tive massage. Now the latter will obviously have a most powerful influence on the motion of the heart and blood. Another advantage of the process over direct massage is the fact that at the same time the heart is acted on, the lungs are fully ventilated, artificial respiration being produced simultaneously. This process of heart massage in connection with simultaneous artificial respiration will warrant success even in most hopeless cases, another good point being the fact that it can be continued for a long time without fatigue.

Experiments made on fresh corpses (that is to say, in the case of absolute standstill of the heart) have shown the blood to be sucked into the right heart and into the lungs and afterward to be thrown through the vessels of the lungs into the left heart, whence it must be thrown into the arteries, owing to the increasing pressure. These experiments have really borne out the fact that the above process not only warrants an artificial respiration more analogous to the natural process than any other method, but at the same time an artificial circulation of the blood. Owing to the revivifying effect it exerts on the organism the apparatus will be used to advantage also in the case of many affections of the body. It has been given a most convenient form and is constructed by Hermann Straube, of Dresden-Neustadt.

Digging Out Shale With the Steam Shovel.

BRICK MAKING.

BY W. FRANK M'CLURE.

Brick making, like so many other industries of ancient origin, has undergone a very marked evolution in recent years. Machinery has taken the place of dynamite in the loosening of shale, one machine accomplishing the work of seventy-five men. After coming from the pug mill, the pasty material is cut into the shape of bricks by machinery which works automatically. Modern methods also provide for the using of exhaust steam and heat from the kilns for the heating of the drying house.

The demand for brick of nearly all kinds is increasing. The value of common brick alone according to recent statistics is more than forty per cent that of the entire clay products of the United States. The accompanying photographs were made in Cuyahoga County, Ohio—the State which leads all States in the production of clay products. And while in the amount of common brick the Buckeye State is exceeded by three other States, in the production of paving brick Ohio leads. Cuyahoga County yields vast quantities of the shale and clay used in the making of paving brick. It is said that the various brick-making industries of this section have a combined daily capacity of more than 500,000 bricks, besides many new kilns building.

At the site where the steam shovel in the photograph is at work, it is estimated that there are more than 25 acres of shale and clay. Beneath a depth of about 30 feet of clay there lies between 300 and 400 feet of shale, and beneath this lime rock. As yet the digging is done only in the side of the banks, and not below the surface. In fact, it will be many years before it will be necessary to dig below the level. The machine used for extricating the clay and shale is a steam shovel, which has a daily capacity of 500 yards of shale or 1,500 yards of clay. It is operated by two men. The scoop of this machine is also used in loading the raw products onto cars, which in turn deliver it to the brickyards.

From the cars the clay and shale are shoveled into grinders, which reduce these two products to a powder, which in turn is carried by a bucket elevator to a big hopper. After it has been sufficiently screened, the powdered clay and shale next go to the pug mill, that which will not pass the screen going back to the grinders again. In the pug mill—a sort of conical trough—the raw material is tempered with water, and kneaded by means of a device somewhat resembling a screw propeller in shape. From this mill it is forced through a mold into one long, continuous brick, and this, as it comes from the mill, is carried on a wide belt to a cutting machine, which automatically cuts the continuous brick into many bricks of just the desired size, the machine cutting sixteen bricks at one time. As the bricks come from the cutting machine, still soft and still resting on the belt, they are loaded onto flat cars and removed to the drying house, where they remain not less than a day and night. The capacity of a large drying house is about 100,000 bricks. The different apartments of this house are brick-lined.

The brick next go to the kilns for baking. One of the engravings gives a good idea of the manner in which these brick are piled within the kilns. Five or six men often work three full days in filling one kiln, which fact gives some idea of the size of the interior. After the entrance to the kiln has been closed and sealed, the fire beneath is started. The baking process is then continued for nine or ten days, the temperature maintained within being 2,300 deg. F. Then, when the kiln has been cooled, the bricks are taken out and are ready for shipment. Where fifteen or sixteen kilns are in use, the daily capacity of ordinary-sized brick may reach 150,000.

