

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 displacements 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 pin which fastens 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

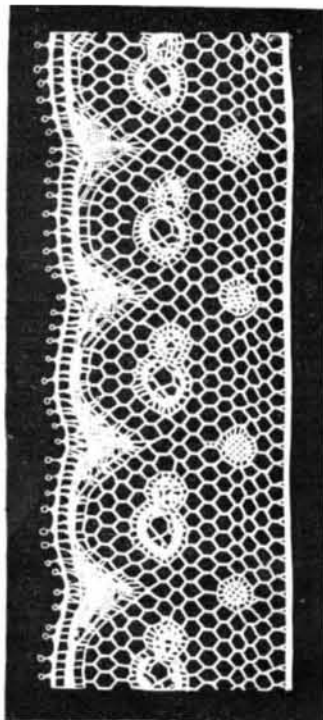


Fig. 3.—Bruges Valenciennes made by the Lace Loom.—From a Photograph.

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.



Fig. 4.—Bruges Valenciennes.

An arrangement 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 immediately 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 posi-

tion, 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 the 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 retrograde 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*.

#### Bro. Gardner on Labor and Capital.

The Lime-Kiln Club is a facetious creation of the *Detroit Free Press*, and the reports of the imaginary meetings of the club, under the imaginary presidency of Brother Gardner, furnish the readers of the *Press* with perennial supplies of wit. The following is a specimen:

The Secretary read the following:

CHICAGO, March 30, '81.—*Bro. Gardner*—Please inform your friends whether you sympathize with capital or labor, and oblige a

WORKINGMAN.

"In the fust place, dar' am no call for me to sympathize with either," replied the old man in answer. "One am jist as necessary to the odder as two wheels to a wagun. Capital cl'ars away a spot an' builds a factory an' gins fifty or a hundred men a chance to airn a fa'r support fur demselves an' families. Dat factory wouldn't be dar' 'cept fur capital, an its wheels can't move widout labor. If dis' workin' man wanted to draw me out on the question of strikes I has only a word to say. I believe dat de average employer pays his help a far price an' all he kin afford to. I b'lieve he knows his business, an' am mo' competent to run it dan de men who labor fur him. If I can't work fur a man fur de price he offers I stan' aside. If I hire a man I pay him do goin' price, an' I doan' let him tell me dat I mus' do thus an' so. Men strike becase dey can't dictate, but de same men wouldn't be willin' dat deir employers should dictate to dem how much rent to pay, what close to buy, and how to spen' deir wages. As I said befo' dar am no call fur sympathy in de case. De mo' strikes we have de less money will be put into manufactures. When a capitalist kin loan his money at good interest he am foolish-to put it into a factory whar' demagogues kin hariss an' ruin him. Jist you remember what I'm talkin'. De mo' unions de less factories. De mo' strikes de less work. Do you fink I'm foolish 'nuff to take my \$800 out'n de bank, whar' principal an' interest am safe as a rock, an' put it into a coopershop, whar' three workmen could sink de hull of it in one strike becase I couldn't pay mo' fur makin' de bar'ls dan de same would sell fur? Shoo! Fings am comin' to a putty pass when de man wid a shovel on his shoulder kin boss de man whose factory turned out dat identical tool!"

#### AGRICULTURAL INVENTIONS.

Mr. Bishop L. Smith, of Loogootee, Ind., has patented a riding revolving horse rake for raking stalks, grain, and hay, so constructed that it can be easily and conveniently controlled by the rider.

Mr. Charles S. Giger, of Highland, Ill., has patented an improved harrow, so constructed that either side or the whole harrow can be readily raised from the ground to clear the harrow teeth of trash.

An improved mower and reaper has been patented by Mr. Milan D. Farnam, of Ira Hill, N. Y. The invention consists in the peculiar construction of the mechanism for connecting the cutter bar and shoe, and also for connecting the pitman with the shoe and the cutter bar; also in the combination with the various bearings of mechanism for taking up the wear; and in the combination with the brace or coupling of a mechanism for holding the brace bar and the shoe at the desired distance from the ground.

An improved cultivator has been patented by Mr. Fayette K. Tipton, of Maysville, Mo. The object of this invention is to furnish a cultivator so constructed that it can be

readily adjusted to work deeper or shallower in the ground, that the points of draught attachment can be adjusted directly in front of the centers of resistance, and that the mechanism will not be broken should the plows strike obstructions.

