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THE MANUFACTURE OF SEWING MACHINES.

On the first page of this paper we present three views illustrative of the machinery used, and the methods of manufacture, in the factory of the Weed Sewing Machine Company, at Hartford, Conn., a firm which has for some time past taken a front rank in bringing the sewing machine to its present high state, and whose endeavors have been rewarded by a flattering degree of success, whether this be measured by the encomiums of those who are most expert in the business or by the rapidly increasing patronage of the public. In the engravings, the blacksmith shop represents what may, perhaps, be considered the commencement of the making of the working parts of the machine, and here are a number of drop forges in which these are struck out, homogeneous steel being principally used. Nearly every important piece of the machine, except the cast iron frame, is made by these forges, the exact pattern being first cut in the toughest steel. These dies are necessarily very costly in the first instance, but parts so made are always interchangeable; they make of each piece a thousand or more at a time, and every one stamped out must be a counterpart of every other one.

From this department the parts go to the machine room, shown in the large view at the top of the page, for milling, grinding, drilling, and a multitude of other finishing operations, and here also the cast iron work is finished. This room is filled with a great variety of costly machines, several of which would require considerable space to fully describe, but the ruling idea here, as in every other division of the business, is to have a perfect machine for each particular portion of the work. No part is so small but the most complete machinery is provided in order to make it just right, in the shortest time, and to insure the production of hundreds and thousands of the same part so they will be exact duplicates of the first one made. The shuttle, for instance, goes through thirty-four distinct operations, from the time it is cut from solid half inch bar steel until it is completed; all of these operations, with the machinery employed therein, were subjects of careful study and experiment, before the details of the work touching the production of shuttles were satisfactorily arranged. When this point is reached, however—and it is in a similar way that the work is carried on with reference to every other piece in the working part of the machine—then the manufacture proceeds like clock work, and the greatest exactitude and highest finish are regularly obtained.

In the "assembling" room, as its name indicates, the parts are put together, having previously gone through a testing room, where each separate piece is inspected and gauged, the defective ones being sent back to the machine room. As the machines are put together they are, at different times, placed upon "jacks" or frames driven by steam power at a high rate of speed, and run for some time, to insure that all of the parts are properly adjusted. From this room they are taken to another apartment, and again inspected piece by piece in their completed shape; after which each machine is sampled on various thicknesses of cloth, and with fine and coarse threads.

The japanning, or putting on the hard, polished black finish of the cast iron work, has a special department. The japan is put on with a brush, three coats being given, the pieces after each coat being baked for twelve hours, at a temperature of 360 degrees. After this process, and before the varnishing, the bronze and silver ornaments and fancy designs in colors are put on. This was formerly done with a brush, and anything as elaborate as the decorative work now put on machines would have been very expensive, but within the past two years the decalcomanie or transfer process has been generally adopted, and by this means the most profuse ornamentation can be quickly put on at a moderate cost. When this has been done, the varnishing is next in order, after which is another baking of twelve hours at a heat of about 160 degrees.

While it is not our purpose in this description to institute a comparison of the merits of the Weed machine with those of others in the market, it is not out of place to call attention to the special features to which the company principally attribute the deserved popularity of their machines. Four styles of machines are made, the "People's Favorite," the "Family Favorite," and two styles of the "General Favorite," the first-named being the lowest priced, while the latter are more especially intended for manufacturers, tailors, shoemakers, etc. All of these are alike distinguished for their simplicity of construction and perfect balance of parts, which renders them very unlikely to get out of order and reduces to a minimum the expense of repairs. The company claim that the latter class of machine is capable of being run at the rate of 800 stitches to the minute on leather work, and 1,250 stitches a minute on cloth, but in a New York factory the "General Favorite" is run on calf-skin uppers for men's shoes at a considerably higher speed than the company claim. All the machines make an elastic lock stitch, the loop being formed in the center of the material; the "feed" is either drop or wheel feed, as customers desire, and the tension can be so easily regulated as to afford some of the advantages of an automatic tension. A special merit is also claimed for the superior work which this machine will do in the use of cotton or linen where silk had heretofore been employed—a point in regard to which manufacturers have experienced no little difficulty, as cotton, with what is called a "silk finish," where the stitches can be seen, is now used to a great extent in place of silk.

