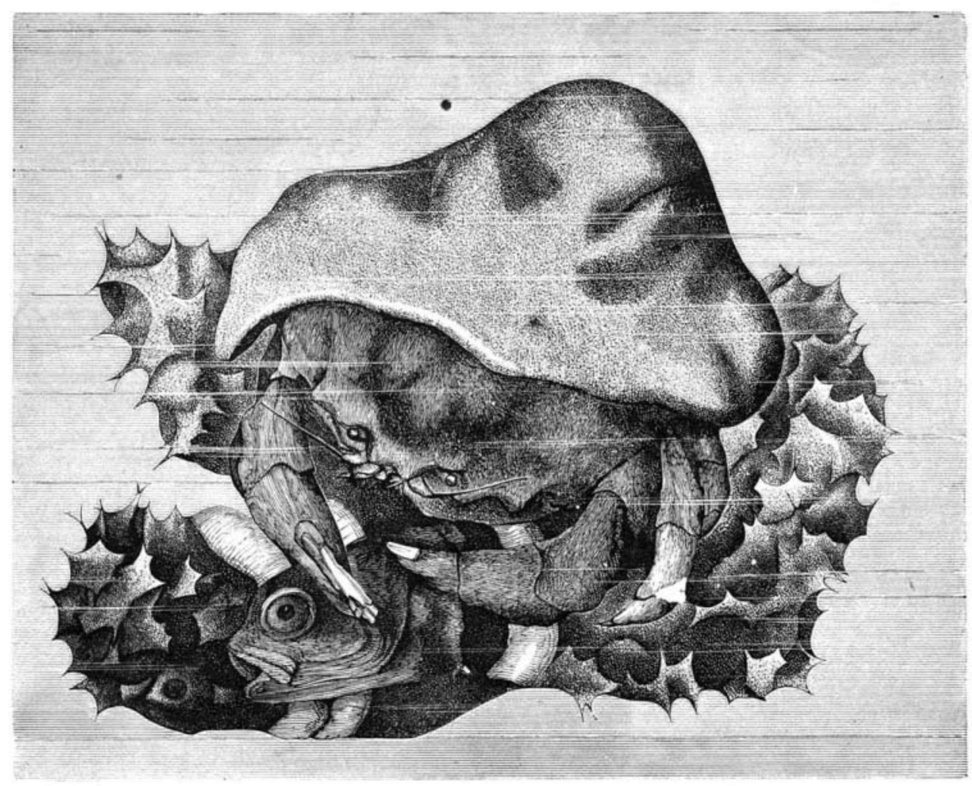
THE HAIRY CRAB.—(*Dromia vulgaris.*)

This crab belongs to a class which forms one of the connecting links between the crab and the lobster. The last pair of legs are perfectly useless for walking, and are modified into a pair of appendages by means of which the animal is enabled to cling to an object very firmly. The body is covered with hairs, generally filled with such a mass of seaweeds and dirt that it requires a good washing to show the real color of the animal. The peculiar habit of this crab is to drag along some kind of sponge, generally a *Tragus spinosulus* or a variety of *Suberites domuncula*, on its back, and to hold it by means of the deformed pair of legs. It uses this sponge to conceal itself, and only drops it when pursued.



HAIRY CRAB (*Dromia vulgaris*) COVERED BY A SPONGE (*Suberites domuncula*), NATURAL SIZE.

The Touracou.

This curious bird, the touracou (*Turacus albocristatus*), is one of the plantain eaters. This bird has bright red feathers in its wings, the red coloring matter of which is soluble in water, so that the birds are apt to wash their red feathers white when in confinement. The coloring matter, "turacin," as was discovered by Prof. A. H. Church,* is distinguished by yielding a remarkable absorption spectrum, and contains a considerable quantity of copper.

The bird is very common in the Kuys-na, and I was told by sportsmen who had shot it, that in rainy weather it will hardly fly, but crouches down under the bushes, and may sometimes be knocked down with a stick.

