THE CHILIAN NITRATE OF SODA MINES AND WORKS.

The two nitrate oficinas or establishments of Jaz Pampa and Paccha count among the most important, and are undoubtedly the most picturesquely situated, of any on the pampas or plains of Tarapaca. They are built on opposite sides of a deep quebrada or gulch, through which the Nitrate Railway passes. Indeed, the word Jaz, a local term implying divided, is here used to denote the fashion in which the level surface of the pampa has been rent apart by some bygone convulsion of nature.

Advantage has been taken of this natural formation to lay out the oficinas of the Jaz in such wise as to obtain unusual facilities for commodious and economical working. The caliche or raw material of nitrate, having been extracted from the calicheras or pockets situate on the pampas, is brought to the crushers erected at the edge of the gulch or summit of the maquina, and, being run through them, falls into the boiling tanks below. The nitrate in solution flows into the bateas or precipitating tanks, where on cooling it crystallizes, while the earthy refuse, or ripio, left in the boiling tanks, is cleared out by hand, and shot from tip cars into the valley below.

The washed and prepared nitrate is then bagged and transported to the shipping port of Pisagua, where a fleet of vessels is generally anchored to receive and convey the product to all parts of the world. At this port there are piers alongside of which launches are brought into which the nitrate bags are dumped and towed out to the ships. Quite a large part of the shipment, however, is effected by means of balsas or small floats, consisting of a pair of tubular skins, lashed together and inflated with air. These balsas are very buoyant, very light, easily propelled. The manner of loading and propelling them is clearly shown in our engraving. The native boatmen are exceedingly dexterous at the business, and are satisfied with earnings of a few cents a day.

We are indebted to the *Illustrated London News* for our engravings.

SIMPLE MILLING ATTACHMENT FOR FOOT LATHES.

The plan of making one machine answer the purpose of several separate machines for different purposes is not advisable, for many reasons; but when a simple and useful attachment, like that shown in the engraving, can be readily and cheaply made without altering the lathe, and arranged for use without waste of time, it is desirable, especially when the use of such an attachment effects a great saving of time, and takes the place of files in many kinds of work.

The milling attachment here shown is applied to the small engine lathe (8 inch swing, 42 inch bed) made by W. C. Young & Co., of Worcester, Mass., as this lathe is well fitted for the purpose, but it may of course be applied as readily to other lathes fitted with the same slide rest, and with some changes it may be adapted to almost any engine lathe.

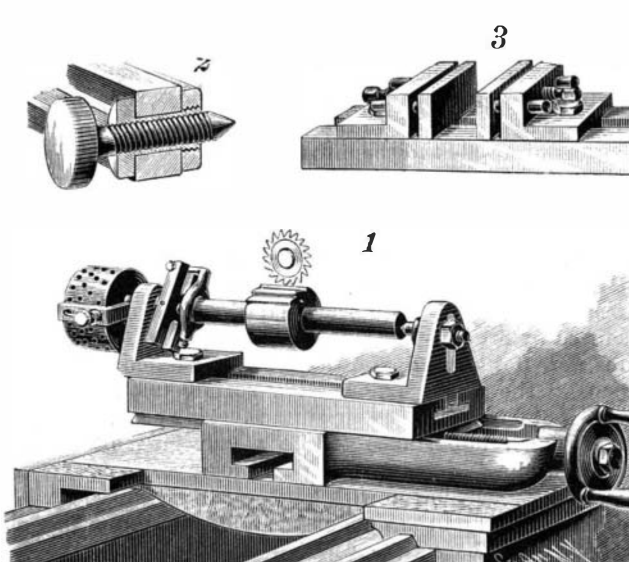
The slide rest illustrated is inverted, and the part which is designed to hold the tool post is secured to the lathe carriage by the bolt that commonly holds the slide rest in the position of use. The bottom of the slide rest, which is thus placed uppermost, forms a bed of sufficient size for receiving work as large as would usually be done in a lathe, and the T slot furnishes a ready means of securing the work or the holders for the work. In Fig. 1 two angle plates are shown secured to the slide rest by bolts entering the T slot. The upright portions of the angle plates are slotted to permit of adjusting the centers at the desired height. The fixed center is held in place in one of the angle plates by nuts on opposite sides of the plate. The movable center is supported in the other angled plate by a sleeve which passes through the slot in the plate.

