

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*.

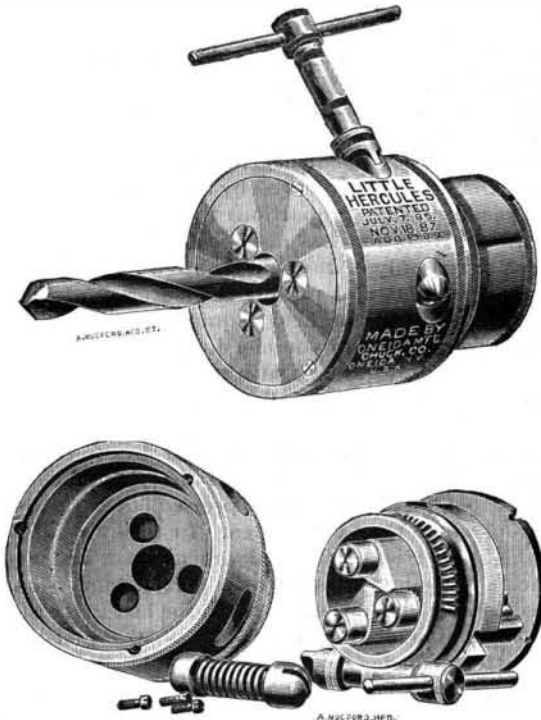
PORTABLE ELECTRIC LIGHTING PLANT.

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*.

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.

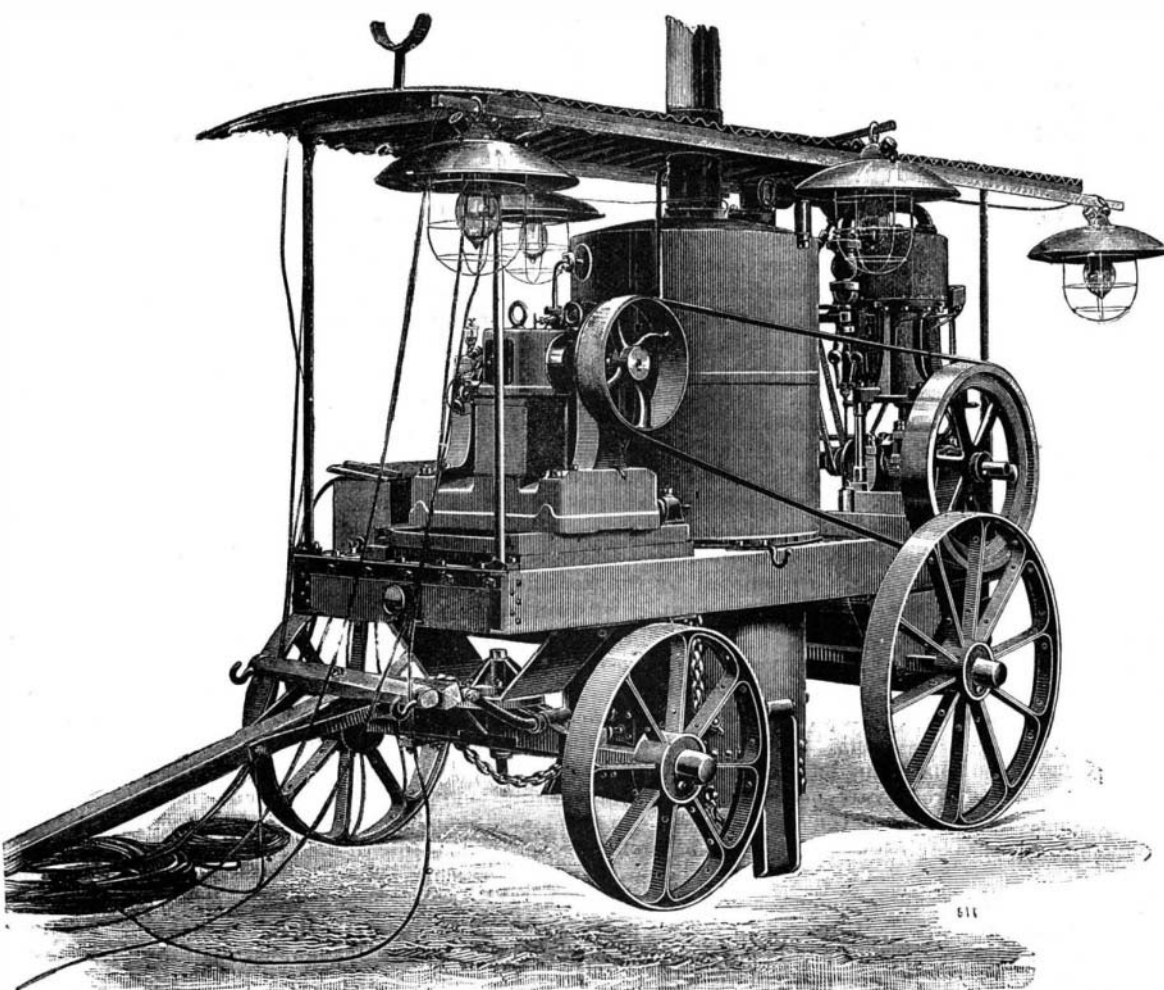
Steamer Empress of China.

