Manufacture of Bits.

In the United States there are fourteen bit factories, eleven being in Connecticut. A *Sun* correspondent recently described the various operations necessary in the manufacture as carried on at Chester. Along the ceiling of the forging room extend lines of heavy shafting filled with driving pulleys from 6 inches to as many feet in diameter. The floor is of clay, packed as hard and smooth as cement, and on it are thrown heaps of red hot bits. Long bars of cold steel are placed between shears which cut them as easily as a lady cuts thread with a pair of scissors. The steel bars are placed in forges which heat them to a white heat, when they are put under trip hammers, striking hundreds of blows per minute, that flatten the bars on one end, round the center, and square the other end. The bit has now started into existence, and is called a "plate."

"It is next passed to the crimpers, who again heat it to whiteness and run it through machines which twist the flat end into a 'pod,' or spiral of beautiful regularity. The 'swedgers' seize it now, and again under the influence of the blowpipe the steel is soon red hot, when one blow from a powerful drop fashions the square end into a shank properly beveled for the bit brace; again it is heated and passed under another drop, which stamps on its shank a figure telling the size of the hole it will bore when finished. Once more it endures the fiery ordeal, and, glowing red, passes through the heading presses, which with a hug and a squeeze crush two inches of the twisted end into a mass in which you faintly discern the point spurs and cutting edges of the future bit. It is next carried into the annealing room, where, with thousands of others, it is buried beneath heaps of charcoal and thoroughly baked until the steel is well softened or annealed. Next it is pickled for several hours in vats containing a strong solution of sulphuric acid, which eats off all the scale left by the many previous heatings in the forges.

"The bit now passes into the machine room, where the rasping machine cuts out all superfluous stock in the head, forming rude cutting edges. The milling machine cuts the point smoothly to the correct bevel, ready for the screw to be made upon it. The leveling machine smooths the bottom of the blades, the facing back machine cuts the edges of the blades straight, the screw cutting machine forms the threads on the point, and the sizing machine cuts the boring end to the exact diameter required. And still the bit is only about half made.

"You pass into another department, and here you see long rows of skilled mechanics seated upon high stools, each man having in front of him a heap of bits and a lot of files of various sizes and forms, known as 'square' 'round,' 'flat,' 'half round,' 'humpback,' 'ground-off,' and 'feather-edge,' and each of these is used in turn to form and smooth the various parts and cutting surfaces of the bit. The squeaking of a hundred files of almost as many sizes and shapes fills the air with shrill notes and sets your teeth on edge.

"You pause for a moment to watch a couple of men who, seated in front of tiny forges, are heating the bits to a cherry red color and then dipping them into dishes of oil and water. You learn that they are tempering them to the proper degree of hardness for cutting. You also learn that, although they can control the temper of the steel, they cannot control their own—when they burn their fingers.

"You now open a door lettered "Polishing Room," and start back at the scene which meets your gaze. A living reproduction of Dante's dream is before you. Men with faces blackened by charcoal dust and emery stand in long rows, while a sheet of fire five or six feet long plays from the hands of each, lighting up their blackened features and making them look like veritable demons. Each man holds in his hand a bit and presses it upon the polishing wheel, which makes many thousand revolutions in a minute, causing by its friction a great sheet of sparks to fly out in front of the operator. You behold the many different processes of finishing as the bits pass on from one workman to another down the row, until at last they look as bright as burnished silver.

"In the packing room many men are sharpening the finished bits, and a few inspectors are examining them with magnifying glasses to see if they can detect any scratches that have been left by the polishers. Here also the bits are sorted into first class and second quality, stamped with the manufacturer's name and trade mark, wrapped in strips of paper, and packed in pasteboard boxes. You are astonished at the variety of sizes and forms, running from small bits hardly an inch long, up to car bits, more than two feet in length, and from the little bit cutting a hole but three-sixteenths of an inch in diameter to the great six-inch auger, which requires two strong men to turn it. You are struck, too, by the oddly shaped machine bits and the curious mortising bit which bores a square hole."

