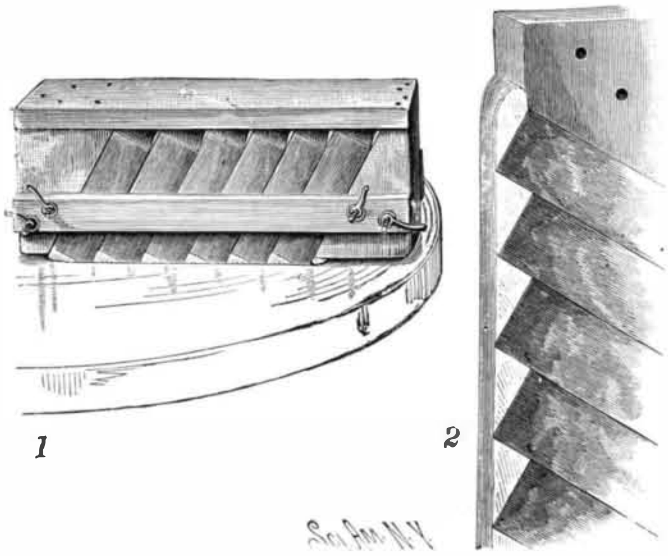
NEW METHOD OF CHAMFERING STONE.

The usual method of chamfering stone is to chip off the corners by means of a mallet and chisel, and afterward to grind and polish the surfaces separately, thus involving a great amount of labor and much expense.

Mr. John L. Dalot, of Addison, Me., has recently patented a novel method for producing chamfers upon the edges of stone blocks and slabs without liability of chipping the corners. According to this method, the slabs are mounted in a frame which holds them at the



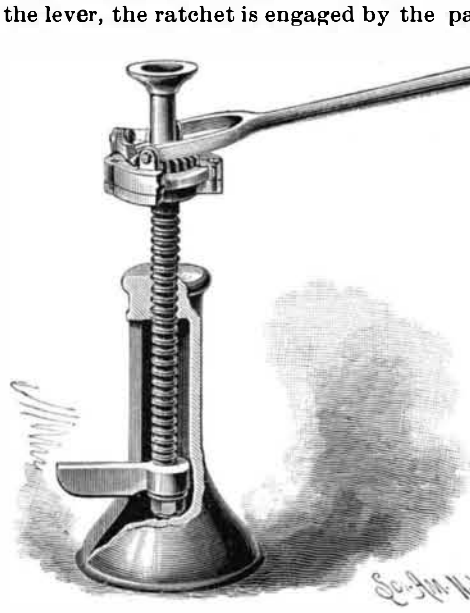
DALOT'S APPARATUS FOR PRODUCING CHAMFERS.

required angle, and the edges of the blocks or slabs to be chamfered are covered with a suitable cement, which fills in the angles between the blocks, and sustains the surface of the stone so that it does not chip in the process of grinding. Any suitable cement is used for this purpose; plaster of Paris has been found effectual and convenient. The arrangement of the slabs in the frame is shown in Fig. 1, and in Fig. 2 the slabs thus prepared are shown in position on the lap which carries the abrasive and polishing material.

It is obvious that this improvement is equally applicable in hand polishing, where an ordinary hand rubber is used. The chamfers produced according to this method are uniform, the angles are sharp, and the surfaces plane.

IMPROVEMENT IN JACK-SCREWS.

We give an engraving of a jack-screw which is designed to operate in much the same manner as the well known hydraulic jack. The screw turns in a nut in the standard, and carries at its upper end a flange and ratchet wheel. The screw-operating lever is pivoted to a movable ring inclosing the flange, and the movable ring carries a pawl for engaging the ratchet. The upper end of the screw is prolonged, and furnished with a shoe for receiving the load when it is desired to apply pressure from the upper end of the screw. Upon the lower end of the screw is swiveled an arm which extends through a slot in the standard, for engagement with objects to be lifted from the ground. By oscillating the lever, the ratchet is engaged by the pawl and



KALBACH'S JACK-SCREW.

carried around, thus turning the screw and raising or lowering the object supported by it. The pawl may be reversed so as to turn the screw in either direction.

This invention has been patented by Mr. M. D. Kalbach, of Harrisburg, Pa.

In relation to his scheme for a tubular railway across the Straits of Dover, Sir E. J. Reed points out that, unlike the tunnel, the tube can be destroyed if required by torpedoes or mines by the fleet, and hence could never be used by an enemy to maintain the communications of an army of invasion.

Artesian Wells.