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 16½ 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 24½, is 4,000 tons. The vessel is divided into fifteen watertight 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.

**IMPROVED PORTABLE ELECTRIC LIGHTING PLANT.**

Deterioration of Water in Reservoirs and Conduits.

Some time ago at a meeting of the New Jersey Sanitary Association, Mr. C. B. Brush dealt with the above subject in a paper. He remarked that all water supplies are better at certain periods of the year than at others. In the hot, dry days the water becomes dead and lifeless, and if allowed to remain at rest for any considerable length of time, algæ formations appear on the surface. These, however, are destroyed and disappear as soon as the water is put in motion. If allowed to remain, the water cures itself—the algæ disappearing after a few weeks and leaving the water again in its normal condition. The algæ show themselves more quickly on water that has been filtered, either naturally or artificially. The author also stated that water is delivered in its best condition when taken from a running stream and supplied directly to consumers without coming to rest during its passage. Water discolored by sediment is very often in its best condition, because the sediment is due to the fact that an abnormal volume of water is blown off from the watersheds, and any pollution there may be is so diluted as to be incapable of harm. But there is such a demand for clear water that reservoirs are necessitated, with their attending evils. Water that is stored for twenty or thirty days commences to deteriorate. This is due to stagnation, and the stagnation begins to manifest itself as soon as the oxygen in solution in the water becomes less than 0.3 per cent. The best means of preventing stagnation consists in keeping the water in motion, and there is no better way than forcing air into the bottom of the reservoir, and keeping the water aerated. Mr. Brush gave an interesting account of his experience with a number of reservoirs where the water had become tainted in consequence of lying stagnant, and in every instance he obviated the difficulty by forcing air into the reservoir or the mains.

Electric Lights without Wires.

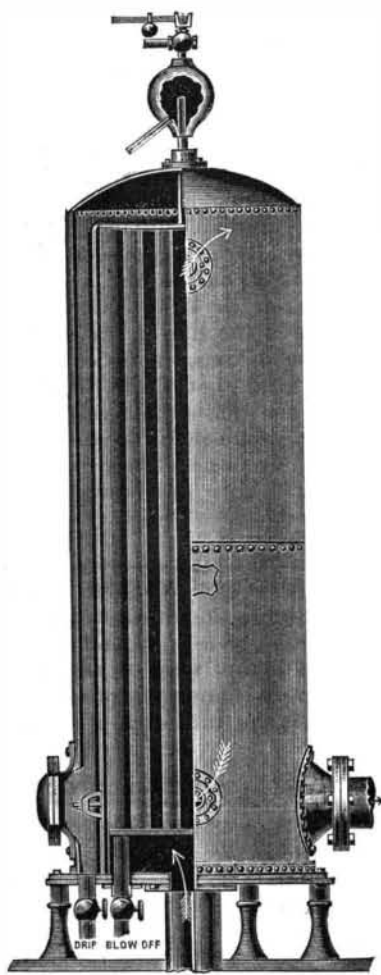
Professor J. J. Thomson has prepared a number of vacuum tubes in which there are no electrodes, but which are surrounded by coils of insulated conductors connected with batteries of Leyden jars. These tubes contain a little gas, of sorts, remaining after they had been exhausted in the ordinary way, and every time the jars are discharged through the surrounding conductors, the insides of the tubes are filled with light, which varies in color with the kind of gas contained therein. A Wimshurst influence machine furnishes the electricity, and the display is an exemplification of the connection between induced electricity and the phenomenon of light.

AN ATTACHMENT TO COOL WATER IN MAINS.

