THE MANUFACTURE OF NEEDLES.

Needles are most usually made from steel, though the cheaper and coarser varieties are made of iron wire, which in the course of manufacture becomes converted into steel. The first operation is to wind the wire upon large reels or drums of from fifteen to eighteen feet in diameter. The large coil so obtained is next cut into two portions by means of pow-

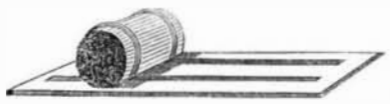
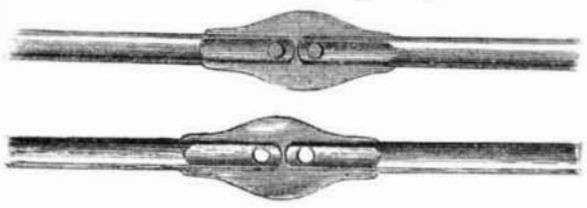


Fig. 1.—STRAIGHTENING THE NEEDLES.

erful shears, and these two bundles are further reduced by the same means and the use of a proper gauge, to pieces of double the length of the future needles. In this way one workman can produce in an hour 40,000 of these pieces, or shafts as they are technically called, equivalent to eighty



Figs. 2 and 3.—PUNCHING THE EYE.

thousand needles. This rate of production has been greatly exceeded by the introduction of automatic machinery.

The shafts now undergo a process of straightening, and to this end are gathered into bundles of five to six thousand pieces, upon which strong iron collars are slid. These bundles are slightly heated in order to soften the metal, and are then inserted between two plates of steel, the lower one of which is fixed while the upper

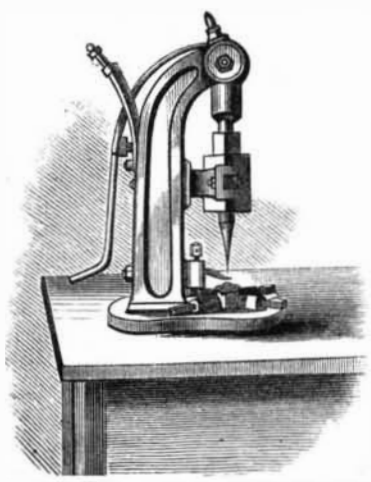


Fig. 4.—MACHINE FOR PI RCING THE EYE.

one is made to swing about an axis. These plates have longitudinal grooves for the reception of the iron collars so that the pressure is mainly and properly exerted upon the wires alone. The next operation consists in pointing the shafts at both ends. Grindstones of fine-grained sandstone are used with this view, rotating by means of belts with a velocity of about two thousand revolutions per minute. The workman, according to the fineness of the wire and the skill he possesses, takes one or two dozen or more shafts at a time and spreads them out upon the stone, giving them a slight rotary motion by means of his thumb and forefinger. In order to prevent the formation of rust the grindstone must be kept dry so that quite a quantity of stone and metal dust is produced, rendering the operation one not unattended with considerable danger to the health of the workman. After this sharpening operation the mode of procedure branches off into two different methods, the first and older one being to cut the shaft at this stage into components, while the one more recently brought forward continues the operations upon the double needles until very near the concluding steps. We will begin with the former method, being the one at present more extensively pursued.

The divided shafts, after leaving the shears as such, have their blunt ends flattened preparatory to the formation of the eye. This operation is conducted with great rapidity upon a small iron anvil. The workman takes a few dozen needles by their pointed ends, spreads them out fan-shape upon the anvil, and strikes several light and rapid blows with his hammer, flattening the heads of five or six at each blow. The ends, having been rendered too hard by this procedure for the following operation, have first to be heated and slowly cooled.

The eye is formed either by punching or piercing, never by drilling in the true sense of the word. In punching, the flat end of the needle is first placed upon a vertical steel point and struck with a hammer. Into the depression thus formed a steel punch is placed and the hole completed by another blow. A few taps about the punch then finishes the eye. The two stages of this operation are shown in Figs. 2 and 3. The delicacy of such manipulation, especially in the case of very fine needles, is really surprising and can scarcely be acquired by other than children, who attain an incredible degree of skill and rapidity. Their favorite trick of forming an eye in one end of a human hair and threading it with the other is no doubt familiar to all.

