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## GUTTA PERCHA.

The price of gutta percha has nearly doubled in two years, and now rules at $1.30 per pound. This remarkable advance in the price of the article is attributed to two causes—the large quantities required in the manufacture of electric and other modern devices and the reckless destruction of the trees from which the gum is obtained. Gutta is the Malayan term for gum and percha is the name of the tree from which it is obtained; therefore the name may be translated, gum of the percha tree. This gum or sap is not obtained by merely tapping the trees, as is done by the gatherers of crude rubber along the Amazon and its tributaries, but the Malays and natives of Borneo who collect gutta percha fell each tree from which gum is to be extracted, and thus the destruction of the trees and consequent scarcity of the product is explained. From 1854 to 1875, 90,000 piculs, weighing 133⅓ pounds each, of gutta percha were exported from Sarawak alone, and this meant the death of 3,000,000 trees. As no trees are planted, the only thing which has saved this species of plant from annihilation is that it does not produce the gum in paying quantities until it is twenty-five to thirty years old.

The method pursued in felling the trees is as follows: A staging is erected from fourteen to sixteen feet high, which enables the workman to cut the trees just above the buttresses or banees as they are called. The tools used in felling are either "billiongs" or "parangs." A billiong is a kind of ax used by the Malays in felling, building and the like. The blade is of a chisel-like form, and the tang is secured at right angles to a handle by means of a lashing of rattan or cane. The parang looks more like a sword bayonet, and in the hands of a Malay is said to be a box of tools in itself, as with it he can cut up his food, fell a tree, build a house or defend himself. After the tree is cut down, some natives beat the bark with mallets to accelerate the flow of the sap, which usually runs slowly, changing color meanwhile. It concretes rapidly.

The sap is boiled either with water, lime juice, or cocoa nut oil, and it is generally run into moulds which sometimes produce forms of the hardened material resembling various animals in shape.

The gutta percha tree, the vernacular name of which is taban, also bears a fruit about an inch long, ovoid in shape, which is eaten by the natives. In Siak, Sumatra, a vegetable butter is prepared from the seeds of this fruit. The trees attain to a height of from 60 to 80 feet, with a diameter of from 2 to 4 feet. The wood is soft, fibrous, spongy, of a pale color, marked with black lines, these being the reservoirs of the gutta percha. The yield of a well grown tree of the best variety is from 2 to 3 pounds of gutta percha, such a tree being about 30 years old, 30 to 40 feet high, and 1½ to 3 feet in circumference.

Gutta percha is used in a multitude of different ways. It has been found to be the best non-conductor of electricity and most perfect insulator that has yet been discovered. A wholesale dealer in the article recently stated that scarcely a week passes but some one calls upon him claiming to have found a substitute for gutta percha, but none of the substitutes so far offered has been able to meet the requirements. No other substance has been found so efficient for submarine cables, and according to a statement recently published in the New York *Sun*, the Atlantic cable laid in 1857 is still preserved by its gutta percha covering.

This article retains its form at a temperature below 115° F. It is insoluble in water, even in salt water, and it is also insoluble in alkaline solutions and various acids, and is, therefore, made into vessels to contain these substances. By mixing bisulphate of carbon with gutta percha, a liquid cement is produced which is employed in putting patches upon shoes, thus dispensing with sewing and securing a neater appearance on the shoe. The same cement is also used in repairing rabbit skins. These skins are weak and are easily torn; but by backing them with this cement they are made tougher, and are sold in some cases by unscrupulous dealers for squirrel skins. Another use to which gutta percha has been put is placing it around the bottoms of pantaloons to protect them from wear. It has been made so thin that a yard of it weighed only 7 to 8 pounds. A piece of this was placed around the bottom of the garment, then an inch of cloth was turned in on top of the gutta percha, a hot iron was passed over it, which rendered it secure, thus saving the expense of sewing to the manufacturer.

Since gutta percha has advanced so greatly in price, it has been found impracticable to use it for this and many other purposes, in fact it has been stated that a large engineering firm in the United States proposed to enter upon the manufacture of submarine cables on an extensive scale, but were unable to carry out their purpose, on account of the scarcity and the difficulty of obtaining gutta percha.