Mr. William J. Powell, of Marshfield, Mass., has patented a cotton harvester, which gathers cotton from the plant while in the field by means of a vacuum.

Mr. John L. Scharff, of Womelsdorf, Pa., has patented a bean pod stringer for removing the string or threads from bean pods, and cutting off the ends of the pods. It consists in three bars, forming a clamp, clamping screw, a block or blocks having a semicircular flange, and a curved knife for removing the strings from the pods.

Mr. Thomas W. Hogsett, of Edray, West Va., has patented an improved churn, which is simple, easily operated, and the working parts of which can be adjusted for the operator while either sitting or standing, and which working parts can be placed aside altogether when the churn is to be cleaned.

#### Exploration of the Beni River.

The April number of the *Kansas City Review of Science* contains an article by Professor John D. Parker announcing the recent important discoveries by Dr. E. R. Heath in South America. Dr. Heath has solved the problem of the Beni River, and completed in this respect the work of Professor Orton, left unfinished by his untimely death. He has discovered two new rivers, one of which has been named in honor of Professor Orton, and explored the hitherto unknown mouth of the Madre de Dios, which is 2,350 feet wide where it empties into the Beni. The "multitudes of man eating savages," so long believed as existing along the Beni River, proved to be a myth, and the superstitious fear that has so long hung over this portion of the Beni River has been dissipated. He accomplished this perilous exploration in a frail canoe with two Indians, at his own expense. Dr. Heath will hereafter be remembered and counted among the discoverers of South America.

#### The Chagres River Dam.

Late advices from the Isthmus of Panama state that the engineers of the proposed ship canal have sunk a shaft 100 feet deep, where the Chagres River dam is to begin, and have not yet found bed rock. This is not an encouraging sign, as the possible success of the canal hinges on the feasibility of diverting the course of the river by the proposed dam. The dam will have to be over a mile long and 150 feet high. It is proposed to make it 3,150 feet wide at bottom and 780 feet at top, the lake created by it to contain a thousand million tons of water. This is a stupendous project at best; and if the foundations of the dam must be laid more than a hundred feet below the surface, the successful issue of the undertaking to which it is preliminary becomes more than ever problematical.

#### Correspondence.

##### A Remarkable Hailstorm in Arkansas.

To the Editor of the *Scientific American*:

We were visited on the afternoon of April 11 by the most terrific hailstorm ever witnessed in this region. The atmosphere had been oppressive for twenty-four hours, the thermometer reaching 73° Fah. at 2 P.M., and the hygrometer showed the air to be nearly saturated with moisture. About 5:30 P.M. the air was "hot" and suffocating. Two cloud masses appeared moving upon us, the one from the southwest soon presenting the peculiar "boiling," jagged appearance so often noticed in precursors to hail; the other, from the northwest, very black and moving rapidly. A little before the time of meeting the sky overhead was of a livid green color. The first dash of hail was from the west, but the direction of the falling stones was quickly shifted to northwest, and finally almost from due north. It was observed that the stones fell, for the most part, at an angle of not more than 10° or 15° from the vertical, and their effective force indicated a fall from a considerable height. The storm continued about fifteen minutes, and the noise produced was almost deafening. I was able to make some measurements, which will convey a better idea of the size and nature of this hail. One stone measured 7 inches in circumference, and weighed 5.6163 ounces avoirdupois. Six stones showed an average diameter of 2.2 inches, and together weighed 14.119 ounces avoirdupois. Other stones were picked up later which would measure nearly 3 inches in diameter.

The stones were formed by ten to fourteen concentric layers of snow and ice around a single nucleus, the outside layers being chiefly snow, and deeply corrugated. The shape, in many cases, was not spherical, but more like that of an apple, having two flattened and pitted surfaces opposite. The average number of stones found upon the level ground was about 135 per square foot. I hardly need say that the damage has been very great. The iron roofs in the town have been well nigh ruined. The tin roofs fared, in some cases, better, but present very much the appearance of a waffle iron. The destruction of glass has been immense, the heaviest double thick offering no effective resistance. A number of small animals were killed or injured. Men exposed to the storm were badly bruised. Is not this the champion hailstorm of the season? C. P. C.

Fayetteville, Ark., April 13, 1881.