AMERICAN INDUSTRIES.

[*Continued from first page.*]

also the cutting of the inner lining, which is of coarser and heavier muslin, to hold the starch better, and a collar is styled three, four, five, or six ply according as it has one to four pieces between its outer and inner sides.

From the cutters, the goods go to the room shown in one of the upper views, where the various pieces are "assembled," as it may be called, that is, a sufficient number of pieces of each kind to make two dozen shirts, with the stock necessary for their finishing, are put together in one bundle, ready to give to those who do work outside of the factory, or to send to the stitching room on the premises. All the orders for goods of different kinds and styles have here to be closely looked after to see that the work is started right.

The stitching room, as shown in the view on the left at the bottom of the page, presents no features of especial novelty, except for the great number of sewing machines at work. Great care must be taken to keep the work free from oil, and so preference is given to a machine which will require little lubricating, and at the same time can be run at a high rate of speed. A number of buttonhole machines are employed, but a portion of this work is also done by hand.

Making the folds on the edges of collars and cuffs and the plaits in bosoms is shown in the view at the top, in the center. A machine introduced for this purpose within the past two years has proved very successful. The edges are folded down or the plaits laid by a metal former, when they receive a quick pressure from heated plates, which puts them in the exact position required, and so that they retain the form thus given until the stitching is done. At the right of this picture is seen a representation of the turning room, where the collars, which have been stitched wrong side out, are turned and the seams pressed out. This work is all done by hand.

The view of the packing room, as seen in the middle, explains itself. The pasteboard boxes used are made for the firm by a local factory, where little else is done than supply this demand.

The laundering of the shirts and collars forms a separate department of the business, not shown in our engravings. In the collar laundry about 100 hands are employed, and rather more than that number in the shirt laundry. A good deal of machinery is used in this part of the work, including huge wash wheels, which will take in four to five hundred dozen collars and cuffs at one time; centrifugal wringers, which turn at the rate of a thousand revolutions a minute; immense starch wheels, steam ironers, etc. In addition to the starching done by machinery a large number of "hand starchers" are employed for the collars and cuffs, and the drying is all done by steam heat. The ironing machines consist of various arrangements of heated rollers and revolving drums, which give to the goods a smooth, fine finish, and all the work of washing, drying, starching, and ironing is performed so expeditiously that the laundry work is regularly kept close up to the production of the factory.

The cost of making a shirt runs from $1.50 to $3.50 a dozen, and, low as this price seems, and impossible as it would be for ordinary seamstresses to make a living in this way, there is never any difficulty found in obtaining all the help needed. There are about 300 hands employed in the building, of which 50 are men, but there are some 1,500 names on the pay-roll besides, of those who take out work to do at their homes in the city and for many miles around, so that, where the money thus earned does not go directly to the support of families and individuals, it enables those who are industrious and ambitious to supply themselves with many additional comforts and luxuries which they would not otherwise have. This is exclusive of the hands employed in the laundry work, which would make the total help engaged in shirt and collar making and laundering number fully 2,000.

The present firm was organized in 1865, but the business was established over twenty-eight years ago. The partners are all practically conversant with and take an active part in the work. Their goods are sold only to jobbers: in New York, from No. 87 Franklin street; in Boston, by Whittemore, Cabot & Co.; and in Philadelphia, by W. L. Wetherly.

The Nature of Light and its Action upon the Eye.

At a recent meeting of the Buffalo Microscopical Club, Dr. Lucien Howe presented the subject of the undulations of light and their perceptions by the eye. Brief mention was made of the different theories, accounting for the phenomena of optics previous to the present century. The difficulties of this subject were first solved by Thomas Young, who satisfactorily explained the undulatory theory of light. He showed that what we call light is an impression produced upon the retina by the wave-like motion of the particles of matter. Subsequently the lengths of these waves were measured. It would take 36,918 waves of red light, or 64,631 waves of violet light, placed end to end, to make an inch. From the speed of light, which has been measured, it is proved that at least four hundred and fifty one millions of millions of these minute waves flow into the eye and dash against the retina in each second. Dr. Howe proceeded with a minute description of the microscopical anatomy of the eye, more particularly relating to the "layer of rods and cones." These were stated as being in reality the terminal filaments of the optic nerve. These are shaken or acted on by the waves of light, and it is especially these with which we see.

The Proposed Illinois Ship Canal.