Whether water can be obtained by artesian borings in any district, or not, depends upon the geological structure. All rocks contain more or less water. Sandy formations absorb water mechanically, and fine sand can take in about one-third of its bulk of water, and if a well be sunk into it, and regularly pumped from, nearly all of this moisture can be drawn out. Chalk, and similar rocks, which are made up of very fine particles, closely compacted together, contain a very large proportion of water, but from the capillary attraction of this rock, very little of this water will drain into a well sunk into it. But as there are often wide crevices in chalk rocks, through which water flows in much greater quantity than the rock can retain in its pores, wells sunk into chalk formations often secure water. There is another formation, that of the clays, through which water does not percolate, and a well sunk in this rock cannot secure water. In the geological strata of the earth, the veins which are impervious to water and those through which the water readily penetrates may occur in alternating layers, and when in this manner a pervious bed of earth lies between two impervious ones, it is plain that we have a formation altogether favorable to the objects of the artesian well. For, if a perforation be made through the retentive rock, into the water-logged strata below, the moisture there contained will rise through the bore to a height depending upon the pressure of water which has accumulated in the confined space between the two impervious veins.

When, as so often happens, especially when the surface of the country is uneven, the vein of water-yielding sand may run beneath the surface of the earth, to a level far above the point where the boring has been made, the water will rise rapidly in the well, to the surface of the earth, and often higher, and will then flow continuously by hydrostatic pressure. As veins of sand or pervious rock run through the earth everywhere, there seem to be few places where the process of boring cannot secure water at less or greater depth. Many artesian wells have been made in the deserts; in the Sahara a number of wells made in this way are transforming a perfectly arid land into a fertile, beautiful country. And as surface waters are continually percolating into the strata from which the artesian well draws, such wells seldom fail, even after many years of usage. There are such wells in the Old World that have been in use for centuries.—*Chicago Inter-Ocean.*

OPEN COLUMN MANOMETER ON THE EIFFEL TOWER.

M. L. Cailletet, the eminent French physicist who has become famous for his researches on the liquefaction of gases, has put the Eiffel tower to a new use. As a verifier of high pressure instruments the open column mercury manometer has been found unsurpassed. Already M. Cailletet has used one over three hundred feet high. In the Eiffel tower he has recently established one three hundred meters in height, giving unrivaled opportunities for standardizing high limit pressure gauges.

As a glass tube could not be constructed that would be practical under so great a pressure, a soft steel tube was adopted. This was carried up the tower and secured thereto as shown. It is about 4 millimeters (0·16 inch) in internal diameter. It is attached to one of the rails of the inclined elevator until the lower platform is reached. A stairway was constructed along the line it follows. A portion of this section is shown in the cut. Then, by a series of vertical and almost horizontal elements, the tube makes its way to the second platform, whence its rises vertically, except for one break, to the top of the tower.

The lower end of the tube enters a vessel of mercury and is immersed in the same. By pumping water into this vessel, the mercury is forced up into the tube.

As it would be manifestly impossible to read the level of the mercury in the opaque tube, a series of auxiliary open glass reading tubes is connected to it at intervals. These communicate through a lateral connection with a stop cock with the main tube. If the cock of one of the connections is open as the mercury reaches the level of the auxiliary tube, it rises in it to the same level.

Telephonic communication is maintained between the observer at the tube and the manometric station, by which the movements of the pump and escape valve are directed. If too much water is pumped in, a little is allowed to escape. As the point is nearly reached, the pump is worked very slowly, so that, by practice, the exact point can be reached nearly every time. An overflow tube is provided in case any of the mercury escapes. After a reading the cock is closed if higher pressure readings are to be taken, and the mercury is pumped up to the next desired auxiliary reading tube.

The manometric station, whose interior in shown in our illustration, is situated at the base of the western pillar of the tower. The observation or auxiliary tubes are known by number, and besides carry each an independent graduation. In practice the pump is caused to force the column up to a tube of a certain number and to a definite graduation on the scale of the same tube.

In this way high pressure gauges can be graduated up to 400 atmospheres. Of course the reliability of the method depends on the accuracy of the levels of the reading tubes. Special care has been taken to determine these levels.—*Illustration.*

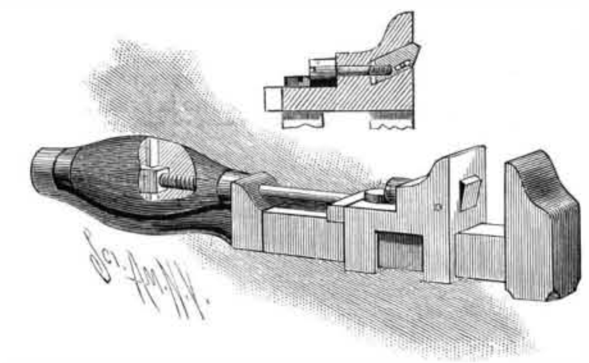
Healthy and Vigorous at 104.