A most extraordinary statement concerning these birds, to the effect that the red color, when washed out of the feathers, becomes restored, is made by M. Jules Verreaux.† It seems impossible to understand how this can happen, since there seems no means by which the coloring matter can be conducted from the body of the bird to the web of the feather.

Such a result seems only possible in hornbills, some of which, as is well known, paint their feathers yellow by rubbing in a yellow secretion discharged from glands under the wing. M. Verreaux states that in rainy weather, just as I was informed, the touracous get their feathers wet through, and are, in consequence, unable to fly, but crouch on the ground, instead of resting on the tree tops as usual. He caught several with the hand; the color came out on his hands from the wet feathers. He washed the color out of their wings with soap and water till the feathers were almost white. The bright red color, however, returned directly the feathers were dry, and this occurred even when the same bird was washed twice in the same day. The red coloring matter is scarcely at all soluble in pure water, but the addition of the slightest trace of alkali to the water enables it to extract the pigment from the feathers, and yield a blood-red solution.—*H. N. Moseley, Challenger Notes.*

Sugar Beet Industry in Delaware.

The Legislature of Delaware in 1876 appropriated $300 toward the encouragement for the growing sugar beets within the State, and subsequently increased the appropriation to $1,500, and a commission of three well known citizens of the State were appointed to disburse the appropriation by offering premiums to the growers of beets, and otherwise promoting the new industry. To this end the commission obtained pure imperial sugar beet seed from abroad, which they distributed to farmers who desired to raise them. With the seed were furnished documents containing instructions as to the character of the soil needed and its preparation, the time of planting, cultivation, and harvesting, also copies of the following conditions as the principal ones to be observed: "Select a suitable soil; use fertilizers or well rotted manure; deep plowing in the fall or early spring; straight rows, close together, and plenty of seed; early and frequent working and careful thinning to one beet in a place; place one beet to every 120 or 200 square inches, which will give from 30,000 to 50,000 beets per acre, which, in rich land, will weigh from 1 to 2 pounds each."

The action of the commission induced a large number of farmers in Delaware to commence the culture of the sugar beet as an experiment, and premiums were awarded for the growth of 1878 to twenty-two farmers in Kent county, ten in New Castle county, and one in Sussex county. The reports from the various parties contain a description of the soil, the time of plowing, and the mode of cultivation. The premiums for the growth of 1879 were $100 for the best one acre and upwards grown under contract; $75 for second best; $50 for the third, and $25 for the fourth. This action of the commission stimulated the farmers, and, according to the Philadelphia *Ledger*, from which we derive our information, during the past year from 75 to 100 of them, principally in Kent and New Castle counties, cultivated the beet with an aggregate production of about 600 tons. The result of the experiment was considered so favorable that a company was formed under the name of the Delaware Beet Sugar Company, to erect a factory for the purpose of manufacturing sugar from the beet. A lot was purchased on the line of the P. W. and B. R. R., four miles north of Wilmington, and about six months ago a brick building was erected in which the work was to be carried on. About four months ago the machinery necessary for the operation was set in motion, and since that time has been in constant operation.

The method adopted for the manufacture of the sugar is known as the diffusion process. The beets are first placed in a cylinder of wood, with slight openings, and thoroughly washed, after which they are conveyed by an elevator to the second story and emptied into a cutting machine, where they are cut into thin slices, and from there carried by another elevator into the diffusion battery. This arrangement consists of eight iron tanks, each holding about 1,500 pounds of cut beets, into which the water is introduced. The water is started in one of the tanks, and, after passing through it, is conveyed to the outside by means of pipes, which connect all the tanks, so that the water from the first tank flows through each, thus absorbing all the sugar possible. When the water has thus become impregnated it is shut off, and the juice, as it is now termed, is withdrawn and conveyed to larger iron tanks, where lime is introduced with the juice so as to absorb its impurities. Carbonic acid gas is then introduced to precipitate the lime, after which the production is run through bone-black to clarify it. From these tanks the juice is passed to a steam pump, where it is forced to the filter presses, which still further extract impurities. From here it is conveyed into the vacuum pan, where it is concentrated almost to the crystallization point.

