R. EICKEMEYER.

Process of Stiffening Hats.

No. 167,513. Patented Sept. 7, 1875.

Fig. 1

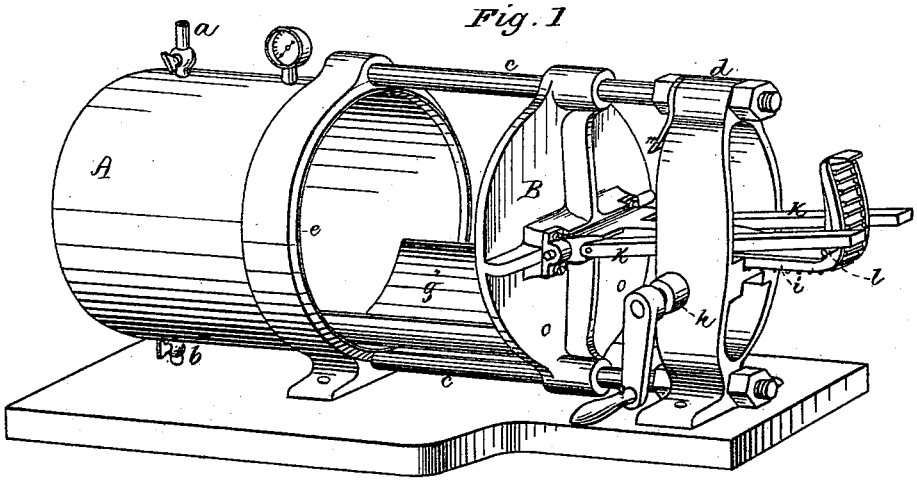


Fig. 2

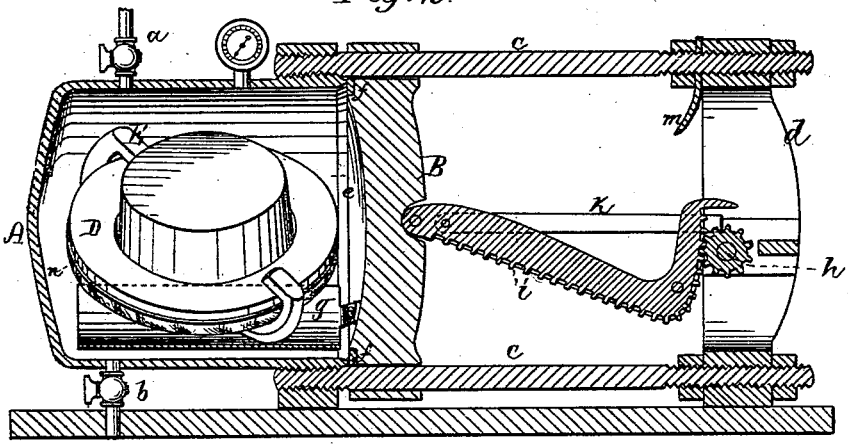


Fig. 3.

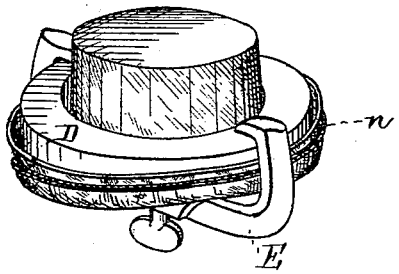
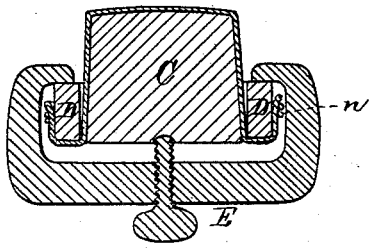


Fig. 4



Witnesses:
A. B. Gauldwell
Edmund Masson

Inventor:
Rudolf Eickemeyer
By. Wm. Wood. Attorney
per P. F. Garner asso- atty

UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK.