Mrs. Mehitable Dayton, the oldest person in Connecticut, celebrated her 104th birthday on May 1. Mrs. Dayton received her guests sitting in a chair which is 150 years old. She is a remarkably well preserved woman, and does not look over 70 years. She is perfectly healthy and vigorous. Mrs. Dayton was born May 1, 1787, the eldest of nine daughters of Samuel and Mary Stratton, who lived but a few rods north of the house in which she now resides. Each of her sisters married, and each lived in a different State. There are two other sisters now living—Mrs. Dolly Morgan, of Holly, N. J., aged 91, and Mrs. Electa Haskell, of Otis, Mass., aged 89. On December 14, 1806, she married Ezra Dayton, of Marlboro, who was also one of ten children. They had ten children, two of whom are now living.

AN IMPROVED WRENCH.

We give an engraving of a new wrench recently patented by Mr. Frank S. Chaney, of Honolulu, Hawaiian Islands. This wrench is designed for applying and removing nuts of various kinds, and to holding and turning round objects such as rods and pipe. The construction of the wrench, as will be seen by reference to the engraving, is simple and comparatively inexpensive. The shank and thread are formed integrally of a single piece of steel, and a sliding jaw, which is fitted to the shank, is made of steel by the usual method of drop forging.

In the face of the jaw is an oblique mortise in which is placed a pawl of hardened steel, which is adjusted in the mortise by a screw, as shown. When the wrench



CHANEY'S WRENCH.

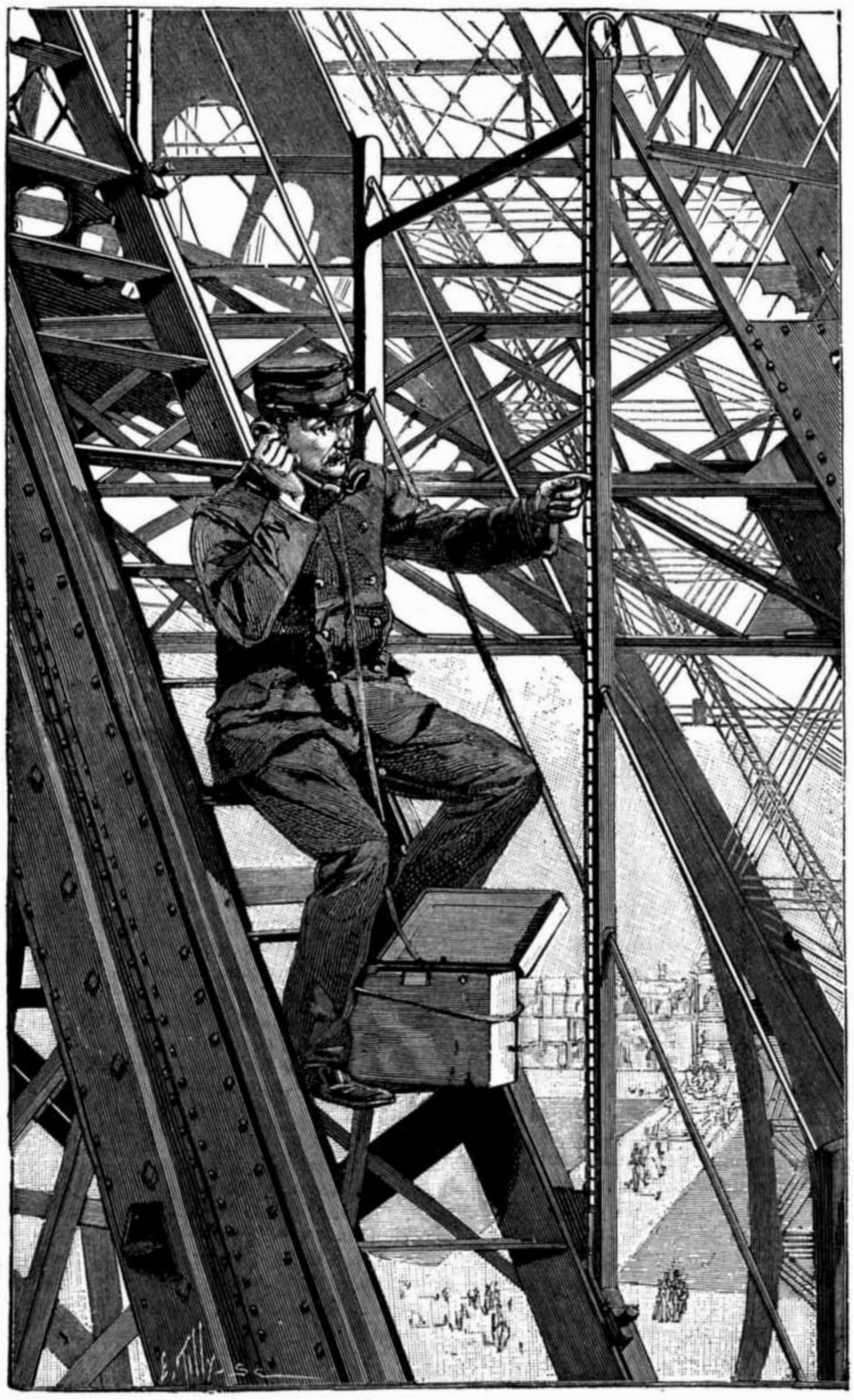
is to be used upon nuts or square objects, the pawl is withdrawn into the mortise, but when it is to be used upon round objects, the pawl is projected beyond the face of the movable jaw. The lower end of the shank is curved and bent at a right angle to receive the pivotal screw of the handle. The handle contains a nut which receives a rod connected with the movable jaw, and the rod is guided by a clip attached to the straight portion of the shank. By turning the handle in one direction or the other the required adjustment of the movable jaw is secured.

