Sheet 1-2 Sheets.

M D Whipple.

Fulling Machine.

No. 51884 Patented Jan. 2, 1866.

Fig: 1

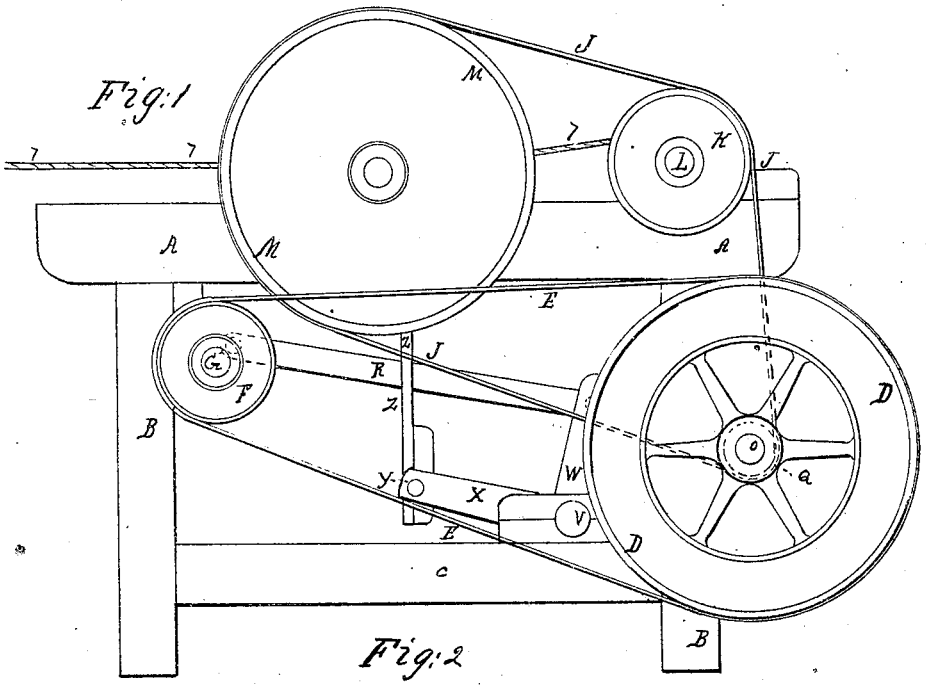
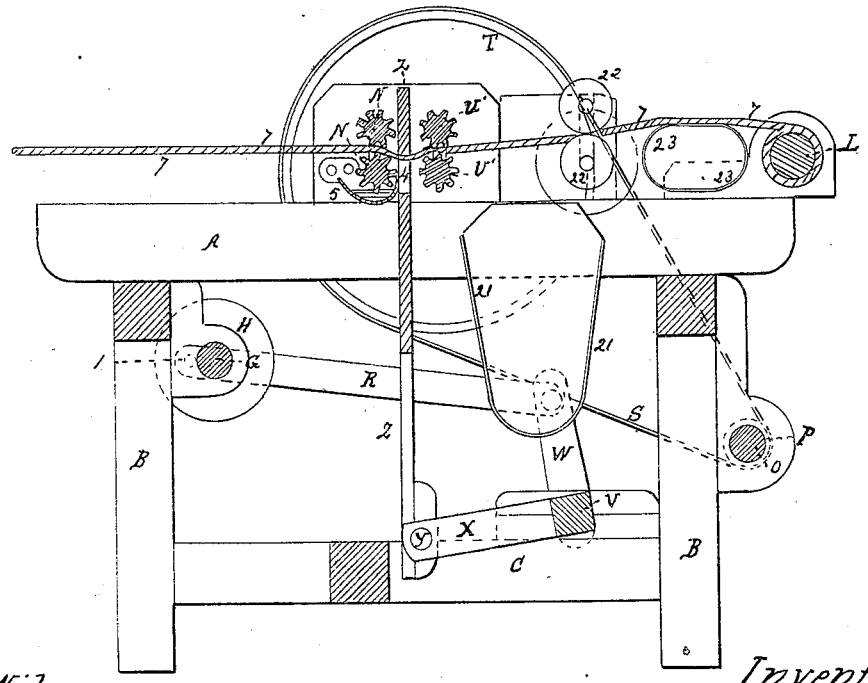


Fig: 2



Witnesses.