After having passed through this process, the juice is placed in iron wagons and run into a room with a temperature of about 125°, where it remains from four to five days, when it is ready for the last process, which consists in passing the juice through a centrifugal machine. This revolves at the rate of 1,500 revolutions per minute, and from one end runs the molasses or sirup, and from a box a dark yellow substance, known as raw sugar, is taken, and which is sold to the refiners.

The capacity of the present works is 25 tons of green beets per day, but it is expected to increase them to 200, as the cultivation of the beet increases throughout the State. The product so far has been from 8 to over 18 tons per acre, and the price realized was about $4 per ton. After extracting the sugar from the beet, the pulp is sold to farmers at $1 per ton, and used by them as food for cattle. The only other establishments now making sugar from beets is one in Maine and one or two in California.

* Researches on Turacin, "Phil. Trans.", 1870, p. 627.

† M. Jules Verreaux, "Proc. Zool. Soc." 1871, p. 40.

Fast Horses.

The running horse in this country is not so valuable as the trotter. Pierre Lorillard paid $18,000 for the famous runner Falsetto, three years old, recently sent to England. Mr. Keene paid $15,000 for Spendthrift. When we come to the trotters we find the prices up. Mr. Bonner paid $40,000 for Pocahontas, $36,000 for Rarus, $33,000 for Dexter, $20,000 for Startle, $16,000 for Edwin Forrest, and $15,000 for Grafton. Mr. Smith, of New Jersey, paid $35,000 for Goldsmith Maid, $32,000 for Jay Gould, $30,000 for Lady Thorne, $25,000 for Lucy, and $17,000 for Tattler. Mr. Vanderbilt paid $21,000 for Maud S., and $10,000 for Lysander Boy. The largest sum ever paid for a horse in England, where they have few trotters, was close on to $72,000, paid for Doncaster by the Duke of Westminster.

New Method of Extracting Plant Perfumes.

The *Revue Industrielle* states that M. Camille Vincent, who has already created two industrial applications of the chloride of methyl derived from the residue left in the manufacture of beet sugar, has, in conjunction with M. Massignon, discovered still another. Seeing that this substance had the property of dissolving fatty bodies, resins, and essential oils, these gentlemen were led to consider why it might not be made available for the extraction of the odoriferous principles of plants. The first experiment, made upon odorous woods, was successful, but gave a product which had a disagreeable smell, owing to the fact that the commercial chloride of methyl employed contained traces of a pyrogenous matter with a very persistent odor. M. Vincent, therefore, purified the methyl by means of concentrated sulphuric acid, and obtained a product entirely free from disagreeable odor, and having the property of dissolving perfumes and giving them up again, on evaporation, with all their fragrance. A trial was made with orange flowers in a glass apparatus, and a product obtained which was asserted by several perfumers to be much superior to the neroli obtained by distilling the flower with steam. After these first encouraging experiments, an apparatus of modest size was constructed for the purpose of ascertaining the industrial value of the new treatment by operating at one time on several pounds of flowers and different plants. This apparatus, which has now been working with great regularity for several months, consists of: (1) A digester in which the plants are placed; (2) a reservoir of liquid chloride of methyl; (3) a closed vessel in which is received the chloride charged with the principles derived from the odoriferous plants, and in which, by means of a pump, the same is vaporized; (4) of a pump for creating a vacuum above the chloride to be vaporized, and for compressing the vapor into a serpentine liquefier, from whence the liquefied chloride returns to the reservoir. The latter portion of the apparatus is the same as the ice machine of which we have already spoken in a previous number. In extracting the perfumes, the digester is filled with the flowers, the apparatus is closed, and then by means of a faucet the liquid chloride is allowed to flow into vessel No. 2. Here digestion is allowed to take place for two minutes, and the liquid loaded with the perfume is drawn off into vessel No. 3. Then a new charge of chloride is passed over the flowers, and this is repeated several times. Finally a vacuum is created in the digester to remove the chloride which has taken up the perfume, and it is forced into the liquefier; then a jet of steam is passed through the exhausted mass in order to drive off the chloride which is retained by the small quantity of water contained in the flowers, and the damp gas is collected in a gasometer. The liquid charged with perfume and contained in vessel No. 3 is evaporated in a vacuum. On opening the vaporizer at the end of the process, the perfume is found, mixed with fatty and waxy matters. This mixture, treated with cold alcohol, gives up the perfume with all the fragrance and sweetness that it possessed in the plant. M. Massignon's works are prepared to treat 2,200 lb. of flowers per day. This new manufacture makes the third industrial application of chloride of methyl (as before stated), the other two being the manufacture of methylated products and the production of ice.

