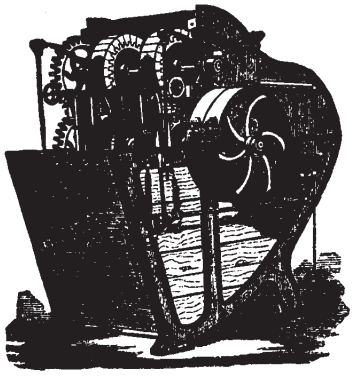
**Ful'ling Mill.** 1. The old fulling mills were generally of wood, and the necessity for weight gave rise to their being of enormous size. The beating mill, which the nearest resembles the ancient tramping, — practiced in Asia with camel's hair for thousands of years past, — is shown in Figs. 2125, 2126, p. 923, "*Mech. Dict.*" The roller mill, which is more compact, is shown in Figs. 2127, 2128, *Ibid.*; but a still more improved form is the Rodney Hunt, shown in Fig. 1109.

In this mill, the shape of the box answers to the requirements of the work, to avoid useless quantity of suds. The

Fig. 1109.



*Rotary Fulling Mill.* (*Top casing removed.*)

frame is of iron, and casing of hard pine. The main squeeze rolls have cast-iron shafts covered with wood, the fiber of the wood being presented endwise outward. The bottom rolls have brass flanges between which the top rolls run. The rolls are geared, and pressure is obtained by elliptic springs. All the inside working surfaces are of wood or brass, to avoid staining the goods. By certain attachments the fuller has control of the goods, felting and stretching lengthwise, or felting the width as he may desire. An automatic stop-motion stops the mill in case of the "knotting up" of the goods.

*Baldwin* . . . . * "*Scientific American*," xxxviii. 88.
*Benoit*, Fr. . . . * *Laboulaye's* "*Dictionnaire*," ii., article "*Laine*," Figs. 1328, *et seq.*, ed. 1877.

2. A machine in which wool hats are felted; an operation equivalent to the *sizing* formerly done at the battery.

The hat body having been *formed* by a fleece of wool from the carding machine wound upon the cone, and thence removed and given a certain amount of consistence known as *hardening* (see HAT-HARDENING MACHINE), is then to be felted or fulled to give it strength, an operation which compacts the fibers and makes the cone much smaller.

The principle of felting is probably sufficiently well understood, and need not be explained here. See pp. 833, 834, "*Mech. Dict.*"

The precursor of the fulling mill was a machine invented by James S. Taylor, of Danbury, Conn., and patented May 3, 1853, as a hat-shrinking machine.

It had four rollers set with their axes in relatively angular position, which caused a roll of hats placed between them to travel slowly along while turning around between the rollers. Two of the rollers had also a vibratory motion, and the effect was a rubbing pressure, and an advancing motion. An ingenious device, and useful in its day.

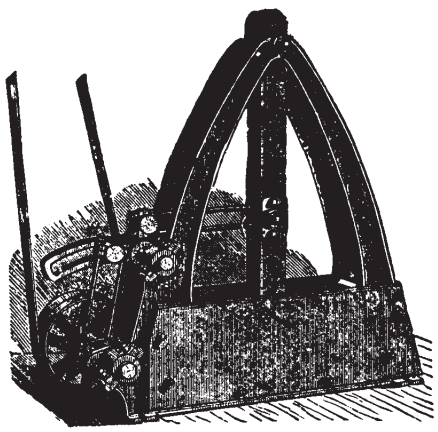
The first successful fulling mill was used in the factory of the "Seamless Clothing Manufacturing Company," of Mattewan, N. Y., about 1860, at which time the company commenced the manufacture of wool hats; and it may be remarked that the use of the fulling mill is yet principally confined to the wool hat factories, the sizing of fur hats being almost wholly done by hand on the battery.

Various styles of fulling mills are now used.

Fig. 1110 shows a mill called a *pusher*, which is used to start the hats — to follow the language of the factory — when they leave the hardening machine. The beater is driven by a bell crank, which receives motion from a crank shaft by means of a connecting rod, which is adjustable in a curved slot in the bell crank to vary the stroke of the beater.

Sometimes one beater is used, but generally two beaters acting in opposite directions, and placed side by side in the same fulling bed, and consequently acting upon two batches of hats in the respective ends of the bed.

Fig. 1110.



*Crank Mill for Fulling Wool Hat Bodies.*

To finish the hat body another kind of fulling mill is used, having *fulling stocks*.

Four cast-iron frames are bolted to a solid foundation; these form the bearings for the beater shafts, and contain the fulling beds. A driving shaft operates two large gear-wheels, to which the lifting toes which actuate the beaters are attached. Two beaters operate in each bed, and the hat bodies placed in a body in each bed, slowly turning by the successive blows, are gradually fulled to a suitable size.

In some cases acidulated water is used to facilitate the fulling of the hat bodies, but in most cases fuller's soap is employed.