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THE MANUFACTURE OF SEWING MACHINES.

Not the least prominent among those American manufactures which have made the reputation of our mechanics and inventors so well known throughout the world is that of the sewing machine. Not only was it here that the invention had its birthplace, but through all the succeeding years we have been adding improvements to enlarge the variety and perfect the quality of its work, to make it run more easily and more rapidly, and to lessen its cost while increasing its durability. Thus it is that, beside supplying our home demands with a greater variety of machines for especial uses than are known in any other market, we have not only furnished the models from which most of the European manufacturers now work, but we have, from the commencement of the business to the present time, steadily been large exporters of sewing machines and sewing machine parts.

In the illustrations on the first page of this paper we present views of the leading operations in their manufacture, as conducted by the Davis Sewing Machine Company, of Watertown, N. Y. This machine differs from most others in being what is known as a "vertical feed," that is, while the feed motion in other machines is commonly communicated by a horizontal under feed with a complicated movement, in this machine the work rests upon the perfectly smooth surface of the bed plate except as it is moved forward by the stepping of the vertical feed in connection with each up-and-down movement of the needle. The company own the patent on this principle, and claim for it decided advantages over the under feed motion, as, in the latter, the feed moving while the presser foot is upon the goods, the under-ply will be carried forward faster than the other, the tendency being to cause a "gather" in the lower piece, so that it will yield more readily to the upper in any strain upon the garment, and thus prevent the making of a perfectly strong and elastic seam. In this vertical feed the presser foot is raised from the fabric when the feed takes place, so as to present no resistance to seams or ridges; the needle is in the fabric when the feed moves, and so helps carry the work along firmly and make the stitches of uniform length, and it is claimed that the machine is capable of sewing elastic goods, making a smooth and flexible seam with stitch alike on both sides, and also that it will sew any number of thicknesses without basting, working as well on the heaviest as on the lightest fabrics.

To one ordinarily conversant with the mechanical details of the sewing machine the view of the new No. 1 Davis machine, as shown by our artist, will be easily understood, and the motion of the vertical feed with the needle bar readily comprehended, as may also be said in regard to the tension wheel and check spring on the upper thread, the tension on the lower thread being regulated in a simple way by a pad spring on the under side of the bobbin in the shuttle beneath the bed-plate.

Of the manufacturing details in the construction of the machine, we give a view of one of the large machine rooms, where lathe work, milling, grinding, drilling, and many other operations are conducted, to give an exact fit and proper finish in all the working parts of the machine. The division of labor, for the attainment of the greatest possible excellence in the minutest detail, is the leading idea in the conduct of this part of the work, the different pieces being interchangeable, and all being inspected, tested, and gauged before finally passed. Many of the pieces subjected to most wear in the operation of the machine have hardened steel parts, and although there are fewer pieces in this machine than in many others, the working parts being mostly in the head of the machine, the design is to make it strong and durable as well as simple.

The putting on of the hard, polished black surface, shown in the representation of the japanning, is a department by itself. The japan is put on with a brush, in successive coats, the pieces being baked from ten to fifteen hours after each coat in an oven kept at a temperature of from 350° to 380° Fah. After this process the pieces to be ornamented go to another department, where a wide variety of decorations are put on them, either in painting, bronzing, gold leaf, or by the now very popular decalcomanie or transfer process. Great improvements have been made in this branch of the business within a few years past, so that the most tasteful ornamentation now costs but a fraction of what was formerly paid for the most ordinary work.

In the "assembling" of the machines, all of the work which has preceded is, to some extent, looked over and tested, except that connected with the setting up of the tables on their stands. In connection with the assembling is what is called the "jacking," that is, the machines, as put together, are, at different times during this part of the work, placed upon jacks, or frames driven at a high speed, and run for a sufficient time to enable the inspector to see that all the parts are properly adjusted. After this each machine is threaded and actually tested on a sample of work, and a machine coming direct from the hands of the manufacturers is always found with such sample under the presser foot.

In the multitude of sewing machines which have been placed upon the market it would be invidious to attempt any comparison here, covering so large a field. The Davis Company claim that their machine is better adapted to a wider range of work than are the under-feed machines, and the attachments they have cover devices for nearly everything yet done on a machine, from gauging and hemming to ruffling, tucking, and fancy embroidery. The company also point with considerable pride to the fact that they

obtained the only first award of merit at the recent Exhibitions at Sydney and Melbourne, Australia, where several leading machines were represented.