Efforts have been made to check the destruction of this most useful tree by substituting tapping for felling, but the greed of the natives is so great that they adhere to the latter method, because it gives them more of the sap for immediate marketing, being regardless of the fact that the trees are being exterminated. The only remedy for the great scarcity of the article seems to be the cultivation of the tree, and measures of this kind will have to be adopted if gutta percha, which seems to be an article entirely indispensable in some lines of manufacture, retains its place in the commerce of the world.

### The Atlantic Record again Lowered.

At 2:30 in the morning, August 5, the White Star steamer Majestic arrived at Sandy Hook lightship, at the entrance of New York harbor, breaking all previous records and achieving the quickest voyage ever made across the Atlantic. She had left Queenstown in the afternoon of July 30, and completed the trip in 5 days 18 hours and 8 minutes. The best undisputed time previously made was that of the City of Paris, which sailed from Roche's Point, Queenstown harbor, to the Sandy Hook lightship in 5 days 19 hours and 18 minutes, ending August 28, 1889. The friends of the Teutonic claim for her a record of 5 days 19 hours and 5 minutes for her passage west in August, 1890, but this record is disputed, it being claimed on the Maritime Exchange that the time of the Teutonic was 5 days and 20 hours. The course of the Majestic was 11 miles shorter, or more direct, than that of the City of Paris in her record breaking trip, and the latter vessel also has a higher record for the number of miles traveled in single days. The knots logged per day in each of these three great trips was as follows:

| | Majestic. | City of Paris. | Teutonic (Disp'd.) |
|---|---|---|---|
| First day | 470 | 432 | 473 |
| Second day | 501 | 493 | 496 |
| Third day | 497 | 502 | 512 |
| Fourth day | 501 | 506 | 500 |
| Fifth day | 491 | 509 | 485 |
| Sixth day | 317 | 346 | 340 |
| Total | 2,777 | 2,788 | 2,806 |

It is said that the record of the Majestic would have been a few minutes better had it not been for the snapping of a bolt in the starboard engine Tuesday morning, so that for one hour only the port engine was running. The two engines developed 19,500 horse power, and the screws made an average of seventy-eight revolutions per minute, while the consumption of coal is stated to have been only 220 tons a day.

### Strength of Various Kinds of Iron.

A number of experiments on the strength of malleable cast iron have been made by a committee appointed by the Master Car Builders' Association. The strength of this metal varies with the thickness, as the following results on specimens from ¼ inch to 1½ inches in thickness show:

| Dimensions. | Tensile Strength. | Elongation Per Cent on 4 in. | Elastic Limit. |
|---|---|---|---|
| in. in. | lb. per sq. in. | | lb. per sq. in. |
| 1·52 by 0·25 | 34,700 | 2 | 21,100 |
| 1·52 " 0·39 | 33,700 | 2 | 15,200 |
| 1·53 " 0·5 | 32,800 | 2 | 17,000 |
| 1·53 " 0·64 | 32,100 | 2 | 19,400 |
| 2 " 0·78 | 25,100 | 1½ | 15,400 |
| 1·54 " 0·88 | 33,600 | 1½ | 19,300 |
| 1·06 " 1·02 | 30,600 | 1 | 17,600 |
| 1·28 " 1·3 | 27,400 | 1 | |
| 1·52 " 1·54 | 28,200 | 1½ | |

The low ductility of the metal is worthy of notice. The committee give the following table of the comparative tensile resistance and ductility of malleable cast iron as compared with other materials:

| | Ultimate Strength. | Comparative Strength. Cast Iron = 1. | Elongation Per Cent in 4 in. | Comparative Ductility. Malleable Cast Iron = 1. |
|---|---|---|---|---|
| | lb. per sq. in. | | | |
| Cast iron | 20,000 | 0·1 | 0·35 | |
| Malleable cast iron | 32,000 | 1·6 | 2 | 1 |
| Wrought iron | 50,000 | 2·5 | 20 | 10 |
| Steel castings | 60,000 | 0·3 | 10 | 5 |

Some experiments were recently made at the Riverside Iron Works, Wheeling, West Virginia, on the comparative liability to rust of iron and soft Bessemer steel. A piece of iron plate and a similar piece of steel, both clean and bright, were placed in a mixture of yellow loam and sand, with which had been thoroughly incorporated some carbonate of soda, nitrate of soda, ammonium chloride, and chloride of magnesium. The earth as prepared was kept moist. At the end of 33 days the pieces of metal were taken out, cleaned, and weighed, when the iron was found to have lost 0·84 per cent of its weight and the steel 0·72 per cent. The pieces were replaced, and after 28 days weighed again, when the iron was found to have lost 2·06 per cent of its original weight and the steel 1·79 per cent.

