Sheet 1-2 Sheets

G. G. Bishop.

Felting Machine.

No 8821

Patented Mar. 23, 1852.

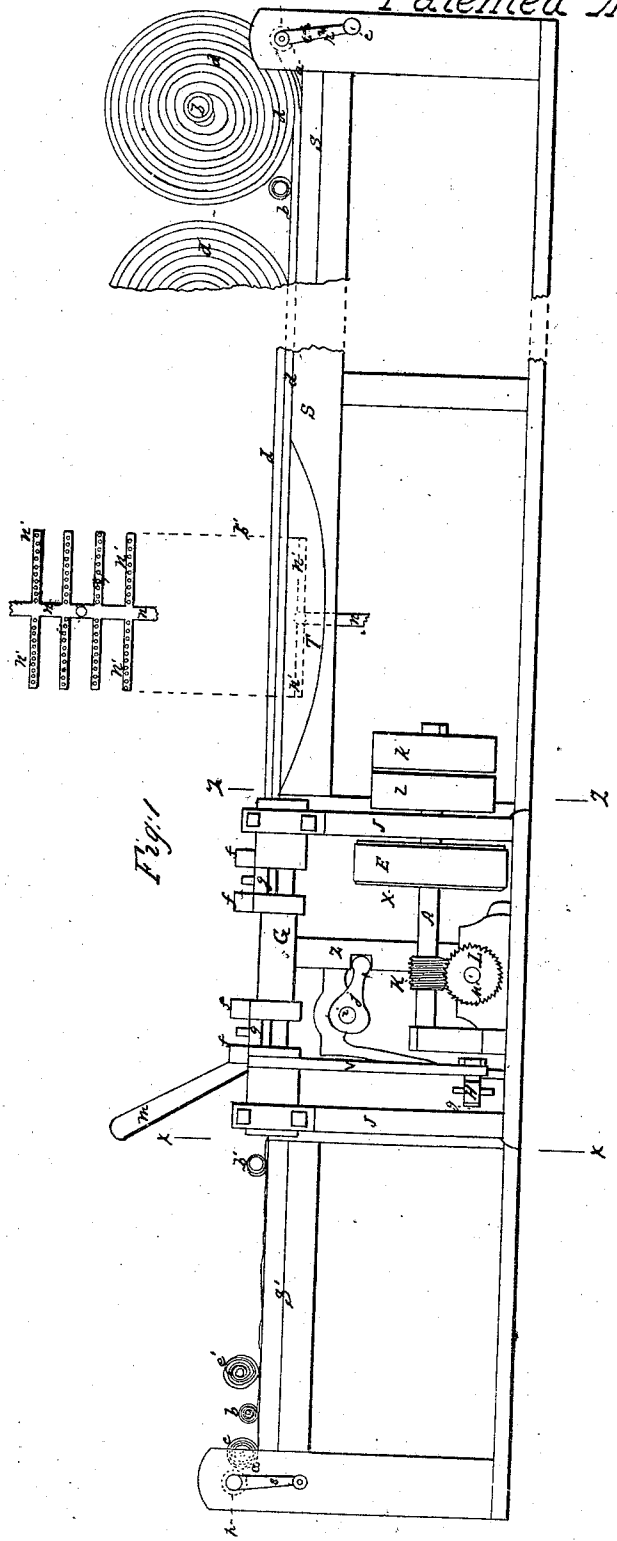


Fig. 1

Sheet 2 2 Sheets