At the most recent of the International Exhibitions, that held at Melbourne, Australia, the Davis machine last spring took the first award; the representatives of seven other machines appealed from this decision, and experts were then appointed to make a special examination, which resulted not only in confirming the award, but brought out the following report from the jury:

"The competition in sewing machines proved very keen, and great interest was evinced both by the representatives of the makers and the public in the result of the trials. The machines were removed from the stand, and were submitted privately to the jury, and their various qualifications explained by skilled operators. The jury then retained possession of them for some time, and at their leisure examined the workmanship and material, testing the latter for hardness by use of a file.

"Among domestic machines the highest place was awarded to a machine comparatively new in the Melbourne market, though by no means untried elsewhere, and known as the Davis vertical feed sewing machine. In this machine the shaft, pulley, and flywheel occupy the same position relatively to the other parts as in the well-known Singer form, and the vertical motion of the needle bar is produced by the usual crank pin moving in a heart-shaped cam; here, however, the resemblance ends, and the mechanism is of a most novel and curious kind. The shuttle, which moves in a curved path, is operated by a system of jointed levers proceeding from a small eccentric placed on the shaft immediately behind the driving pulley, thus dispensing with the miter wheels and vertical shaft hitherto so general. The feed apparatus is entirely removed from the usual position beneath the table of the machine, and is attached to the head. It consists mainly of a vertical bar placed close to the presser foot, and which receives suitable vertical and horizontal motion from mechanism contained in the head of the machine. We find the other points entirely novel:

"First. The presser foot, instead of being continuously urged downward upon the work, is lifted slightly at the instant that the forward motion takes place.

"Second. The feeding is accomplished while the needle is in its lowest position, and the needle partakes of the forward motion of the feed bar, pinning the two plies together and causing both to advance equally.

"The machine is also provided with a very complete series of adjustments for counteracting the effect of wear, and an improved automatic bobbin winder, and in all its details is carefully and judiciously worked out.

"Owing apparently to its peculiar feed motion the Davis machine possesses an astonishing power of passing over seams and other irregularities, and accomplishes with the greatest ease a remarkably wide range of work.

"It is also provided with a very ingenious and novel set of attachments adapted to work in unison with the new feed motion, and enabling very complicated operations to be performed with facility, and in many cases dispensing altogether with the necessity of guiding the work by hand. It was at first supposed by the jury that this excellent performance was in some measure due to the special skill of the operator. This view was, however, entirely negatived by the fact that a change of operators in no way impaired the result.

"The Davis machine is made for either foot or hand power, and performed equally well in each case. To it the jury awards the first order of merit as being prominent for simplicity, convenience, efficiency, and rapidity, both as a treadle and hand machine."

A good idea of the extent of the works of the Davis Sewing Machine Company is afforded by the illustrations on the first page, although it should be stated that most of the castings and all of the cabinet work are made outside by contract, leaving all of the facilities of the establishment for employment on that which is more directly machine work. The company was established in 1868, and from a small beginning then, the business has steadily grown, new buildings being erected and additional hands and machinery employed as called for by the growing demand. The works have not been stopped since their commencement, but their production has largely increased each year, even through the times of severest commercial depression.

The Company are represented by agencies in the principal American cities, and in Switzerland, Russia, and Australia.

Gas from Castor Oil.

At the gas works of Jeypore, India, illuminating gas is made chiefly from castor oil, poppy, til, or rape seed being used when the supply of castor beans is short. One maund (82 pounds) of castor oil produces about 750 cubic feet of 26½ candle gas, or 1,000 cubic feet of 18½ candle gas. The process of extracting the oil for carbonizing is as follows: First, the castor seed is passed through the crusher, when the shells only are broken off. The shells are then picked out by hand, and the seed is again introduced into the crusher, where it is ground to a paste. It is then passed into the heating pan, and, after being well heated, it is packed into horsehair bags and filled up hot into the press immediately. After about twenty minutes' pressing, the exuding oil being meanwhile collected, the cake is removed and ground over again. It is subsequently heated and pressed a second time until about 33 or 40 per cent of oil is obtained from the seed. The labor of preparing and press-

ing the castor seed costs two shillings (about fifty cents) per maund of oil. The total cost of the oil is somewhat over \$5 per maund.