THE *Northwestern Architect* for July, royal edition, is a fine number. Five splendid photographic plates and numerous other illustrations adorn the issue.

### Nitro-Cellulose.

BY DR. J. B. LITTLEWOOD.

Gun-cotton is obtained by the action of nitric acid, in the presence of sulphuric acid, upon the purest cellulose—cotton fiber—and is a substitution product. According to the treatment followed—the strength of the acids, etc.—are obtained mono-, di-, tri-, tetra-, penta- and hexa-nitro compounds. These are termed soluble and insoluble, according to their solubility in alcoholic ether. The equation illustrating the reaction has been written for tri-nitro-cellulose :

Cotton. Nit. Acid. Gun-cotton. Water.

$$C_6H_{10}O_5 - 3HNO_3 = C_6H_7(NO_2)_3O_5 - 3H_2O$$

A number of these substitution products are known; the soluble varieties being used for collodion ; the insoluble as explosive agents, generally the tri-nitro.

The process consists essentially in exposing the dried cotton for a sufficient length of time to the action of a mixture of nitric acid (sp. gr. 1·45 to 1·50) with sulphuric acid (1·84 to 1·85), and in then thoroughly washing the fiber to remove all free acid adhering thereto.

The fiber has been submitted in all forms, from the carded mass or hank to the finest impalpable powder. This powder has been obtained by both chemical and mechanical means—by cuprammonium and by grinding. The reasons for comminution of the cotton are that when the cotton is subjected to the action of the acids in its natural state and length of fiber, the line of least resistance seems to be by way of the inside of the tubes constituting the fiber of the cotton, into which they are taken in part by capillary attraction, subject to change themselves as they progress, and to increased resistance from any oil or gum, etc., in their progress, and therefore to modified action, the result of which is slower and slower, and otherwise more and more imperfect chemical change. It may also be that the power of capillary attraction is balanced in the tubes by air contained therein sufficiently to prevent the acids from taking effect.

It has also been customary to wash the cotton in alkaline baths, rinse and dry before steeping in the acids mixture, and whatever alkali was not neutralized would effect the nitration.

The cotton fiber has for its protection a glazed surface, as if it were enameled by nature. It is tubular and cellular in structure, and contains a natural lubricating semi-fluid substance, composed of characteristic oil or gum, or water, or other material, or a combination thereof. Both the glaze and the lubricating substance as well as the fineness of the fiber vary with the soil, climate and other accidents of growth. Where cotton waste is obtainable, this is cleansed for the purpose of conversion, and, unless carefully treated, there is liability of variable nitration of material thus obtained. Where yarns and hanks are employed it has been found that the twisting of the fiber and the disposition in the yarn form caused a resistance to the penetration and to the action of the acids, with the result that parts of the fibers were not acted upon, or acted upon imperfectly.

The same difficulty has been observed where paper has been expressly prepared from cotton fiber for conversion. In this last case the fiber is, of course, modified by the chemical and mechanical treatment which it has undergone in the preliminary preparation of the paper; but, if the adherent oil or gum or glaze has been attacked, or if all have been removed by subsequent washing, etc., which is very difficult, if not impossible, the character itself seems to have been altered to such an extent that the cellulose product of the paper process is not uniform, or always otherwise satisfactory.

The proportions of acids used vary from one of nitric with three of sulphuric to one to two (as at Le Bouchet). Abel's method (British) and that in use at Newport are alike in using one to three. At the torpedo station either raw or carded cotton is used. It is first steeped in a weak solution of carbonate of soda, to remove the resin from the raw cotton, or the oil from the carded, then washed and carefully dried. The acids are the strongest nitric and sulphuric. A large quantity of the mixed acids is placed in the leaden pan and into this a small quantity of the dried cotton is immersed. When thoroughly saturated, the cotton is lifted upon a reticulated shelf over the pan to drain. It is then pressed, placed in an earthen jar, and, when this is half full of the dipped cotton, fresh acid is poured upon it until the cotton is covered. It is then set where the temperature may be kept reduced for 48 hours. The greater part of the conversion takes place at the dipping, but that it may be complete it is necessary that the contact with the acids should continue for the time stated. When the cotton is removed from the first bath, a quantity of fresh acid equal to that removed with the cotton is added before a fresh batch is treated.