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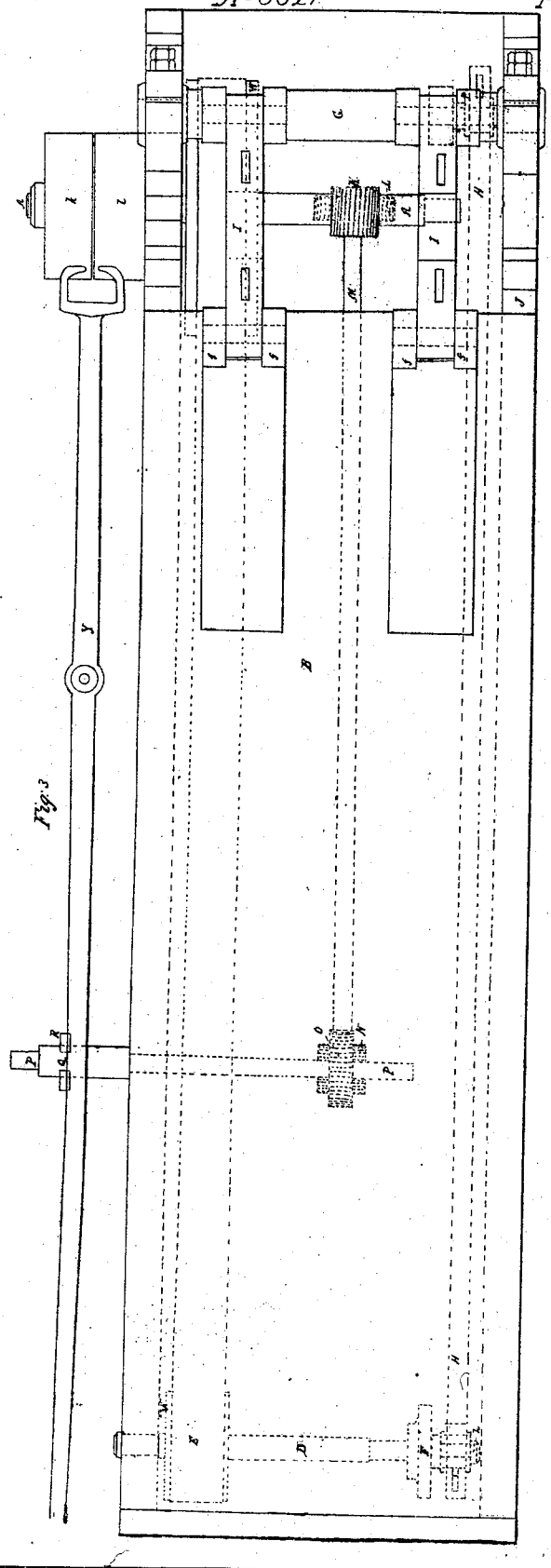


Fig. 3

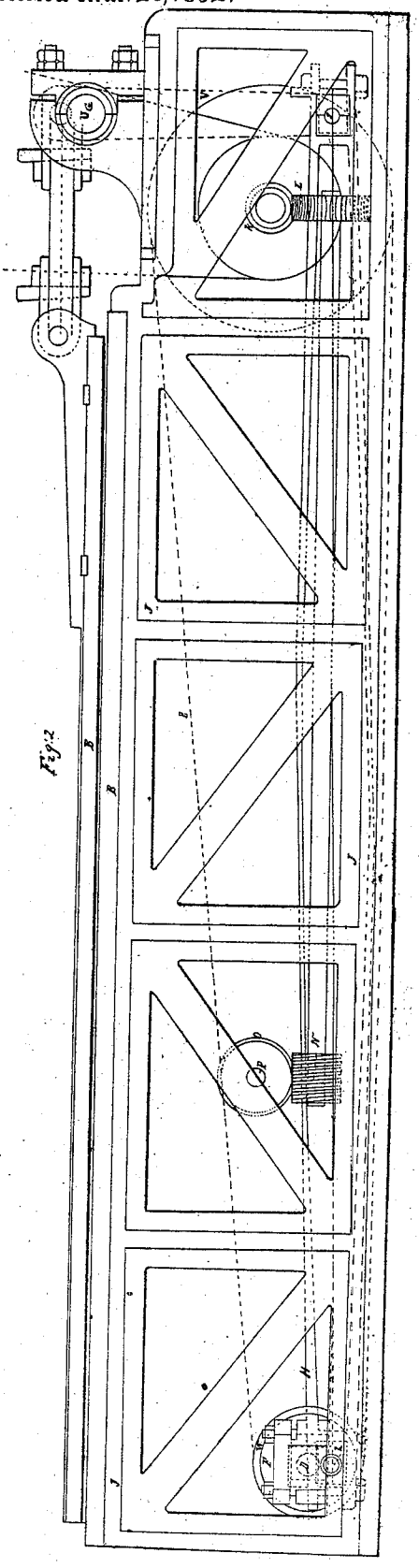


Fig. 2

UNITED STATES PATENT OFFICE.