THE PHYLLOXERA IN CALIFORNIA.

It appears from an article in Prof. Riley's new journal, the *American Entomologist*, that the phylloxera has established itself in the Sonoma Valley of California, and destroyed hundreds of acres of vineyards, while only a few miles distant, in the most important wine district of the State—the Napa Valley—not a single case of phylloxera has been detected. "It is," remarks Prof. Riley in commenting on this singular fact, "fortunate for the California grape-grower that the insect has, to all appearances, there undergone a considerable modification in habit, which very much limits its destructiveness. It is steadily spreading from infected centers, but very slowly indeed, compared to its spread in France. Prof. E. W. Hilgard writes that he believes this is due to the non-appearance of the winged female, as he has not been able to obtain it. If such is the fact it is one of the most curious modifications in habit, as a result of climate, that is on record, and will go far to explain the immunity in the Napa Valley while the Sonoma Valley is being ravaged, and the fact that the insect has not appeared in other parts of California. It also offers an additional incentive to grape-growers in other sections of the State to exercise the utmost vigilance to prevent the introduction into their own locality of infested vines or cuttings. That the species may exist for an indefinite time without the winged female seems highly probable from the fact that the sexual individuals may be produced from hypogean females as well as from aerial ones. Yet so singular a change in the insect's nature can only be accepted upon the most thorough and satisfactory evidence. This is easily obtained by half filling large glass jars with badly infested roots, interspersed with a little soil, about the time or some time before the grapes begin to ripen. If there are pupæ upon such roots the winged females will soon begin to appear on the side of the jar toward the light."

One of Prof. Riley's correspondents, who has large interests in Californian grape culture, and who has recently returned from an extended visit to the richer wine producing sections of the State, says that the insect has been established in the Sonoma Valley for the last five years, and is now working there with terrible effect. No one in this valley seems able to give any suggestion as how the pest may be successfully fought. Every variety of vine planted in the valley has been attacked and destroyed, or is being destroyed.

ENGINEERING INVENTIONS.

Messrs. John Maguire and William A. Alexander, of Mobile, Ala., have patented improvements in vessels and apparatus for river and harbor dredging, wherein pumps are made use of for elevating the material from the bottom. The inventors make use of a vessel of suitable dimensions, formed with a central well and water ballast compartments, whereby the vessel may be sunk to the bottom. The vessel is also fitted with pumping apparatus, whereby the water in the space inclosed by the well is first to be pumped out, and the mud, sand, etc., of the bottom then pumped out to the desired depth. Within the well of the vessel is a frame fitted for being raised and lowered, and carrying discharge nozzles of a second pumping apparatus, whereby streams of water are discharged for agitating the mud, etc., and rendering it semi-liquid, so that it may be pumped out. These discharge nozzles are fitted upon carriers that are movable upon slideways, whereby all portions of the inclosed bottom may be subjected to the action of the water.