At the end of the time stated the cotton from the jars is passed through rubber or leaden wringers.

Where equal parts of the concentrated acids were used, the acids from the first batch were used once again, the time of immersion being extended. In other cases the spent acids are restored in bulk by the addition of a suitable quantity of a nitrate and sulphuric acid, thus employing the acidulous mixture continuously in the conversion of successive batches of material. In this case, by using a nitrate the base of which forms, when introduced into the bath, an insoluble compound, the bath becomes clarified by subsidence of the precipitant. In other cases the spent acid is treated to free it from flocculent matter, after which it is restored by means of fresh acids, and so utilized. The proportions of cotton to acid vary from 1 to 6 up to larger baths. At Waltham Abbey the cotton in 1 lb. quantities is dipped into a 12 gallon pan of the mixed acids.

The same acids have been used again for treatment of successive batches without strengthening, except the addition of such a quantity of acid as may be required to properly cover the fiber. Again, the spent acid has been analyzed to ascertain its condition, and an amount of fresh acids mixed therewith sufficient to restore it for use. Spent acids are in some cases used for the first dipping, followed by a bath of the concentrated acid in usual proportions to fully complete the nitration. Nitration has also been effected by addition of a part only of the acid required for conversion; allowing reaction, and passing the material into additional quantity of the acid required to complete. It has also been effected by immersion of the cotton in a series of tanks, beginning with that having the weakest acid, and following until the fiber has been fully nitrated. As soon as the acid of the first vat falls below the required strength it is replaced by fresh, full-strength acid. This is operated by having the vats on a turn-table, passing the acids pressed out back to the vat from which they were taken. In this way all the suitable properties of the acid are utilized, the weakest acids becoming weaker by the partial conversion of the cotton which they effect, while the last immersions of each charge of cotton are in the strongest acid. This latter plan was to render available all the valuable properties of the acids, and enable the use of such acids until they have become entirely spent, in lieu of the usual way of treating the cotton by repeated immersion in the same acids, or by successive immersions in different receptacles, where the weakened but not entirely spent acid is thrown away.

Earlier, the spent acids were used only for the manufacture of the weaker kinds of powder, to economize the cost of manufacture.

Fiber has been treated with sulphuric acid prior to nitration, and in this way the material has the character of vegetable parchment imparted to it before it is subjected to the bath of mixed acids. The fiber is washed and dried in this case before nitration.

Where wood is used as the form of cellulose it is necessary to comminute or disintegrate it, and by boiling in presence of alkali under pressure to remove sap, resin, and salts ; then washing in a poacher with pure water ; beating, straining, and drying. This fibrous pulp is submitted to the usual bath of nitric acid at 1·40 to 1·50 (one part) with sulphuric acid at 1·80 to 1·84 (two parts). The fiber is kept in this bath of cooled acids twenty-four to thirty hours, with occasional agitation, squeezed, and thoroughly washed, steeped in alkali ; again washed and dried.

The washing is performed at Newport by repeated passage through a wringer, which is so mounted that the water pressed out is led away, the squeezed gun-cotton falling into fresh water, and in this way a more thorough purification is obtained, in a shorter time, than by the ordinary method of very long exposure to the action of running water.

The Abel method of washing included the use of a pulping engine or beater, where the fiber was submitted to a revolving wheel carrying projections which passed between stationary projections on the bottom of the tub, and thus became fully torn, and from this beater the pulp passed to a washer (poacher), where the pulp was stirred for a long time with large quantities of water. The revolution of the wheel in this tub prevented deposit in any part of the tub.

At Stowmarket an artificial cascade is made by leading a stream of water along a trough, and allowing it to fall from a height into the washer. The gun-cotton is thrown on the falling stream and immediately carried deep down into the vessel, the agitation being further promoted by the workmen. In this way the cotton comes in contact with such a large quantity of water that the rise in temperature is inappreciable, and the pyroxyline almost altogether free from acids. But, to perfect the washing, the pyroxyline is passed through the centrifugal machine and then thrown into tanks, where it is subjected to the action of water for one to three weeks, and is afterward boiled in large vats below 212° F. These washings may be followed by the addition, or use in them, of alkaline material.

Oxidants may be added to the fiber before drying, and it may be pressed into the form of slabs, cylinders, or pellets.