The inner end of the center carries an H-shaped bar, which clamps the end of the dog on the mandrel which holds the work. The outer end of the movable center is provided with small cylinder divided like an index plate. The outer nut on the sleeve which supports the movable center has a slotted right-angled arm, which extends outwardly and along the face of the graduated cylinder. In the slot of the arm is clamped a sleeve, in which is inserted a screw with a conical point, which may be inserted in any of the holes in the graduated cylinder, the screw being adjustable along the slotted arm to bring it opposite any series of holes as may be required.

The division of the cylinder may be effected with sufficient accuracy for most purposes by means of dividers, but more accurate results may be secured in the manner described in SUPPLEMENTS No. 317, 732, 740.

Taps, reamers, and cutters may be fluted by the aid of this simple and easily made apparatus, the cutter being carried by the lathe either on a mandrel between the centers or projecting from a chuck on the lathe mandrel.

For plain work, the simple vise, shown in Fig. 2, may be used. If the work to be done is too large to go between the slide rest and cutter, it will be necessary to raise the head of the lathe. If, on the other hand, the slide rest is too low, it may be raised by inserting washers between the rest and lathe carriage. To facilitate placing these washers, they should be slit from the center outward to the periphery, to allow of putting them in place without removing the bolt from the slide rest and lathe carriage.



MILLING ATTACHMENT FOR FOOT LATHES.

OLIVE OIL LAMP.

The lamp shown in the engraving was recently purchased in the *Mercato Vecchio* at Florence. These

OLIVE OIL LAMP.

lamps are used not only in Tuscany, but in many of the other provinces of Italy, and form an article of commerce not only for actual use, but being so artistic, large numbers are sold annually to European travelers as souvenirs. They are quite inexpensive, considering the amount of material and the work put upon them, the larger ones costing only $1.35 complete, while small ones may be purchased for 75 cents. They show an amount of hand work which is seldom seen in American goods of the same class.

These lamps are made in several different designs and with one, two, three, or even four beaks. The lamp illustrated is 22 inches high and is made throughout of cast brass, with the exception of the extra oil carrier, which is of copper. Every lamp is provided with a pair of snuffers, an extinguisher, and an instrument for picking the wick. These three articles are suspended from the lamp with brass chains having brazed links. The lamp font is tinned on the inside to prevent corrosion, and is arranged to slide up or down the rod. The wicks, which are of wool, pass through small brass tubes inserted loosely in the beaks. The supply of oil contained in the font being limited, the small oil reservoir holding a charge of oil is suspended from the lamp. The olive oil, which is very cheap, costing only 8 to 10 soldi (8 to 10 cents) the liter, is manufactured from small olives or those unfit for eating. These lamps give a soft, pleasant light.

Food before Sleep.*

Many persons, though not actually sick, keep below par in strength and general tone, and I am of the opinion that fasting during the long interval between supper and breakfast, and especially the complete emptiness of the stomach during sleep, adds greatly to the amount of emaciation, sleeplessness and general weakness we so often meet.

Physiology teaches that in the body there is a perpetual disintegration of tissue, sleeping or waking; it is therefore logical to believe that the supply of nourishment should be somewhat continuous, especially in those who are below par, if we would counteract their emaciation and lowered degree of vitality; and as bodily exercise is suspended during sleep, with wear and tear correspondingly diminished, while digestion, assimilation and nutritive activity continue as usual, the food furnished during this period adds more than is destroyed, and increased weight and improved general vigor is the result.

All beings except man are governed by natural instinct, and every being with a stomach, except man, eats before sleep, and even the human infant, guided by the same instinct, sucks frequently day and night, and if its stomach is empty for any prolonged period, it cries long and loud.

Digestion requires no interval of rest, and if the amount of food during the twenty-four hours is, in quantity and quality, not beyond the physiological limit, it makes no hurtful difference to the stomach how few or how short are the intervals between eating, but it does make a vast difference in the weak and emaciated one's welfare to have a modicum of food in the stomach during the time of sleep, that, instead of being consumed by bodily action, it may during the interval improve the lowered system; and I am fully satisfied that were the weakly, the emaciated, and the sleepless to rightly take a light lunch or meal of simple, nutritious food before going to bed for a prolonged period, nine in ten of them would be thereby lifted into a better standard of health.

In my specialty (nose and throat) I encounter cases that, in addition to local and constitutional treatment, need an increase of nutritious food, and I find that by directing a bowl of bread and milk, or a mug of beer and a few biscuits, or a saucer of oatmeal and cream before going to bed, for a few months, a surprising increase in weight, strength, and general tone results; on the contrary, persons who are too stout or plethoric should follow an opposite course.

