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MACHINERY IN THE BOOT AND SHOE MANUFACTURE, AT THE FAIR OF THE MANUFACTURERS AND MECHANICS' INSTITUTE, BOSTON.

Never before has there been so good an opportunity for the public to become familiar with the modern processes of boot and shoe making as is presented in the "Model Shoe Factory" of Messrs. Houghton, Coolidge & Co., now running in the Fair of the New England Manufacturers and Mechanics' Institute at Boston. About 100 hands are employed, making an average of 600 pairs of boots a day, and doing the work thereon in the same way as the business is followed in half a hundred towns in Massachusetts, with all the modern appliances for facilitating production and making the best finished goods in complete and regular operation. There have been other exhibitions in which portions of the work have been shown, and much of the machinery now employed in the boot and shoe manufacture has been in use many years, but here a visitor can see every detail of the work, from the leather as it arrives from the tanneries and currying shops until the finished goods are boxed up in the cases which are to convey them from the exhibition building to distant parts of our own country, or even to foreign ports. We have, it is true, but a small export trade in boots and shoes, but this exhibition has been an object of great interest to many foreign visitors interested in the trade, as well as to our own manufacturers, and some orders for goods for export direct have been placed by foreigners who have been there looking into our processes of manufacture.

The illustrations on our first page give a good representation of this "Model Shoe Factory" and the building in which the exhibition is held, as well as of some of the most important machinery used. The building is a solid structure of iron and brick, and occupies a ground space of 403 by 551 feet, the shoe factory taking up an area of about 50 by 450 feet, and in this section are to be found nearly 100 machines, large and small, operated by over 300 feet of shafting. But it is curious to note that, with the vivid portrayal of the methods of modern manufacture here brought before the eye, the crowds constantly passing and repassing seem nowhere to find so great an attraction as in watching the work of the venerable looking shoemaker, who, occupying an old shoemaker's bench on which he has followed his trade for fifty-six years, continues here to represent, in the midst of such surroundings, the difference between "the old and the new."

The cutting of the sole stock, as in most modern factories, is here done with dies, and the fitting up of a large factory with the different sizes and shapes of dies required forms no inconsiderable item of expense, leading the manufacturer to strenuously oppose any change of fashion which will necessitate the making of a differently shaped sole. In many cases the sole leather is first cut into strips, the width of which equals the length of a sole, but the later and more approved plan is to cut directly from the whole side, as here shown. The whole side is laid out upon a large table, the top of which is level with the bed of a machine long enough to take in its entire length, so that the workman can place the die on any portion of the side, and then, by a treadle movement, instantaneously bring down a bar with sufficient force to cut out the sole. This may be done as rapidly as the operator can place the die, but good judgment is required in selecting the most thick and solid parts of the leather for outsoles, the thinner and poorer portions being used for insoles and heels. Smaller machines of the same style are used for cutting out the taps, counters, and heel lifts, as these are cut from the parts of the side left after all the outsoles possible have been cut therefrom, the idea in each instance being to so place the dies on the stock as to avoid waste.

The cutting of the uppers is all done by hand, the sides of upper and calfskins being laid out where the cutter can have good opportunity to examine the leather in every part before placing his patterns thereon, in order not only to cut up the stock with the least waste, but to be sure and have good strong leather on the vamp and forepart of the boot, the poorer portions being used for the backs.

In order, however, to give the leather such shape that it may be brought to fit the last snugly, and not partially straighten out or lose its form at any time afterward, the uppers must be broken or crimped. To do this work well was always a laborious and tedious operation, until, about ten years ago, the S. W. Jamison crimping machine was introduced. A view of these machines is shown at the top of the page. By their use the vamp of a boot of the heaviest cow-hide leather can be forced into the desired shape for lasting almost instantaneously, the stretch of the leather required in this forming being so evenly distributed that the strength of the stock is not impaired and the leather will hold permanently its new form. The machine is a powerful but not very complicated one, a former, worked by a lever, forcing the upper into suitably shaped jaws, which close upon and smooth it into the desired shape. These machines have so fully met the requirements of the trade that they have become deservedly popular and been widely introduced, as it had hardly been possible, before this machine was brought out, to thoroughly crimp the leather used in heavy boots and brogans so that they would steadily retain their shape after repeated wettings.