John M. Batchelder

Franklin Hunt

Inventor.

Milton D. Whipple

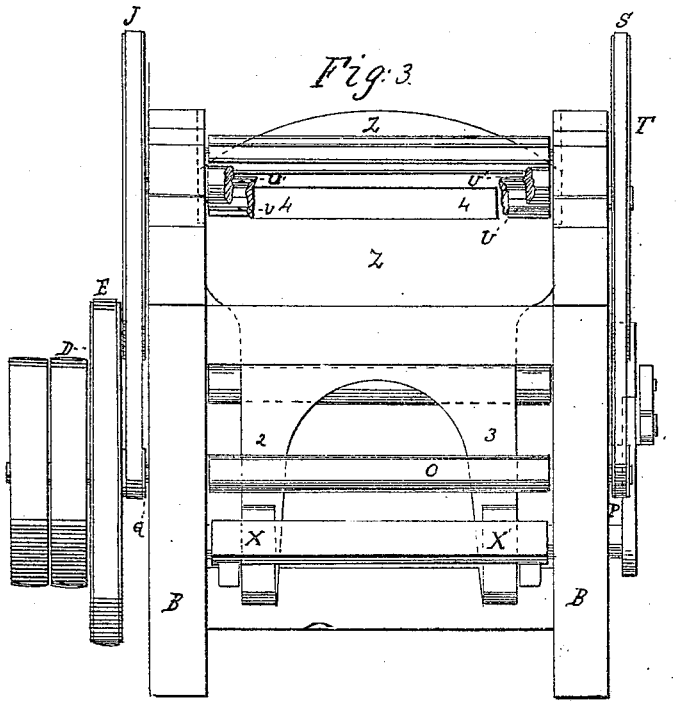
Sheet 2 - 2 Sheets.

M. D. Whipple.

Filling Machine.

No. 51884 Patented Jan. 2, 1866.

Fig. 3.



Witnesses

John M. Batchelder

Franklin Hunt

Inventor.

Milton D. Whipple

UNITED STATES PATENT OFFICE.

MILTON D. WHIPPLE, OF CAMBRIDGE, MASSACHUSETTS.

IMPROVEMENT IN MACHINES FOR FULLING AND FINISHING FELTED CLOTH.

Specification forming part of Letters Patent No. **51,884**, dated January 2, 1866.

To all whom it may concern:

Be it known that I, MILTON D. WHIPPLE, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Fulling and Finishing Felted Cloth; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters and figures marked thereon.

The article termed "felted cloth" is usually made by rubbing bats of wool, as they are delivered from a roller, upon a bed or platen that is pierced with holes to permit the contact of steam or hot air with the wool, the heat, moisture, and friction causing the fibers of the wool to be felted or matted together.

My improvement relates to the treatment of cloth thus made—that is to say, of felted cloth after it is delivered from the felting-table.

The usual mode of fulling this kind of cloth, subsequent to the felting process named above, is as follows: The long strip or piece of cloth is folded or rolled, and prepared with soap or other suitable compound. It is then placed in the common fulling-mill and treated in the same manner as woven woolen cloth, with this exception, that it is necessary to overhaul it often and apply an additional quantity of soap, in order to prevent the layers of cloth that are in contact from being matted or felted together. This extra handling of the goods and waste of soap in the process of fulling is not required in my process, and the cloth is well condensed and consolidated without being subjected to the action of fulling-stocks or any similar mechanism, while at the same time it is more elastic and even. It is also more free from thin places, which, by the common mode of fulling, are liable to occur unless great care is taken in soaping and handling.

Figure I is a side elevation of the machine. Fig. II is a vertical section. Fig. III is an end elevation.

The frame of the machine is represented at A B and C. The power is applied at the driving-pulley D, affixed to the shaft O, which carries a band, E. This band extends around the pulley E on rocker-shaft G, and drives the rocker-shaft and its connecting-bar R, on the opposite side of the machine, by means of a crank-pin on the opposite end of said shaft. A small pulley, Q, on the inner side of the pulley D, carries a band, J, which drives the pulley K and its shaft L, and also drives the pulley M and the attached fluted front roller, N.

To the shaft O, upon the opposite side of the machine from the main driving-pulley, a small pulley, P, is attached, its band S driving the pulley T, affixed to the fluted back roller, U.