Mr. John H. Wait, of Opelika, Ala., has patented an automatic railway switch, that may be operated by the wheels of the passing locomotive, or by means of levers attached to the locomotive or one of the car trucks. The invention consists in a combination of pivoted rails, levers, and locking devices, which cannot be fully explained without engravings.

An improved process and apparatus for sinking piles has been patented by Mr. Henry Case, of Brooklyn, N. Y. The object of this invention is to sink piles for submarine or other foundations without the aid of pile driving machinery, and to secure good bearings for the piles at proper depths.

An improved car brake and starter has been patented by Mr. John L. Cole, of Williamstown, Mass. The improvements relate to apparatus for checking the momentum of railroad cars and storing power to be subsequently used in starting or impelling the car. The apparatus consists, generally, of springs, a cord or chain, a conical spirally-grooved winding drum, and gearing and clutches for connecting the drum with the car wheels or axle, whereby the cord is wound on the drum, the springs compressed and held for use in propelling the car by their expansion. The invention has certain novel features of construction and combination of mechanism by which the propulsion of the car in the proper direction by the springs is obtained and the compression of the springs by the momentum of the car is arrested at a definite point, and the mechanism is automatically thrown out of gear when the momentum is arrested, and also when the springs have expended their force in starting the car. It may also be thrown into and out of gear at any time by the driver.

ARTESIAN WELLS FOR COLORADO.

The Committee on Public Lands has reported favorably the bill introduced by Senator Hill, of Colorado, providing for an appropriation of $50,000 to be used in sinking artesian wells in the arid regions of the Rocky Mountains.

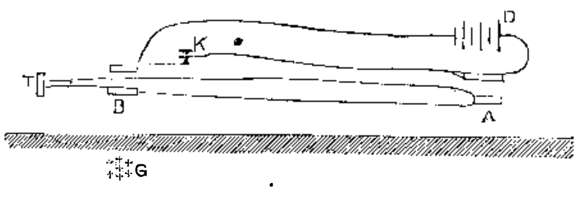
It is estimated that there are in those regions five hundred million acres of government lands, now unsalable because of their aridity, which could be converted into valuable farming lands by irrigation, and that such artificial watering is entirely feasible by means of artesian wells. The government is asked to pay the cost of the experimental proof of this position because it owns the land, and private enterprise cannot be expected to undertake its improvement. It is asserted, however, that having demonstrated the possibility of reclaiming such lands, the government will have no difficulty in selling the land to men who will go on sinking wells at their own cost. Mr. Hill's bill provides for the sinking of five wells, two on the east and three on the west of the Rocky Mountains, the sites to be selected by the Secretary of the Interior.

A New Way of Studying Sounds.

The London *Times* reports that a new and simple way of producing colored rings, which seems capable of some interesting applications, has been recently brought to public notice by M. Guébhard. A saucer filled with not very pure mercury is all the apparatus required. Then clear off with a piece of card or paper the thin pellicle of oxide and dust, breathe on the bright surface, and a magnificent system of colored rings is given by the film of condensed moisture then formed. Instead of the four or five "irises" described by Newton, six or seven can be well made out, and the thickness of the film increasing from the border inwards, the order of hues is reversed. Still better effects can be got by dropping volatile substances (as petroleum oil) on the mercury surface, instead of breathing on it; but the most remarkable results are had with collodion. Diluted with ether, this gives pellicles on the mercury, which may be detached (after their thickness and colors have been regulated at will) and transferred to paper. M. Guébhard has utilized these effects in study of the sounds of the voice. Vowel sounds uttered above the moistened mercury surface produce characteristic ring figures which throw new light on the nature of the vibrations involved. The vibratory state, indeed, for vowel sounds, appears to be often very complex, the figures presenting groups of several ring systems, indicating several centers of percussion.

"Prospecting" Metal Veins by the Induction Balance.