THE GIANT HERON.

The giant heron (Ardea Goliath gigantodes and nobilis) is found in the central and southern part of Africa. The feathers of the upper part of the head and the tuft upon the top of the head, also the feathers on the curve of the wings and the under part of the body with the exception of the white throat, are chestnut brown. The remaining upper part of the body is ash gray. The loose hanging feathers on the fore part of the neck are white on the outside, and black inside. The eye is yellow, the upper part of the bill is black, the under part is greenish yellow at the point, and violet color at the root. The foot is black. The length of this heron is about one hundred and thirty-six centimeters, the breadth one hundred and eighty-six; the length of the tail twenty-one centimeters, and the length of the wings fifty-five.

This bird is found near shallow water. It visits small ponds in the fields, water ditches, and pools, and in winter seeks shallow bays of the sea and waters about the coast, especially where there is a forest in the vicinity, or at least high trees, where it is accustomed to rest.

These giant herons are more timid than any other of the species. Every clap of thunder terrifies them, and they are afraid of men even when seen at a distance. It is a very difficult matter to surprise an old heron, for it seems conscious of every danger, and immediately takes to flight if frigbtened. They have a shrill voice.

GIANT HERON.—(*One-fifth Natural Size.*)

Their food consists of fishes, frogs, serpents, especially adders, young swamp and water birds, mice, insects that live in the water, and earth worms. Naumann says that when a heron reaches the pond, if it does not suspect the presence of an observer, it generally goes immediately into the shallow water and begins to fish. Bending its neck, and lowering its bill, it fastens a keen look upon the water, and moves softly and with measured strides, but with such cautious steps that not the least splashing sound is heard. It circles round the whole pond in this way, seeking for food, throwing its neck quickly forward, then suddenly drawing it back, holding a fish firmly in its bill. If the fish aimed at is in deep water, it moves with its whole neck under the water, and in order to preserve its balance opens its wings a little. It seldom misses its aim.

These herons form settlements, the nests sometimes numbering a hundred. In April the old herons make their appearance at the nests, repair them if necessary, and then begin to lay. They are about a meter broad, shallow, and simply put together of sticks, twigs, reeds, or straw. They are lined in a very slovenly manner with hair, wool, or feathers. They lay three or four eggs, which average sixty millimeters in length and forty-three thick. The shells are smooth, the color is green. After three weeks of brooding the young birds are hatched. They are helpless, awkward, ugly creatures. They seem to be constantly hungry and eat an incredible amount. They remain in the nest about four weeks. After leaving the nest the parents care for them for a few days, and then leave them to their fate. Old and young then disperse, and the settlement is deserted.

Baldamus says that the fear which these herons have of all birds of prey, even crows and magpies, is really laughable. The robbers appear to know this, for they plunder the heron settlements with shameless impudence, and expect no greater revenge than a few feeble blows of the wings.

They are easily raised in captivity, their food consisting of fish, frogs, and mice.—*From Brehm's Animal Life.*

Snake Mortality in India.

The great mortality in India resulting from snake bites is the direct issue of carelessness on the part of the natives. The snakes abound, the country and climate being particularly favorable, and the foreign residents being their only enemies, the Hindoos not only refraining from killing them but failing to take any precautions to ward off attacks. The native wears little or no clothing; his house is built on a level with the ground, the greater part of the front being formed of hanging mats; his chattels are generally kept in the darkest part of the hut. The snake, being compelled or from inclination desiring to change his quarters, enters the domicile and coils up in the gloomiest part. The first visit of the owner disturbs and angers him, and his resentment is proved by the presence of two little punctures on some part of the dead body of his victim.