Mr. Daniel C. Jenne, Chief Engineer of the Illinois and Michigan Canal, contributes to the Chicago *Inter-Ocean* the following account of the proposed through water route from the great lakes, at Chicago, to the Mississippi River:

The first division of the project consists in the enlargement of the Illinois and Michigan Canal from Chicago to Joliet. The present canal was built 48 feet wide on the bottom, with side slopes 1 to 1 in earth, making 60 feet surface width at 6 feet deep, or below the low water of Lake Michigan, with a descent on the bottom of one-tenth foot per mile across the Summit level, toward Joliet. It is proposed to make the enlarged canal 144 feet wide on the bottom, side slopes 1 to 1 protected by slope wall in earth, and 160 feet wide at surface at 8 feet deep, or below low water of Lake Michigan, with a descent of two-tenths foot per mile. This will pass 112,321 cubic feet of water per minute, and give a current of 1·06 miles per hour. The average stage of water in Lake Michigan for the last eight years has been about 2 feet higher, which would make the water 10 feet deep, and would pass 158,533 cubic feet per minute, with a current of 1·19 miles per hour.

The canal enters the Desplaines River about one mile and a half north of the main street at Joliet, or nearly opposite the State Penitentiary, and will be about 33 miles long. The work of enlargement consists of about 15,000,000 cubic yards of excavation, including the removal of spoil banks made from the excavation of the present canal, of which there will be about 4,000,000 cubic yards of solid magnesian limestone to be excavated. Three lift-locks will be required at the southern end, one grand lock at Bridgeport or north end, six public road and street drawbridges, and one double railroad drawbridge, and a large water weir at Lockport. The locks are to be 350 feet long between the gates and 75 feet wide, to correspond with those now built on the Illinois River.

The second division extends from one and one-half miles above Joliet to La Salle, about 67 miles, and will consist of the improvement of the Desplaines and Illinois rivers by locks and dams, and an independent short piece of canal around the rapids at Marseilles. It will require the construction of eleven locks, nine dams, the raising of two dams, nine drawbridges, the independent piece of canal above referred to, and other incidental work.

The third division consists in the improvement of the Illinois River from La Salle to Grafton, on the Mississippi River, and was described in my former communication, distance 227 miles. Of this, 90 miles have been finished by the construction of two locks and dams.

COST OF THE WORK.

The estimated cost of the first division, 33 miles, is	$11,532,932
Estimated cost of the second division, 67 miles, is	4,327,879
Estimated cost of the third division, 227 miles, is	1,000,000
Total cost to complete 327 miles	$16,860,811
There has been expended by the State on locks and dams	747,747
There has been expended by the United States on locks and dams	62,360
There has been expended by the United States on dredging wing, dams, etc.	526,000
Amount already expended	$1,338,107
Total estimated cost of the entire work	$18,196,918

The item of work, quantity, and the estimate of cost on the first and second divisions are from the report of F. C. Doran, Esq., civil engineer, who made a survey of the same in the fall of 1874, under the direction of Colonel J. N. Macomb, Corps of Engineers, United States Army.

According to these estimates the canal, 327 miles long, will cost $55,560 a mile, and will have twelve times the capacity of Erie Canal, which cost about $90,000 a mile. This route opens an inland water communication between the Gulf of Mexico, New Orleans, St. Louis, and other cities of the great West and Southwest, through the city of Chicago, with the city of New York in one direction, and with the cities on the St. Lawrence River and the Gulf of St. Lawrence in another direction, and through both routes and the extremes with the Atlantic Ocean.

The dimensions of the proposed canal are sufficient to admit boats of 2,500 to 2,800 tons burden, being 80,000 to 85,000 bushels of grain, or one and a half to one and eight-tenths million feet of pine lumber; or fleets of smaller boats can pass the locks at the same time with about the same tonnage, or twelve of the boats of the Erie Canal, or the Illinois and Michigan Canal, can pass the locks at one lockage.

The summit level of the canal could be reduced to 100 feet on the bottom with the same slopes and declivity, and construct basins at every mile 500 feet long and 50 feet wide for boats to pass, and reduce the cost of the first division about $4,000,000, and these at 10 feet deep would pass over 100,000 cubic feet of water per minute.

The Railway up Vesuvius.

The station is situated on a level spot on the west side of the mountain, about half an hour's walk from the observatory. The constructors of the railway have adopted the American double iron rope system. There are two lines of rails, each provided with a carriage divided into two compartments and capable of holding six persons. While one carriage goes up the other comes down, thus establishing a counterpoise, which considerably economizes the steam of the stationary traction engine. The incline is extremely steep, commencing at 40°, increasing to 63°, and continuing at 50° to the summit. Every possible precaution has been taken against accident, and the railway itself is protected against possible flows of lava by an enormous wall. The ascent will be made in eight to ten minutes, while before it required from one to two hours. To obtain the necessary supply of water, large covered cisterns have been constructed, which in winter will be filled with the snow that often falls heavily on Vesuvius. This snow will be quickly melted by the internal heat, and, besides the water thus obtained, the frequent rainfall will also be conducted into the cisterns.