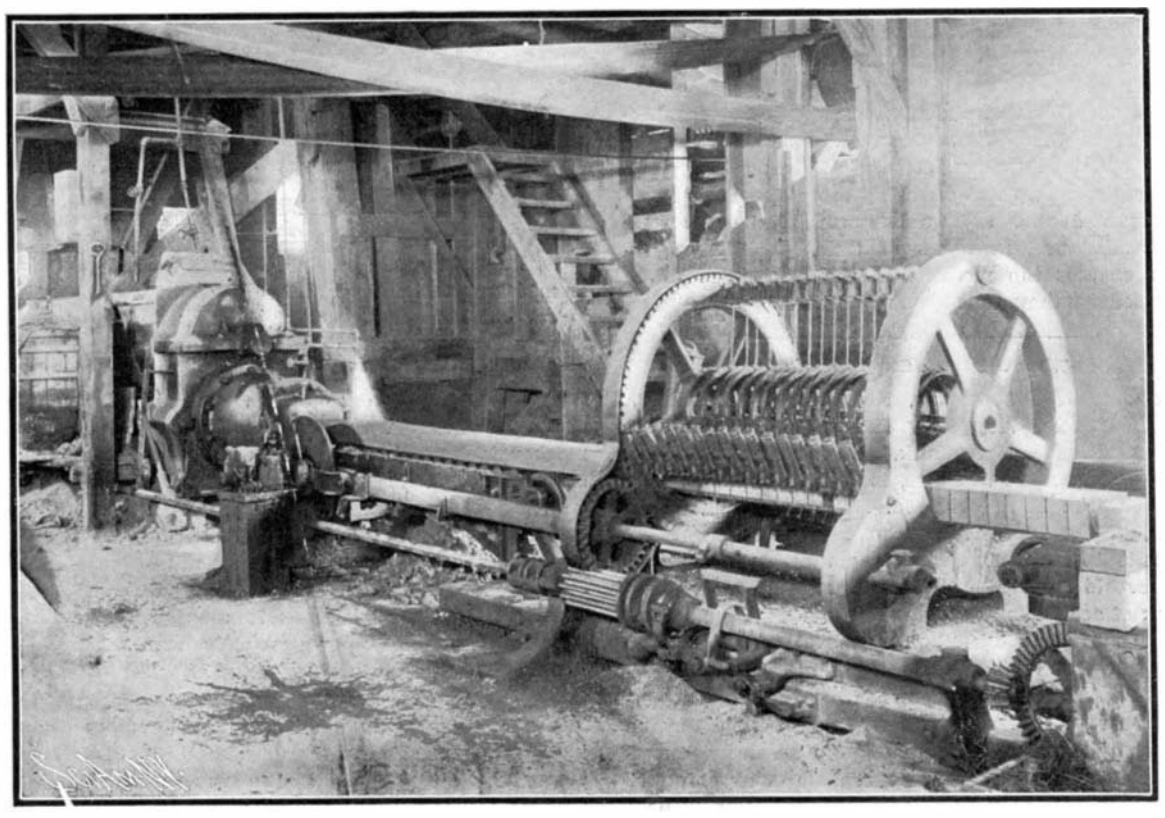
Some skill is required in operating the kilns while the baking is in progress. Cognizance must be taken of the heat-giving power of the fuel, the burning qualities of the brick, and the draft of the kiln. A uniform heat must be maintained. When the baking process has been finished dampers are opened, and the heat from the red-hot brick is forced by means of a fan to the drying house through brick-lined flues. This heat, together with the exhaust steam from the engine, comprises the economical method for heating the drying house heretofore mentioned in this article.

Besides common brick, front brick, and vitrified paving brick, there are the fancy and ornamental brick, enameled brick, fire brick, ornamental terra cotta, fireproof partitions, sewer pipe, drain tile, and some others, the manufacture of which requires slightly different methods of production, but all coming under the head of clay products.

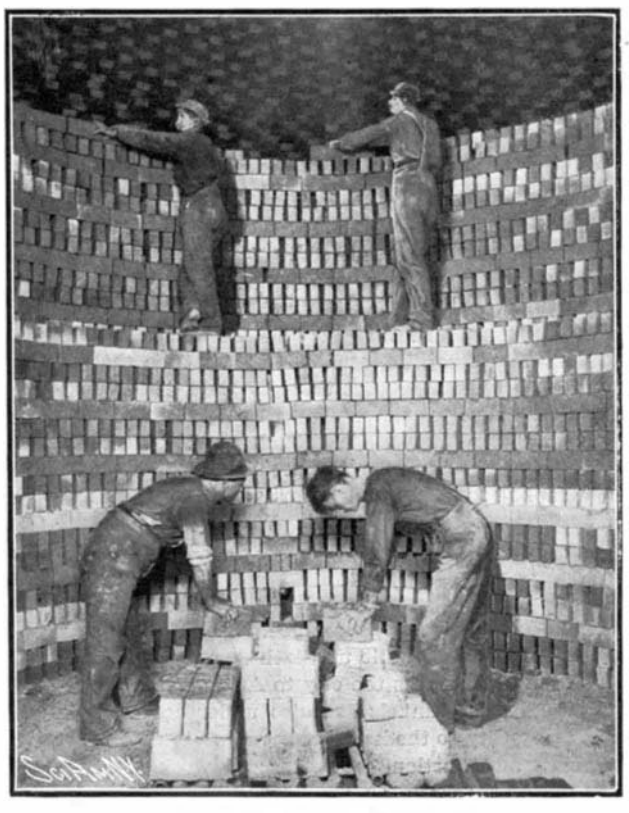
Waldstein and Herculaneum.

