produced simultaneously by the superposition of the thread carriers. M. Malhere has also invented a comb with independent teeth which replace the pins of the hand lace worker. The movements of the several independent members of this machine are controlled by the Jacquard arrangement of perforated cards. Such is the succession of ideas which led to the invention of the lace loom.

The lace from the spindles of the hand lace-worker is not made like net or imitation lace, by two distinct groups of threads, warp and woof, but by veritable twisting, in the interlacing of which all the threads may concur, following the fancy of the designer.

The interlacing threads are collected and fixed in the central part of the machine (corresponding to the pillow of the hand lace-maker) by means of pins. This hand method of making lace suggested to M. Malhere the peculiar form which he has adopted for the frame of his automatic loom. It consists of two concentric cylinder segments supported at a convenient height upon a cast iron table. As all parts of the segmental frame are nearly equidistant from the converging point of the threads, the tension of the thread is uniform, and this arrangement allows each one of the bobbins to circulate in the interior of the cylindrical surface without any displacement of the threads. In the work by hand the lace-maker chooses among the suspended spindles around the drum those that she needs successively ; she rolls them between her fingers, either to the right or to the left, in order to twist the threads and interlace them ; then she sets the pins which fasten this portion of the mesh, until by another interlacing another mesh is formed, when she withdraws the pins from the portion of the work already finished. Then three kinds of movements are required : A conveying or removal of the selected spindles ; rotation of the spindles to the right or to the left ; the fixation and displacement of the pins.

From what has been said, it will be seen that each thread must work in a manner absolutely independent, and this independence of the different elements constitutes the great difficulty of the mechanical problem.

If one places himself in the center of the Malhere loom, having in front of him the lower segment, it will be seen that this segment is perforated over all its circumference, and that each one of the holes is filled by a metallic cylinder which manipulates the thread, and is operated and controlled by the Jacquard mechanism. According to the piercing of the pasteboard of the Jacquard band, the carriages carrying the bobbins are pushed from the groove of one pin to the groove of another, by little pushers, and may occupy successively all the disks.

In order that the threads leading from the bobbins to the rollers, which occupy the center of the loom, may be interlaced or twisted, the transposition of the bobbins must be by circular motion.

An arrrangement of rack work and pinions worked by a double chain is controlled by another set of perforated cards, giving an intermittent traction to the chains. This latter Jacquard arrangement is capable of imparting to the cylinders a quarter or half revolution as is needed. We have said that the heads of the pins are tangent in a vertical direction and in a horizontal direction. This construction is not only designed to increase the height of the segments and the number of rows of pins, but to allow the transport of the bobbins from a determined horizontal row into the row situated below or above it. When a bobbin is to be transferred from one row to another, the pins in the Jacquard mechanism corresponding to the motion required cause the pin in the segmental frame to turn a quarter of a revolution only, the sliding groove assuming a vertical position, then the bobbins are moved forward in a vertical direction, and a second quarter revolution of the pin places the bobbin in a horizontal position in such a way as to renew the interlacing of t e threads.

The heads of the pins may be compared to the turntable of a railroad. The aim is to remove or add threads, as cars are added or removed in the composition of trains.

The insertion of the retaining pins may be from above or below. The inventor has preferred the latter method, as it furnishes a solid base for the pins and facilitates the removal of the finished fabric. These pins have a lateral and vertical motion.

At the moment that the interlacing of the threads is effected, the retaining pins placed behind and at a little distance from the roller must remain pressed down in order not to interfere with the play of the thread. When the interlacing is accomplished the pin rises in the angle formed by the threads, and the threads are separated by the horizontal movement of the carriages which carry them.

Arriving at a height a little above the upper net of threads, the pin is maintained laterally by a metallic platform, which is traversed over all its surface by radial slots equal in number to the pins, and the lower end of each pin is attached to a slider, moving in a vertical guide, which is capable of moving towards the roller, bringing the pin against the twist previously formed, where it is arrested by a stop, and the pin continues stationary as long as it is necessary to maintain the mesh. In order to release itself and before returning to the point of departure, it falls below the net of threads, in such a way as not to touch them in its retrogade movement. These quadrangular displacements of the pins are effected independently, being controlled by Jacquard mechanism.

Such, in general terms, is the lace loom of M. Malhere which has been recently exhibited in Paris. The apparatus is certainly a masterpiece of mechanism, and is an ingenious conception. The accompanying engraving indicates in some measure the intricacy of the machinery.—*La Nature.*

Miscellaneous Items.

ADHESIVE FOR BELTS.—A writer says a good adhesive for leather belts is printers' ink. "I have the case of a six-inch belt running dry and smooth and slipping, which latter was entirely prevented for a year by one application of printers' ink." —*Mining and Scientific Press.*

MAKING HOLES IN GLASS OR PORCELAIN.—The operation of making holes and sections in glass and porcelain is often a troublesome and unsatisfactory one. The firm of Richter & Co., in Chemnitz, have found a way of so impregnating thin German silver discs (.59 to .98 inch diameter) with diamond that when fitted to a quickly rotating tool, these cut through glass or porcelain in a few seconds, or effect any desired carving with great accuracy. With cylinders made on the same principle, round holes can be quickly and exactly made. The wear of the implement, even after much use, is hardly perceptible.

DANGER OF LIGHTNING FROM TELEPHONE CONNECTIONS.—The Cantonal government of Zurich, having been applied to by a telephone company for permission to fix the supports of insulators on the tops of certain public buildings, applied to Prof. Kleiner for an opinion. The following is a summary of the chief points in his report :

1. The danger of lightning in houses over which telephone wires are stretched is not increased, but lessened, if the total conductivity of a wire is approximately equal to that of a lightning conductor. This condition is not always fulfilled under existing arrangements. It may be insured by very simple arrangements, such as the introduction of a special wire for the conduction of lightning wherever the number of wires of two millimeters in thickness running in the same direction is less than 60. This should be insisted upon in all cases. Single connections running along the houses should be stronger than at present—at least as strong as telegraph wires.

2. As the properties of a telephonic plexus for attracting and conducting lightning extend over far wider tracts than those of a lightning rod, a strict regulation of their make and condition is necessary.

The use of telephones should be suspended during thunderstorms.—*Neue Zurich Zeitung.*

Scientific Items.

HEATING BY ELECTRICITY.

We have been much pleased to notice the various comments upon an article in *Scribner's Monthly.* One thing treated of in this article was the fusing disk for cutting iron, and the other was the production of heat by friction for warming water to heat a railway car. The water in this case has to be heated by friction discs, driven at a high rate of speed by some sort of connection with the axles of the railway car. We believe there is a great deal shorter way to heat a railway car or to heat a room. Some months ago a gentleman forwarded to us a model of what he called a "shad pan." We have spent some pleasant hours with it, and recently very much astonished some gentlemen of Boston who are underwriters and mechanics, and are great on the electric light question. This little arrangement was connected to a dynamo-electric machine of small calliber, and in less than two minutes it was so hot that the gentlemen readily warmed their hands, as from a steam radiator.