Soldering of Glass and Porcelain with Metals.

Mr. Cailletet has recently made known to the Societe de Physique a process of soldering glass and porcelain with metals. Mechanists, physicists, and chemists will appreciate the practical importance of this process, which permits of adapting any metallic object whatever (cock, tube, conducting wire, etc.) to experimental apparatus in such a way as to prevent any leakage, even under high pressures.

The process is very simple. The portion of the tube that is to be soldered is first covered with a thin layer of platinum. This deposit is obtained by covering the slightly heated glass, by means of a brush, with very neutral chloride of platinum, mixed with essential oil of chamomile. The oil is slowly evaporated, and, when the white and odoriferous vapors cease to be given off, the temperature is raised to a red heat. The platinum is then reduced and covers the glass tube with a bright layer of metal. On fixing the tube thus metallized, and placed in a bath of sulphate of copper, to the negative pole of a battery of suitable energy, there is deposited upon the platinum a ring of copper, which should be malleable and very adhesive if the operation has been properly performed.

In this state, the glass tube covered with copper can be treated like a genuine metallic tube and be soldered by means of tin to iron, copper, bronze, platinum, and all metals that can be united with tin solder.

The resistance and strength of such soldering are very great. Mr. Cailletet has found that a tube of his apparatus for liquefying gases, the upper extremity of which had been closed by means of an ajutage thus soldered, resists pressures of more than 300 atmospheres. The tube, instead of being platinized, may be silverized by raising the glass covered with nitrate of silver up to a heat bordering on red. The silver thus reduced adheres perfectly to the glass, but numerous experiments have caused platinizing to be preferred to silverizing in the majority of cases.—*La Nature.*

Eczema from the Virginian Creeper.

The *Lancet* (London) relates a number of unmistakable cases of eczema produced from gathering leaves of the Virginian creeper. The effect, rash, heat, and irritation of the skin, is the same as that caused by ivy and dogwood on some persons.

* Dr. Wm. T. Cathell, in the *Maryland Medical Journal.*

Progress of Steam Navigation on the Great Lakes.

Census Bulletin 29 says: It is probable that the history of marine architecture does not furnish another instance of so rapid and complete a revolution in the material and structure of floating equipment as has taken place on the great lakes since 1886.

The facts show not only radical changes that have taken place in the class of vessels used for transportation on the great lakes, but an increase in the tonnage and valuation during this brief period. In 1886 the net tonnage was 634,652, in 1890 it had reached 826,360, an increase of 191,708 tons. The estimated value of these vessels in 1886 was $30,597,450, and in 1890 the aggregate valuation was $58,128,500, an increase compared with 1886 of $27,531,050. Sailing vessels are fast giving place to vessels propelled by steam.

In 1886 there were but 21 propellers of over 1,500 tons burden. In 1890 there were 110 propellers of this class. But the tonnage of vessels of this class has increased more rapidly than their number. Thus the total tonnage of the 21 vessels of over 1,500 tons burden in 1886 was 34,868, while the total tonnage of the 110 vessels in 1890 was 188,390; that is to say, the percentage of increase in the number of vessels is 423 81, while the percentage of increase in tonnage is 440·29. The total value of this class of vessels in 1886 was $2,645,000; in 1890 it was $15,000,092, showing an increase for the four years of 570·59 per cent. A comparison similar to this for any of the classes of vessels, when taken in connection with well known facts relative to the ownership of these large vessels, clearly shows that the traffic of the great lakes is rapidly coming under the control of companies having at their command large capital.

The same conclusion may be arrived at if the changes in the material made use of in the building of new vessels are considered. Steel is more generally used for large vessels than iron, composite, or wood. In 1886 there were but 6 steel vessels afloat on the lakes, with an aggregate tonnage of 6,459 tons and an aggregate value of $694,000. From the corresponding data for the year 1890, it appears there are now 68 steel vessels afloat on the lakes, with an aggregate tonnage of 99,457 tons and an aggregate value of $11,964,000. This shows an increase in number of vessels of 1,033·33 per cent, in tonnage of 1,439·82 per cent, and in valuation of 1,623·99 per cent. Iron and wooden vessels have barely held their own during these years. Vessels built of composite, on the other hand, show a marked increase, both in number, tonnage, and value.

These facts indicate that a new factor is being introduced into the problem of transcontinental transportation.

Economic Steaming.

