Hat Making. The manufacture of felt hats in the United States has, by the introduction of improved machines, methods, and machinery, reached a high degree of perfection and importance.

Fifty years ago the business was carried on in small establishments in towns and cities and in very small shops, even in villages. In the latter case the making of hats was as simple as that of the shoemaker, and a boss hat or two or three, or any hat of the ordinary shapes, was made by the individual himself. Now the process is a great deal more complicated than that, and the making of a hat is a business requiring the superintendence of skilled workmen. In the United States the business is carried on by American companies and is the most important industry of the country.

The best machinery for making felt hats is of American origin and was designed to meet the requirements of the American market. It is a combination of the best known methods for making hats, and is much used by the manufacturers of felt hats in America.

The hat-making process in America is as follows: The felt is prepared and made into pieces, called "curtains," which are then cut and shaped into the desired form. The hat is then made by attaching the curtains to the frame of the hat, and the hat is then finished by a process of blocking and shaping.

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ice stone, and afterwards put on a block to be ironed off and touched up with sandpaper. Warming the hat to a chuck which fitted to a lathe spindle, and the operator, while the hat was revolving rapidly on the lathe, held a sand or emery-paper on the hat, and thus finished the hat. The advances made in the manufacture of wool hats date from the introduction of this improvement. Prior to this time wool hats were made of the lowest grades, and could not compete with fur hats, but, by the use of the finishing lathe, it became possible to give hats made of finer grades of wool finish closely simulating the appearance of the lower grades of fur hats, and from this time the wool-hat trade began to rival the fur trade. See HAT-FINISHING LATHE.

Shortly after the introduction of the finishing lathe, sewing-machines were first introduced to put the lining on the brim of the hat. See HAT-LINING SEWING-MACHINE.

Consequent upon this came the hat-sewing rolling machine, which turns the edge of the leather, sweat-lining in order to prevent its marking or hurting the forehead. Next in order came a machine, invented by Eckemeyer and improved by Jusdun, to make the hat-finishing. The tip is secured upon a table having a round or oval motion, while another piece is put in a folding gear in such a way that the stitching will fasten the edge of the piece which forms the side-crown in a circular or oval line to the flat tip. Jusdun added to this a pair of rotary trimming shears, and arranged the turn-table upon a swinging lever.

The poucing machine, however, now finishes the sides of the hat almost equal to the outside, and crown-lining is at most discontinued in felt hats.

Another addition to the machinery in the manufacture of hats is that used to put the stiffening into the hat-bodies. To give the body a more conical shape, some stiffening material is generally put into the body; in the better class of hats a solid of shellac; in those of cheaper character, Irish moss, glue, etc. The solution is put into a trough under a pair of rollers which are geared together and drawn by a handle with hand- or line-mill. Two trough and two sets of rollers are generally mounted on one frame, one trough containing the solution into which the whole hat is plunged, and the surplus matter pressed out by passing up the hat-bodies between the rollers. The other trough contains a heavier solution into which is dipped that part of the hat which is to form the brim. The troughs are heated by steam to keep the stiffening in a fluid state, and the hat-bodies, after being stiffened, are ready to be blocked.

This is the last operation the hat-body goes through, and comes from the machine with the same size and shape as when in the case of the wool hats. Only it has been already explained that the operation for fur bodies is upon a special set of machines.

The blocking of the hat-body is that part of the manufacturing process in which the cone-shaped hat-body is pulled out around the circular form that it has been given, and the upper part is widened out to form the flat tip and the side-crown. This is described under BLOCKING MACHINE, pp. 130, 131, supra.

The machine of Feun may be described in brief to have had two pairs of rollers, one pair traveling somewhat faster than the other. The edge of the central hat-body being nipped between the rollers, the pair in advance pulled upon it faster than it passed through the hand pair and so stretched it. It was thus gradually flattened so as to form a brim, but did not act upon the crown or tip, and as its action was slow and incomplete it only came into partial use.

The first complete machine for forming hat-bodies, wool or fur, was the corrugation stretcher of Eckemeyer, and these machines, in various modifications to suit the different kinds of work, are now used almost exclusively in the hat factories of this country. Described and illustrated under BLOCKING MACHINE, it need not be considered at length here. It has a rubbed and recessed former which rises vertically and pushes the hat-body into a cup which has a number of yeilding levers corresponding in number with the recesses in the former. The edge-rollers, on the ends of the levers push the felt into the recesses of the former and stretch it. This is repeated again and again, the hat being moved from the former between each operation. The brim and tip are thus developed.