The idea of piercing the eye originated in England. The

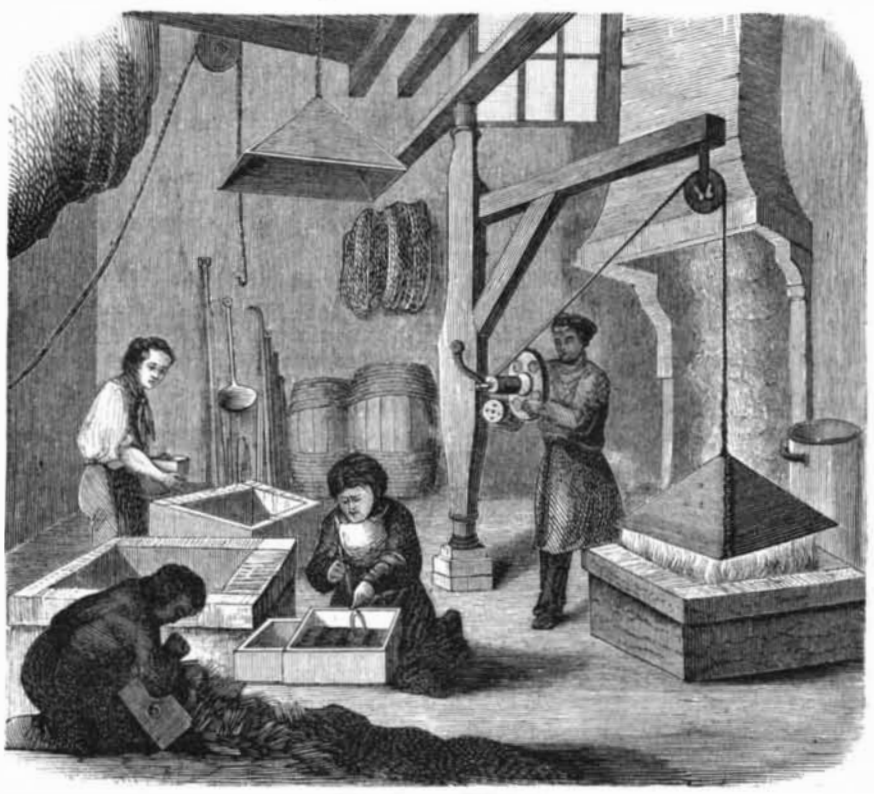


Fig. 6.—CEMENTING.

machine employed is shown in Fig. 4, and will be readily understood. A lever worked by hand lowers the steel point and drives it through the end of a needle placed properly beneath. The needles after receiving the eye have next to be provided with the groove serving to guide the thread to the hole. This is accomplished by means of a file which, at the same time, removes any burrs or other irregularities that may still be remaining.

We will now go back a step in order to describe the second and improved mode of bringing the needles to the stage where we here stop.

The shafts, after being sharpened, are not divided as in the former instance, but are introduced whole, one by one, into a small stamping machine. They here are made to undergo the following changes by one stroke of the heavy die, both sides being acted upon at once. The central portion is flattened, the two longitudinal grooves in which the eyes are to lie are formed, together with a notch which is to assist later in separating the needles, and any numbers, letters, or other marks which the latter are to bear. Both eyes are formed at the same time by means of the piercing device shown in Fig. 5, after which the double needles are strung upon cords, and passed to a workman who files the whole string at once, breaks the shaft into two, and finally rounds their heads. Hardening of the needles made from steel wire then follows, the iron ones being converted into steel by means of the process of cementation (Fig. 6).

