(No Model.)

J. T. WARING.

Machinery for Felting Hat Bodies, &c.

No. 231,125. **Patented Aug. 10, 1880.**

Fig 1.

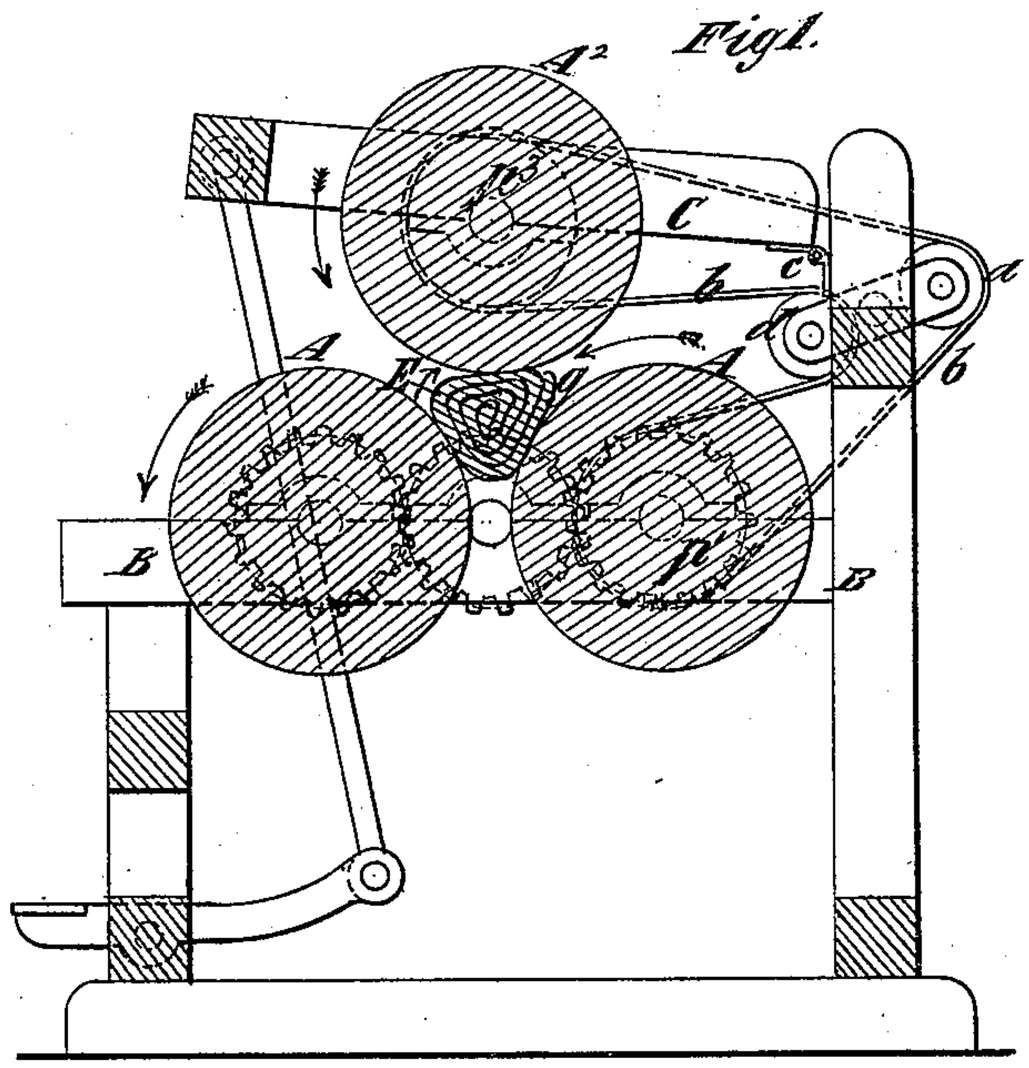


Fig 3.