Next in order comes the blocking machine to make the brim, as the shape of the four cornered of the brim and side-crown is known in the trade. This is done by a rising spindle which carries the hat on its block, in its first place against a clamping plate which holds the brim flat and then pushed it over a crowned to a cylindrical banding shell, whose lower edge forms the band or angle. See BLOCKING MACHINE, Fig. 337, supra.

To adopt the principle of stretching by corrugation to fur hats a number of modifications were required. It was found advantageous to separate the frame stretcher from the tip stretcher, and to substitute round-edged bars for the round-edged rollers.

These machines are considered in their places. See HAT BLOCKING, supra, Fig. 427, p. 138, supra; TRIM STRETCHER, infra.

Wickemeyer's finishing blocking machine, known as a hat-shaping machine, is considered and illustrated under SHAPING MACHINES. The hat placed upon an expandable block (which has been previously contracted to its smallest diameter) and a circular series of 28 tongs is made to grasp the edge of the crown all around. The banding ring is thrown over the hat and locked fast. The edge of the rim being firmly held by the tongs, the operator raises the block and expands it to the desired size. The hat is then cooled and taken off, and the operation repeated on the next hat.

All the adjustments—size of band, height and diameter of crown, and width of brim—are made by gages and stops to block to the different levers, so that the operator can set each part in a few moments, and all sizes of hats can be shaped on the same machine. A good operator will block from four to six dozen per hour. See SHAPING MACHINES.

The introduction of these machines for the stretching and blocking of hats has had a marked effect both upon the quality and facility of production of the hats so treated. When but imperfectly done, hats will in a short time lose their shape and "go to seed," as it is called in the trade, but when properly blocked on a machine, the felt is well and equally stretched and shaped that the hat is much more durable.

Next in importance to the machine for blocking and shaping are the poucing machines, for sand-papering the surface of the hat-body or the hat after it has been blocked.

The hat-finishing lathe, used in the wool-hat factories, was never successfully introduced in the fur-hat manufactories, owing to the fact that fur hats were usually made in small shops where power was not used, and also on account of the difference in the material.

The poucing machine now in general use are constructed on two principles.

A rapidly rotating cutting or rubbing cylinder, which operates upon the hat-body or hat while it is fed along upon a yellowing bed, is used in one class of machines. In the other class, a reciprocating motion is given to the cutting surface to rub in two directions.

It is noteworthy that all the machines for poucing fur hats, the rotating cutter machines are exclusively used.

Under their own service, the machines are machines for poucing hat-bodies, special machines for poucing the brims, and for the crowns of the common grades of blocked hats, and also the reciprocating machine for the finer classes of felt hats. See POUCTION MACHINES.

The foregoing account comprises the most important machines used in the hat factories of the United States, but mention may be made of some machines used in the final finishing of the hat.

Jesus's hat-brushing machine is frequently used to remove the dust left in the hat by the poucing machine. See Stork's sewing-machine, adapted to sew ribbons on hats, has lately been extensively used in wool-hat factories.

Hydraulic presses to press hats into molds of proper shape, so extensively used in Europe, have been successfully used in this country, although a great many attempts have been made, and many machines patented by different inventors.

India-rubber blocks, made in the shape of the hat-block, have, however, been used in molds which surround the crowns only of the hats. See Hat Presses.

Various styles of ironing machines are also in use, one of which is shown in Ironing Machine, supra.

But little improvement has been made in the finishing process of fur hats, and although many different machines have at times been used, and some with considerable success, none have been able to escape the hands of the trade. It is the use of the falling mill to fell fur hats has also been frequently attempted, but with moderate success.

See:

- **"Scientific Amer.,"** xxvii. 300.
- **"Scientific Amer.,"** xl. 32.
- **"Scientific Amer.,"** xxxvii. 507.
- **"Scientific Amer.,"** iv. 36.
- **"Scientific Amer.,"** vii. 6.
- **"Scientific Amer.,"** vi. 10.
- **"Scientific Amer.,"** iv. 27.
- **"Scientific Amer.,"** viii. 27.

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- **"Scientific Amer.,"** vii. 3.