The houses of Europeans are raised above the ground, every opening, even the drain pipes, carefully guarded against the ingress of snakes; above all, the houses are well lighted. The Europeans are well clothed and their feet protected by leather, so that the attempt of the reptile to strike is seldom successful. As a consequence we find that of the 22,125 persons killed in India last year by snakes and animals, 19,519 were killed by snakes. The government paid rewards amounting to 141,053 rupees, and 322,421 snakes were destroyed.

How Salmon Eggs are Obtained.

The work of stripping begins during the latter part of October and is continued until all the fish have been operated upon. The Portland (Me.) correspondent of the Boston *Journal* says that the fish when wanted are taken from the water in a dip net, and their condition readily ascertained by gently pressing the abdomen just back of the pectoral fin. If the ova are ripe they will be felt like so many peas beneath the skin, and a slight pressure will cause them to be deposited in a pan placed for that purpose. If the ova are not ripe, or the fish is not disposed to yield them, she is returned to the water a few days longer. After the ova have been deposited the milt is obtained from the male in the same manner, and immediately after falling upon the ova it diffuses itself among them, causing them to at once individualize and grow harder, till within two hours they will be as hard as unripe peas and perfectly globular in form. At once after this fertilizing process the ova are washed several times in cold water, and then set away in cold water for a couple of hours, that all impurities may be removed. The number of eggs obtained from each fish varies from 2,000 to 20,000, the latter number having been obtained this season from a 44-inch salmon, estimated to be a dozen or more years old, and about as old as any are ever obtained for spawning purposes, as the ages of such fish are estimated to be from four to fourteen years. At the expiration of the two hours mentioned above the ova are prepared for the hatching troughs by being placed upon wire screens with meshes about an eighth of an inch square. These screens are inclosed in frames a foot square, and thick enough to allow a half inch of water to flow beneath each one, to assist which an eighth of an inch is removed from the bottom of each of the four sides for three-fourths of their length. Ten of these hatching frames are then placed above each other in a skeleton frame to form a "nest," and the whole then deposited in the hatching troughs of a depth and width just sufficient to contain a row of these nests, after which the water is turned on and a steady flow maintained through the trough till the latter part of January, when the ova will have developed as much as it is safe to allow before distribution among the several States, under whose care they are finally hatched and disposed of as desired.

A Good Deal of Sweetening.

At the recent opening of a new commercial exchange in New York, the president stated that the annual value of the raw sugar imported and produced in the United States considerably exceeded our importations of tea and coffee, with silk, hides, hemp, and rubber added. The figures for sugar were stated at $130,000,000.

Photo-Prints from Tracings.

The most important of all photographic tracing methods is the cyanotype of Pellet, a process depending upon the reduction of an organic ferric salt to the condition of a ferrous salt by the action of light; and so far it is analogous to the platinotype. Ferric compounds react with ferrocyanide of potassium to form Prussian blue, while ferrous compounds form a white salt with the same reagent. If the prepared paper of Pellet were introduced into the ferrocyanide developer without exposure, it would become blue all over, in consequence of the uniform deposition of Prussian blue; but should any part have been sufficiently exposed to the light, the paper will remain white, owing to the complete reduction of the ferric salt to the condition of the ferrous salt. It will be thus obvious that the Pellet process will therefore reproduce a positive as a positive, and a negative as a negative, this circumstance giving it an especial value for copying tracings or drawings by direct contact printing.

The paper for the Pellet method is supplied commercially by the patentees of the process; but it is convenient for those who wish to practice it experimentally to be able to prepare their own; and the following directions will be found amply sufficient:

A solution is made of

Common salt	3 parts.
Perchloride of iron	8 "
Tartaric acid	4 "

in 100 parts of water, and this mixture is thickened by stirring in 25 parts of powdered gum arabic. The paper should be a well-sized and rolled paper, that known as cream laid note paper being the most suitable. It is easy to obtain this paper in the original sheets from a wholesale stationer.

The sheet to be coated must be laid on a drawing board, and it is desirable to fasten it down by means of two pins, after which the mixture is applied as evenly as possible with a broad camel's hair brush. This operation should be performed in a subdued light, and it is desirable to dry the paper as quickly as practicable, in order that the sensitive coating may remain as much as possible upon the surface of the paper. When quite dry, the paper may be stored away for future use.