Certain remarkable economical results have been obtained by M. August Normand, of Havre, with the engines of a torpedo boat constructed by his firm, which were made the subject of a paper which he read before the French Institution of Civil Engineers on the 5th of December last. The following abstract, for which we are indebted to the *Engineer*, will be found interesting:

M. Normand has recently delivered to the French government three single screw torpedo boats, Nos. 126, 127, and 128, and one twin screw boat, the Avant-Garde. The consumption of fuel at slow speed—ten knots—was found to be so small in the case of Nos. 126, 127, and the Avant-Garde, that it was deemed advisable to carry out a trial with No. 128 with exceptional care, and for this purpose the boat made two runs on successive days, of eight hours each.

M. Normand puts down the consumption at 0 5 kilo. per horse per hour, which means about 1·25 pounds of coal per English horse power per hour; an extraordinarily low figure, when it is borne in mind that the engines are compound, not triple expansion. The trials were carried out by an official committee. The principal dimensions of the boat are as follows: Length over all, including the rudder, 121 feet; beam, 13 feet 2 inches; mean draught, 3 feet 9½ inches; displacement, about 79 tons.

The boiler is of the locomotive type, but presents many peculiarities. There are 317 tubes, 8 feet 8 inches long and 1½ inches diameter. These tubes are rolled into the plates, and fitted at the fire box end with bell-mouthed ferrules. The grate surface is a little over 30 square feet. The total heating surface is 1,425 square feet; the pressure 143 pounds per square inch. A deep hanging bridge is worked into the flat crown of the fire box, and a fire brick bridge curves back over the grate. Thus a species of combustion chamber is formed, which, with the bell-mouthed ferrules, perfectly protects the tube ends and tube plate and prevents leakage. These boilers, we understand, give no trouble whatever. The total weight of the boiler, with water and all fittings and accessories, is nearly 16 tons. Of this the water represents about 4·5 tons, and the grate bars and bearers about 17 cwt. The external fire box crown is brought down lower than usual, and to provide steam room a steam drum about 2 feet in diameter has been added to the barrel of the boiler. In the water space at each side of the fire box thin plates are placed to permit the quiet descent of water between them and the outer shell plate, while the steam and water together can rise unhindered at the fire box side. The tubes are of brass, with copper ends next the fire box.

The engines are intended to indicate 900 horse power when making 320 revolutions per minute. They weigh complete, without water, about 12 tons. The water in the condenser and hot well adds about 1·25 tons to this. The water circulates automatically through the condenser when the boat is in motion. A small centrifugal pump is provided to maintain the circulation when the boat is not moving through the water. The cylinders are 17·3 inches and 27·24 inches by 17·3 inches. The valve boxes are placed between the cylinders. They are cast in one with the small cylinder. The cylinders are jacketed all over. The jackets are supplied direct from the valve chest of the high pressure cylinder, and the drain pipes are fixed at the lowest points, so that the jackets can be kept quite clear of water. At each end of the high pressure cylinder is fixed a small relief valve, which opens if the compression becomes excessive, as may be the case when the engines are running linked up. If it were not for these valves, the engines must when running at full speed have too little compression, but by their aid M. Normand is able to give ample compression at full speed, and yet run no risk at low speeds when working very expansively. The valves open at each stroke, permitting the surplus steam to escape into the chimney before the admission port opens. These valves have worked satisfactorily up to the present. The frames of the engine are of gun metal, with diagonal steel ties. The slide bars are of bronze, grooved for oil, and with water circulation through them. The piston and connecting rods are of steel. The condenser tubes are fixed by rolling into the tube plates. They are bent slightly to permit contraction and expansion. No packing of any kind is used. This method is said to answer perfectly. The feed water is cleared of grease and dirt by being passed through a sponge filter. The sponge arrests the grease, but lets the water pass freely. The feed is next passed through a heater consisting of a sheaf of tubes rolled into plates at each end. The sheaf is placed in a copper vessel. The feed water circulates round the tubes. A special valve worked by an eccentric on the after end of the crank shaft admits, during the period of expansion, steam from the large cylinder to the heater at each stroke. This steam moves through the tubes in a direction opposite to that in which the water moves. The water at slow speed is raised to a temperature of about 158° Fah.; at full speed it is heated to 212° Fah. The water resulting from the condensation of the steam passes by a steam trap to the condenser. A second and similar trap drains the jackets, and the hot water is passed through a copper coil in the hot well, so that it gives up its heat to the feed water before entering the condenser.