The next stage of the manufacture—scouring and polishing—is about the most tedious and troublesome of all, though several millions of needles are worked upon at once. The needles are arranged in parallel layers upon pieces of coarse, strong cloth, mixed with sharp sand or emery, moistened with oil, usually linseed, and, after the mass is sufficiently large, rolled up into bundles of about eighteen inches in length by four in diameter. Twenty or thirty of these bundles, each containing about half a million of needles, are placed in a scouring mill and rolled back and forth under heavy pressure for about twelve to eighteen hours. The filthy looking mass is then removed from the bundles and stirred about in a large drum full of sawdust, which removes the oil, dirt, and sand, and leaves the needles already pretty bright. These are then separated from any adhering sawdust by means of an air-blast, and are again submitted to the scouring operation. This is repeated for about ten times, finer grades of sand and emery, binoxide of tin, rouge, or bran being successively used. After this the needles undergo a thorough washing in warm soap water, and are dried in sawdust, which completes the cleansing process.

The common cheap varieties are then hastily gone over again with a piece of cloth or soft leather, after which the broken and otherwise defective ones are removed and the rest properly assorted and arranged. The better classes of needles undergo various additional manipulations. To begin with, their points are gone over again more carefully, the rough treatment in the scouring mill being very apt to render them blunt. They are held about twenty-five at a time against a cylindrical or prismatic grindstone (Fig. 7), at the same time being slowly rotated between the fingers. In order to prevent the fraying or cutting of the thread against the possibly rough edge of the eye, these latter are gone over again with a rapidly rotating fine steel drill. This operation is shown in Figs. 8 and 9, the latter giving a clearer view of the mechanism employed.

Fig. 7.—RE-SHARPENING.

England and Germany are the two principal countries engaged in the needle manufacture. Redditch is the needle-producing center in England, and enjoys in its own special branch of manufacture as high a reputation as do Sheffield and Manchester in theirs. The largest factories in Germany are situated at Ichtershausen, in Thuringia, and at Aix-la-Chapelle, and

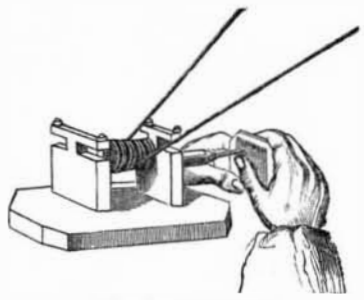


Fig. 8.—DRILLING.

turn out, in the course of a year, respectively about three hundred and fifty millions and one hundred and fifty millions of needles of all grades.

The earliest needles were "square eyed," that shape being the most readily produced. Drill eyed needles, after many unsuccessful attempts, were first brought out in 1826. The burnishing machine, in which the needles are on a steel wire to which rapid revolution is imparted, was introduced two years later. By this, a beautiful finish is imparted to the eye. The process of hardening them in oil was introduced in 1840, water having been previously used for this purpose, which caused a large proportion of them to become crooked, requiring the services of a large number of workmen to straighten them. These being thrown

Fig. 5.—PIERCING THE EYES.

Fig. 9.—THE DRILL BENCH.

out of employment by the introduction of the new process made a riot, and drove its introducer out of town; but it was generally adopted. A similar disturbance had taken place in 1830, on the introduction of the stamping machine. The machine for pointing is of still more recent introduction.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The following appeared in the *Star* of this city:

A board appointed by Secretary Schurz, consisting of Z. F. Wilbur, examiner of interferences in the Patent Office; N. S. Howe, of Assistant Attorney General Marble's office; and J. A. Armstrong, chief of the private land claim division of the General Land Office, met to-day to inquire into the truth of the charges preferred by Mr. Doolittle, Assistant Commissioner of Patents, against J. McClary Perkins, a patent attorney of this city. The charges allege malpractice and irregularity on the part of McC. P. When the board have finished their investigation they will report to the Secretary, with their recommendations.

This is the same J. McClary Perkins that reported that he had preferred charges against the Commissioner some time ago.