GEO. G. BISHOP, OF NORWALK, CONNECTICUT.

MACHINERY FOR FELTING CLOTH.

Specification of Letters Patent No. 8,821, dated March 23, 1852.

To all whom it may concern:

Be it known that I, GEORGE G. BISHOP, of Norwalk, in the county of Fairfield and State of Connecticut, have invented sundry new and useful Improvements in Certain Parts of the Process of Manufacturing Cloth by Felting without Spinning or Weaving, of which the following is a full, clear, and exact description, reference being had to the annexed drawings of the same, making part of this specification, in which—

Figure 1 represents a side elevation of the machine with a portion of one of the tables and the web lying thereon broken out; Fig. 2 represents a vertical transverse section through the dotted line *x x* of Fig. 1, and Fig. 3 represents a top view of that portion of the machine included between the dotted lines *x x* and *z z* of Fig. 1.

The process of manufacturing a web of cloth by felting may be divided into three parts: first the carding of the fiber and forming it into a bat of suitable length breadth and thickness, second the condensing and interlacing and hardening of the fibers of the bat into a compact sheet or web, by the conjoint action of steam, a vibratory motion, and pressure, and third the fulling and dressing of the web of cloth so condensed and hardened.

My invention and improvements relate to the second branch of the process, and consist in alternately steaming the bat and hardening it by pressure and motion applied successively to small portions of it, also in giving a tremulous or jarring motion and at the same time compressing the fibers of the bat by means of two flat smooth plates, beneath which the steamed bat is extended, the upper plate being very heavy, and resting on the bat with its whole weight, and a rapid vibratory motion being communicated to either or both of them by means of mechanical contrivances adapted to the purpose.

My invention further consists in performing the operations of steaming and hardening on two or more bats or webs at the same time, whereby the work is much more rapidly and cheaply performed, and the cloth rendered smoother, finer, and more uniform in its texture.

The last improvement I shall enumerate consists in so constructing the machine for condensing and hardening the bat while its fibers are put into motion by a rapid, tremulous, vibratory movement of the upper pressing plate, that every part of the bat shall have its fibers subjected to an equal amount of motion under the same pressure, irrespective of the length of time it takes to perform the operation.

The machine represented in the accompanying drawings for carrying my improvements into effect consists of a pair of pressing plates B B′ (Fig. 1) between which the bat is condensed and hardened, a strong frame J to support these plates, and the mechanism for communicating a rapid vibratory motion to the upper one of the two, and for raising and lowering the same. This portion of the machine is commonly called the "jigger," and the operation of condensing and hardening is technically called "jiggering the bat." To one side of the jigger a bench or table S is connected, this table supports one end of the carrier sheets *a*, on which the bat *d* is conveyed through the jigger, and also the roll of bat to be jiggered, and the steam chamber T over which the bat is steamed preparatory to being subjected to the action of the jigger. To the opposite side of the jigger another table S′ is connected which supports the opposite end of the carrier sheet and the cloth or hardened bat *e*, which is wound upon a roller as fast as it is jiggered.