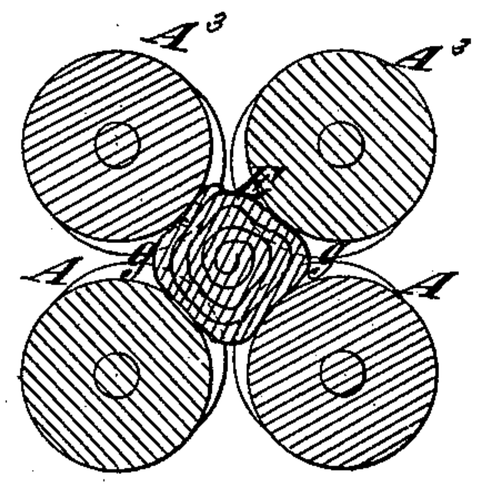
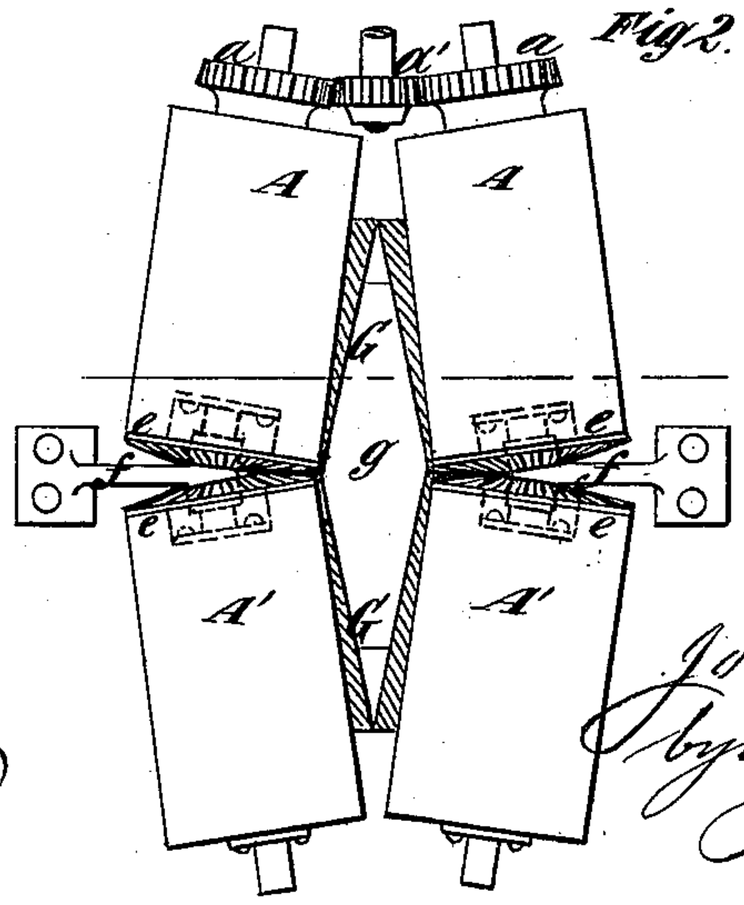


Fig 2.



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JOHN T. WARING, OF BOSTON, MASSACHUSETTS.

MACHINERY FOR FELTING HAT-BODIES, &c.

SPECIFICATION forming part of Letters Patent No. 231,125, dated August 10, 1880.

Application filed July 2, 1880. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. WARING, of the city of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machinery for Felting Hat-Bodies and other Articles, of which the following is a specification.

This invention relates to that description of sizing-machines for felting hat-bodies and other articles the principal elements of which are a series of rollers arranged side by side in a group so as to have a cavity between them, in which a roll of hat-bodies or other articles is placed and subjected to a rolling and pressing operation. Such machines are commonly provided with either three or four rollers, but might have a greater number.

These rollers have been arranged with their axes parallel to each other and of equal diameter throughout, leaving a cavity between the rollers of uniform size from end to end thereof; but in my Letters Patent No. 228,704, dated June 8, 1880, I have described a machine in which the rollers have a longitudinal profile of such curved, concave, or taper form that there is formed between said rollers, for the reception of a roll of hat-bodies or other articles, a cavity or pocket which is larger at the middle of the length of the rollers, and tapers toward the ends thereof, by which means I prevent the extension in a longitudinal direction of the roll of hat-bodies or other articles placed between the said rollers, and thereby obtain a more rapid shrinking or sizing.

The object of this invention is to provide another means of making such taper cavity or pocket; and to this end it consists in a sizing-machine for felting hat-bodies and other articles, comprising a series or group of three or more pairs of rollers, the rollers of each pair being placed end to end, and the rollers so arranged that their axes all converge from the meeting ends of the rollers of each pair in opposite directions, whereby there is formed between them, for the reception of a roll of hat-bodies or other articles, a cavity which is larger at the middle of its length and smaller at the ends.

It also consists in a sizing-cloth of novel construction, for use with the above-described arrangement of rollers, or other rollers for felting hat-bodies, the said sizing-cloth having its thickness increasing from the middle of its width toward the edges thereof.