The accompanying table gives the results of the trials for economy:

	First Day.	Second Day.
Total number of revolutions	67,000	64,577
Speed in knots	10·819	10·412
Consumption of coal:		
Total during eight hours	926 lb.	881 lb.
Per hour	127 lb.	1[illegible] lb.
Per hour and square foot of grate	7·5 lb.	6·5 lb.
Per knot	11·75 lb.	10·75 lb.
Per knot at ten knots	10 lb.	10·2 lb.
Water per hour	1,988 lb.	1,988 lb.
Indicated horse power	119·95	112·33
Coal per horse per hour	1·054 lb.	0·979 lb.

The extreme economy obtained during these trials is attributable to two causes. In the first place, the boiler was very economical. In the second, the engines used the steam supplied to them to the best advantage. The report of the commission estimates the theoretical value of the fuel, which was special torpedo boat briquettes from Anzin, at 16 pounds of steam to the pound of fuel. The boiler actually made 12 pounds per pound of coal, so that the efficiency was 75 per cent, a very excellent result. During the trial the grate area was reduced by fire tiles to a little over 17 square feet, the fans were not worked, and the stokehold hatches were open all the time. The heating surface stood in the ratio of 81·6 to 1 of the grate surface. M. Normand attaches much importance to the arrangement of the tubes in the tube plates, and he cites a very remarkable experiment made with a locomotive boiler. A cock was fitted on the shell of this boiler, and from the cock a small bore tube was led down through the water to a point in close proximity to the tube plate of the fire box. When the boiler was worked at full power with a sharp draught, no water could be got from the cock, nothing but steam. This is a highly suggestive experiment, and does much to explain why tubes become leaky when forced draught is used. M. Normand classifies the causes of the exceptional economy of his engines under four heads: First, the great economical efficiency of the boiler; second, the complete compression in the small cylinder, by which clearance was eliminated; thirdly, the heating of the feed water; fourthly, the superheating of the steam due to throttling.

Revolutions per minute, 135·7. Mean pressure, small cylinder, 19·3 pounds; indicated horse power, 51·72; boiler pressure, 60 pounds; ditto in intermediate receiver, 8·5 pounds; vacuum, 22 inches; temperature of feed water, 178° Fah. Large cylinder, average pressure, 9 pounds; indicated horse power, 62·60. Total indicated horse power, 114·32.

As the boiler produced 12 pounds of steam for each pound of fuel burned, and the consumption was 1·25 pounds nearly per English horse power per hour, we have $12 \times 1·25 = 15$ pounds as the weight of steam used per horse per hour. This is an extremely small consumption, but not impossible. It has been exceeded with some pumping engines, for example. But it appears yet smaller when we consider that the pressure during the trial did not exceed 60 pounds above the atmosphere. We see no reason to doubt the substantial accuracy of the report. The diagrams were taken every half hour; the briquettes put on board before the eight hours' run were weighed, those left unburned were weighed after the run, and the difference was the consumption. The feed water was not measured, however, and the evaporation of 12 to 1 has been deduced from that of a Scotch boiler in the steamship Chasseur, which was found by actual experiment to make 9·29 pounds of steam per pound of coal. We believe that the actual efficiency of the torpedo boat boiler has been underestimated.

The heating surface for the power was enormous; the rate of combustion, very slow. The firing seems to have been conducted on the principles with which our own engine trials under the auspices of the Royal Agricultural Society have made us familiar, the briquettes being carefully broken into small pieces. The feed water was raised to a high temperature. Under the circumstances, we think we may take the evaporation as more nearly 13 pounds than 12 pounds of water per pound of fuel, and the consumption then becomes $13 \times 1·25 = 16·25$ pounds, which is not exceptional, although very good. Nothing is known with certainty as to the consumption when the boat is running at full speed. It is, of course, considerably in excess of that reported for the low speed.

The entire experiment is very instructive, and the results all go to teach the same truth, namely, that maximum economy can only be had by using dry steam and neutralizing the effect of clearance. The performance of the machinery as a whole reflects very great credit on M. Normand.

The Dangerous Alternating Current.

Humidity reached pretty nearly high water mark as midnight approached last night, and several things resulted.

One was the display of three electric lights on Broadway, opposite St. Paul's chapel, that nobody will ever pay the electric light company for. Some high tension wires run on poles on the west side of the street in front of the chapel, and trees in the churchyard extend their branches over the sidewalk and very close to the wires. The trees and their branches were soaked with water, and therefore good conductors of electricity. The saturated atmosphere between the branches and the wires completed the circuits, and the result was three brilliant electric arc lights, which blazed, sputtered, went out, and blazed again, until finally the branches were burnt off and dropped to the street. During the display a considerable number of people gathered at the corners and watched it curiously.