The Breathing of a Locomotive.

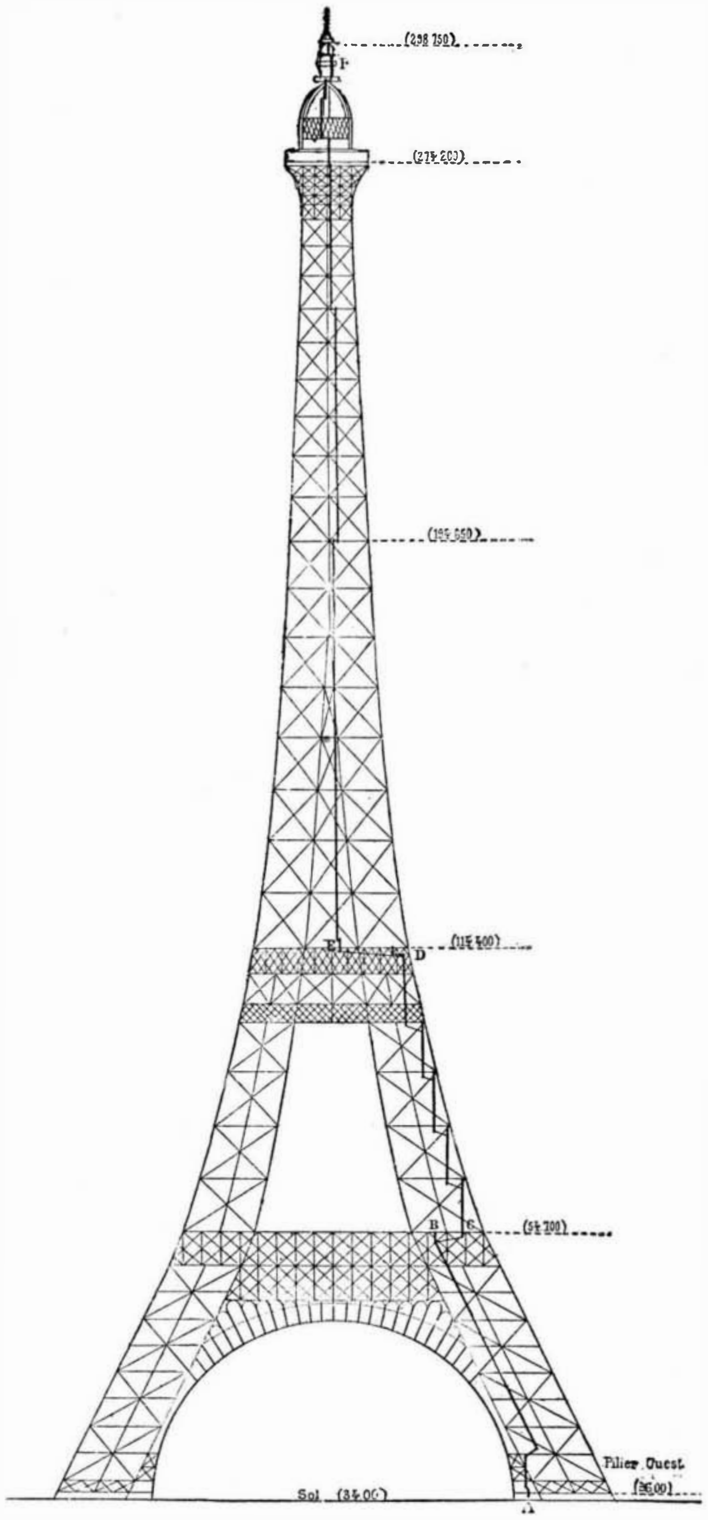
The "breathing" of a locomotive—that is to say, the number of puffs given by a railway engine during its journey—depends upon the circumference of its driving wheels and their speed. No matter what the rate of speed may be, for every one round of the driving wheels a locomotive will give four puffs—two out of each cylinder, the cylinders being double. The sizes of driving wheels vary, some being 18, 19, 20, and even 22 feet in circumference, although they are generally made of about 20 feet. The express speed varies from 54 to 58 miles an hour. Taking the average circumference of the driving wheel to be 20 feet, and the speed per hour 50 miles, a locomotive will give, going at express speed, 880 puffs per minute, or 52,800 puffs per hour, the wheel revolving 13,200 times in 60 minutes, giving 1,056 puffs per mile.