The Weed Company have been manufacturing sewing machines since 1866. They were the first to apply to this manufacture the principle of interchangeability of parts, and at an early day began to use forgings to a very large extent in place of cast or malleable iron. In all their sewing machines steel and forgings are used wherever possible, great care being taken that adjoining working surfaces be of metals of different nature, thereby causing least wear from friction, and provision being made for the taking up of lost motion wherever such may occur from long continued strain. Direct crank movements are the main principles of these machines, gears, springs, and cams being eliminated, thereby securing positive yet easy action. The shuttles used in the Family Favorite and General Favorite machines are alike, carrying over fifty yards of coarse thread, having only one hole through which to pass the thread. The automatic bobbin winder, shown in Fig 2, is an especial feature of the Family Favorite machine, represented by Fig. 3, being patented and applied solely to it. Smoothly and evenly filled bobbins are a necessity for nice stitching, and this simple contrivance secures this end without trouble to the operator. All the modern improvements, such as "loose flywheel," "casters in stand," "rubber socketed hinges," "adjustable balance wheel shaft," "needle sockets," "self-acting tensions," etc., are incorporated in this machine, while, of course, the never ending variety of attachments are as applicable to it as any other.

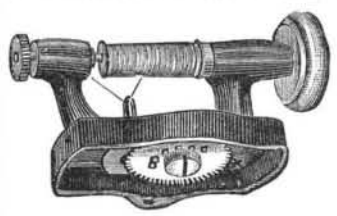

Fig 2.—Automatic Bobbin Winder.

The works of the Weed Sewing Machine Company cover two acres of ground, and besides manufacturing the sewing machine, they make bicycles and an extensive line of fine steel and iron forgings for agricultural implements and steam machinery; also a number of other sewing machines for companies not having works of their own, among which is the McKay Twin Needle Machine, to the application of the principles of which the Weed General Favorite machine was especially suited. The power required is supplied by a 250 horse power engine, and the capacity of the factory is equal to the production of 250 machines a day.

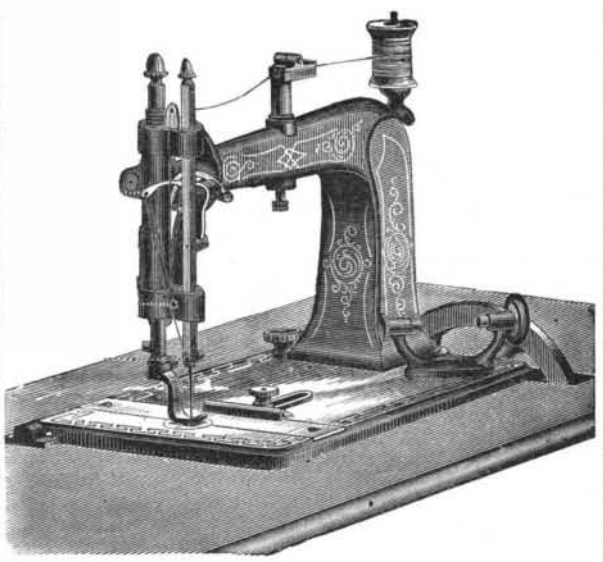

Fig. 3.—Family Favorite.

THE BICYCLE MANUFACTURE,

which is an important branch of business carried on at the Weed factory, is illustrated in the view at the bottom of the first page, in which are shown some of the final processes in the manufacture; on the left hand will be seen "forks," "backbones," "wheels," etc., in various stages of progress, and rows of completed machines awaiting shipment. The Weed Company are the sole manufacturers of bicycles for the Pope Manufacturing Company, of Boston, who control the patents for the United States on this specialty, and during the past year the demand for their "Columbia" machine has largely increased.

Although bicycles have been very popular in England for some time past, over 250,000 of them having been made there during the last few years, their adoption in this country has not been so general.

They differ in many points from the velocipede, the drive wheel being much larger, and the rider sitting almost vertically over the center of the wheel. It has been demonstrated that about as good "time" can be made with them as can be reached by the fastest trotters, taking only a mile or two at a time, while for long distances a good bicyclist will cover the ground in even quicker time than a horse can make. These "machine horses" have of late been coming into considerable favor, especially in Massachusetts and in the vicinity of Boston; such exercise is recommended by physicians, and, when one has acquired sufficient dexterity to be able to ride with facility, they afford the means, where the roads are open and good, of taking a kind of recreation which now promises to become more generally popular.