The moisture-saturated atmosphere occasioned an alarm of fire at about the same time. The Pennsylvania Railroad ferry slips at Cortlandt Street are lighted by electricity, and the wires run under the roof within a few inches of the wooden rafters. These wires were evidently badly insulated, if insulated at all, for fire broke out at nearly the same moment at three points in the roof just above them at the time when the fog from the river was thickest. An alarm was sent out, and the first engine that arrived quenched the flames within less than a minute with no appreciable damage. The new fire boat New Yorker steamed up immediately afterward, but there was no use for her.

While the *Sun* reporter was talking to the policemen on duty at the ferry, immediately after the fire, a newly erected telegraph pole suddenly broke into flame in front of the ferry house on the west side of West Street. The flame flickered and went out before an alarm could be sent. The same wires which fired the ferry house hung on this pole. They were strung to it on glass insulators set at least three inches from the wet wood. The current apparently jumped to the pole through the medium of the water-saturated air, forming an arc and firing the wood.

From Fulton Street to the Battery the wires kept sizzling here and there, sometimes sending out a spurt of flame as big as an average sized Derby hat, and sometimes dwindling down to a spark.—*N. Y. Sun, Feb.* 17.

Cement for Microscope Slides.

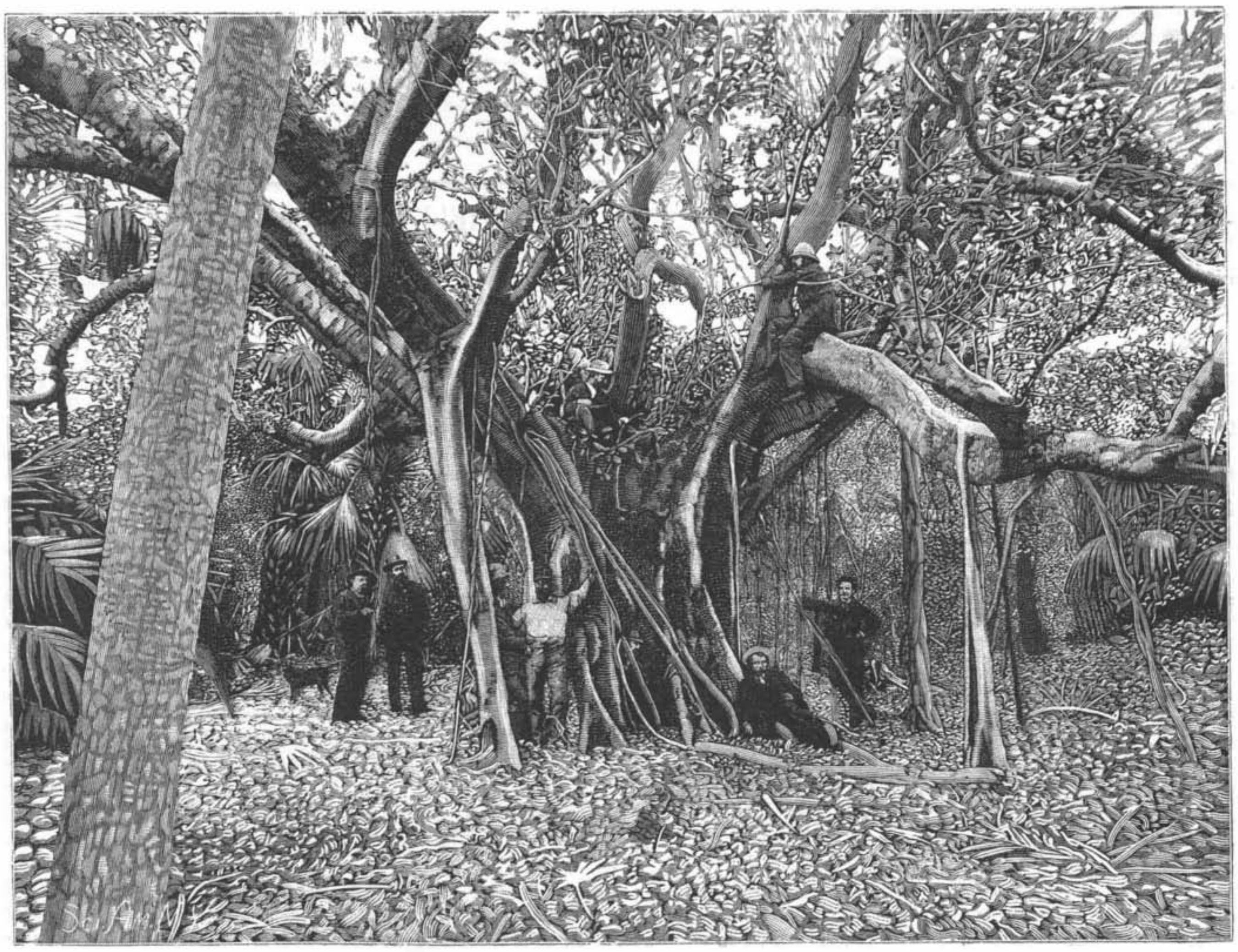
Take a tube of Winsor & Newton's flake white, as used by artists, and mix with an ounce of Berry's oil finish varnish. It makes a most durable cell, and one with which a cell can be rapidly built. The materials can be obtained at any drug store.