The Electric Omnibus.

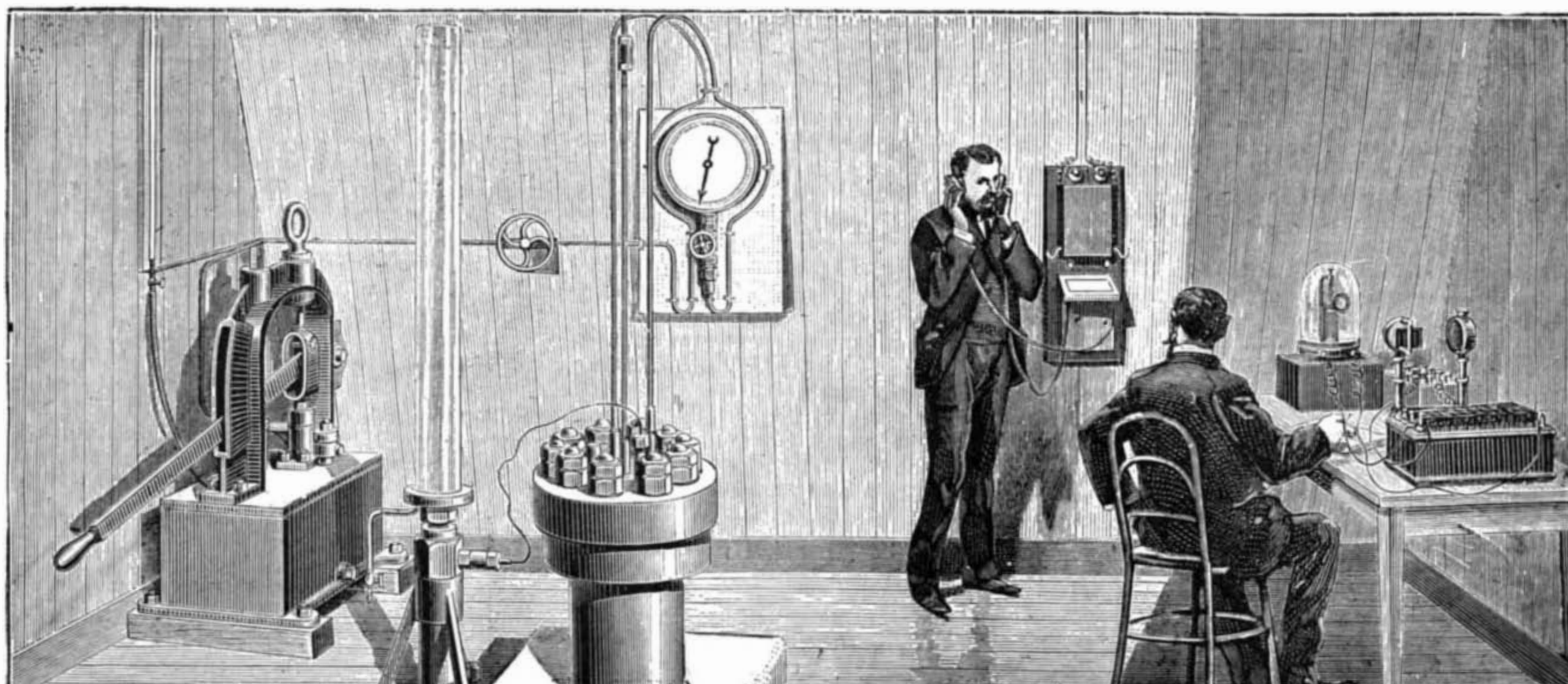
A curious incident was lately witnessed in Palace Yard, Westminster, London. About four o'clock an electric omnibus started from the St. Stephen's Club, and carried some dozen members of Parliament round to the members' entrance in Palace Yard. Admiral Mayne was in charge of the omnibus, and among the passengers were Sir William Marriott, Sir Walter Foster, Major Waring, Mr. Majoribanks, and Sir William Walrond. The arrival of the car attracted a large crowd of members, and subsequently a series of trips was made round the neighboring streets, some hundred members in all availing themselves of the opportunity of testing the practical utility of the omnibus.