IMPROVEMENT IN PROCESSES OF STIFFENING HATS.

Specification forming part of Letters Patent No. **167,513**, dated September 7, 1875; application filed March 23, 1875.

To all whom it may concern:

Be it known that I, RUDOLF EICKEMEYER, of the city of Yonkers, county of Westchester, in the State of New York, have invented a certain new and useful Process of Stiffening Hats and other felted goods composed of wool or fur; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and accurate description thereof.

Heretofore, in the manufacture of felted goods composed of wool or fur, such, for instance, as hats, caps, and other articles of wearing apparel, great difficulty has been experienced in giving them a capacity for retaining their desired shape regardless of wear and exposure. Prior to my invention felt hats, whether composed of wool or of fur, have always been stiffened by the use of more or less stiffening material, in order that they might, as far as possible, be capable of retaining through ordinary usage the shape imparted to them on the finishing-blocks; and hats, as heretofore treated, have depended solely upon the quality or quantity of the stiffening matter used for the durability of their shape-retaining capacities. So far as my knowledge of the art extends, hats of the class referred to have heretofore always had the "stiff" applied thereto, either while in the conical form and prior to the development of the crown and brim, as effected by stretching or blocking, or after some slight preliminary blocking operation. The stretching operations necessarily displace the fibers from their normal condition, as in the conical hat-body, and there subsequently exists a constant tendency for it to lose its finished shape and return to said conical form. This tendency is partially overcome by the presence of the stiffening matter; but as the power of the latter is weakened by wear and exposure, the hat gradually resumes the original conical form of the body, and, as it is expressed in the trade, the hat "goes to seed."

One of the principal novel features of my invention is to stiffen the fabric and set the fibers of the felt, whether they be of wool or of fur, after the felted article has received its final shape or form, so that whether stiffening matter be used or not, the article, although long used and exposed, will retain its desired shape, thereby practically overcoming the tendencies heretofore existing for said articles to resume objectionable forms which are necessarily incident to the earlier stages of their manufacture.

Under my novel process, without the use of stiffening matter, I produce what is known as a "soft" wool or fur hat, possessing the required degree of stiffness, and a degree of desirable elasticity never before attained to my knowledge. Hats known as "full stiff" and "half stiff" are also produced under my process by the use of less than half the quantity of stiffening matter heretofore used for effecting the same purpose.

Stiffening matter has heretofore been applied to the fabrics either in a pasty condition or in solution. When applied in solution the conical hat-bodies are dipped therein, and when withdrawn are subjected to pressure after the manner of wringing for expelling the excess of solution which they naturally absorb. When the pasty stiff is used it is applied with a brush after the hat has been but partially shaped by blocking. The hats, when treated by either of these methods, have heretofore been then placed in a steam-box until well heated and the stiff has fully penetrated the felt. This heating in the steam-box results in a partial setting of the fiber, while the hat-body is either cone-shaped, as in one case, or only partially shaped by blocking, as in the other instance referred to. This setting of the fiber at either of these intermediate stages of the manufacture is detrimental rather that otherwise, because the execution of the final operations of stretching or shaping and block-finishing is rendered all the more difficult because of this steaming operation, and the setting of the fibers incident thereto.

The novel feature in my process, which consists in stiffening hats and other felted articles, after they have been fully stretched and blocked on the finishing-blocks, is accomplished by subjecting them to a steam-bath while properly secured on blocks corresponding in shape with the finishing-blocks, whereby, whether with or without the use of stiff-

ening matter, the felted fabric, whether of wool or of fur, is condensed, hardened, stiffened, and set in the shape or form required by the trade.