The Bell and Drawbaugh Telephones.

H. C Andrews, of New York City, is counsel for the Drawbaugh claims on the telephone. He was seen a few days ago by a representative of *Modern Light and Heat* in regard to the rumor that the Bell Telephone Company might seek to continue its monopoly after the expiration of its patents by admitting the priority of Drawbaugh's claim for a patent on the carbon transmitter and then purchasing his rights. He said that it would not do the Drawbaugh claims a bit of good if they were admitted by the Bell Company, for the United States Patent Office, and not the Bell Company, was the contestant. He admitted, however, that if Drawbaugh's claim to a patent on the carbon transmitter were now established and his rights were bought up by the Bell Company, the monopoly on the transmitter could be continued for many years to come. That there had been any negotiations to that end he denied positively.

AN AMERICAN BANYAN TREE.

Probably nothing in the way of natural growth affords greater interest to the young student of geography than the banyan tree, with its huge arms extending out in every direction, and dropping down shoots, which in turn change into trunks, and instead of remaining a cumbrous dependent, become a support to the parent branch and furnish it sustenance and life—a curious and interesting provision which leads to one of the most extraordinary growths that we have in nature. The parent tree multiplies itself and becomes a group and then a grove, until it spreads over a tract of land large enough to shelter an army. We published some weeks ago a description and illustration of a remarkable banyan tree that has for many years attracted the attention of visitors to the island of Nassau, but in the accompanying engraving we illustrate a fine example of this tree, and this specimen is to be found upon this continent. In this land of many climes, there are a variety of growths which are not generally known. This is especially the case in southern Florida, where many of the tropical genera are indigenous. The banyan or rubber tree is one of this number. Our illustration is from a specimen at Palm Beach, Lake Worth, Florida, and is from a photograph by Mr. Wm. H. Jackson, of Denver. There are very few of them known, however, now in Florida, and this tree is probably the largest of its kind in North America.



AN AMERICAN BANYAN TREE.

The Annual Report and Annals of the Astronomical Observatory of Harvard College.

The report of the director of this observatory indicates an extensive range of work in both hemispheres, and the elaborate celestial tables issued as the "Annals" are the best evidence of its work. The observations are now executed in three fields, Massachusetts and California in the United States and at Chosica, Peru. The latter station will probably be abandoned for Arequipa, where a drier air and better climatic conditions prevail. The accumulation of photographic plates is noted, some twenty-seven thousand being now stored in Cambridge. By the application of photography a record is now obtained for the benefit of future generations of astronomers that goes back to 1885. Thus the observers of to-day have witnessed the establishment of an epoch, the birth of the new astronomy, where photography does the recording and the gelatine plate supplants the eye of the observer with its inevitably varying personal coefficient. Besides the volume of annals, a number of special publications on various subjects, by the members of the observatory staff, are noted, most upon pure astronomy, but some touching on photography and horology.

Electricity in Law.

One of the effects of the rapid introduction of electrical inventions during the last quarter of a century, says the *Pittsburg Dispatch*, has been to open up entirely new fields of litigation for the lawyer and new questions for the bench. This in a general way is true of every new creation of industrial property, but with electricity many of the problems to be solved are quite novel, and a judge has often to go wide of practice or precedent before he can determine the legal principle proper to apply in the case before him.