READING THE DEGREES OF PRESSURE.



SITUATION OF THE MANOMETRIC TUBE ON THE EIFFEL TOWER.



AIR PUMP FOR FORCING THE MERCURY INTO THE TUBE.

OPEN COLUMN MANOMETER FOR EXPERIMENTS ON COMPRESSION OF GASES.

The Odor of the Soil after a Shower.

BY DR. T. L. PHIPSON, F.C.S.

This subject, with which I was occupied more than twenty-five years ago, appears from a paragraph in a late number of the *Chemical News* to have recently attracted the attention of Professor Berthelot and M. Andre. I find, on referring to my old notes, which are dated 1865, that it is doubtful whether I ever published the results of these observations; and as the distinguished chemists I have just named have not quite solved the problem, I hasten to give the results I obtained so long ago.

After a considerable number of observations, I arrived at the conclusion that the odor emitted by soils and sedimentary strata after a heavy shower of rain in summer was due to the presence of organic substances closely related to the essential oils of plants, and it appeared evident to me that, during the hot dry weather, these porous surfaces absorb the fragrance emitted by thousands of flowers, and give it up again when the rain penetrates into these pores and displaces the various volatile substances imprisoned therein, which are only very slightly soluble in water. I believe that many kinds of soil possess this property, but those on which my observations were first made were the chalk soils of Picardy, in France. I found that not only chalk, but also marls, compact limestones, phosphatic rocks, and some kinds of schists and amphibolites are porous enough to possess it to such a degree as to emit a decided odor when they are strongly breathed upon.

Finding the property of which I speak very remarkable in certain chalk rocks of Picardy, I endeavored to ascertain the nature of the substance, or substances, to which it was owed. I dissolved a very large quantity of the chalk in dilute hydrochloric acid, and passed the carbonic acid through various media, water, alcohol, weak potash solution, and dilute acid; but none of these liquids appeared to arrest the passage of the odoriferous substance. The only liquid which I found would retain it was an aqueous solution of bromine. This arrested it, and when the bromine solution was afterward carefully evaporated at a low temperature, a yellowish product, soluble in alcohol, and having a strong odor of cedar wood, was obtained, which, from its chemical and physical properties, appeared to be very similar to, if not identical with, bromo-cedren, derived from essence of cedar.

Magnetic Rocks.

In a letter to *Nature* the following instance of extraordinary local magnetic disturbance, due to the presence of magnetic rocks, is cited by Commander Creak:

In September, 1885, when her Majesty's surveying vessel Meda was passing Bezout Island, near Cossack, Northwest Australia, a steady deflection of her compass of 30 degrees was observed. This remarkable result has, however, since been exceeded by observations made in the Penguin on November 6, 1890. The Penguin being two miles north, 79 degrees east, from Bezout Island, a deflection of 22 degrees was observed. The ship was immediately anchored, and some hours of the next day were spent investigating the matter. On Bezout Island itself the absolute values of the variation and dip were normal, the dip being 50 degrees 1'·7 south. But at a position north 79½ degrees east, distant 2·14 miles from that on Bezout Island, the observed dip on board was 83 degrees south, with a very small deflection of the compass. At 900 feet to the westward of this the dip was normal, and it decreased rapidly as the center was quitted in any direction. At about 100 feet south of the center of disturbance, the compass was deflected 55 degrees. This was the largest deflection observed, but the compass was disturbed over an area of about a square mile. The general depth of water in this area was nine fathoms, and the quality of the bottom quartz sand. The observations of the magnetic elements at Cossack and the neighborhood showed little or no disturbance from local magnetic effects. It is therefore evident that the disturbances were due to magnetic minerals at the bottom of the sea.