Under my novel process, without the employment of any stiffening material, I can produce those known as soft hats, and also those known as half stiff. In the manufacture of so-called full stiff hats this novel feature referred to is also of value, in that the operations of stretching and blocking on the finishing-block are first completed, and to the fully-shaped hat about one-half of the heretofore-used quantity of stiff is applied with a brush, after which, while on a full-shaped block and secured thereto, it is subjected to the steam-bath, resulting not only in setting the fiber, as when no stiff is used, but also causing the stiffening matter which is employed to be well incorporated with the fabric. In some classes of hats an extra stiff brim is required. Heretofore it has been difficult to properly proportion the stiffening matter to brim and body, but under my process no difficulty is experienced, as the stiffening matter may be applied only to the brim, the body being sufficiently stiffened solely by the steam-bath.

Among the advantages of my novel process are, as in soft hats, the economy resulting from not using any stiffening matter whatever, and a partial saving in cost of labor heretofore requisite for its application. Also, in half or full stiff hats, that economy which results from the saving of at least half the value of the stiffening matter heretofore employed, and in large manufactories this is an item of considerable importance.

In addition to this saving effected by my novel process, another valuable result accrues in that the felted fabrics, properly stiffened by this reduced quantity of stiffening matter, present a much clearer and softer appearance, and their durability is greatly increased.

The manufacture of seamless felted wearing apparel has, to a great extent, been abandoned, by reason of such garments speedily losing their shape when exposed to wear and the weather. Felted goods of this class condensed, stiffened, and set by my process, while on a shaping-block, will not be liable to lose the form imparted thereto by the block, and at the same time they will possess the desired degree of elasticity and durability.

My invention further consists in a novel apparatus adapted for convenient use in practically stiffening hats under my novel process. Said apparatus is composed of a steam-tight chamber, provided with suitable pipes, a detachable head, and means for readily attaching and detaching said head during its use; and my invention still further consists in the novel combination of a crown-block, rim-block, and screw-clamp, for preventing a hat from shrinking out of shape during the stiffening operation.

In the drawings, Figures 1 and 2 represent a novel apparatus practicably adapted for stiffening hats by my novel process. Figs. 3 and 4 represent, in perspective and section, a hat with clamp ready for stiffening.

In connection with the apparatus, A denotes the steam-chamber. It should be composed of suitable metal, and so constructed as to enable it to safely withstand a steam pressure of, say, from sixty to eighty pounds to the square inch, and so arranged as to afford free and convenient access to its interior. It is provided with a steam-pipe, as at *a*, and preferably with a condense-water pipe, as at *b*, both having suitable cocks. To enable the pressure of steam to be accurately determined, the chamber will be provided either with a steam-gage, as shown, or, instead thereof, a graduated escape-valve may be employed. B denotes a detachable head. It is mounted on slide-rods *c*, which extend from the chamber to a standard, as at *d*, on which the head can slide to and from the opening of the chamber. Any suitable means may be employed at the points where the head and chamber are in contact to effect a steam-tight joint. In this instance I have provided the chamber at its open end with a sharp annular edge, as at *e*, and the head on its inner face with an annular packing-ring of soft metal, as at *f*. When the edge *e* and soft metal are brought into contact under pressure a steam-tight joint is effected. Instead of the soft metal, a rubber gasket may as well be employed, in which case the edge of the chamber will preferably be rounded to afford considerably greater packing-surface. To the inner face of the head a carrier, *g*, is secured, which conforms more or less closely to the lower walls of the chamber. This carrier is somewhat elevated at its inner end, in order that the charge of hats may be more securely retained thereby during the outward movement of the head, and also so that condense water may freely flow therefrom through an open space near the head.

It is, of course, important that the operation of adjusting and removing the head be performed with dispatch, and at the same time it is important that said head be securely held against the immense pressure of the steam when in position. I have therefore combined with the head a moving and locking mechanism, which is operated by a crank.