Unmixed with salts, it may be stored in this wet condition, and is then the safest of all explosive agents. It is not liable to be fired by a spark or flame, nor is affected by blows, friction, or other rough handling. The only care necessary is that the cakes be not frozen.

### The Divining Rod.

From the large number of inquiries about divining rods and their efficacy, we infer it to be a subject which interests a great many persons. The latest account on this mystic subject comes from Australia. Mr. William Spiers, M.A., F.C.S., F.R.M.S., writes to the *Mining Standard*, "Probably most of your readers have heard of the 'divining rod,' and have concluded that it was either a myth or that its effects were the results of evil agency. The reports that by its means subterranean watercourses or buried minerals have been discovered are generally rejected as mere rumors, or as instances of self-deception or even fraud. I confess I have myself been quite a skeptic in regard to the matter, but I have now what I consider good reasons for recanting. Being recently in the company of a few geologists on the Yorkshire Wolds, it was stated that one of our company was able to discover hidden water or metals by means of the magic rod. Our friend cut out of the hedgerow a fork of hawthorn shaped like a long V. Holding a prong in each hand, with the apex downward, we soon had an opportunity of seeing that 'there was something in it.' Here and there as he slowly walked along, the apex of the branch curled upward as if alive. I knew the gentleman too well to suspect that he was cheating us, but, in order to see that he was not self-deceived, I placed my hand around the muscles which must have moved had the contortions of the rod been due to unconscious muscular contractions. I quite satisfied myself upon that point.

"I then requested him to close his eyes, and I led him over a small rivulet that was running down the hill on which we were walking, and the moment he reached it the rod commenced its remarkable movements. As soon as I touched it with my fingers it resumed its natural position. For water it moved away from him, but for metals it swung round in the opposite direction. To test this a botanical case made of galvanized iron was brought near our necromancer, and the rod at once flew up. Our friend related many discoveries that he has made during the last 20 years. Generally he used hazel. Copper wire shows the same peculiarities, and this we were able to see at the time. When standing on a non-conductor, such as broken china, the effects were not produced. Our comrade is a student of science, and has not sought to make money by his gift, and this, of course, makes it impossible to doubt his integrity.

"He has plans of wells that have been sunk in various places as the result of his indications, and in one instance he was instrumental in discovering a disused and forgotten gas main. As he found out quite accidentally that he possessed this faculty, it may be that some of your readers may make a similar discovery in regard to themselves, and, as Abraham Cowley puts it, may amuse themselves by searching 'with fond divining rods among the dead for treasures buried.'"

### The American Institute Fair.

The interest of the public in industrial and commercial exhibitions generally will undoubtedly be greatly stimulated this year by the extensive preparations almost everywhere being made for the World's Columbian Exhibition at Chicago. Among the various attractions of this kind offered to the public, and presenting valuable opportunities to inventors and artisans ready to invite attention to their work, perhaps there are none which have a longer or more useful record than the annual fairs of the American Institute, New York City. The Sixtieth Exhibition of the Institute will open this year, September 30, and close November 28, giving two months' time to exhibitors improving the full period. The General Superintendent, Mr. Charles Wager Hull, is ready at the offices of the Institute, No. 113 West 38th Street, to give information and receive applications for space. The fair will be held in the Exhibition Hall on Third Avenue, and the building will be open for the reception of machinery on September 14th, and for other exhibits on September 21st. The early applicants for space will have the advantage of position, and the entries for the forthcoming exhibition already show a continued interest in the American Institute.