The jigger frame J must be made in the most solid and substantial manner, and firmly anchored to a solid and heavy foundation of masonry to withstand the severe and incessant concussions, vibrations, and strains to which it is subjected. Upon this frame is firmly secured a smooth and truly plane slab or plate B, which I prefer to make of cast iron; the length of this plate should slightly exceed the width of the widest sheet or bat to be jiggered. Upon the stationary plate B another plate B′ of corresponding size and form is placed. This plate is fitted at one end with two pairs of strong lugs *f f* each pair having a stout joint pin passed through them and the end of a connecting rod I inserted between them; the opposite ends of the connecting rods I, I, are secured to crank or wrist pins of a rock shaft G, which is supported in pillow blocks on the end of the frame. In this instance the rock shaft is fitted near each of its extremities with a double crank to support the wrist pins, but these pins might be supported by short arms in place

of the cranks. From the lower side of the rock shaft a long arm V depends whose lower extremity is fitted with a wrist pin *g* which is embraced by one end of a connecting rod H, the other end of which extends to and embraces the wrist pin *h* of a revolving crank F; this crank is secured to a shaft D which is supported in pillow blocks secured to the lower part of the frame J and is fitted with a belt pulley *w* by which it is turned, the belt E which drives this pulley is itself driven by a pulley X on the main driving shaft A. The latter is supported on pillow blocks secured to the lower portion of the extremity of the frame, one of its ends being prolonged beyond the pillow block to support a fast pulley *k* and loose pulley *l* to which the main driving belt is applied by means of which motion is communicated from the prime mover to the shaft A; this shaft is also fitted with a worm or endless screw K which gears into a worm wheel L on one end of the shaft M; this shaft rests in pillow blocks on the lower portion of the frame and has an endless screw N secured to it which gears into a worm wheel O on a shaft P; the latter lies across the lower part of the frame in suitable bearings and is fitted at its outer end with a notched disk R by means of which the shifting of the belt from the fast to the loose pulley, and consequently the stopping of the machine, is effected whenever the shaft P has accomplished a complete revolution. In order that this operation may be effected by means of the notched disk the shipper Y is pivoted to a bracket at the side of the frame, its outer forked arm embraces the belt while its inner arm is fitted with a pin which rests against the face of the disk R, and is thus held in a position to keep the belt running on the fast pulley except when the disk is turned to such a position that the pin on the arm of the shipper can be forced outward through the notch, by a spring or otherwise, and thus throw the belt on to the loose pulley.

On the under side of the lower jigger plate and parallel therewith is a shaft *i* which is supported in suitable bearings and is fitted at each extremity with a short arm *j* that projects in nearly a horizontal direction from the shaft; the outer extremities of these arms take into notches in the side of upright bars Z, Fig. 1, which are constructed to slide vertically in suitable boxes secured to the main frame, so that when the arms are turned up or down by the turning of the shaft, the bars will be raised or lowered. The shaft *i* is turned when necessary, to raise the bars by means of a hand lever *m* which is secured to the hinder extremity of the shaft. When the bars are raised their upper extremities strike the lower faces of the upper jigger plate and raise it from the lower plate, and when the bars are lowered the upper jigger plate is lowered also. The use of this arrangement for raising and lowering the upper jigger plate is that the plate may be raised off the jiggered bat to permit it to be wound on the cloth roller, and to bring another length of bat between the plates to be jiggered, when the plate is again lowered.

The tables S, S′, each consist of a strong frame joined in any suitable manner to the jigger frame; their width should equal the length of the jigger plates; the length of the table S′ should be such as to afford room for the convenient rolling up of the division sheets *b*, *b′* and of the cloth of three hardened bats at least, and the table S should be of sufficient capacity to support and admit of the free manipulation of as many bats and their division sheets, together with sufficient room for the steam chamber T. The latter consists of a shallow pan or tray of the same length and breadth as the jigger plates, and covered with a perforated plate, or with wire gauze or other material which will permit the free passage and equal distribution of the steam through it. The steam is admitted to the tray from pipes *n* which enter its bottom, and are connected with cross tubes *n′* within it, which discharge the steam through numerous adjustages at different points so as to distribute it more equally throughout the whole tray than could be done if the steam issued from a single orifice; the object for which an equable distribution of the steam within the chamber is maintained is that the bat or bats lying upon the perforated plate may be equably permeated and heated by the steam passing through it, which operation is found to be essential to the production of cloth of uniform texture. Steam may be supplied to the steam chamber by the boiler of the engine which drives the jigger, or by a separate boiler provided specially for the purpose, and any water resulting from the condensation of steam in the steam chamber is discharged through a tube in the bottom of the latter. The perforated top of the steam tray or chamber is flat and should be placed in the same plane with the upper surface of the lower or stationary jigger plate, and the top of the tables, in order that the carrier sheet and the bats may lie flat upon its surface and thus be equally exposed to the action of the steam.