The horizontal rocker-shaft V has its bearings upon the cross-girt C. One of its arms, W, extends upward and is jointed to the connecting-arm R, the opposite end of which plays on the crank-pin 1 affixed to the pulley H. The other arm, X, of the rocker-shaft is nearly horizontal, and its outer end plays on the pin Y, which forms a joint and attachment to the upright beater Z, and gives it a vertical reciprocating motion. The shape of the beater is seen at Z, Fig. III. It consists of a thin board or plate of nearly the same breadth as the inside of the frame of the machine, its lower end being forked or divided, forming two legs, 2 3, which are jointed to the rocker-arm X X′. The upper part of the beater passes between and above the two pairs of fluted rollers N N′ and U U′, Fig. II, and has a narrow slot or opening, 4, cut through it at or near the level of the junction of the two pairs of fluted rollers, the length of this opening being nearly equal to the breadth of the inside of the frame. The two lower rollers, N and U, revolve in their fixed bearings, and the two upper rollers, N′ U′, rest upon them, being free to rise and fall a short distance, according to the thickness of the cloth or bat 7, that passes between them. The pressure of the rollers upon each other may be increased or diminished by means of springs or weights. The first lower roller, N, has below it a trough, 5, to contain soap, water, or other liquid, through which the fabric may be passed, when required.

No definite velocity is prescribed for any of the parts of the machine, with the exception of the fluted rollers. The velocity at which these move constitutes one of the main features of my improvement, and consists in this—viz., that the second pair of rollers moves slower than the first pair, thus causing the bat to be held back and retained in a slack or loose condition between the rollers. During the time that the fabric is thus held suspended it

is raised and depressed alternately by the rapid vibration of the beater Z, which causes the fibers of the wool to be interlaced, contorted, and condensed, while at the same time the cloth is contracted and thickened. By this process the fibers of the wool or other felting material are so thoroughly incorporated that the common process of fulling (which succeeds the felting process) is dispensed with.

The description given above of two pairs of rollers and a vibrating beater working between them will produce the thickened or fulled cloth, as stated; but on many articles it is desirable to produce the effect gradually, and by the successive action of rollers and beaters, and for this purpose I make use of additional pairs of rollers, each set of rollers that receive the fabric moving slower than those that deliver it. A vibrating beater is placed between each pair of rollers and its next adjacent pair and acts upon the fabric in the manner herein described. After leaving the last pair of rollers the cloth is wound upon the roller L, and is subsequently pressed and finished in the usual manner.

In the common process of fulling the strain upon the cloth is very unequal, while in my improvement the tension is uniform, and the velocity of the passage of the cloth through the rollers can be exactly regulated. This insures the production of a very thin, light, and elastic cloth, which cannot be made by the process heretofore known and used, for that requires the production of a thick fabric upon the felting-machine, in order that it may be strong enough to bear the common fulling process and the necessary moving and handling, while my process takes a thin and delicate fabric directly from the felter and fulls it without any change or disturbance during its progress from the felter to the roller, upon which it is wound ready for the ordinary operation of dyeing, pressing, and finishing. As the cloth is taken from the roller the selvage is found to be even and free from the curves and wrinkles caused by the tenter-hooks used for stretching and drying the cloth that has been fulled by the old process.

On some light styles of goods the cloth may be washed, dried, and partially finished by passing it, after it leaves the fluted rollers, through a wash-box, 21, squeezers 22, and over a drying box or cylinder, 23, as represented by the red lines in Fig. II, after which it is wound upon the roller L. In some cases I omit the washing and pass the cloth directly from the fluted rollers to the drying-box. To insure the regular decrease of velocity of the successive pairs of fluted rollers they should be driven by chains or gears.

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

1. The mode of fulling or contracting felted cloth by raising, depressing, or bending the fabric while it is held in a slack or loose condition, this effect being produced by means of fluted rollers and a beater, or their equivalents.

2. A series of pairs of rollers in which the surface velocity of each pair that receives the cloth is less than that of the pair which delivers it, substantially as specified.

3. In combination with two or more pairs of rollers and a beater, arranged as herein described, the attached wash-box and the drying apparatus, substantially as herein described, and for the purpose specified.

MILTON D. WHIPPLE. [L. S.]

In presence of—
JOHN M. BATCHELDER,
FRANKLIN HUNT.