The standard *d* is a bow-shaped structure of cast-iron, and is firmly attached to the chamber by the rods *c*, and mounted on a suitable base. At right angles to the rods, a little below a central point between them, the crank-shaft *h* is located on the standard, and provided with bearings on each side thereof. To the center of the head B, on its outer surface, a rectangular rack-gear, *i*, is hinged by means of a heavy joint having extensive bearings independent of the hinge-pin. The rack-gear engages with a small gear on the crank-shaft. The rack-gear *i* carries, on each side, a locking-bar, *k*. These bars are hinged to the rack, and have also extensive end bearings against

the rack, which are also independent of the hinge-pin. Within the bow of the standard, above the crank-shaft, are two solid abutting shoulders, one on each side of the rack, and exactly in line with the locking-bars *k*. When the crank-shaft is turned in one direction the gear thereon engages with the rack-gear, and carries the head to the chamber and closes it. The rectangular portion of the rack is then carried downward, and so forces the head with great pressure against the chamber. The locking-bars then fall to a horizontal position, with their outer ends abutting against the abutting shoulders before referred to as being on the standard within the bow. By this abutment of the locking-bars with the standard it is obvious that no pressure can move the head so long as the standard is maintained in position by the rods *c*. When the crank is turned in the opposite direction the outer end of the rack-gear is elevated; and the pins *l* on the rack, by engaging with the under side of the locking-bars, lift them from contact with the abutting shoulders, and the head is freely withdrawn by the rack and crank gear.

Similar locking and operating mechanism is described in Letters Patent heretofore issued to me in another connection, and therefore constitute, in themselves, no portion of my present invention.

In order to cause the rack and crank gear to maintain working relations at the time the outer end of the rack is fully raised, a guiding-surface, as at *m*, is provided, which assists the gear in imparting the initial backward movement to the rack.

The condense-water pipe, as shown, although of value as a means for reducing pressure within the chamber, when desirable, may be dispensed with as a condense-water discharger by having the front or open end of the chamber slightly lower than the rear end, so that the condense water incident to each operation will be freely discharged on the removal of the head, the carrier *g* being sufficiently above the lower side of the chamber to keep the hats out of the water. It is important, however, to provide for a discharge of the steam from the chamber before starting off the head, and a pipe could therefore be provided for that purpose, which, from its location, might not be able to operate as a duct for the waters of condensation.

For practically stiffening hats by my novel process it is impossible to present inflexible instructions. Felted fur, for instance, requires a longer time and a greater pressure of steam than woolen felt. So also do differently-colored hats require variable treatment, for the reason that some colors are employed which, of themselves, as well as the mordant employed therewith, variably affect the fibers of fur and wool.

By steaming the fabric it is condensed or hardened, and thereby stiffened. A shrinking of the fabric is an attendant result; and, as the hats are not subjected to the steam-bath until after they are shaped by stretching and blocking, it is of importance that during the steaming process the hats be so controlled as to permit shrinkage only in lines at right angles to the outer and inner surfaces of the hat; or, expressed in different terms, shrinkage is prevented, except such as will render the fabric firmer and thinner. To control the shrinkage, as aforesaid, the full-shaped hat is placed upon the block C, which has a form corresponding with that of the finishing-block. A rim-block, D, is then placed on the upper side of the hat-rim. The edge of the hat-rim is then tightly drawn up around the edge of the rim-block, and secured thereto by means of a wire or cord, as at *n*, which operates in conjunction with an annular groove in the edge of the rim-block. A detachable screw-clamp, E, is then applied, which has two bearings on the upper side of the rim-block at opposite points, and a central screw, which bears on the lower side of the inner block C at its center. By turning the screw the hat-block C is forced inward, and the hat thereby properly strained at its rim, side, crown, and tip. When thus clamped and held the hat is subjected to the steam-bath.

The steam-chamber may be constructed of any convenient size; for instance, with a capacity of containing one dozen hats on their blocks. I find it preferable to clamp as many as six hats, or even more, on one block, one over the other, and to stiffen, at one operation, all of them, which requires but a little more time than is requisite for stiffening a single hat. Therefore, in a chamber capable of containing about one dozen clamping-blocks, it will be possible to stiffen, say, six dozen hats at one operation.