The great point in the manufacture of bicycles is to secure the maximum of strength with the minimum of weight, and the bicycle, as now made, is a splendid specimen of American workmanship. We say "American," because our mechanics have brought it to its present state of perfection, in England it is made in a number of factories, where most of the work is done by hand, and no one establishment has taken hold of the work in earnest, as is now being done at the factory of the Weed Sewing Machine Company. Here the same thorough and costly preparation as has marked their perfecting of the machinery for the manufacture of sewing machines is now evinced in their bicycle manufacturing department. The hub of the bicycle is forged in one piece of homogeneous steel, case-hardened, as are also the cranks and yoke, with dies made after patterns which embrace all the latest improvements. The steering head is a solid forging, and the backbone, as the tube is called, which extends from the yoke to the small wheel in the rear, is of steel, brazed to the head. The seat rests on a spring attached to this backbone, the spring being held by a sliding clasp. Wire of 12½ gauge is used for the spokes, which are headed in the fellies and then tightened in a socket at the hub by a nut. It is a work of considerable nicety to put a machine together, after all the parts are ready, so each spoke will be true and have its proper bearing; but they are tested as to how they will "track" until the variation is below one-sixteenth of an inch. The fellies are either V shaped or half round, and the tire is solid rubber, round, made especially for this purpose, and cemented in its place. The different sizes made range from 36 to 60 inches for the diameter of the large wheel, and the weight will vary from 40 to 55 pounds. There is, of course, a wide range of prices, which vary with the size of the machine, and the finish, there being three different styles made, known as the "special," the "standard," and the "ordinary," varying in material and design to suit the public tastes, from the heavy roadster to the light and trim racer, with ball bearings and all the latest devices to avoid friction and secure speed, strength, and lightness. The "Columbia" standard is a practically serviceable machine, especially suited to the wear and tear of ordinary American roads. In the construction of the higher priced machines nothing but steel and the finest forgings are used, to insure the greatest strength and rigidity with the least weight and most graceful shape. The company have thus far made about 1,200 bicycles, but now have orders on hand for 2,500, and they expect to be able to turn out 500 a month.

Although no "records" have been made in bicycling here to compare with what has been done in England, there have been many cases reported in which quick time has been accomplished for both long and short distances. One instance is given where forty miles were made in 3 hours and 36 minutes, and another where 100 miles were made in 11 hours and 45 minutes, including stops, the riding time being 10 hours and 15 minutes. In England, however, single miles have been made in a little less than three minutes, and from that up to thirty miles at a speed greater than a mile *each four minutes;* 212 miles have been made in less than 24 hours, and at Agricultural Hall, London, in April, 1879, 1,170 miles were made in six days. The difficulties of learning to ride a bicycle are said to be not as great as learning to ride horseback, or to skate or swim, and the healthfulness of the exercise, with the advantages which so simple and efficient a means for rapid locomotion offers to those so situated that they can avail themselves of it, would seem to give promise of its steadily increasing popularity.

Velocity of Rifle Balls.

Prof. Spice recently measured, before a large audience, the velocity of a rifle ball fired across the stage. The distance was only 33 feet. Lieutenant Merriam co-operated, and his duty was to shoot away, with a Creedmoor rifle, two loose wires, each of which connected in an electric circuit two globules of mercury. One wire was placed just in front of the supported muzzle of the rifle, the other 33 feet distant. Two levers were arranged, with bent wire points, over a piece of smoked glass to which a uniform motion could be imparted, and the electric connections were such that on the first wire being broken the point of the corresponding lever descended on the glass; but when the bullet broke the second wire it immediately rose again by the action of a spring. The result of this was that the point connected with this lever scraped a very short line on the smoked glass. The other point, being kept down during the swing of a seconds pendulum, scraped a longer space. After firing, the glass was withdrawn, and a magnified image of the lines thrown on a screen. The relative lengths of these lines were then ascertained, the longer being found 110 inches, the shorter 5 inches, making the duration of flight of the ball 5-110ths or 1-22d of a second, its velocity being $33 \times 22 = 726$ feet per second, or at the rate of a little under 500 miles per hour.