Among the patents recently issued, I notice several to Mr. Holly, of waterwork fame, for his system of warming a city by steam, supplied as gas and water is now through a series of mains. The idea of distributing hot air and steam for heating buildings, etc., from a number of heaters or boilers in a central location has been a favorite idea of many inventors, and some have proposed the distribution of cooled air in the same way, one at least of which proposed to erect a tall tower to draw down from the upper regions cool and pure air. Mr. Holly, therefore, is not the first worker in this field, and all that he can cover is his peculiar arrangements, which, it must be confessed, are very comprehensive, as they include, besides heating buildings, furnishing steam for driving machinery, operating steam fire engines by connecting them direct to the mains, protecting hydrants from freezing, freeing the streets from snow and ice, heating greenhouses, supplying steam and hot water for culinary purposes, etc.

One of the members of the Virginia Legislature, having invented a register, succeeded at the last session of that body in getting a law passed to compel every barkeeper to purchase one of his instruments to record every drink sold, and on every drink thus registered the landlord was to pay a tax to the State. This, of course, caused considerable excitement among the dealers in the "ardent," and they no sooner became aware of the law than they set about finding some means to evade it. Having learnt that the Moffett liquor register had been rejected in the Patent Office, they bought up the patent that formed the basis of the rejection and engaged Messrs. Hill & Ellsworth, of this city, to bring suit against the manufacturer of the Moffett register, which was done, and an order has been issued by Judge Hughes, at Norfolk, restraining the issue of the registers until the question as to a preliminary injunction can be argued.

General Le Duc, the new Commissioner of Agriculture, has instituted a series of inquiries from which he expects to procure such information as will enable him to prepare a plan of operations that will very much increase the economic value of the department under his charge. The department has been of little real use so far, as very little has been accomplished beyond the collection of statistics regarding crops and the ravages of insects, which, though in themselves valuable to the commercial and agricultural interests of the community, are not all that the country has a right to expect from the operations of the department. General Le Duc proposes, among other things, to establish a comprehensive system of inquiry into the physical characteristics of the various sections of the country, with a view to the propagation of various products thought to be adapted to certain localities, but as yet have not been cultivated there, and also intends to stimulate, as far as practicable through the agency of the department, the cultivation of those agricultural productions for which we have now to send to foreign countries. The reports so far received show that the climate and soil of the Pacific coast are apparently very well suited to the cultivation of teas, which he thinks could be made an important industry, especially in view of the number of Chinese already on that coast, and the ease with which more could be had if found desirable. Sugar, also, though now largely cultivated in the South, it is believed could be made a much larger item in our annual production, if properly tried in other suitable regions. In view of this proposed action, the Commissioner recently addressed letters to prominent senators and representatives, asking them to furnish the department with all information in their power as to the character and diversity of the crops in their sections, the kind of soil and climate, and any other data that they might consider of interest on the subject; and also requesting them to furnish the names of such leading farmers as would be likely to receive and experiment with such seeds and plants as might be sent to them from time to time.

The Bureau of Statistics having now received full returns from all the customs districts, of the exports and imports during the last fiscal year, furnishes the following corrected statement: Total exports (specie values) $602,474,581; total imports, $451,307,549—showing an excess of imports over exports of $151,167, 032. In the fiscal year 1876, the excess of exports over imports was $79,463,481. In the fiscal year 1877, the exports of coin and bullion amounted to $56,163,237, and the imports to $40,774,414, while in the preceding year the exports were $56,606,305, and the imports only $15,936,681.

It is reported that the Post Office authorities here have serious apprehensions of a general strike of the engineers and firemen of the various roads throughout the country, which it is thought will begin towards the close of the present month, or the beginning of next. The information is said to come from reliable sources; and it is feared that great inconvenience in all the departments of business, and especially in the postal service, will be caused by it. *Per contra*, Chief Arthur of the Brotherhood of Locomotive Engineers positively contradicts these rumors and says that his society is at present on amicable terms with the railroad companies, and that in the event of a future disagreement the brotherhood will not resort to a strike until all other efforts at a settlement have failed.