### Novel Heat Motor.

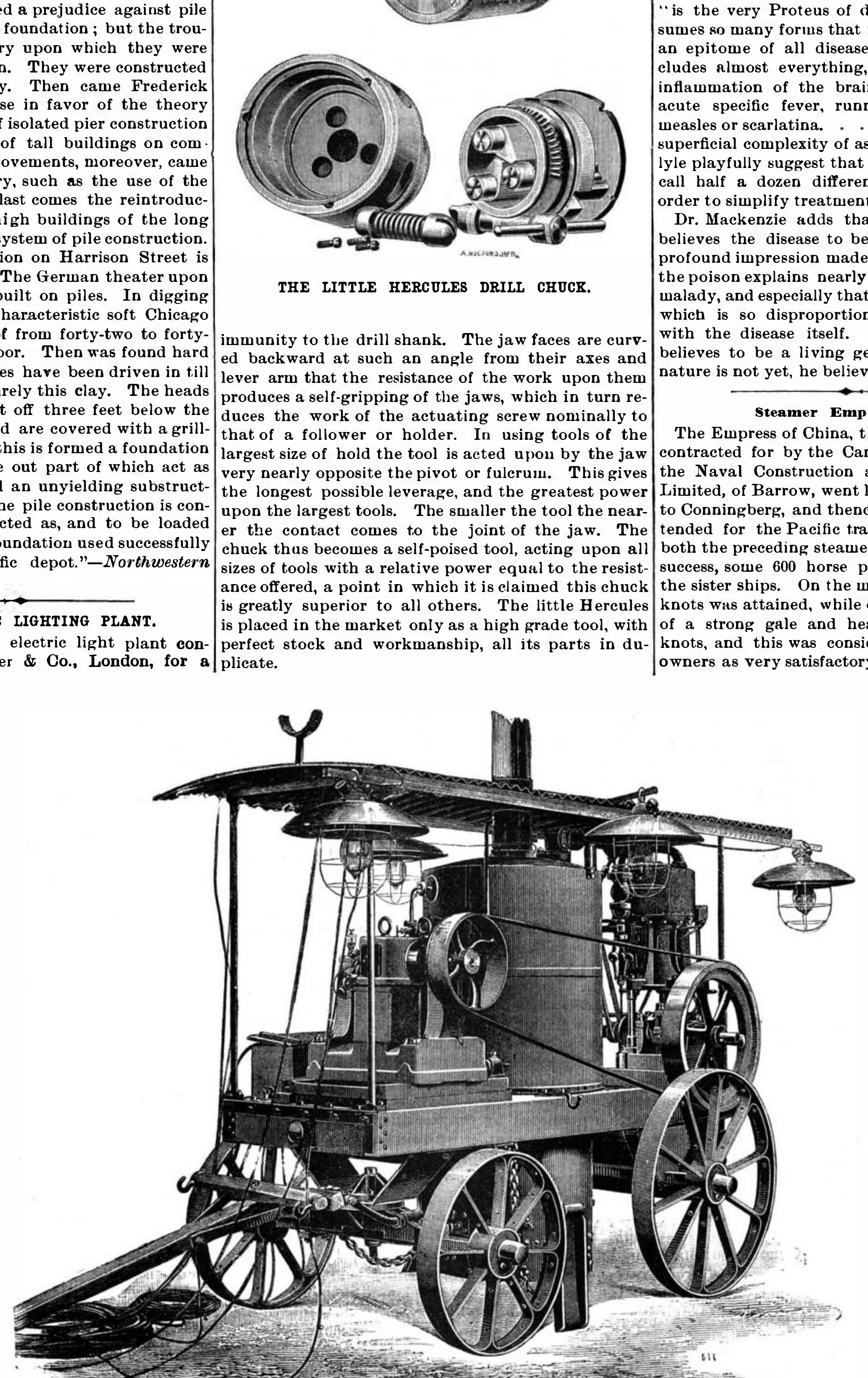
Mr. Shelford Bidwell's heat engine depends for its action upon the fact that nickel is magnetic at ordinary temperatures, but at 300° C. becomes suddenly non-magnetic. A slip of nickel is attached to a disk of copper suspended by two strings, so that it can swing like a pendulum. On one side of the hanging metals is a magnet, with which the piece of nickel is ordinarily kept in contact, and held by it. By placing a gas flame or a spirit lamp underneath the nickel, so as to warm it, it becomes so heated as to lose its magnetism, or power of being magnetized, and falls off—the pendulum thus making a swing. By its passage through the air, the nickel is cooled below the critical point, and on returning is held again by the magnet, only to fall off again as before, and so on, with considerable regularity, so long as the source of heat is kept up.