Thus, for instance, in Pennsylvania the question has recently been adjudicated upon whether a local electric light company was a manufacturing concern. The court says it is not, and yet all that it does is to make current for sale.

A similar point is that raised as to the dutiability of electric current. The law officers of the Treasury say it is intangible, and therefore pays no duty ; yet it can be measured to the minutest fraction. The Western Union Company has had many a fight as to whether pole lines had any right on the public highway, and Massachusetts says they have, as transporting messages is part of the work of intercourse for which roads are laid out and maintained. The American Bell Telephone Company for years spent hundreds of thousands of dollars in defending the abstruse doctrine that telephonic speech can only be transmitted by an undulatory current, that a make and break current would not do it, and that other devices are simply a juggle to get around Bell's patent. In electric lighting, millions of investment have hung on a "filament" and on the exact meaning that the courts might attach to the word.

Among the latest legal fights is one that probably the United States Supreme Court will have to settle, namely, whether the telephone companies or the electric railway companies have the right to use the earth as a "return" circuit. The telephone people claim that the leakage from the railway throws their service out of gear and renders the instruments useless. The railway people reply that their telephonic friends have a remedy in metallic circuits and that no one electrical interest anyhow can "own the earth." Already this dispute has cropped up in nearly a score of States, and the increasing number and magnitude of the electric roads renders it more and more important. In the meantime, the telephone companies as far as possible are putting their metallic circuits in, with a marked improvement in the service. New questions thus crop up every day. In the use, for example, of the alternative currents now becoming so common, not a little has depended on the patentability of the principle of transforming the current, and on whether a "step up" was equivalent to a "step down," in other words, whether raising the voltage and decreasing the amperage was a simple and inevitable converse to decreasing the volts and raising the amperes. Another point around which legal controversy has gathered is the fine one as to where "low" potential ends and "high" potential begins.

[The points here given, with many others of equal importance, were discussed in a very able address recently delivered by Hon. John S. Wise, at the fourteenth annual meeting of the New York State Bar Association, at Albany.]

The Relations of Men of Science to the General Public

was the title of the address of T. C. Mendenhall, as retiring president of the American Association for the Advancement of Science, at its annual meeting in Indianapolis for the year 1890. The main points of his theme were :

1. The particulars in which scientific men fail as exponents of science among their fellows. Under this head is named, with proper qualification, the fact that such men are sometimes unable, or unwilling, to present the results of their labors in form intelligible to intelligent people.

2. Men of science are liable to fall into the error of assuming superior wisdom as regards subjects outside the lines of their specialties.

3. Men of science are not always reasonably free from egotism in matters relating to their specialties, particularly in reference to authority and attainments in the same.

4. Another element of weakness in scientific men is that they are often less "practical" in their work than they should be. Sometimes they even despise the useful and practical in science, and their dignity is disturbed when an honest and innocent layman asks what the use of this or that discovery is. This we deem one of the most important points of the address, because the fault is so commonly noticed and spoken of by intelligent laymen. We have ourselves been recently ashamed of some of our prominent scientific men for grievous errors in this way.

5. The last point of the paper is the demand which the public may justly make upon the man of science, that his interest shall not be less in public affairs than that of other men. The paper, as a whole, is well calculated to call the attention of scientific men generally to a line of usefulness and an opportunity for good not duly appreciated heretofore.—*Sidereal Messenger.*

Lubec Channel, Maine.

The report of Lieut.-Col. J. A. Smith, Corps of Engineers, upon the preliminary examination of Lubec Channel, Maine, shows that this channel is worthy of improvement, which is concurred in by the Chief of Engineers. The improvement proposed is the excavation of a channel with a width of 500 feet at its narrowest place, increased to a width of 650 feet to make room in the bend, and 12 feet deep at mean low water, at an estimated cost of $231,000.

Lubec Channel lies between the township of Lubec, on the extreme eastern boundary of the State of Maine, and Campobello Island, of the province of New Brunswick. At its narrowest place, which is between the village of Lubec and a point of the island, the distance is but 805 feet from high water on the end of Gun Rock to high water mark on the Campobello shore. Between the natural contours of mean high water on the respective shores the width is 960 feet, and between contours of mean low water the distance is but 390 feet.

After passing Lubec, going southward, the channel leads into a small bay known as Quoddy Roads, which forms a good anchorage in northerly and northwesterly storms. When a storm changes from westerly to easterly directions, vessels which are at anchor in the roads are seriously endangered, and must accept the alternative of trying to ride out the storm or to escape through the narrows into the protected waters above.