For generating gas, the oil is used as it comes from the press. Formerly, at other places, when the oil-bearing seeds were carbonized for gas without previous treatment as above described, the product was overloaded with carbonic acid from the woody part of the seeds, and correspondingly heavy cost for purification was incurred.

For out of town consumers the Jeypore gas works supply gas compressed to about three atmospheres by means of a pump driven by a bullock. The compressed gas is then delivered in a wrought-iron receiver to the point of consumption, where it is either transferred into fixed receivers and burnt by the aid of suitable regulators, or is delivered into small portable or service gasholders, and burnt in the usual way. A *ghat*, or landing-stage, two miles distant, is thus supplied with 400 cubic feet of gas every day, which is consumed by 30 jets, each burning 1½ cubic feet per hour for nine hours. There have not been any accidents from the distribution of gas in the portable reservoirs or otherwise. As railroad carriages are also supplied with compressed gas, it is evident that the introduction of this branch of service has widely extended the utility of the establishment. Another peculiarity of the Jeypore undertaking is the necessity that exists for the manager to unite the attributes of a farmer to his other acquirements, for the purpose of securing a constant and cheap supply of raw material for gas making. Last year, the manager, Mr. Tellery, personally superintended the sowing of 300 acres with the castor plant (*Ricinus vulgaris*).

RECENT INVENTIONS.

An improvement in the class of scrapers having wooden sides and a body constructed of steel or other thin metal, has been patented by Mr. William Haslup, of Sidney, O. The features of improvement and novelty are the means for connecting the sides and body both at the bottom and back of the scraper and the devices for attaching the bail.

An improved pocket knife has been patented by Mr. August Rischow, of Elizabeth, N. J. The object of this invention is to prevent the blades of pocket knives from being raised accidentally and from folding or collapsing while the knife is being used. The invention consists in a handle with longitudinal slots, in which bars fit, which are pivoted to the lower ends of the knife blades, which slide between suitable guides in the handle, and are provided with suitable packing.

Mr. Alexander Watson, of East Pepperell, Mass., has patented a combined coal hod and sieve, by the use of which partially burned coals may be cleared of ashes without raising dust.

An improvement in sash fasteners, patented by Mr. Stephen P. Rush, of Tyrone, Pa., consists in the peculiar arrangement of parts whereby the lower sash is locked when down and the upper sash locked when raised by the movement up and down of the sashes; or either sash may be locked in a partially raised or lowered position.

An improved method of preparing and welding pipe sections has been patented by Mr. Henry V. Hartz, of Cleveland, O. This invention relates to a novel method of preparing and welding together sections of metal pipe or tubing. It is designed more particularly for welding short sections on to old boiler tubes, so as to give them sufficient length to permit them to be again reset in the same tube sheets, the old tubes being too short to be reset without lengthening. The ordinary method of resetting old tubes is to mill down or hammer one end of a section of tube to an entering bevel or male end, and expand by hammering or milling the end of the other section to a tapering or female end adapted to receive the male end, after which they are joined and welded together by hand. The difficulty attending this plan is that much labor is required to prepare the ends, and the time required to turn and weld the sections on all sides is such that the heat decreases at the end of the operation, so as to fail to secure the most perfect uniting of the parts, and both skilled workmen and hand labor are required for the work. The invention referred to consists in simultaneously cutting off and scarfing or beveling the male or entering end by rolling a bevel channel around the tube on a mandrel, and continuing this rolling action until the section is severed, and at the same time holding down the metal on each side of the bevel channel to prevent enlargement of the cut ends; then in a second operation cutting and expanding the female end simultaneously by rolling a bevel channel around the tube on a mandrel, and continuing this rolling action until the section is severed, and at the same time allowing the metal on each side of the bevel cut to spread or move freely, to permit the cut ends to be expanded, by the mashing action of the roll, to a diameter large enough to receive the male end.

anchors, as usually made, have two rigid flukes projecting in opposite directions from one end of the shank, an eye or ring at the other end, for connection of the chain, and a stock passing through the shank at the end where the chain is connected. Such anchors hold by either fluke, and, as will be readily understood, the fluke end will be lowest in the bottom while holding, the other end of the shank remaining above or being in the bottom but a short distance. Mr. John J. Moule, of Fishkill-on-the-Hudson, N. Y., has patented an improvement, the object of which is, first, to cause the anchor to sink throughout the whole length of the shank and to give a hold on the bottom at both ends of the shank; second, to prevent the chain from fouling on the stock.