### Troublesome Building Foundations.

There has been so much discussion of the merits of obtaining a foundation for high buildings on the treacherous soil of Chicago that it may not be amiss to give a summary of the views of the two architects that seem to be the especial champions of opposite systems. The Chicago *Herald* boils the long letter by Mr. Dankmar Adler, recently published in the *Economist*, to the following: "He claims at the outset that the present methods employed in the foundations of tall buildings, however ingenious they may be, are insufficient for the ultimate development of the requirements of tallest business buildings. He then cites the grain elevators, which are subjected to very great pressure and variation of pressure, and are also usually built upon treacherous soil. These stand upon pile foundations. This simple fact seems to have escaped notice. The theory of the isolated pier construction seems justifiable, because a careful computation of weight to be sustained and careful workmanship have made it possible to secure so slight settlement and deviation that architects have lost sight of the desirability of securing the nearest approximation to an unyielding structure. The Cook County court house, which is built on piles, the Chicago city hall and the United States government building, which are built on concrete, are cited. These buildings have created a prejudice against pile and also against monolithic foundation; but the trouble was not with the theory upon which they were built, but with the execution. They were constructed wrongly and unintelligently. Then came Frederick Baumann's admirable treatise in favor of the theory and practice of the system of isolated pier construction as applied to the erection of tall buildings on compressed soil. Gradual improvements, moreover, came upon this isolated pier theory, such as the use of the cantilever system. Now at last comes the reintroduction in the construction of high buildings of the long neglected and undervalued system of pile construction. The Northern Pacific station on Harrison Street is built successfully on piles. The German theater upon Randolph Street is to be built on piles. In digging upon this latter site the characteristic soft Chicago mud was found to a depth of from forty-two to forty-eight feet below the cellar floor. Then was found hard tunnel clay. Fifty-foot piles have been driven in till the points penetrated securely this clay. The heads of the piles have been cut off three feet below the sewer level or water line, and are covered with a grillage of oak timbers. Upon this is formed a foundation of concrete and I beams, the out part of which act as cantilevers. Thus is formed an unyielding substructure for the foundations. The pile construction is conceived to be as well constructed as, and to be loaded no more heavily than, the foundation used successfully under the Northern Pacific depot."—*Northwestern Architect.*

### PORTABLE ELECTRIC LIGHTING PLANT.

We illustrate a portable electric light plant constructed by Hayward Tyler & Co., London, for a large dock company. It is mounted upon a frame carried by four wrought iron traveling wheels, and is fitted with a pole for two bullocks. The boiler stands in the center, the engine being at one end and the dynamo at the other. The boiler is 6 ft. 6 in. high by 2 ft. 9 in. in diameter. The firebox is crossed by two tubes 8 in. in diameter. The engine has a cylinder 5 in. in diameter by 6 in. stroke, and is of the inverted type with Pickering governor. By means of a belt it drives the dynamo. This is compound wound to give 20 amperes of current at a pressure of 10 volts, when running at 650 revolutions per minute. It supplies four incandescent lamps of 200 candle power each. Each lamp is provided with a strong enameled iron reflector fitted with a wire guard, and a length of twin flexible cable. A plant of this description will be very useful in many kinds of outdoor work.—*Engineering.*

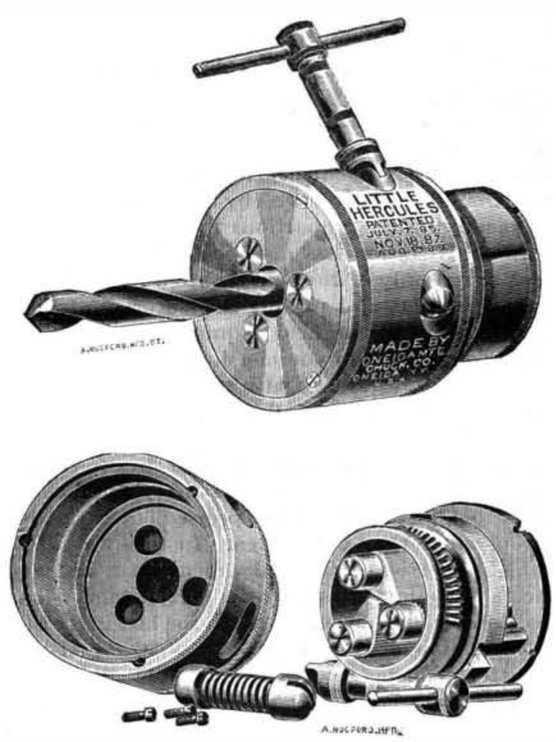


IMPROVED PORTABLE ELECTRIC LIGHTING PLANT.

BY the use of a new machine, potatoes may be planted in a straight line and with the hills at equal distances apart.