An Ancient Lock.

The *European Trade Mail* says that "an Egyptian lock has been found which was in use more than 4,000 years ago. The old Egyptian lock was not made of metal, like those we use nowadays, but of wood, and the key that opened it was wooden, too. On one side of the door to which it was fastened there was a staple, and into this staple fitted a wooden bolt that was fixed to the door itself. When this bolt was pushed into the staple as far as it would go, three pins in the upper part of the staple dropped into holes in the bolt and held it in its place, so that it could not be moved back again until the pins were lifted. The key was a straight piece of wood, at the end of which were three pegs the same distance apart as the pins which held the bolt firm. When the key was pushed into the bolt through a hole made to receive it, the pegs came into such a position that they were able to lift the pins that fixed the bolt, and when these were lifted, the bolt could be lifted out of the staple." The most modern locks work on a similar principle.

Hydraulic Monitors.

One of the most noteworthy features in many portions of the gold region is the elaborate system of water supply for the use of the hydraulic mines and the tremendous changes which were the result of the few years during which hydraulicking was at its height. So great have been these changes—hills washed away, valleys filled up, others created—that in many localities the entire landscape has been altered. The old proverb ascribing the power to remove mountains to such as had faith only to the amount of a grain of mustard seed has never been exemplified, but the hydraulic miners have afforded the most ample demonstration of their ability to move mountains in the search of wealth. Lofty mountains have in fact been brought low through no other agency than the pipe line, the monitor, and the sluice, and the tremendous power of water never received such an exemplification as in the history of the hydraulic mines of California.

There are, indeed, so many remarkable facts connected therewith that, were they not abundantly substantiated, one might well be pardoned for receiving their relation with incredulity. One might not believe that a stream of water issuing from a nozzle or pipe six inches in diameter, and with no other force but gravity behind it, would have much effect at any considerable distance from the aperture, yet such an apparently insignificant stream, with a fall behind it of 375 feet, will carry away a solid bowlder weighing a ton or more at a distance of 50 to 100 feet, while at a less distance it will toss such a bowlder about as a boy would throw a pebble.

The velocity and force of such a stream as it issues from the nozzle of the monitor is something terrific. The column of water is solid—so solid that if one were to undertake to thrust any object into it, it would make no more impression than if it were iron instead of liquid. If a crowbar or other heavy object be thrust against the stream, it would be snatched from the hand and thrown to a great distance as if it were a featherweight, while the man who should firmly grasp an ax and attempt to cut through the stream would undergo an experience that he would remember for many a day.

If a man were to receive the full force of such a stream at a distance of a couple of hundred feet, even though the impact be momentary, he would be killed as quickly as though struck by a cannon ball. He might escape being mangled, but the breath would be most effectually and suddenly expelled from his body.

At 400 feet from the nozzle, a six inch stream with 375 feet fall, swung momentarily against the trunk of a tree, will denude it in a second of the heaviest bark as cleanly as if an ax had been used. Whenever such a stream is turned against a gravel bank it cuts and burrows into it in every direction, gouging out great caves, causing thousands of tons of earth to fall, which is in turn quickly disintegrated and washed into the sluices. Bowlders so heavy that a man can scarcely lift them are tossed about like chaff, stumps and trunks of trees are thrown to one side like straws, and the work of destruction goes on at a pace that is appalling. If one who has never seen a monitor in operation under full head could imagine the ordinary stream from a fire hose magnified about a thousand times, he would be able to form some conception of its power.

The water is brought in open ditches or flumes, sometimes from a great distance, around mountain sides, and across valleys and ravines. When the vicinity of the mine is reached a box is put in, from which a pipe conducts the water to the point where it is to be used. It is the distance between this box and the level of the monitor that gives the pressure. With from 300 to 450 feet fall the execution done is tremendous. At the monitor the water is conducted into a still smaller pipe with nozzle about one-third the size of the supply pipe, the compression giving it still greater force. The monitor is constructed something like the ordinary hose nozzle, but has a ball joint that permits it to be swung in any direction. It is balanced with weights, and by means of an ingenious device known as a deflector the tremendous stream can be turned in any direction by the slightest force. Almost the weight of a finger will suffice to direct the movement.