All the division sheets extend across and between the jiggering plates, the lowermost of the sheets (*a*) is the carrying sheet. It is wound upon windlasses or rollers *o*, *p*, mounted in suitable bearings upon the outer extremities of the tables; each roller has a winch *r*, *s*, attached to one of its extremities by means of which it may be conveniently turned. The bat *d* is wound upon a roller *t*

and placed upon the carrier sheet in such position that it can be unwound as the sheet is moved along by the windlass toward the opposite table, the hardened bat or cloth *e* is in like manner wound upon a roller on the opposite table. Upon the bat *d* a division sheet *b* is placed; this sheet is wound upon rollers which are similar to those around which the bat is wound, and lie loosely upon the bat. A second bat *d'* wound upon a roller is spread upon the division sheet *b* in precisely the same manner as the first bat *d* is spread upon the lower carrier sheet *a*, and this second bat is covered by a third sheet *b'* spread over it in precisely the same manner as the second sheet *b* is spread over the first bat *d*. In this manner any suitable number of bats with their carrier and division sheets may overlie each other and be steamed and jiggered at the same time, it being in all cases necessary that there should be a sheet interposed between the adjacent bats to prevent them from felting together, and that the uppermost bat should be covered by a sheet.

The division sheets may be made of any material of which sheets are ordinarily made, but I prefer to use thin, but open and stout cotton-sheeting or canvas for the purpose as it works better than anything else that I have tried.

The operation of jiggering a bat is as follows: The upper jigger plate is raised by depressing the lever handle which turns the shaft *i* and forces the bars Z upward, the carrier sheet *a* is now unwound from the windlass on the table S and wound upon the windlass on the table S' until the ends of the bats spread between the sheets are brought over the steam chamber as shown in Fig. 1; steam is then admitted to the steam chamber and is allowed to permeate the bats, which are soon raised to the temperature of the steam, when they are ready for jiggering; the hand of one attendant is next applied to the winch of the windlass *p*, and the latter is turned until a sufficient length of the carrier sheet is wound up to draw the steamed portions of the bats between the jigger plates, another attendant in the meantime by turning the winch *r* unwinds the carrier sheet from the windlass *o* as fast as it is taken up by the other windlass, and also unwinds the bat and the several division sheets by turning back toward the windlasses, their respective rolls; the upper jigger plate is now let down upon the steamed portion of the bat by raising the lever *m* and thus lowering the slide bars Z on which the plate is held up; the inner arm of the shipping lever Y is then moved in toward the machine to shift the main belt from the loose to the fast pulley and thus put the main shaft A in motion; as this shaft revolves it imparts a rotary motion by means of the belt E to the crank shaft D; and the latter, by means of its crank, gives an alternating motion to the pitman H, which in turn oscillates the arm V, and through it communicates a similar motion to the rock shaft G; as this shaft rocks, it communicates, through its connecting rods, a rapid tremulous or vibratory motion to the upper jigger plate B'. The main shaft A at the same time puts into operation the train of worm gear which turns the disk shaft P; the worm K on the main shaft driving the wheel L on the shaft M, and the worm on the latter shaft driving the wheel O on the shaft P, the speed being by this means geared down or reduced so that in the present instance the notched disk R will make one revolution for every twenty two hundred vibrations of the jigger plate B'; the moment the disk begins to turn, its notch Q is carried past the pin on the arm of the shipper Y, the inner face of the disk will therefore hold this arm of the shipper in the proper position to keep the belt on the fast pulley until the notch, after performing a complete revolution, again comes around to the pin, when the weight or spring acting against the back of the shipper Y and constantly tending to push it outward, being no longer resisted by the face of the cam, will move the shipper and shift the belt to the loose pulley, thus stopping the machine.