Mr. O'Sullivan, who has been prominent in the Nicaragua Canal scheme, has been at the State Department on diplomatic business connected with that enterprise. He says that the work will cost about $80,000,000, and can be completed within five years. It is said that no appropriation is to be asked of Congress, but subscriptions are to be opened in all the money markets of the world. He speaks confidently of the success of the work, the surveys of which have been made by United States officers.

Since the first of July the Secretary of the Navy has given employment to 3,400 men at the different navy yards throughout the country. The appropriations for the several bureaus of the departments, although smaller than usual, have been liberally distributed so as to give employment to as many men as possible; and that it may be made to go as far as practicable, the wages paid per day to each man have been reduced to some extent, so that the more men may be employed.

There has been more activity in the Navy Yard in this city during the past month than for many years, except for a short time during the Cuban trouble.

Captain Howgate of the Polar expedition has returned from New London, where he has been superintending the sailing of the Florence for the Arctic seas. He is well pleased with the success that has so far attended his enterprise and will not let the grass grow under his feet, but, it is said, will immediately urge all the members of Congress that he can reach to aid him by passing the bill which was presented to the last Congress, making an appropriation to aid him in his exploration. He does not, however, intend to rely wholly upon the rather uncertain favors of Congress, but hopes to take such steps that, in case it refuses him any aid, he will still be able to leave in August, 1878, with the second and most important part of the expedition.

There are imprisoned in Fort Marion at St. Augustine, Fla., some seventy Indians, and Clark Mills the sculptor, of this city, has been sent down by the Government to take casts of the more prominent among them. Some anxiety was felt as to the success of the operation, as it was quite uncertain how the Indians would relish the operations incident to having their casts taken. They, however, made no trouble, and were quite interested in the matter, allowing sixty-two casts to be taken, which are to be given to the Smithsonian Institute, and are said to be the most remarkable collection of Indian heads in the world.

Washington, D. C. OCCASIONAL.

A Question of Axial Change of the Earth.

To the Editor of the Scientific American:

Granting the axial motion of the earth to have been communicated by the sun, at the time it was thrown off from the sun: First, does it necessarily follow that the present axis is the same as at the time the earth took position in its orbit after severance from the sun? Second, would not the destruction of individual fixed stars and planetary bodies by combustion or disruption change the position of the earth relative to our solar center, affect its orbital motion, and change its original axis? Third, if the axis of the earth has changed, or its obliquity to the plane of its orbit has changed, from any cause within or outside our solar system, could not the glacial drift be imputed to this cause as necessarily producing climatic disturbances resulting in the conversion of the frigid to the torrid zone, and *vice versa?*

Nashville, Tenn. JOSEPH PHILIPS.

Leaks in Gas Pipes.

To the Editor of the Scientific American:

It sometimes happens in fitting gas pipes, no matter how careful or cautious the workman has been, small leaks will occur. Any one who had the mercury go down on him, after he has used every endeavor, made every precaution against leaks, knows how exceedingly annoying it is. It often takes nearly as much time to locate the leaks and stop them as it does to do the work previously done.

If gas fitters will act on the following hints, which is my plan, they will save themselves a large amount of unnecessary labor. I am going on the idea of a job worth doing at all is worth doing well. I have no patience with botches, or workmen whose highest ambition is to deceive the inspectors, or those who will do a job and leave without being able to tell truthfully whether their work is tight or not.

In getting out pipe, I notice each length and see that it is perfect. It sometimes gets damaged in transportation. In screwing on the fittings, see that they are cemented inside and out. Have the pipe just warm enough to melt the cement. Have the fitting as hot as it can be without burning the cement. Screw together tight, and when cold the fitting, by reason of its greater heat, will contract more in proportion than the pipe. You will not lose much time by this extra care, and certainly no reputation.

If, after all your pains, a leak is indicated by the gauge, you may be sure it is a very small one, or, as for that matter, the rapidity of the mercury's descent will indicate the character of the leak.

