a time over the end of the hook, which the weaver then drew through the cloth.

Last summer the writer visited the factory of the Pawtucket Hair-Cloth Company, which is a large and substantial brick building on the banks of the Blackstone River, whence water-power is obtained to run four hundred and fifty looms, each producing six yards of hair-cloth per day.

As soon as the hair is received it is sorted, and hairs of the same length are placed together in bunches varying by an inch at a time from sixteen to forty inches in length; thus providing for twenty-five different widths of cloth, from twelve to thirty-six inches wide. The shorter lengths are sold to brush makers. Most of the hair is dyed black, but some is left of its natural color, and makes gray hair-cloth.

The loom is automatic, requiring only to be supplied with a new bunch of hair whenever one is used up, so that one girl can easily attend to ten looms. The other employees in the weaving room are the section hands and the "needle fixers."

The success of the loom depends upon two exceedingly ingenious devices, one for picking a single hair out of the bunch, thus performing the functions of the "server," and another by which the further operations of weaving are made to depend upon this hair being picked up and properly drawn through the warp.

Above one end of the bunch of hair, which lies horizontally in the machine, is placed a device whose action resembles very much that of the human thumb and finger. Its principle will be understood from the accompanying enlarged sketch. A curved steel arm a is pivoted at b to a plate, from which there projects a straight steel wire c, called a needle, which has in its lower end a minute notch just large enough to admit a single hair and no more. These form a pair of nippers, which are pushed down, while open, into the bunch of hair and brought together, the bunch being moved slightly back and forth, so as to bring different portions of it under the needle. The ends of some of the hairs are slid or rolled between the jaws a and c, and a single hair is caught in the notch, where it is held by the piece a. The machine can pick only one hair from the bunch at a time, because the notch is not large enough to admit more. Sometimes, however, it fails to get hold of any, in which case it instantly comes down and tries again, making three attempts to pick up a hair while the lay is beating up; but as soon as it succeeds in getting one, the hair itself, in being drawn up from the bunch, presses against a wire, and thus, by suitable connections, prevents the needle from returning to make another attempt.

In these looms the ordinary shuttle is replaced by a long, wooden rod provided at one end with nippers, which take hold of the hair after the needle has drawn the end of it up from the bunch and pull it through the warp. If, as occasionally happens, the needle has missed in all three of its attempts to pick up a hair while the lay is beating up; but as soon as it succeeds in getting one, the hair itself, in being drawn up from the bunch, presses against a wire, and thus, by suitable connections, prevents the needle from returning to make another attempt.

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In these looms the ordinary shuttle is replaced by a long, wooden rod provided at one end with nippers, which take hold of the hair after the needle has drawn the end of it up from the bunch and pull it through the warp. If, as occasionally happens, the needle has missed in all three of its attempts to pick up a hair, it cannot of course deliver any to these nippers, and, consequently, none is drawn through the warp. In this case a wire, which is ordinarily supported by resting on the hair, falls, and thus throws out of gear the mechanism for actuating the harnesses and the take-up. Thus, though the motions of pulling through the weft and beating up always go on, the take-up and the harness motion act only in case a hair is actually drawn through. This device insures that any failure of the needle to pick up a hair can never cause a fault in the cloth. After the weaving is done the projecting ends of the hairs are trimmed off, and the cloth is finished by pressing between hot iron plates. The writer came away from the Pawtucket Hair-Cloth Mill impressed with the idea that no problem in machine design is too difficult to be solved by well-directed and patient study.