Williams.

Felting Machine.

No. 1897

Patented Dec. 14, 1840.

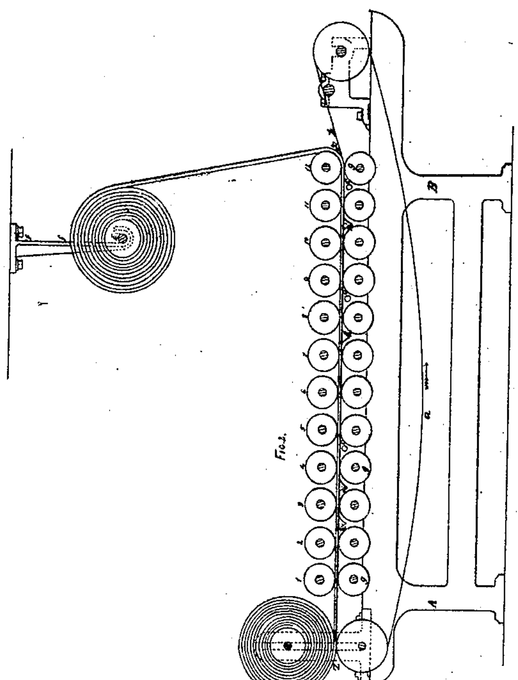

Fig. 2.

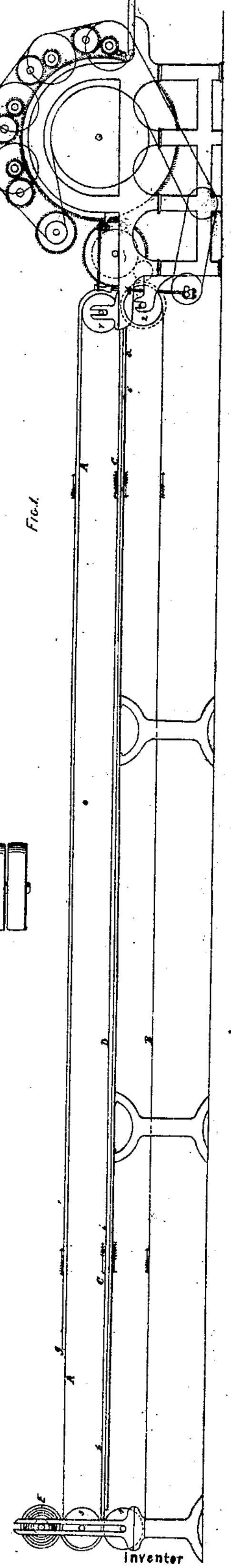

Fig. 1.

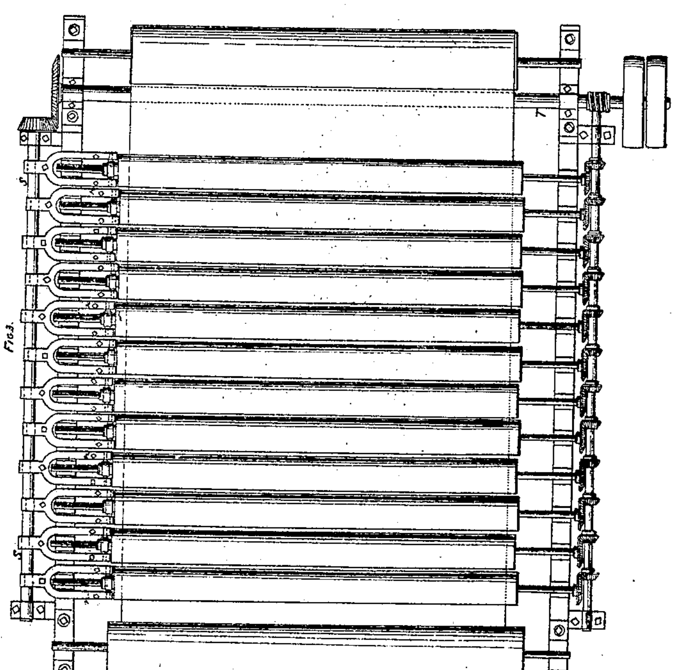

Fig. 3.

Witnesses.

Wm. Hudson Markley

J. W. Moffatt

Inventor

Thos. R. Williams

Sheet 2 - 2 Sheets.

T. R. Williams.

Felting Machine.

No 1897 Patented Dec. 14, 1840.