The tracings from which copies are to be taken should consist of well defined opaque lines upon a ground of clean tracing paper or tracing cloth, and many prefer to use India ink into which a little gamboge has been rubbed. It is unnecessary for us to say anything with respect to the kind of printing frames suitable for the process; but it may be mentioned that large frames on swing stands are required in establishments where the cyanotype process is carried on commercially, as the drawings to be copied are often as much as four feet long.

In sunlight an exposure of one or two minutes is generally sufficient, and in dull weather it may be necessary to give as long an exposure as one hour. Electric light is often used for work of this character, the time of exposure varying, according to the intensity of the light, from twenty minutes to half an hour. To develop, the print is transferred *direct from the copying frame* to a saturated solution of ferrocyanide of potassium, but it is not immersed in this, being merely floated upon its face downward. In order to prevent the developing solution reaching the back of the paper, it is usual to fold back the edges so that the paper forms a kind of dish, and this dish floats boat fashion upon the developer. In ordinary cases, the development is complete in less than a minute; and as soon as the paper is once thoroughly wetted on the face, it may be lifted off the bath, as the solution adhering to the face will complete the development. A blue coloration of the ground indicates an insufficient exposure, while weakness of the lines indicates over-exposure.

The development being complete, the print is floated, face downward, upon clean water, and in about two minutes it is plunged into an acid bath containing 8 parts of hydrochloric acid and 3 parts of sulphuric acid, with 100 parts of water. From six to eight minutes is sufficient time to allow for the removal of redundant iron compounds by the acid, and all that is now required is to thoroughly wash the print with water and to dry it. Any blue spots may be readily removed from the finished print by means of a dilute solution of caustic potash, applied with a camel's hair brush; 1 part of potash dissolved in 28 parts of water answers the purpose admirably.

When cyanotype prints are to be used in the workshop as a guide to working engineers, it is an excellent plan to saturate them with white hard varnish, as this prevents the penetration of oil and the adhesion of dirt.—*Photo. News.*

Currier's Soap for Brown Upper Leather.

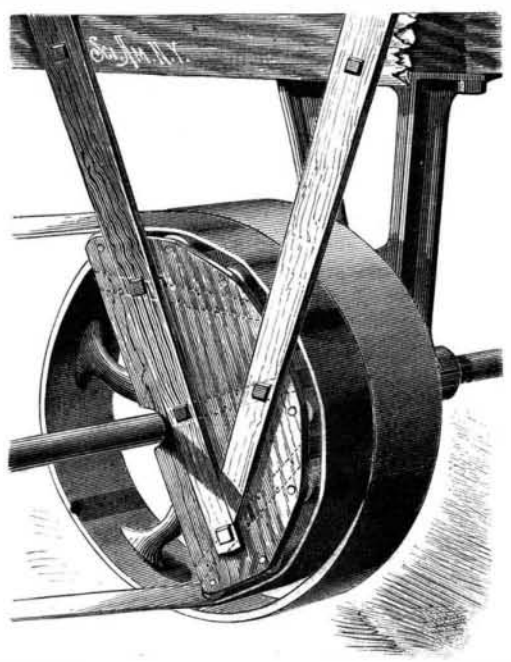
A good soap for currier's use on upper leather, says the *Gerberzeitung*, can be made as follows:

In twenty pounds of soft water dissolve two pounds of white curd soap, half a pound of pure beef tallow, half a pound of light resin, two pounds of glycerine, and half a pint of light train oil or vaseline. The soap is cut in small strips to make it dissolve quickly, and put in half of the water and set over a gentle fire. As soon as the soap is dissolved add the tallow, and when it all begins to boil put in the resin. The latter is added slowly with constant stirring. After boiling rapidly for a while the mass is put into a stone crock and the glycerine stirred in, after this the train oil or vaseline, and finally the remainder of the water.