A correspondent of the *Electrician*, referring to the reported invention of a method for detecting and tracing veins and lodes of metals in the earth by means of electricity, says there has been suggested to him the application of the induction balance of Professor Hughes to the purpose. It is well known, he adds, that the balance is extremely sensitive to the neighborhood of metals, and it becomes a question worth settling by experiment whether this sensibility could not be employed as a means of indicating the presence of metalliferous ores underground. The obvious mode of applying the apparatus would be to separate the two induction pans of the balance to such a distance apart that, while one of them was brought under the influence of the concealed metal, the other would be comparatively unaffected. This could be done, perhaps, by elevating the balance vertically on a pole or standard, to be carried about by the prospector, so that one pan was brought near the surface of the ground, while the other was raised above it to a considerable height, say, of ten or twelve feet. On a balance being obtained in a proper locality the search could begin, and the presence of veins under foot might be found to reveal itself by disturbing the balance. A better but more inconvenient plan, from its rendering it necessary to pay out a portable line or wire,



would be to keep one pan of the balance stationary in one place, while the other was being moved about so as to feel for the hidden ores. The latter method is shown in the accompanying sketch, where A is the stationary pan of the balance, and B is the movable pan carried by the prospector; C is a metal lode under the surface, D is the battery, and K is the key in the primary circuit of the balance, and T is the telephone in the secondary circuit.

While moving over the ground the prospector makes and breaks the primary circuit by means of the key, and listens in the telephone for any sound indicating that the equilibrium of the induced currents has been disturbed. Should the balance prove sufficiently sensitive, it can, of course, be used for similar and allied purposes in mining and boring operations, so as to trace the positions and roughly determine the richness of metal veins, ores, and other conducting minerals, such as coal, graphite, etc. The first plan would probably answer best in cases where the metal was at or near the surface, as is the case in "surface diggings."

Job Shops and Slop Shops.

A writer in the Boston *Journal of Commerce* pictures the difference between a well organized job shop and what he terms a slop shop, as follows. The job shop is *sui generis*. While it partakes of the character of those adapted and intended for special productions, it has a character of its own not shared by any other. The various jobs and the frequent make-shifts tend to produce what would seem to the unpractical eye an appearance of disorder, and would convey such an impression, possibly, to the experienced mechanic, who might be unacquainted with the methods and system of that particular shop. But the well arranged job shop has an all-pervading character of order in the seeming disorder, and its workmen waste little time in preparing for emergencies, and are usually ready for any job that comes up.

The slop shop is exactly the reverse in character, and is never just ready for an unexpected job. Its apparent character is its true one. An outsider could just as readily find a missing tool or designate the hiding place of a needed appliance as the proprietor, foreman, or any one of the workmen. The floor is rarely swept; when the debris of work accumulates too much in one spot, it is spread by a few hasty kicks, and all is serene. There are "glory hole corners" under the benches which rarely are overhauled. There are hiding places for spoiled jobs which are inquired for by the vexed foreman, but rarely found. The shafting welcomes the visitor with a beseeching squeak, the repetition of which finds an echo in the chafing of a lathe belt on the cone. Some of the belts show angular gaps across their face, premonitions of sudden partings and telltales of neglect. The workmen are lavish with oil and waste, put new files on cast iron scale, toss a broken tool under the bench, and if they get hold of a decent tool, in decent order, chuck it into their private drawer or locked box. If a drill is wanted for a three-quarters of an inch hole, one sized to thirteen-sixteenths is taken and ground to size. Possibly half an hour after it has been transformed another workman needs it on work for thirteen-sixteenths holes. So the drills can never be kept in sets and sizes, and when account of stock is taken at the end of the year the proprietor wonders what has become of the sets of drills with which he started off so sanguinely and hopefully the preceding January.