As instances of the variable treatment in the stiffening of hats by my novel process, I will state that I have properly stiffened black wool hats in about thirty minutes with steam at about fifteen pounds pressure to the square inch. Light-colored wool hats I have properly stiffened in about the same length of time with steam at about twenty-five pounds pressure. I find that fur hats can be well stiffened in about thirty minutes with steam at about forty-five pounds pressure. The stock in fur hats so stiffened is in no manner injured, and the hats have a degree of desirable elasticity which, as I believe, has never before been attained in the art.

I do not lay down as absolute the above pressures and lengths of time, as the time and pressure must necessarily be varied in accordance with the character of the stock in the hats, as will be readily comprehended by persons skilled in the art.

Light colored hats stiffened by my process are not liable to be spotted in the operation, as is frequently the case when stiffening matter is employed as heretofore; and in this connection it will be well to state that the interior of the chamber should be so lined that light-colored goods cannot be endangered by stain from iron-rust. Hats stiffened by my

process are not materially affected by moisture, as has been evidenced by a test, in which the curled rim of one of them was filled with water for several days, without in any material manner affecting its symmetry, stiffness, or elasticity. The process of stiffening as heretofore practiced resulted merely in imparting to the hat a short-lived capacity for retaining its shape, without in any manner contributing to its intrinsic value, while my novel process not only results in all that was heretofore attained, but, in addition thereto, increases the life of its capacity for retaining its shape to an extent almost equal to the life of the hat, and actually improves the hat by increasing the solidity and elasticity of the felted fabric, and giving it greater durability.

Whenever it is desirable to produce soft-finished hats, with half-stiff or full-stiff brims, I apply to the brims about one-half of the quantity of stiffening matter heretofore employed for attaining a half or full stiff, as the case may be, and then subject the hats to the steam-bath in like manner as already described. The same lessened proportion of stiffening matter is employed by me for rendering the entire hat half-stiff or full-stiff.

It will be understood that steam-chambers, however constructed, provided they have a capacity for containing the hats, are readily accessible and rendered steam-tight, may be employed for stiffening hats under my process, and that I have purposed, by that portion of my invention which relates particularly to the apparatus, the production of means having a practical value by reason of the facility afforded for safe and rapid operations.

It is well known to persons skilled in the art that hot water and steam have long been used in various stages of the manufacture of felted goods. In stretching hats and other articles steam and hot water have been employed for warming and softening the fabric, in order that the stretching could be more easily effected with decreased liability of injury by rupture. I am not aware, however, that prior to my invention hats or other felted goods have ever been stiffened in whole or in part by subjecting them to a steam-bath after they have been fully shaped, and while they were securely confined on blocks.

Having thus described my invention, I claim as new, to be secured by Letters Patent—

1. The novel process of stiffening hats and other felted articles, which consists in subjecting them to a steam-bath after they have been shaped on a finishing-block, and while they are secured on blocks, which prevent them from shrinking out of shape, substantially as described.

2. The improvement in the art of stiffening hats and other felted fabrics, which consists in applying thereto the stiffening matter after they have been properly stretched and shaped on a finishing-block, and subsequently subjecting them to a steam-bath while secured on blocks which retain them in the shape imparted by the finishing-block, substantially as described.

3. An apparatus for stiffening hats, composed of a steam-tight chamber, provided with a suitable induction-pipe, a sliding head adapted to form a steam-tight joint, with an opening in the chamber, and a locking device for securely holding the head under pressure against the chamber, substantially as described.

4. The combination, with a steam-chamber, of a sliding head, rack, crank-shaft, locking-bars, and abutting standard, substantially as described.

5. The combination of the crown-block, rim-block, and screw-clamp, substantially as described.

RUDOLF EICKEMEYER.

Witnesses:
GEORGE NARR,
JOSEPH H. TARBELL,
JAS. G. WOODWORTH.