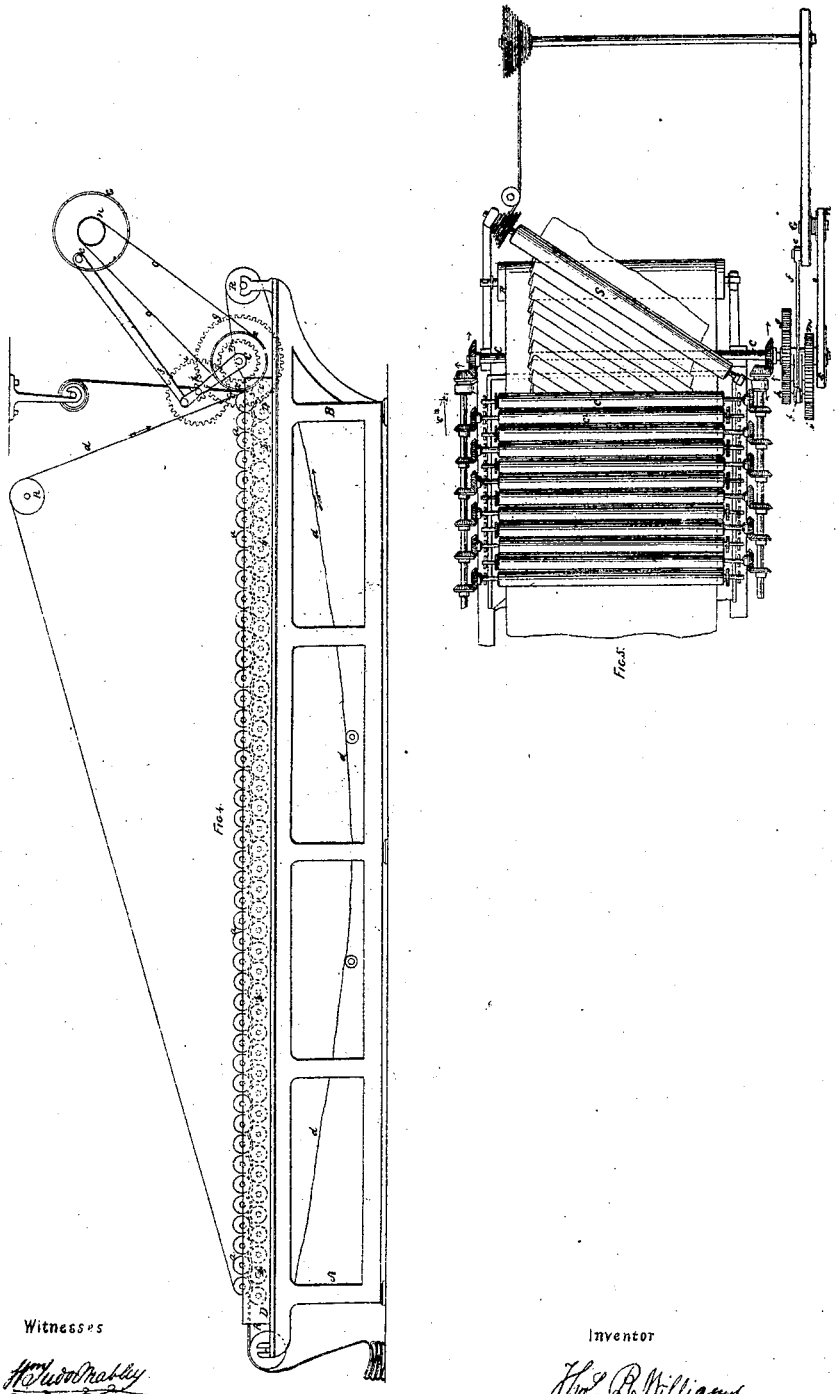

Fig 4.

Fig 5.

Witnesses

H. Tudor Mabbitt

J. W. Moffatt

Inventor

Wm. R. Williams

UNITED STATES PATENT OFFICE.

THOS. R. WILLIAMS, OF LONDON, ENGLAND.

MACHINERY FOR MANUFACTURING FELT-CLOTHS WITHOUT SPINNING AND WEAVING.

Specification forming part of Letters Patent No. 1,897, dated December 14, 1840; Reissued May 6, 1851, No. 198.

To all whom it may concern:

Be it known that I, THOMAS ROBINSON WILLIAMS, a citizen of the United States of America, now residing at Cheapside, in the city of London and Kingdom of England, have invented or discovered a new and useful invention of Improvements in the Manufacture of Woolen Fabrics, or Fabrics of which Wools, Furs, or Hairs are the Principal Components, as Well as for the Machinery Used Therein; and I do hereby declare that the following is a full and exact description thereof.

