

IMPROVED HAT-MAKING MACHINERY.

The manufacture of felt is a very simple process, and so ancient that it was probably in use long before textile materials, prepared by the comparatively complicated processes of spinning and weaving, were invented. Tradition states that St. Clemens, the patron saint of the hatters, put wool on his sandals to protect his feet, which had become sore by long marches; and he found that, after a short time, the wool became felted together into a fabric. He commenced making cloth by a similar process, and applied the material to the manufacture of hats. But there is reason to believe that the capability, which some kinds of hair and wool possess, of being felted, was known long before St. Clemens' time, as felt goods have been very long in use in China, and the ancient Greeks and Romans unquestionably wore felt hats.

If the hair or wool is capable of being felted, if it will adhere together when subjected to pressure or friction, the process is a very simple one. An examination with a microscope will at once tell if the hair is suited to the purpose: if the hair be smooth, consisting of a single cylindrical fiber, it cannot be felted at all; but the hair of beavers, rabbits, hares, and some other animals possesses, on each principal fiber, points which project obliquely, as shown in Fig. 1. When a mass of such hair is moistened and subjected to heat, pressure will cause the oblique fibers to entangle, and in a short time the hairs will be so intimately connected that a fabric equal in durability to a woven stuff will be formed.

The best hats are made of beaver hair, and hence the cheap silk imitations of the finer kinds are commonly called

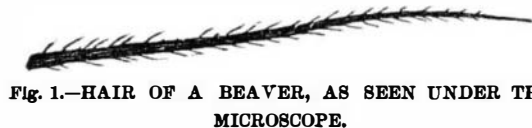


Fig. 1.—HAIR OF A BEAVER, AS SEEN UNDER THE MICROSCOPE.

beavers; commoner qualities are made from the hair of otters, musk rats, and other small animals; and others, still inferior, are made from sheep's wool, but this requires a treatment different from that for hair. Some kinds of hair, notably that of the hare, needs to be treated with a solution of the nitrate and chloride of mercury, and arsenic is applied to the skin before the hair is removed, to better adapt the hair to the felting operation. A very excellent felt for hat-making purposes is made from the fur of a large species of water rat, somewhat resembling an otter; it is a native of South America, and more than a million of the skins are annually exported from that continent for the purpose.

Originally hair was felted by being pressed together into a loosely adhering mass, and then suddenly plunged into hot water. The heat and moisture caused the hair to curl slightly, and the oblique fibers to interlock and hold the mass together in a tough fabric, which was then laid on a flat surface and repeatedly rolled with a round stick; it was then dipped again, and the rolling operation repeated. By this means a very solid sheet of felt was obtained, which, moreover, was quite plastic, and could be shaped over any smooth block, and was therefore well adapted for use in making hats. However, it was long since found that this process was tedious and expensive, and it has been abandoned in all countries where the hat manufacture is of any importance, such as the United States, England, France, and Germany. In these countries, where the trade is one of great extent and value, very expensive and elaborate machinery is employed; and the method now in use in the factories was originated by M. M. Laville and Crespin, hatters of Paris, France. It consists mainly in mixing the hair in a series of large boxes communicating with each other. The hair is first conveyed on an endless belt of cloth to a cylinder, provided with fans, and rapidly revolved in the first box, in the sides of which are placed glass windows, through which the hair can be seen kept in violent commotion by the wind from the cylinder fans. The finer hairs soon adhere together, and the coarser, which are unsuited for felting, fall in a drawer in the bottom of the box, from which they are readily removed. The mass of finer hair is then placed on a felting machine, called in French *une batisseuse*. This is done by women, as shown in our Fig. 2, who spread the hair on an endless belt of linen, T, by

which it is carried forward to a pair of rollers, V, which deliver the hair to a large rotary brush placed in the lower part of the case, A. The action of this brush is peculiar, and it forces the hair through the end of the case, A, in which is a long perpendicular slit, in front of which stands a cone, C, made either of sheet copper perforated with holes, or of fine wire gauze, and covered with a cloth which is kept moist. The cone is revolved by a vertical axis, and the air is exhausted from its interior, through the box-shaped base on which it stands, by an air pump. The hair ejected

After the hat is thus made, it needs to be shaped, dyed, and finished, the last operation consisting of polishing, ironing, and trimming. The polishing is done on a machine represented in our Fig. 3, the conical felt being drawn over a metal form and manipulated till it fits tightly. The edge or brim is then worked into shape, and trimmed to the proper dimensions; the hat is then placed on a rapidly rotating block, F, and a wire brush is pressed against it to remove superfluous hair. Pumicestone is applied to smooth the fabric, and sealskin to produce a polish. The lower side of the

brim is finished by putting the hat, inverted, in a hollow form, the rim resting on a projection. The loose hair is removed by an air blast, through pipes, T, by which the hat is kept free from dust, etc., while under treatment.