Easily as it is managed, however, the monitor sometimes becomes uncontrollable, and when this happens a scene of destruction and even death ensues. The pipe sways to and fro at its own volition, and the stream flies first in one direction and then in another. If the miners are not warned in time to get out of range, they may be mowed down as if by the discharge of a volley of grape. Sometimes the runaway monitor seems as if manipulated by some bloodthirsty monster, and appears to be deliberately turned upon the fleeing men, following them as they flee in every direction and overtaking them before they can reach a place of safety. In one case a sluice tender, hearing an unusual noise, raised himself above the edge of the cut in which the sluices ran just in time to receive the full stream square in his face and chest. He was knocked down, thrown into the sluice, and washed away. When found his body had not a stitch of clothes upon it, and apparently every bone in it was broken.

When a monitor gets away from control in this manner, there are two things that can be done. The water may be shut off at the head gate, a process involving much delay and perhaps loss, or some brave man may rush in and get to the monitor without being struck by the stream. To do this requires agility and pluck. The stream is liable to box the compass inside of a minute, and its course must be watched and the probable direction noted. Then over the rough surface the man must hasten, careful not to make a misstep, and at the same time ready to flee should the erratic stream betray a tendency to change its course so as to endanger life. There have been many hairbreadth escapes and some thrilling exhibitions of bravery under such circumstances as these, and it has been only by the exercise of the greatest coolness and bravery that great loss of property and life has been prevented.

A. J. Bowie, of this city, in his work on hydraulic mining, states that the stream from a six inch nozzle, with a 450 feet vertical pressure, delivers a blow equal to 588,735 foot pounds per second, equivalent to 1,070 horse power. When one comprehends this fact, he will be abundantly prepared to believe almost anything that could be said about the power exerted by such a stream.

With a force such as that exerted by the stream from a monitor, it is apparent that a tremendous amount of material can be washed away in a very short time. The quantity removed depends, of course, upon its nature, whether loose soil, ordinary gravel, or cement gravel. In some places, under favorable circumstances, as high as thirty-six cubic yards to each inch of water have been removed in twenty-four hours. With a flow of 500 inches the bulk removed each day is thus seen to be enormous. In cement gravel the amount handled daily is as little as three cubic yards per inch. The quantity handled daily is, however, almost entirely dependent upon the grade of the sluices. In the case of the highest amount just mentioned the stream had a fall or head of 350 feet, the banks were 100 feet high, and the sluices had a grade of one inch to the foot, while 1,000 inches of water were used. Under such conditions and with such results it must be apparent that the removal of mountains is only a question of time—and not a very long time, either.

Some idea of the immense amount of earth and gravel moved by the hydraulic mines of this State can be gathered from some recently published statistics upon this point. During the height of the hydraulic industry there were in use from the Feather, Yuba, Bear, and American Rivers, Butte Creek, and the two Dry Creeks, a total of 10,650,505 miner's inches of water each twenty-four hours. At an average of 3½ cubic yards of gravel to the inch there was thus washed away daily 38,600,000 yards of material. This is a low estimate. As an actual fact much more was carried away. But the amount stated represents a mass of earth 500 yards long, 386 yards wide, and 200 yards high. With such a tremendous quantity washed away every twenty-four hours, it can readily be understood that no great length of time need elapse literally to remove mountains and cast them into the sea.—*San Francisco Chronicle.*

The Advance in Paper Making.

In an interview with Col. A. G. Payne, of the New York and Pennsylvania Company, by a representative of the *Paper Trade News* relative to the prices for soda fiber, Mr. Payne, who was a pioneer in the business, said: "I remember when soda fiber brought thirteen cents; that was about eighteen years ago, when it was first used for paper. It is now quoted at three and three-fourths cents. The Yaryan system revolutionized the cost of recovering soda ash by cheap evaporation. Until recently this system was used by Americans only, but now they have adopted it abroad, and are using it at Glasgow. Everything is cheaper to-day in the manufacture of soda fiber than it was in the old times, except wood and labor, and it was natural for the decrease in the cost of the production to be accompanied by a falling off in the price of the product. The manufacture of chemical fiber has become a great industry, and the fiber itself is used more in the manufacture of good book paper than ever before. There were only two mills which manufactured chemical fiber at the start, and they produced twelve tons daily, whereas now the total monthly product foots up to fifteen million pounds. This increase does not seem so great, however, when we consider that a five ton paper mill in the early days was a big thing, whereas to-day mills with an output of thirty or forty tons are common."

THE telephone line between London and Paris went into regular operation on April 2 with much success. The charge is $2 for a talk of three minutes. The opening of this line is considered a big thing in Europe. The distance is 297 miles, of which 23 miles are by cable laid under the British Channel. Long distance telephoning has been in vogue in this country for many years. In the SCIENTIFIC AMERICAN of March 24, 1883, we recorded a conversation we had by telephone between New York and Cleveland, O., a distance of 650 miles.