

fulled in a fulling mill if they are to be farther treated by machinery.

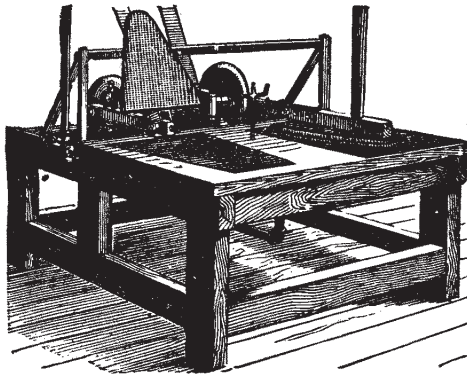
In some factories a separate machine is used to harden the tips of hat bodies. It consists simply of a rubbing board which acts upon a round steam chest of suitable size, upon which the hat body is placed after the sides have been hardened in the ordinary hardening machine.

Hard'en-ing Ma-chine'. A machine for rubbing and pressing hat bodies in order to felt the materials, increasing the density, diminishing the size, and making the material hard and compact.

The machine for hardening wool hat bodies operates by means of a reciprocating rubbing board. It is placed upon a strong wooden frame which serves as a table on which the hat-body rests. Into this table is fitted a steam box which is perforated on top to allow the steam, which is admitted by a pipe, to penetrate the hat bodies to be hardened.

Fig. 1308 shows a machine with two rubbing boards which receive a rapid reciprocating motion from two adjustable wrist-pins fitted to the fly-wheel disks on each end of the driving shaft. One of these rubbing boards, the nearer one, is shown thrown back and out of work. The other one is in operation.

Fig. 1310.



Hat-body Hardening Machine.

The hat bodies are built into a pile and laid upon the steam-box, coarse hardening cloths being sandwiched between each and pieces of cloth of suitable size and shape being laid inside each hat body. The object of these interposed cloths is to prevent the adherence of the hats, one to another. Two of them laid in immediate contact and rubbed while hot and wet would soon coalesce and be impossible to divide. The rubbing board, which is also covered with coarse cloth and is somewhat smaller than the hat-body, is then lowered upon the hat bodies and held down by a post which is hinged to a spring on the ceiling of the room and has a yielding pressure upon the rubbing board.

Three to five hat bodies are thus partially hardened at one operation; the projecting portions, however, not having been acted upon, the hat bodies are removed and so disposed as to bring under the rubbing board at the next operation the portions which were formerly the edges.

This operation completed, the hat bodies are ready for the *sizing kettle*, or battery, when to be made by hand, or to be