THE unreasonableness of mankind in general is pretty truthfully illustrated in the following item from the *Builder and Woodworker:* "When a man's house is building, he never thinks the carpenter puts in one-third enough nails, and frequently, and with biting sarcasm, asks him if he doesn't think the house would stand if he just simply leaned it up against itself and saved all his nails? Then, a few years afterward, when he tears down his summer kitchen to build a new one, he growls and scolds, and sarcastically wonders why that fellow didn't make the house entirely of nails, and just put in enough lumber to hold the nails together."

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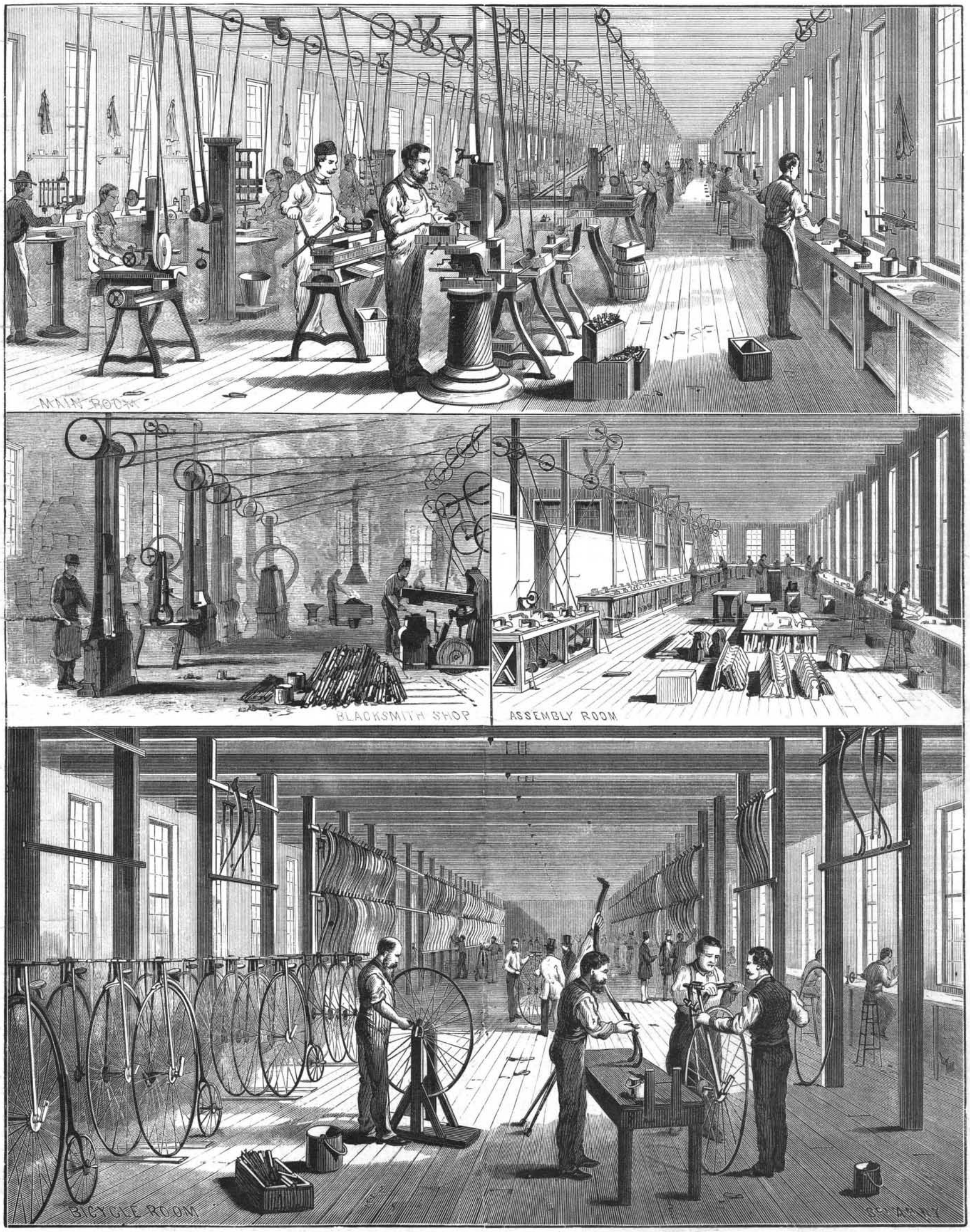

THE MANUFACTURE OF SEWING MACHINES AND BICYCLES.—THE WEED SEWING MACHINE FACTORY.—[See page 181.]