An improvement by means of which the water carried in main service pipes, for use in cities or towns, may be cooled during its passage to be fit for drinking in warm weather, without the addition of ice, forms the subject of the accompanying illustration. It has been patented by Mr. Arthur B. Wood, of Port Byron, N. Y. As shown in Fig. 1, the water main is supported upon a suitable foundation, and lying close to its top are cooling coils connected by a coupling to suitable nipples extending out from a heading, which is divided into a series of valve chambers having channels communicating with each other, and right angle channels leading into the coils. Fig. 2 is a detail view of one of the valves, a three-way valve having a bottom fitting on the base of the heading, and an outwardly extending stem with squared end and screw-threaded portion on which is a binding nut. The valves are opposite the ends of each pipe, to turn on or cut off the refrigerating material, Fig. 3 being a section through the end of two pipes and the valves, and Fig. 4 being a similar view showing the valves turned to cut off the sections. The inlet pipe through which the refrigerating material is forced from any suitable source of supply is connected with the heading opposite the top coils, the discharge pipe leading therefrom at its lowest portion. The coils are held in position by a top casing, made in flanged segments which can be readily placed in position or removed, the inclosed chamber formed by the casing and the water main to be filled with brine or cold air introduced by a pipe at one side and discharged by a pipe leading from the opposite side. The chambers are preferably covered with asbestos, sawdust or other non-conductor of heat. The sectional construction permits the ready removal of any coil, should it become rusted or stopped up, without interfering with the working of the system, the valves being turned to admit the refrigerating material only to the coils desired. In operation, it is designed to force anhydrous ammonia or other suitable refrigerating material into the heading and through the cooling coils, surrounding the top of the main for a short distance only at a convenient point for cooling the water for a certain district or town, the apparatus being duplicated as required when an extended territory is to be covered.

A FEED WATER HEATER AND PURIFIER.

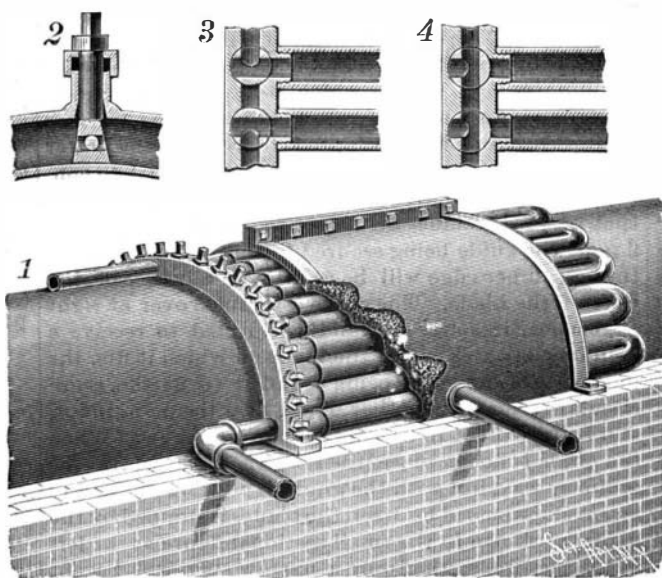
The accompanying illustration represents a feed water heater which is itself practically a boiler, and is designed to heat the feed water to or above the boiling point. It is a plain tubular heater, the whole of the shell of which is surrounded by a steam jacket. The steam enters a central compartment at the bottom, passing up through the tubes, around which the feed water circulates, and thence down on the outside of the shell, thus entirely preventing the radiation of



THE BARAGWANATH FEED WATER HEATER.

heat from the water. The feed water is fed in at the lower end of the shell and drawn off at the upper end. A hollow cast iron ball or scum chamber is arranged at the top for the purpose of collecting the impurities which rise when the water is boiled, this chamber being ordinarily blown out four or five times a day. A blow-off and drip is also provided at the bottom, as well as a suitable hand hole through which sediment may be removed.

This form of feed water heater and purifier has had such extended practical use that its merits have become well known. It is strong and safe, and cannot cause any back pressure, but rather, acting as a surface condenser, is designed to reduce any back pressure that may exist. The heating surface is very large in proportion to the size of the heaters, which are rated at 1 H. P. per sq. ft. of heating surface, so that it heats the feed



WOOD'S REFRIGERATOR FOR WATER MAINS.

water to or above the boiling point, keeps the boilers clean in ordinary water. This, it is claimed, is the special merit of the Baragwanath boiler, that the feed water is more effectually purified by being boiled before it is fed to the steam boiler, while the destructive practice of feeding cold or merely lukewarm water is avoided.