My invention of improvements in the manufacture of woolen fabrics, or fabrics of which wools, furs, or hairs are the principal components, as well as for the machinery used therein consists in a new combination of machinery, apparatus, and processes first for obtaining a long, even, and uniform bat of wool or other materials of any required length width or thickness, and afterward for the purpose of producing a fabric or cloth composed of all the various well known felting substances, such as wools, furs, and the hairs of animals, and which I use either separately or mixed up in every possible proportion together and sometimes with a small addition of non-felting materials as best suits the description of fabric required and which fabric or manufacture as produced by these processes and machinery herein combined and described wholly depend for their union and strength upon the great principle or tendency of these natural products when properly treated to combine and unite or as it is commonly called felt together and this without the usual auxiliaries of spinning and weaving (as in the cloth manufacture) being at all necessary or in anywise employed.

I should first observe that in this new manufacture of cloths I dispense entirely with the use of any oil or oleaginous matter, which is generally required in the common woolen manufacture for assisting the spinning of yarns; and prefer that the wool, &c., should merely be well washed, picked and dried after which it should be teased and scribbled in the usual way. The dry clean material as it is thus prepared is then to be weighed out into quantities for producing any required thickness and width of goods as now described.

Figure 1 represents a common wool carding engine and A C B D two long revolving aprons of cloth (or any other suitable material) attached thereto passing over the rollers or drums 1, 2, 3, 4 and receiving a motion from the doffers of the card as here represented or any other convenient part of the engine. These aprons and drums revolve in opposite directions as represented by the arrows so that the two inner surfaces *a b* move in the some direction with uniform speed and nearly with the same velocity with the doffers of the card as regards their surfaces. The wool is taken off from the doffers by the usual comb crank motion in an attenuated sliver; this sliver is now received btween the two revolving aprons at *c d* which have a slight flooring *i i* for their support and passes on between them until it arrives at the end of the aprons; a direction is then given to it so that it shall pass up and over the upper apron A C and wind itself upon this apron one sliver over the other until the bat has become of sufficient thickness it being during this operation supported and sustained in contact with the apron A, C by the apron B D for which this is principally intended. As the apron A C may be of any determinate length and width corresponding with the card it is evident that any fixed quantity of wool being passed through the engine and received upon this apron may be made to produce any required thickness of bat, and consequently any required weight of goods per yard that may be desirable after having undergone the succeeding operations. I may here also observe that when there is not sufficient room in a building or from any other cause for carrying out these aprons of sufficient length in one direction I sometimes wind them backward and forward with the sliver over rollers or drums. The bat having acquired its requisite thickness it is then cut across its width as represented at *g*, and the bat being passed over the roller E it is wound firmly upon it by the contact of the roll with the apron A C when the other end of the bat reaches the roll 1, it brings with it the sliver which is as before passed up over the apron A C and another bat is then commenced. The roller E with the bat upon it is then taken to another machine represented in elevation

at Fig. 2 and plan view at Fig. 3 called the hardening machine and placed in the situation marked *f f*.

A B is the frame work of this machine and 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 are rollers of which there are two sets one over the others; these rollers are wrapped around with an elastic cloth and the lower tier *g* are furnished with an apron as represented at *a a*. There are several small pipes connected with the boiler brought up and inserted between the lower rollers and under the aprons as represented at *c c c* extended from side to side of the apron and finely perforated upon their upper sides for the purpose of admitting steam to escape upward for moistening and warming the bat of wool where the first stage of the felting process called hardening is now commencing.

The upper tier of hardening rollers receive an alternating motion endwise by a cranked shaft S running along its side upon which there are as many cranks or eccentrics having a short throw of about three-eighths of an inch and connected with each upper roller by shackle bars or slide rods *n n;* the hardening rollers receive also a slow progressive motion from the main shaft on the other side of the machine by suitable gearing consequently moving the apron between them as well in the direction of the arrows. There are likewise inserted between these rollers and under the apron several heaters *h h h h*. These heaters are of hollow metal and connected by stop cocks with the steam pipes which furnish the perforated pipes for the purpose of increasing and regulating the heat applied to the bat and assisting the incipient felt.

As before stated the roller E with its bat upon it being brought from Fig. 1 is placed in the position *f f* Fig. 2 and its end being entered between the front rollers of the hardening machine at *x* it is gradually passed through them which with the alternating motion of the upper rollers acting against the resistance offered by the lower ones (which do not alternate) aided by the moisture and heat arrives at the other end of the machine in a consolidated firm state possessing a considerable degree of felt and very much resembling a fine blanket; here at Z it is again wound upon a roller F by friction of contact with the apron *a* and when the whole bat intended for an end of cloth is finished and wound upon it, it is taken away to receive the next operation.

