

some minor peculiarities of patented needles, and the various sewing-machine firms have their private brands and numbers.

The wire is received in coils of 50 pounds weight, and is passed through the first machine, the straightener and cutter, to take out the bend. It consists of an open revolving cylinder, containing six pins, which pass the axial line, three on each side, alternately. As the cylinder revolves 3000 times in a minute, the wire is very rapidly bent back and forth, the last pin with which it comes in contact being on the central line and leaving the wire straight. A clamp-feed regulated by a cam advances the wire, a revolving head forms the butt, and a cutter removes a blank of the regulated length: the number of blanks is registered on a dial-plate.

The reducing-machines are three in number, for roughing, dressing, and smoothing. The first two work with coarse and fine emery-wheels, and the third with an emery-belt. The blanks are fed from a hopper on to a grooved endless traveling carrier, which exposes to the action of the emery-wheel that portion of the blank which is to be reduced in diameter to form the shank of the needle, the portion not reduced being that designed to be placed in the end of the needle-bar of the sewing-machine. As the needles travel past the emery-wheel, they are rotated by a pair of reciprocating plates, so that they are equally ground all round. The third machine has an emery-belt, which finishes this part of the operation. The taper-pointing is done upon a succeeding machine, only that portion of the needle being exposed to the emery.

In the grooving-machine, the short groove on one side of the needle and the large one on the other side are made by two circular saws, past which it is fed automatically. The saws are pressed in against the needle, and then withdrawn at such times as will give the required depth and contour to the groove.

Next follows the punching of the eye. The correct position of the needle in the machine is insured by a central plate, which fits into the short groove on the side of the needle shank; the punch descends and passes through the needle into a hole through the central guide-plate.

The hardening and tempering follow; the needles are heated to a cherry-red in a reverberatory furnace with a charcoal fire. The bath is of whale oil. The tempering oven is heated by the surplus heat of the furnace, and the needles are here placed in sheet-iron pans suspended from the arms of a revolving shaft.

The needle may now be considered as having its shape and quality, and the remainder of the processes may be classed as finishing.