In this heater the tubes are of heavy brass, and the slight variation in the degree of expansion between the brass tubes and the iron shell is provided for by spring tube sheets, which are made slightly concave. Both

the shell and tubes are in contact with the hot steam and not exposed to the air. The heater is also made in inverted form for use in locations where it is more convenient to have the exhaust enter and leave at the top, and a horizontal heater is provided for use in cramped engine rooms. The latter is adapted to be set on top of the boilers in saddles, or hung from the roof. It has also been found particularly convenient for marine use, as it is not top heavy and can be suspended from the deck.

The Baragwanath feed water heating and purifying apparatus also includes a live steam feed water superheater and purifier, which is not designed to do away with the exhaust steam feed water heater, but rather as an auxiliary to it in certain cases, as where heaters are used which do not boil the water, or where the water contains impurities that cannot be removed by boiling. The latter heater and purifier consists of a heavy boiler iron shell, with removable heads, and containing a series of slightly inclined shelves or pans over which the water flows in direct contact with the live steam from the boiler. When the shelves have become coated with scale they are drawn out and cleaned, the bottom of the superheater and the settling chamber being cleaned at the same time.

This line of steam jacket feed water apparatus is made at the Pacific Boiler Works, Wm. Baragwanath & Son, 40 West Division St., Chicago, Ill.

The Largest Plank in the World.

The *N. W. Lumberman* gives an engraving from a photograph of a redwood plank that is 16 feet 5 inches wide, 12 feet 9 inches long, and 5 inches thick, and is about 90 per cent clear. It was taken from a tree 35 feet in diameter and 300 feet high. According to its rings it was more than 1,500 years old. The tree was cut 28 feet from the ground, and the plank was hewed out of the stump, representing a section taken from near the heart to the bark. After it was displaced it was lowered by block and tackle, with a locomotive for power. In the way of labor its cost represents the time of two men for a month, simply to prepare it in the rough for shipment. To this the cost of transportation must be added, making a total of about \$3,000. It was moved by water to San Francisco.

After being on exhibition some time, a car was specially prepared to transport it to Chicago. This was done by cutting a slot in the center of a flat car, in which stirrups were pendent. The plank was placed on edge in the slot, its lower edge being within about a foot of the ties.

The plank was cut on the lands of the Elk River Mill and Lumber Company, in Humboldt County, Cal., is the property of J. L. Harpster, of Eureka, and B. F. Noyes, of San Francisco, and is on exhibition in Detroit, Mich., whence it may be sent to East Saginaw and elsewhere, to finally bring up in Chicago at the world's fair. The plank shows coarseness of growth, with richness of figure, and a finish such as the highest quality of material and the best efforts of Berry Brothers, the varnish manufacturers, of Detroit, can secure.

Wolfram Mining in New Zealand.

Wolfram, or tungsten, belongs to a group of rare metals, and till a comparatively recent time was known only to the chemist, and its value was only in the laboratory. With the invention of 100 ton guns the demand for tungsten soon made that previously obscure metal well known throughout the mining world. It was soon found that the steel tube lining the bore of these enormous guns could not resist the shock entailed by discharging many shots without becoming fractured, when of course an expensive piece of ordnance became useless. Experiment proved that the addition of a small quantity of tungsten to the fine steel employed in gun making rendered the latter metal wonderfully elastic, so that the steel tube will expand under the tension of firing and contract again to its normal size a great many times before the quality of the metal is in any way impaired. The German gun factories consequently absorb most of the tungsten found in the world, and from being a mere curiosity seen only in the laboratory of the chemist, this rare metal has acquired considerable value. Wolfram (erroneously called tungstate of iron in the cablegram) generally occurs in combination with iron in Europe, but is also found in scheelite, or tungstate of lime. It is in the latter form that it occurs in Otago. The metal itself is of a white color, extremely brittle, and heavy, the specific gravity being 19.1, that of gold being 19.3. It will thus be seen that tungsten is a very heavy metal, being only very slightly lighter than gold.—*Otago Daily News*.

Of the entire human race, 500,000,000 are well clothed, that is, they wear garments of some kind; 250,000,000 habitually go naked, and 700,000,000 only cover parts of the body; 500,000,000 live in houses, 700,000,000 in huts and caves, and 250,000,000 virtually have no shelter.