For the putting together of the uppers of boots and shoes two distinct styles of machines are used, one using waxed thread for heavy leathers, and for stock in general which has oil or stuffing in it, and the other using dry thread for goat and kid and sheepskin work, for fancy stitching generally, and for putting in linings, working button holes, etc. The goods made in the "Model Shoe Factory" being a standard grade of heavy work, wax thread machines only are used here, two, with steam-heated wax cups, being used for siding-up boot legs, two for sewing in the heavy sole leather counters which give a proper stiffness to the heel, two for making stays over the seams on the inside of the leg at the ankle, and another stitching on the straps at the top. Besides the machines here shown doing this work, there are others shown in the Fair for similar use, and for sewing on heavy harness and belting.

The uppers having been put together, and the soles, slightly dampened, having been pressed into shape by a "beating out" or sole moulding machine, the next operation is the "lasting," or the drawing of the upper snugly and evenly over the last, so that it will fit closely in all parts, and the edges just lap over the outer edge of the insole, all temporarily fastened until the outsole can be attached. This is commonly done by hand, the workmen drawing the leather over with pincers and tacking it in place. To do this work by machine has been a task the solution of which has been sought by mechanics and inventors for many years, but no machine for the purpose has yet been introduced which has met with any considerable degree of favor from manufacturers. There is a lasting machine at work here upon which years of labor and experiment have been expended, and it appears to do its work fairly well, but it can hardly be said to have passed beyond the experimental stage as yet, and has been adopted by the trade to only a limited extent.

For the putting on of the soles, four different methods are shown—one by a machine sewing directly through from the inside to the outside (this being under the well-known Blake-McKay patents), one by pegging, and another by wire screwing, and the fourth by what is known as the Goodyear and McKay system. Of the machinery for the latter we give illustrations on the first page, in connection with which will also be found views showing the appearance of the stitch on a finished shoe, a cross section of insole prepared for stitching, and bottom with welt attached. The boots and shoes made by this process differ from all other machine-made work, and are a direct imitation of hand-made goods. The shoe is lasted as for hand sewing, except that the insole is channeled, and then a machine working with a curved needle and awl in a small circle sews on a welt, in the same way as it would be done by hand, after which another machine sews the outsole to the welt. The only difference that can be detected between a boot or shoe made on these machines and one made by hand, is that in the latter the stitches are not likely to be as regular and even as they are in the machine-made work.

Of course, boots and shoes made in this way have no nails or threads on the inside to hurt the foot, they can be readily repaired the same as a hand-made shoe, and they have all the advantages of flexibility with a proper firmness of sole, which is always found in welted shoes. The machines for making this work have been perfected only by the expenditure of many years' labor and a great amount of money, but Mr. Charles Goodyear, their inventor, whose father gave to the world its great India-rubber industry, would never stop short of the realization of the idea with which he started out, of making boots and shoes by machine which would be in every respect equal to the best of those made by hand. That he has succeeded is now being abundantly attested, not only by the samples of work shown, but by the increasing demand for the machines in shoe factories, and for the goods made thereon from buyers in all sections of the country.

Besides the machines for making welted goods, the Goodyear and McKay exhibit also shows their machines for making "turns," a technical name in the trade to denote shoes which are made inside out, and then "turned." This of necessity can only be done in work where both the sole and upper stock are light, but there is a heavy trade in such goods, a very large proportion of which is made on these machines.

Among the machinery required in a modern boot and shoe factory, that for making and putting on heels occupies an important place, and the work in this department is an object of never-ceasing interest to the visitors at the Fair. It is represented in one of the views at the top of the page, and consists of a combination of machinery covering the forming, attaching, and trimming of heels, by what are known as the McKay, Bigelow, and Fisher machines.

The Bigelow machine takes a heel, the lifts or layers of which have been assembled and tacked together, consolidates and shapes it under enormous pressure, punches it with nail-holes, and inserts and partially drives the nails. The McKay machine receives a heelless shoe and the heel thus prepared, and instantly nails and clinches them together, at the same time paring the heel to the required shape.

The Fisher machine, now on exhibition for the first time, we have given the most prominent position at the right of our cut on account of its novelty. It is a modified and improved form of the Bigelow machine, the substantial difference being found in the construction and operation of the mould which compresses and forms the heel. In the Bigelow machine, the mould is made in one piece and is adapted only to certain shapes of heel, while in the Fisher machine the mould is made in halves, which first approach each other and compress the heel laterally, then vertically, and finally punch it with nail-holes, all at a single descent of the plunger; thus closing every joint in the heel, which, upon this machine, may be made of any shape whatever. This machine is the simpler and less expensive, as well as applicable to a wider range of styles.