MISCELLANEOUS INVENTIONS.

Mr. Oscar Kleinberger, of New York City, has patented an improved material for suspender straps or ends. It is made of duck, muslin, or other woven fabric, faced with oil cloth, the two being attached together, with or without a filler, in a solid compact sheet, from which the ends and other portions are afterward cut.

An improved apparatus for flooding oil wells has been patented by Mr. Henry R. Davis, of Pioneer, Pa. The object of this invention is to continuously flood or lubricate oil wells other than flowing oil wells with oil, to prevent the accumulation on their sides of incrustations of salt, lime, paraffine, or other oil deposits.

A portable lantern combined with clockwork mechanism, by which flashing or other signals may be given, so that the number of the signals may convey the desired meaning, has been patented by Mr. Romeo W. Lewis, of Sacramento, Cal.

Mr. William H. Maxey, of Homer, La., has patented a tether for securing horses and other stock while grazing, so constructed as to prevent the animals from twisting the tethers or becoming entangled in them, and also to limit the grazing area without moving the tether.

Mr. John K. Hogan, of Placerville, Cal., has patented a machine intended for splitting peaches and other fruits in halves and removing the stones in preparing the fruit for preserving, and is especially adapted for the varieties of peaches known as "cling-stones," which are generally preserved whole on account of the difficulty experienced in freeing the stones by hand.

Messrs. Lewis B. White and Leonard Henderson, of Middleburg, N. C., have patented a smoke and dust arrester for railway cars, which consists in inclosing the trucks of the cars in a housing having doors at the ends, which housings communicate with a pipe extending through the entire train, through which the air and dust from the wheels is drawn by a fan located in the rear car. Smoke may be drawn from a hood located above the smoke stack of the locomotive by the same pipe.

Messrs. Henry P. Gray and William Gray, Jr., of South Manchester, Conn., have patented an improved apparatus for dyeing and washing yarn, cloth, etc., adapted for use in connection with any desired number of vats.

An improved device for fastening an umbrella to the body of a person who is exposed to the rays of the sun during his work, has been patented by Mr. Thomas Mora, of Franklin, La. The invention consists of a tubular socket provided with side springs and of a tube provided with a laterally projecting ring, both of which are buttoned or otherwise fastened to straps or bands that buckle about the body.

An improvement in heating stoves, patented by Mr. John P. Oeth, of Canton, Mo., is designed to increase the heating surface of stoves, to prevent accidental contact of the body or clothing with the heated surface of the stove, and to enhance the appearance of the stove.

Mr. Hubert Child, of Wichita, Kan., has invented improvements in transparent signs. It consists in "cutting in" a transparent letter on glass by means of an opaque color, and placing behind the glass a packing of broken glass contained between two independent panes of glass, so that when the light from the rear shines through the transparent letter the plane character of said letter is broken up and diversified by the crystals of glass, which may be of different colors to produce a very brilliant and tasteful design.

Mr. William H. Burk, of Greencastle, Ind., has recently patented an ornamental and attractive apparatus for roasting and warming peanuts.

Mr. David N. Smith, of San Bernardino, Cal., has patented improvements in the construction of safes for receiving vegetables, food, clothing, and other similar articles, the object of the invention being to prevent the access of insects to the articles placed within the safe.

An improvement in crates for carrying fruits, eggs, and other perishable articles, has been patented Mr. George E. Bender, of Everett, Pa. The object of the invention is to provide a crate that is perfectly ventilated, and at the same time is arranged to exclude the cold and protect the contents against injury from the outside.

Mr. Edward Barnard, of Rome, N. Y., has patented a quarter boot for horses, having a soft leather body with stiff pads on the quarters, and a stiffening sole strip, the whole adapted to be held in place by straps and buckles.

An improvement in gate latches, patented by Mr. Samuel B. Elzey, of Atlanta, Ga., consists in combining a pivoted latch carrying an arm, a sliding bar carrying an arm, and a spindle carrying an arm, so that the gate may be unlatched by turning the spindle.

Mr. William Linehan, of Chicago, Ill., has patented a device for automatically feeding the fluid for preventing incrustation into the boiler along with the feed water, when supplied by a pump or an injector. It consists of a reservoir for holding the fluid, from the bottom of which a siphon pipe leads to the pump barrel or injector at a point where the water is forced or drawn by suction into the boiler. The siphon pipe is supplied with a stopcock and check valve, to regulate the amount supplied and to prevent back pressure when pumping.