Although this system, somewhat varied and improved, is in use in this country, the hat-making operations have never been exhibited in any of our industrial expositions. The process was shown in Paris, in 1867, and in Vienna, in 1873, and was in each case a very interesting and attractive display, finished hats being placed before the spectators in 15 or 20 minutes after the commencement of the operation. Good practice, however, requires much more time, as the dyeing and subsequent drying are slow processes; and if the felt be hurriedly made, it will not possess much durability. If any

Fig. 2.—HATTER'S FELT-MAKING MACHINE.

through the slit in case, A, is attracted to the cone by the suction; and the revolution of the cone on its axis soon causes it to be uniformly covered with a fine felted fabric. The slit can be closed with a sliding board, by manipulating which the operator is enabled to direct the stream of hair to any desired zone on the conical mold, as shown in the engraving; by this means, any part of the fabric can be made thinner or thicker than the rest. While the right hand of the operator is thus occupied, the left hand is applied to the felt to ascertain its thickness and uniformity; and when the cone is sufficiently and equally covered, the pneumatic action is stopped, and the felt is covered with a wet cloth, or, better, a tightly fitting copper cone, similar to the one within the felt. The cones and the felt are then taken away together, and plunged into a bath of hot acid, which (as before described) causes the hair to become so coherent that it may

of our hat manufacturers have sufficient enterprise to exhibit the system at the approaching Centennial Exposition, they will be likely to interest a very large proportion of the millions of visitors who are expected to throng the buildings.

A Sensible Christmas Present.

The Studebaker Brothers Manufacturing Company, of South Bend, Ind., deserve credit for a very sensible as well as generous proceeding. Just before Christmas, they printed a little circular which was distributed among the seven hundred employees of the concern, and which reads as follows. "In view of the approaching New Year and the coming Centennial Anniversary, it is our desire to present to each of you a copy of some weekly paper (such as you may select) for the year 1876. The year itself will be a memorable one, and full of incidents and interest to you all. We feel also that it will tend to encourage in many of you an increased desire for information, and will be altogether better appreciated by you than the ordinary gift of a Christmas turkey, to be eaten and forgotten." Of course the workmen took advantage of this liberal offer, and as one result a club of new subscribers appears on the rolls of the SCIENTIFIC AMERICAN.

The company suggests that we may approve this course. We do, cordially; we wish more employers would adopt the same plan. We have repeatedly advocated it, and pointed out that employers can do their workmen no better service than to render accessible to them the means of self-education and improvement. This benefits the men directly, for it gives them information both instructive and valuable, and at the same time indirectly, though none the less surely, benefits the givers themselves. Half the strikes and labor troubles between employer and employees have for their basis an ignorant unreasoning spirit existing among the latter. Open up the avenues of knowledge; put in the men's way the newspapers, whereby, under the guise of self-entertainment, they are really educating themselves; and, our word for it, there will be very much less heard of obstinate controversies and uprisings. To give a man a newspaper which keeps him posted as to the progress of his fellow beings, which tells him of new ideas and thoughts, is to lift him superior to his dull routine of every day work. By so doing, you give him something to think about, something which carries his mind far beyond the narrow horizon of his every day existence, and perhaps leads him to the development of new and useful ideas engendered in his own brain. Employers will find money thus expended well laid out; and certainly, viewed as a gift alone, none could be suggested as more appropriate than one which confers a benefit on the recipient every week in the year.

WITH four weights of respectively 1 lb., 3, 9, and 27 lbs any number of lbs. from 1 to 40 may be weighed.



Fig. 2.—HATTER'S FELT-MAKING MACHINE.

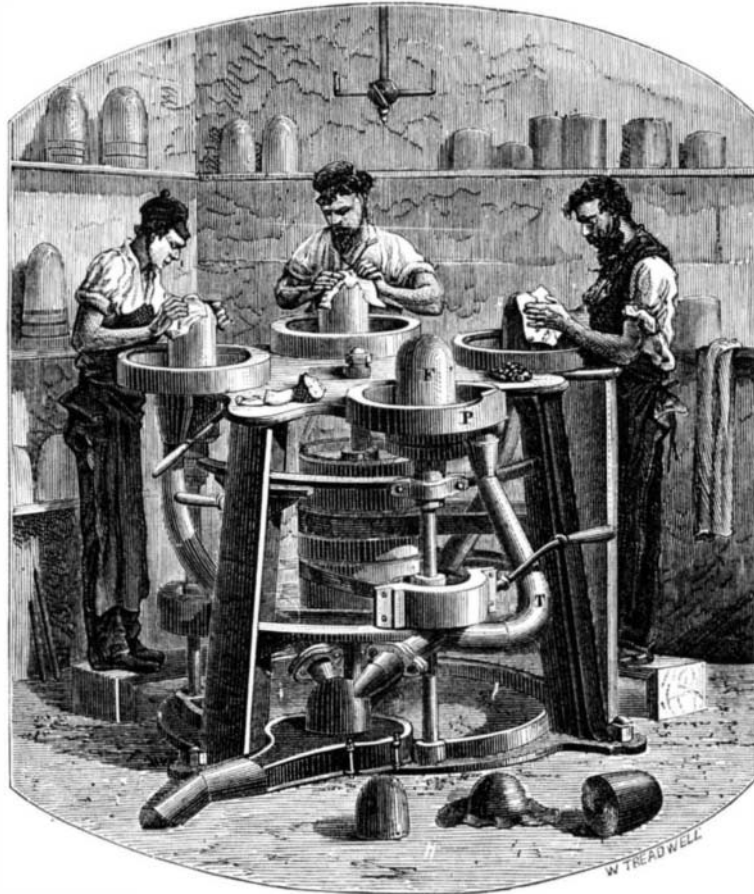


Fig. 3.—HAT MOLDING AND SHAPING MACHINERY.

safely be lifted away from the molds. But the felt requires to be made still more dense, which is done by a mechanical process, a kind of kneading being performed upon it by wooden blocks in a machine. This not only condenses the fibers, but causes the cone to diminish in size, till it is sometimes less than one third of its original dimensions.