After the bottoms and the heels have been attached and trimmed, there is quite a variety of machines for trimming and shaping the edges, for buffing the bottom, and for burnishing the edges of the sole, shank, and heel, in all of which operations the work is greatly expedited and generally better done than it would be possible ordinarily to do it by hand. But one of the last operations is the treeing, which has much to do with the making of a nice looking boot, for the leather, which has been repeatedly wet and constantly handled through so many operations, must be again made to look its best, with all the seams smoothed down, and the shape of the boot effectively brought out.

For this purpose a machine is here used which is quite new in the trade, a representation of which is given in one of the separate views on the first page, while it can also be readily seen in the foreground of the large view at the bottom. By this machine hot air is used to warm the leather thoroughly through, and so soften the oil and tallow with which it has been curried. The operator, after putting the wet boot on an arm of the machine, passes it on and adjusts another, until, when twelve boots are thus placed, the first one has come round to him again, sufficiently warmed and dried to be ready for the final rubbing, after which it goes to the packer. The amount of heat usually applied is only about one hundred degrees, though this can be regulated at pleasure, and the better feeling and fine finish which this process gives to the leather are easily perceptible. The hand rubbing is also materially lessened, as is the work of taking out and putting in the feet, and far less space is required for drying than is called for under the old system.

Our illustration gives a view of the machines as they have thus far been constructed, but patterns are now being made for a new style of table, in which the trees are so arranged by a slotted joint that they may all hang down instead of being rigidly extended in their circuit as at present. A company has been formed for the introduction of these machines under the title of the Hot Air Boot Tree Manufacturing Company.

In all the work of a modern shoe factory, two points stand out in marked prominence. One is the extreme care which is taken in the cutting of stock, not only to see that there is nowhere any waste, but to have every piece of leather, so far as the best experience can effect the object, worked up into just the part of a boot or shoe for which it was intended when the leather was bought. The other, and equally important point is the minute division of labor.

It has often been said of late years that there are no shoe makers now as we used to know them in former times, and this is to a great extent true, for but comparatively few of the workers in shoe factories now know more than one or two special details of the work. But this limiting of their labor has made them especially skillful therein, and machines have been devised for nearly every separate operation. In the boot and shoe manufacture Massachusetts has always been almost immeasurably ahead of every other section of the country, and Boston is by far the largest market for boots and shoes in the world. There were shipped from there during 1880 over two and a quarter million cases of boots and shoes and rubbers, to interior and coastwise ports, the cases holding from twelve to seventy-five pairs per case, but containing, at a low estimate, over fifty million pairs. But with this vast trade the competition is especially keen, a dollar profit on the cost of twelve pairs of staple boots being considered a fair working basis on the business as it is being done this year, with much of the business being done at even less than this figure. It is, therefore, particularly appropriate, that in one of the two great fairs now being held in Boston, we should have so thorough a representation of an industry so distinctively pertaining to that section, and one in which the people everywhere are so directly interested.

The firm of Houghton, Coolidge & Co., who make the exhibit, run several factories, in different towns, for the production of a variety of leading styles of goods, which are sold in all parts of the United States, their aggregate manufacture not being exceeded by that of any other house in the country, and being materially greater than that of any foreign house. Mr. A. L. Coolidge, being one of the executive committee having in charge the getting up of the fair, proposed and undertook the setting up of the "Model Shoe Shop," when but little time was left to make the arrangements, but in selecting as its superintendent Mr. C. H. Tilton, who was a manufacturer for him in Ashland, Mass., he obtained a practical manager of rare executive ability, and the work has gone on smoothly from the day of the opening in such a way as to form the principal attraction of the exhibition, and be in every way a credit to the originator of the plan and the great industry it so well represents.

Portrait of Columbus.

In the Spanish Colonial Office of Madrid there has lately been discovered a portrait of Columbus, made when the great explorer was about 40 years of age. It represents him without any wrinkles on his broad forehead, with dark, thick hair, a brilliant eye, and a beaked nose. The portrait is in perfect state of preservation and the inscription is intact. It reads: "Columbus Lygur., novi orbis repertor." The size of the portrait is about 16 by 20 inches.