This soap is applied lukewarm, slightly dried, and then polished with glass.

BELT HOLDER.

The belt holder herewith illustrated consists of a series of rollers revolving on iron axle bolts whose ends are supported in a strong frame. The rollers form a curved line identical with the face of the pulley on the line shaft, beside which the holder is placed, so that the belt can be thrown, either by hand or by some of the ordinary shifting devices, from the pulley on to the holder and back again at will. By means of braces it is supported parallel with and close to the pulley, but does not touch either the shaft or pulley. It is firmly secured to the braces, by bolts passing through both the sides and the interior stays. The lowest roller is placed inside the pulley circle, so that when the belt is on the holder it is strained less than when on the pulley. It can be used in any position, care being taken to so place it beside the pulley that the highest roller shall be at the point on the pulley where the belt first touches it when running up on it, and the other rollers shall be level with the face of the pulley. Since the belt is stationary while on the holder, it is



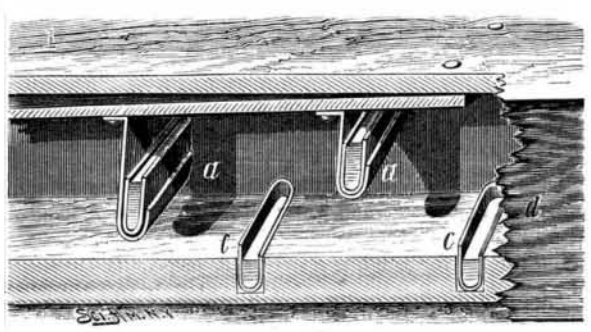
IMPROVED BELT HOLDER.

subjected to no strain or wear; the pulleys and boxes are relieved, there being no strain upon the shaft and its bearings; the belt is in a convenient position for lacing; the work of throwing off and on is simplified, as the belt is in nearly the same position as when at work.

These holders are now being manufactured by Messrs. W. R. Santley & Co., of Wellington, Ohio.

GOLD SEPARATOR.

The invention recently patented by Messrs. H. C. Walker and William Bacon, of Silver Cliff, Colorado, is intended to be applied to a sluiceway through which water and sand pass, and consists in a series of troughs set in the bottom of the sluiceway alternately with similar troughs suspended from the top. The troughs are made of silver-plated sheet copper, the strips of metal being bent lengthwise into a U-shape, one edge being higher than the other, as shown in the engraving. These troughs are set in grooves formed transversely in the bottom of the sluice, parallel with each other and a proper distance apart, so as to be at right angles to the current. The top of the sluice box is, preferably,



IMPROVED GOLD SEPARATOR.

made double, with a hinged under portion that conforms itself to the volume of water passing through. To the top are secured hangers which are bent upward at their lower ends to receive the troughs. By this arrangement the current of sand and water passing through the box, which may be the ordinary sluiceway for the tailings in mining operations, is forced to come alternately in contact with the upper and lower troughs and the fine metal is brought intimately in contact with the mercury in the troughs. A portion of the side or bottom of the sluice is made removable in order that the troughs may be removed from time to time and filled with fresh mercury. In the absence of water, dry sand can be forced through the box.

Lupinosis.

C. Arnold has extracted from lupius a shining brown solid matter, of a pleasant aromatic odor and taste. In water it dissolves slowly, forming a turbid solution. In doses of ten grammes it produces the usual symptoms of lupinosis, especially acute jaundice.

How Canes are Made.

Comparatively few understand how and where the material is gathered, or the process of its manufacture into canes and umbrella handles. The Chicago *Times* furnishes some information on these points. According to that paper, many of the canes are of imported woods, some from the tropics, China, and the East Indies. The celebrated Whongee canes are from China, where they are well known and celebrated for the regularity of their joints, which are the points from which the leaves are given off, and the stems of a species of phyllosiachys, a gigantic grass, closely allied to the bamboo. The orange and lemon are highly prized and are imported chiefly from the West Indies, and perfect specimens command enormous prices. The orange stick is known by its beautiful green bark, with fine white longitudinal markings, and the lemon by the symmetry of its proportions and both prominence and regularity of its knots.