In the accompanying drawings, Figure 1 represents a transverse section of a sizing-machine embodying my invention and having three pair of rollers. Fig. 2 represents a plan of the two lower pairs of rollers, and Fig. 3 represents a transverse section of a group of four pairs of rollers.

Similar letters of reference designate corresponding parts in all the figures.

A A A′ A′ (see Figs. 1, 2, and 3) are two pairs of rollers, which are arranged in bearings in a stationary frame, B.

C designates a frame, hinged at *c* to the main frame B, as shown at Fig. 1, and having upon or in it bearings for a third pair of rollers, one only of which, A^2, is here shown. In lieu, however, of the one pair of rollers, the hinged frame C might have two pairs of rollers, arranged like the rollers A^3 A^3. (Shown in Fig. 3.)

The rollers A A are so geared together by gears *a a* and an intermediate gear, *a′*, that the said rollers rotate in the same direction.

The roller supported in the hinged frame C is so driven by a belt, *b*, running from a pulley, *p′*, on the shaft of one of the rollers A, and over guide-pulleys *d d* to a pulley, p^3, on the shaft of the roller A^2, that the roller A^2 rotates in the same direction as the rollers A A′.

If desirable, the upper roller or rollers might be driven by gearing in lieu of the belt *b*.

The two rollers of each pair are arranged end to end, and, as clearly shown in Fig. 2, are connected by bevel or crown gears *e* upon the adjacent ends of the rollers of each pair. The meeting-shafts of each pair of rollers are supported in common bearings *f*, as shown in Fig. 3, or in separate bearings.

The axes of each pair of rollers are not in line, as shown clearly in Fig. 2, but are placed at an angle to each other, the axes of the rollers A A A^2 all converging in one direction, while the axes of the rollers A′ A′ and the roller connected with A^2 all converge in the opposite direction. This arrangement of the rollers creates a cavity or pocket, *g*, between

them, which is largest at the meeting ends of the rollers of each pair, and tapers gradually toward each end.

The rollers are here represented as of uniform diameter throughout; but if desirable the rollers of each pair might be tapered from their adjacent ends outward, they being largest in diameter at their inner ends, or tapered from their outer ends inward, they being largest at their outer ends.

Although the rollers here shown have smooth surfaces, they might have irregular surfaces formed by attaching ribs to them, by providing their surfaces with knobs or projections, or in any other desirable way.

As here represented, the sizes of the gears or pulleys for imparting motion to the several rollers are such that all the rollers are rotated at a uniform circumferential velocity; but if desirable the circumferential velocity of certain of them might be varied by changing the gearing so as to rotate them at different axial velocities, or making certain of the rollers smaller in diameter than the others and rotating them at the same axial velocity.

The hat-bodies or other articles to be felted may be rolled into a roll, E, in the usual way, in an ordinary sizing-cloth, or one having an irregular surface, like that forming the subject-matter of United States Letters Patent No. 227,331, granted to me May 4, 1880, and afterward placed between the rollers in the cavity *g*, as shown in Fig. 1, and the operation of felting effected in the usual way.

The cavity *g* being largest at the middle and taper toward the ends, the tendency is to gather in the roll E lengthwise or prevent its longitudinal extension, and thereby to obtain a more effective and rapid shrinking or sizing of the hat-bodies or other articles.

If desirable, a sizing-cloth, G, of the kind represented in transverse section in Fig. 2 may be employed. This sizing-cloth may be made of rubber or other material, and, as clearly shown, is thinnest at the middle of its width, and is of gradually-increasing thickness from the middle toward each edge. If desirable, this increased thickness of the sizing-cloth at the edges may be produced by attaching taper lags or ribs to a cloth of uniform thickness throughout.

Though this sizing-cloth is only here represented in connection with rollers arranged according to my present invention, it might be used in connection with rollers the axes of which are parallel, to produce a pocket or cavity larger in the middle and tapering toward the ends.

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

1. In a sizing-machine for felting hat-bodies and other articles, a series or group of three or more pairs of rollers, the rollers of each pair being placed end to end, with their axes at an angle to each other, and the several rollers so arranged that their axes converge from the meeting ends of the rollers of each pair in opposite directions, whereby there is formed between the said rollers, for the reception of a roll of hat-bodies or other articles, a cavity which is larger at the middle of its length and smaller at the ends, substantially as and for the purpose herein specified.

2. A sizing-cloth for felting hat-bodies and other articles, having its thickness increasing from the middle of its width toward the edges thereof, substantially as and for the purpose herein set forth.

JOHN T. WARING.

Witnesses:
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