This is the general practice in the slop shop. There is no real head to the concern, there are no Mede and Persian rules of order, no sharp, overseeing eye, and no developed and vitalized system. A job that should be drilled under the upright drill is taken to the lathe because the former is in use, and a workman is put to a three hours' job of chipping and filing because another is using the planer. In this shop there is manifested little readiness among the workmen to assist each other, except to help in turning the shop into a "hurrah's nest." If one man knows more than another he will hold on to his knowledge very much as a miser clings to his pennies. The foreman, possibly, gives instruction but grudgingly or with an air of reproof. The slop shop is a good place to leave a job, but it is a poor place from which to get the completed work. The foreman will promise readily enough to-day, but his performance and day of redemption are indefinite.

There are plenty of these slop shops all over the country. It is singular to note that, although the proprietors invariably fail in business, there are about so many all the time; soon as one drops out another is anxious to show how little he knows about the management of a business, and the slop shop is probably a permanent institution.

Hydrocellulose in Photography.

M. Aime Girard has communicated to the Photographic Society of France the following note on the employment of hydrocellulose in preparing photographic pyroxyline: "Whenever cellulose ($C_{12}H_{10}O_{10}$), in any form, is submitted to the action of concentrated acids, it is dissolved, and by taking up two equivalents of water is transformed into glucose ($C_{12}H_{12}O_{12}$). But previous to this saccharification, an intermediate stage may be observed, where only one equivalent of water is taken up, and a new compound is formed to which the formula $C_{12}H_{11}O_{11}$ is attributed. This compound, to which I have given the name of *hydrocellulose*, is not soluble in the acids, and provided that care be taken in the manipulation, it still possesses its original external form; but so soon as it is touched it will be found to have lost all its power of cohesion, and to fall away to an almost impalpable powder. Hydrocellulose possesses a number of chemical properties of its own, but it keeps also some of the properties belonging to ordinary cellulose. Among the latter is its capability of being nitrified by a mixture of nitric and sulphuric acids, and of being by this means transformed into either explosive or soluble pyroxyline. In this way we can prepare either explosive or soluble pyroxyline in the state of a fine powder. The manner of preparing it is precisely similar to that of preparing pyroxyline from cellulose, but in this case the product, when rubbed in a mortar, is at once reduced to an exceedingly fine powder. This powder, dissolved in a mixture of alcohol and ether, gives a collodion whose value to photographers it will be most interesting to ascertain.

"The only difficulty, therefore, is the production of the hydrocellulose. This substance can be obtained from any form of cellulose, but the best for the purpose will be found to be raw cotton in tufts. For effecting the conversion there are three ways: (1) Immersion for several hours in concentrated acids; (2) exposure to the vapors of the hydracids, as hydrochloric or hydrofluoric acid; (3) absorption by a weak acid, and then desiccation. Of these three methods the last-named is undoubtedly the most convenient. Take, then, some fine tufted cotton, and immerse it in a 3 per cent solution of nitric acid; remove it immediately, drain it, and put it in a cloth and wring it well; then pull it out and leave it to dry. If you are pressed for time, you may dry it on a stove at a temperature of 40° to 50°; a few hours will in that case suffice to render the cotton quite friable, and its transformation into hydrocellulose will be complete. But care must be taken not to raise the temperature above the point indicated, or the substance will turn yellow and decompose. When, however, time is no object, let the cotton be well pulled asunder, and then be allowed to dry slowly on a plate in the laboratory or studio at a temperature of from 15° to 20°. By this, the more preferable method, the cotton will, in a few weeks, be converted into hydrocellulose, which, though perfectly friable, will preserve sufficiently its fibrous condition to be easily acted on by the acids that are to nitrify it.

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Subscribers to the SCIENTIFIC AMERICAN will be entered on our books to commence at the date the order is received; but those desiring the back numbers to the commencement of the year will be supplied on their signifying a wish to have them. Last year's volumes may be had in sheets by mail at regular subscription price, namely, $3.20.

THE series of illustrated articles on "American Industries," which was commenced in this journal about one year ago, has proved so acceptable to our readers that it is our purpose to continue the publication of manufacturing establishments until every important industry of the country has been illustrated and described in these columns.