If it is small, and you are pushed with other work, it may be stopped effectually by screwing a short piece of inch pipe, with a cap on one end, to the bottom of the receiving main, having previously poured into it some commercial hydrochloric acid—a half pint or thereabouts—with a handful of zinc scraps. A chemical action sets up between acid and zinc, liberating gas that soon rusts the leak tight. What might be termed large leaks can be stopped in this way. I have reference to new pipe. Whether this will stop leaks in old pipes or not I am unable to say.

Frankfort, Ky. M. A. JONES.

oison Ivy and its Remedies.

To the Editor of the Scientific American:

Poison ivy, poison oak, mercury vine, *rhus toxicodendron;* climbing ivy, *rhus radicans;* poison sumach, poison elder, dog elder, poison dogwood, *rhus venenata.*

The milky juices of these shrubs are neutralized and made harmless by almost any alkali. Strong suds made from soft or potash soap, white lye, ammonia water—four or five teaspoonfuls to a pint of common water—or a little saleratus dissolved in water, make good washes for the purpose. These washes may be used as preventives and as remedies.

White lye is made by throwing a couple of quarts of the ashes of hard wood—hickory, oak, or any other hard wood—into a pail of water. Stir and let settle. The clear liquor is white lye, and is a good wash.

First, as preventives—when one is going, or thinks he is going, to be exposed to the influence of these plants—wet every part of the skin that is exposed or uncovered with one of these washes, and be sure to let the wash dry on the skin, by no means wiping it off. This treatment protects the skin from the influences of these poisonous plants.

It must be kept in mind that these shrubs, especially when crushed or cut, have the power of affecting some skins even at the distance of several feet. After one has been exposed, or fears he has, let him follow the same directions, being careful to let the wash dry on the skin.

If, by the swelling and reddening of the skin, by the heat and itching and stinging, one finds that he unawares has been "poisoned," use these washes freely on the inflamed parts, only let them dry on the skin. Keep cool and quiet, restrict oneself to a spare and cooling diet, and keep the bowels gently open.

If much of the skin is involved in the inflammation, some caution may be needed in applying the washes. I once knew a case where the inflammation left the skin—on the hands and face it was—and settled on the lungs. For a few hours it seemed as though every gasp of the patient would be his last. A large and very strong mustard poultice on the chest at last brought the poison all out of there. But it left on the lungs a cough that lasted for months.

Ithaca, N. Y. W. M. KINNE.

Another Remedy for Poison Ivy.

To the Editor of the Scientific American:

I have a remedy which I have used for several years with success. It is one half ounce of salts of tartar dissolved in two ounces of water, and applied to the affected parts several times daily.

Branford, Conn. R. O. SMITH.

Laboratory Conveniences.

To the Editor of the Scientific American:

Little laboratory experiences, the knowledge of which saves much annoyance and contributes greatly to the pleasure of working, are naturally overlooked by the inexperienced. The repetition here of some of them may be of benefit.

A piece of wire gauze soldered over the escape in a sink will prevent the pipes becoming clogged.

To clean greasy utensils, some pieces of newspaper, a soaped sponge, and a little powdered pumice does the work in a twinkling; whereas many will thoughtlessly and laboriously try the effect of soap and water alone. Profanity is known to have been occasioned by a hard water complication.

Bits of paper, with or without muriatic acid, are nearly always preferable to shot for cleaning bottles, of course when there is no thick sediment.

A wet cloth, on which the glass receptacle of a hot liquid is set, will, in some way I am unable to explain, obviate breakage.

A rubber band to keep the cloth used in straining from the sides of a funnel is a convenience. F. E.

Belleville, Ill.

A Peculiar Appearance in Aniline Red.

To the Editor of the Scientific American:

A few evenings ago I put a small quantity of aniline red in a jar of water, to notice the minute division of matter. A lamp stood on one side of the jar. After the liquid had been stirred up and stood a while, I observed little specks of the aniline floating on the top, with what resembled little tails projecting in the opposite direction from the lamp, and as the specks appeared to have no motion I thought this rather peculiar. I changed the lamp to the opposite side of the