Myrtle sticks possess also a value, since their appearance is so peculiar that their owner would seldom fail to recognize them. They are imported from Algeria. The rajah stick is an importation. It is the stem of a palm, and a species of calamus. It is grown in Borneo, and takes its name from the fact that the rajah will not allow any to go out of the country unless a heavy duty is paid. These canes, known as palm canes, are distinguished by an angular and more or less flat appearance. Their color is brownish, spotted, and they are quite straight, with neither knob nor curl. They are the petioles of leaf stalks of the date palm. Perhaps the most celebrated of the foreign canes are the Malacca, being the stems of the Calamus sceptonum, a slender climbing palm, and not growing about Malacca, as the name would seem to indicate, but imported from Stak, on the opposite coast of Sumatra. Other foreign canes are of ebony, rosewood, partridge, or hairwood, and cactus, which, when the pith is cut out, present a most novel appearance—hollow, and full of holes.

The manufacture of canes is by no means the simple process of cutting the sticks in the woods, peeling off the bark, whittling down the knots, and sand papering the rough surface, and adding a touch of varnish, a curiously carved handle or head, and tipping the end with a ferrule. In the sand flats of New Jersey whole families support themselves by gathering nanneberry sticks, which they gather in the swamps, straighten with an old vise, steam over an old kettle, and perhaps scrape down or whittle into size. These are packed in large bundles to New York city, and sold to the cane factories. Many imported sticks, however, have to go through a process of straightening by mechanical means, which are a mystery to the uninitiated. They are buried in hot sand until they become pliable. In front of the heap of hot sand in which the sticks are plunged is a stout board from five to six feet long, fixed at an angle inclined to the workman, and having two or more notches cut in the edge. When the stick has become perfectly pliable, the workman places it on one of the notches, and, bending it in the opposite direction to which it is naturally bent, straightens it.

Thus sticks, apparently crooked, bent, warped, and worthless, are by this simple process straightened; but the most curious part of the work is observed in the formation of the crook or curl for the handles which are not naturally supplied with a hook or knob. The workman places one end of the cane firmly in a vise, and pours a continuous stream of fire from a gas pipe on the part which is to be bent. When sufficient heat has been applied, the cane is pulled slowly and gradually round till the hook is completely formed, and then secured with a string. An additional application of heat serves to bake and permanently fix the curl. The under part of the handle is frequently charred by the action of the gas, and is then rubbed down with sand paper until the requisite degree of smoothness is attained.

Photographing on Linen and Silk.

A Detroit photographer says: "There is this feature about photographing on linen: You can *wash and boil* the work and it won't come out. There is some special interest shown among society people just now on this subject, because of some napkins used at the banquet given to Henry Irving, the actor, before he left London. His photograph was on each one, and of course it was intended as a souvenir for the guest to take away with him. The silk or cambric is printed from the negative. There will be a rage for it if it once gets started, and people will have photographs printed on their curtains and tidies, and in handkerchief corners. The face of a beautiful young lady on the corner of a gentleman's handkerchief would be much more attractive than a monogram or initial letter. It would be just the thing for hat linings and bands." The Detroit *Free Press* suggests that not the least of the advantages of such photographing would be that the wash would be promptly returned if the missing pieces were to haunt the wretched laundress with a vision of her customers.

Illumination of Steam Boilers.

The lighting up of the interior of steam boilers was long ago suggested. It has lately been carried into practical operation by the Patent Steam Boiler Company, London. They arrange lights within the boiler in such a way that the cascades, currents, and miniature whirlpools of the water may be clearly observed. It is believed that useful information will be derived from the observations touching the cause of priming, the best modes of separating steam from the water, etc.