### AN IMPROVED CHUCK.

The drill chuck shown in the illustration has been recently placed upon the market by the Oneida Mfg. Chuck Co., Oneida, N. Y. It is simple and durable in construction, very powerful and accurate. The holding shell includes body face plate and connecting screws, and the working parts are composed of three jaws, an engaging ring and an actuating screw, all inclosed within the body. The jaws are pivoted at their ends and rotate eccentrically, offering an unbroken tool bearing of their whole length, which affords entire




THE LITTLE HERCULES DRILL CHUCK.

immunity to the drill shank. The jaw faces are curved backward at such an angle from their axes and lever arm that the resistance of the work upon them produces a self-gripping of the jaws, which in turn reduces the work of the actuating screw nominally to that of a follower or holder. In using tools of the largest size of hold the tool is acted upon by the jaw very nearly opposite the pivot or fulcrum. This gives the longest possible leverage, and the greatest power upon the largest tools. The smaller the tool the nearer the contact comes to the joint of the jaw. The chuck thus becomes a self-poised tool, acting upon all sizes of tools with a relative power equal to the resistance offered, a point in which it is claimed this chuck is greatly superior to all others. The little Hercules is placed in the market only as a high grade tool, with perfect stock and workmanship, all its parts in duplicate.

### A New Theory of La Grippe.

The unaccountable nature of the influenza commonly known as the grippe has invited the theories of all sorts and conditions of men, not to say of doctors, but among all no one is, perhaps, so well calculated to commend itself to confidence as that of Sir Morell Mackenzie, M.D., who in a paper in the June *Fortnightly* asserts that in his opinion "the riddle of influenza is poisoned nerves," and from this hypothesis "the bewildering diversity of symptoms becomes intelligible, if we regard them as the results of disordered nervous action." Dr. Mackenzie compares it to the extraordinary disturbance in telegraphic systems produced by a thunderstorm, and says this is nothing "compared with the freaks played by the living conductors in the human body, if anything throws the governing centers out of gear."

Now the theory of "poisoned nerves" is one that explains the almost infinite variety of attacks and curious freaks that mark the disease. No two persons, it is safe to say, have ever experienced precisely the same symptoms, and if it is a nervous disturbance, this is the natural result. Dr. Mackenzie regards the epidemic as falling under three general types, each of which include many varieties; these are the catarrhal, the digestive, and the nervous. "Influenza," he says, "is the very Proteus of diseases, a malady which assumes so many forms that it seems to be not one, but an epitome of all diseases, and its symptomology includes almost everything, from a cold in the head to inflammation of the brain. . . . It is really an acute specific fever, running a definite course like measles or scarlatina. . . . It is a disease with that superficial complexity of aspect which made Mrs. Carlyle playfully suggest that the doctors had agreed to call half a dozen different diseases by one name in order to simplify treatment."

Dr. Mackenzie adds that under all its disguises, he believes the disease to be perfectly simple; that the profound impression made on the nervous system by the poison explains nearly all the after effects of the malady, and especially that curious loss of vital energy which is so disproportionately great in comparison with the disease itself. The cause Dr. Mackenzie believes to be a living germ, air borne, but of what nature is not yet, he believes, established.

### Steamer Empress of China.

The Empress of China, the last of the three vessels contracted for by the Canadian Pacific Railway with the Naval Construction and Armaments Company, Limited, of Barrow, went lately on trial from the Clyde to Conningberg, and thence to the Mersey. She is intended for the Pacific trade, and is an exact copy of both the preceding steamers. The trial was a complete success, some 600 horse power being developed over the sister ships. On the measured mile a speed of 19 knots was attained, while on the sea trial, in the face of a strong gale and heavy sea, the vessel ran 16·6 knots, and this was considered by both builders and owners as very satisfactory. The following are the dimensions of the steamer: Length over all, 485 feet; length between perpendiculars, 440 feet; beam moulded, 51 feet; depth, 36 feet; height from top of keel to upper deck beam, 39·10 feet. The gross tonnage is 5,920, and the total deadweight capacity, with a mean draught of 24·6, is 4,000 tons. The vessel is divided into fifteen water-tight compartments.

The Empress of China, as well as her two sister ships, all first class and highest speed, has been built to share in the large subsidy given by the British and Canadian governments to promote trade and maintain British naval supremacy.

TO make skeleton leaves, soak in rain water for some weeks, remove by floating upon a card, and very gently remove upper skin with a soft camel's hair brush. Float in water and catch on a card with the other side uppermost, and remove other skin and pulp. A stiff brush may be needed, to be used by dabbing. Do not touch with finger. Finally wash well, bleach with javelle water, wash and dry.