

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 nailholes, 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 the 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 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 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 shoemakers 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, and 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.—*Scientific American.*

FURNITURE POLISHING

In setting about polishing anything the first necessity is a thoroughly smooth and clean surface. With new furniture not much will be required for this purpose on flat surfaces, except the use of sand-paper. With old furniture the former polish must be carefully scraped off with a steel scraper. The edge of a small piece of window-glass makes a very good substitute but requires more care than the scraper. The article is first rubbed up with No. 2 sand-paper followed by No. 1 fine, the strokes being made in the direction of the grain of the wood. The work should then be rubbed over with plaster of Paris mixed with water, rather thinner than cream. This should be well worked over the surface, then immediately rubbed off again. This serves to close up the pores of the wood. A very thin coat of linseed oil should be next applied and the work put aside until the oil has dried. Any stain which it may be desirable to apply should be used at this stage of the process. To apply French polish, make rubber of cotton wool, wet it with polish, cover it with a piece of soft linen rag through which the polish has to ooze, and polish a small extent at a time and regularly. Take long and light strokes and when the rubber sticks lightly touch with a drop of linseed oil, applied with the finger-end. Extensive flat surfaces require "finishing" after polishing. This is done by cleaning off the surface with spirits used in small quantity. If French polish be used on turned work in hard wood, such as ebony, sandal, box, and others of a like nature, merely apply the polish on a piece of clean flannel while the article revolves in the lathe; after giving one or two coats finish off with spirits on same rubber. A drop of oil should be applied to every rubber except the last one for finishing. Should the wood be porous such as pine, Honduras mahogany, alder, willow, or similar woods, the grain should be filled up with either glue size or plaster of Paris; if for turned articles, plaster of Paris mixed with oil and applied with a rubber while the article is in motion, will generally be found sufficient. For glue size, dilute common glue with hot water until quite thin. When dry, the surface may be papered off with sand-paper when the surface will be quite smooth, no matter how porous the wood.

—*Metropolitan* says that Mr. Swan, having found that the Faure secondary batteries are well suited to operating his incandescent lamps has been led to the following scheme for domestic lighting: He proposes to establish in each house a certain number of secondary cells, and to connect all the cells in the different houses with the central station, where a dynamo machine will be worked by steam, sending a current of high intensity through a comparatively thin conductor, to charge the secondary batteries. It is found that the current can be taken from these batteries and used for the lamps at the same time that the charging process is going on.