A B (Fig. 4) is the frame and supporting parts of the machine. *a b* are a double tier of rollers (now generally of cast iron) but where acids are used it is necessary they should be made of copper the upper tier rest between the lower one so as to double the points of contact and by producing an undulating motion in the bat (or as it may now be called the cloth) materially assists in the felting process. These are all actuated by bevel gear upon alternate ends of the upper tier which turn the lower ones by spur wheels upon their opposite ends connected with similar gear upon the two shafts extending the whole length of the machine on each side and these two side shafts are again connected with each other by similar but stronger gear upon the cross main shaft C C each separate upper roller is weighed upon the lower ones for the purpose of accommodating a certain degree of pressure to all the different degrees of thickness or accumulated thicknesses of various goods submitted to its action.

D D is a box or cistern lined with lead for holding a supply of hot water or soap suds and in which the lower rollers can be more or less immersed. Upon the bottom of this cistern there are several coils of lead pipe perforated in many places and connected by a stop cock with a boiler for heating its contents.

R R are friction rollers or drums over which an upper and lower endless apron *d d* are passed for conducting the bat or cloth from end to end and through the machine. These aprons of cloth move by the friction of the metal rollers in the direction of the arrows and as will be seen by the drawing both pass in together between the front rollers *c c* receiving the felting cloth between themselves and liberating it when they arrive at the lower end, one of course turning upward and the other downward.

The object of the apparatus connected with the main shaft at C is to give the two tiers of rollers a reciprocating or backward and forward motion at the same time to allow the cloth alternately pressed and liberated between their inner surfaces gradually to move in a forward direction through the machine enabling them to do much more work upon the piece without reëntering again at *c c*.

G is a pulley receiving its motion from any convenient part of the running gear with proper speed.

e is a stud and pin working a connecting rod attached to the lever *f f* this lever being loose upon the main shaft at C.

g is a large toothed wheel which is made fast to the shaft C and seen behind the lever *f*.

h is a small pinion likewise behind the lever taking into the larger toothed wheel *g*. Upon the front of this lever but working through it and attached by an arbor to the small pinion *h* is the toothed wheel *i* working into another but smaller toothed wheel *m* which is loose upon the main shaft and upon the front of which a fast pulley *x* is screwed. Now it is evident if this last

pulley and wheel were to be fastened to any adjoining part of the machine or other thing and the main shaft only to turn within them, that a mere reciprocating motion would be given to the felting rollers of the machine without their progressing or moving the cloth at all forward. To effect this purpose a small pulley *n* is fastened to the pulley G having a band *o o* passed over it and around the pulley *x x* which notwithstanding the constantly reciprocating motion is adding thereto a progressive one as well in order to carry the cloth through the machine as so to receive a regular action from end to end.

In order to produce the finest and best felt it is very desirable to allow the felting rollers to act upon the material in every possible direction by the reciprocating motion of this machine; we have seen that this is produced in each direction longitudinally. The cloth is taken in the fold from the last machine and placed at the entering end of another similar felting machine but instead of being entered as before the piece is first passed through the two feeding rollers S S which as seen by the drawing, Fig. 5, are placed at an angle with the feeding cloth of somewhere near 45 degrees. These two rollers have a velocity from three to four times that of the feeding apron upon which the cloth is thrown in regular folds as it enters lying at nearly the same angle as the position of the rollers; this now causes the action to take place diagonally across the piece of cloth and after having passed through in this direction it is reversed and when again passed it will be seen that the action is nearly at right angles with the last. In this way it may now be run through this machine several times and for some descriptions may even be for a time milled in the common clothier's stocks; but it is desirable to avoid this, and at all events the goods should be finished in the felting machine, Fig. 5, the stocks being apt to produce an unequal or uneven surface called a grain.

Now although the hereinbefore described machines have been represented as separate and distinct machines principally for adapting them conveniently to ordinary manufacturing premises yet they are in fact one combined series and each necessary for effecting one object.

I therefore claim as my invention—

The different members of this combination collectively, as they are united and dependent on each other for producing a continuous and connected or combined result that of the manufacture of commercial pieces or ends of cloth without spinning and weaving.

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

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

Witnesses:

WM. TUDOR MABLEY,

J. W. MOFFATT.

[FIRST PRINTED 1913.]