As soon as the machine stops the upper jigger plate is raised as before described, and the windlasses are turned to draw the jiggered portions of the cloth from between the jigger plates. As these portions are drawn out fresh portions of the bats, which have been steamed while the preceding portions were being jiggered, are drawn between the jigger plates, and are subjected to a repetition of the operation above described. As the jiggered bats, which have been condensed and hardened by the operation, are drawn out, they are wound up in rolls upon the delivery table S', and the several operations of steaming and jiggering are continued until every portion of the bats has been alternately subjected to the two operations. The rolls of cloth are then removed from the machine and fresh rolls of batting are substituted in their place.

As each portion of the bat is subjected to the same number (2200) of vibrations of the upper jigger plate, which is either loaded with weights or consists of a solid cast iron plate weighing in the present instance upward of one ton, each portion will be reduced to the same texture so far as this can be accomplished by equal pressure and jarring. What is true in regard to the operation of the machine in jiggering one bat is true in regard to that of jiggering any number overlying each other, and it is found

in practice that it is a great advantage to jigger several bats at the same time say from two to five because a greater uniformity of texture is thereby obtained which is believed to result from the greater mass presented by the overlying bats which retains the heat and consequently the steam in an uncondensed state for a longer period,—from the greater space or play afforded by several thicknesses for the tremulous motion imparted by the jigger-plates, as well as from the irregularities in the thickness of one bat compensating those in others, so that the mean thickness of the whole will be more nearly uniform than that of any single bat and consequently the pressure upon every portion of each bat and the condensation, compacting, hardening, or felting of the fibers produced by the jarring and pressure will be more nearly the same on every part of the resulting fabric whether thick or thin.

It is to be observed that the jigger plates must only have such an amount of motion to and fro as will produce a jarring of the bat, it would not answer to exceed this motion, for in that case the bat instead of being condensed into a homogeneous cloth of even texture would be worked into a series of hard parallel rolls scarcely held together by the few fibers that would be left between them; 1/16 part of an inch is found in practice to be a good range for the alternations or vibrations of the plate.

I have hitherto described the upper jigger plate alone as being put in motion, but the lower may likewise be moved and in some cases it is believed with great advantage. I therefore propose to give to the under plate a motion similar to that I have described as being given to the upper plate but at right angles or obliquely thereto; both having a rectilinear movement; or one only and the other having a curvilinear movement; or both having the latter; both also having one equal range of motion, or one having a greater and the other less; or both having one uniform range of motion, or one constantly varying being greater at the beginning with less pressure, and less toward the end of the operation with increased pressure.

From the results of the changes heretofore made to gain an increased movement of the fibers of the bat among each other, and increased pressure upon them while in motion and a more effectual steaming I am led to believe that an augmented effect of each of these elements of the process will prove highly beneficial and therefore propose the changes above specified in the motion of the jigger plates together with the employment of steam of high pressure.

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

1. The method herein described of hardening the bat by alternate steaming and jiggering substantially as herein set forth whereby one section of the bat is jiggered while an adjoining section is steamed preparatory to being jiggered.

2. I also claim the process of steaming and jiggering two or more bats simultaneously, whereby much labor and time are saved and the texture of the cloth is improved.

3. I also claim constructing a machine for jiggering felt bats in such manner that it will subject successive portions of the bats to equal amounts of jiggering and then stop, whereby a greater uniformity of texture is secured in the cloth.

4. I also claim the arrangement of the steam-pipes and adjustages in the steam chamber substantially in the manner and for the purpose herein set forth.

In testimony whereof I have hereunto subscribed my name.

GEO. G. BISHOP.

Witnesses:

CHARLES T. LEONARD,

GEORGE A. DAVENPORT.