Prof. Charles Waldstein, of Cambridge University, announces that influential personages have promised their support of his scheme to excavate Herculaneum, and that the plan will yet be carried out.

Dr. Waldstein declined to be more explicit, but he was evidently sanguine. It seems that the "influential personages" to whom he referred must be members of the Italian government. So far as enthusiastic approval and support in other countries went, he had all that he required before. It was only the attitude of the Italian authorities which prevented the success of the scheme and the commencement of work at Herculaneum a year ago.



Pug-Mill. Brick-Cutting Machine in the Foreground.



Interior of a Modern Brick-Kiln.

IMPROVED METHODS OF MAKING BRICK.

Engineering Notes.

An ingenious railroad ticket printer has been devised by Count Piscicelli, an engineer of Naples. With this appliance, which is of simple action, the railroad tickets are printed and issued as required, thereby dispensing with the necessity of maintaining large supplies for issue at various stations, while on the other hand fraud, either by railroad officials or the public, is rendered absolutely impossible. The printer is started by a lever working perpendicularly in a slot. On each side of the slot are the names of the different stations of the system, and the lever is depressed to the name of the station required. This action causes a disk to appear on the outward part of the machine, showing the destination of the traveler, together with the price of the ticket. By use of a small bolt the machine can be made to print first, second, and third class tickets, single or return, as well as privilege tickets, etc., on different colored cardboards. Each ticket is reproduced upon a ribbon for the clerk to preserve and the amount encashed appears on small disks on his left hand. Another set of disks on his right hand shows the total amount of money taken. The invention is at present being tested by the Italian railroads.

Suppression of Sounds and Trepidations.—At a recent session of the Societé des Ingenieurs Civils, M. Prache presented a communication on the suppression of vibrations by means of the Anthoni-Prache system. He classifies vibrations as sounds and trepidations. The distinction between different sounds can be distinguished by the ear. Researches as to their origin can alone give information as to their mode of transmission, which it may be important to know. The interposition of obstacles attenuates the sounds transmitted by the air. Insulated foundations suppress the transmission by the ground of sounds and trepidations. Of all insulating substances, caoutchouc, or rubber, alone possesses the requisite qualities, homogeneity, firmness, and elasticity, which is about twenty times as great as that of steel. He shows: (1) that the constancy of the volume appears to be the characteristic of deformations purely elastic; (2) that the module of elasticity may be defined as the ratio of the variation of force to the variation of section perpendicular to the force; (3) that for great deformations, if one is sheltered from secondary phenomena due to the influence of the weather, permanent deformations, etc., and if the forces per unit of section and the sections are taken as co-ordinates, the curve obtained is an hyperbole. The velocity of propagation through caoutchouc may be reduced to a few meters per second. From the great difference between the velocity of propagation through caoutchouc, and through other solids, it results, according to the theory of Fresnel, that the intensity of the refraction is essentially null, and that there is a total reflection when the vibration tends to pass from the caoutchouc into the ground.

Opening of Second Hudson River Tunnel.

Connection by tunnels between New York and New Jersey was completed on September 29, 1905. With the breaking through of the last barrier on the Manhattan side of the North River there was brought to a successful close, after difficulties seemingly insuperable, the greatest engineering feat of its kind.

The length of the tunnels between the shafts at Jersey City and Morton Street is 5,780 feet each, and the interior diameter of the twin tubes is 15 feet 3 inches, and the exterior diameter 16 feet 8 inches. There will be a single track in each tunnel, with concrete walks on the sides, to be used in case of a breakdown. Electric traction will be used, and the westbound, or cars going to New Jersey, will run through the north tunnel and the eastbound cars coming to New York will pass through the tube just opened.

The island of Manhattan and the eastern shore of New Jersey are now connected by giant twin iron tubes, through which, in two years at the furthest, passengers will be carried under the bed of the river, under the streets of New York, and into the very heart of the metropolis, and in far less time than is required to-day to transport them by the fastest ferryboats from shore to shore.

The opening of the south tunnel was celebrated in the afternoon by a trip of the president and directors of the tunnel company and a party of newspaper representatives through the tunnel. W. G. McAdoo, president of the New York & New Jersey Tunnel Company, was the host.

The tunnels now constructed are being extended to Sixth Avenue at Christopher Street, from which point subway lines will be built up Sixth Avenue to Thirty-third Street, and across the city to Astor Place.

Two additional tunnels are also under construction from Jersey City to the heart of the down-town district at Church and Cortlandt Streets, and work is about being begun on a connection on the New Jersey side of the river between the two sets of tunnels.

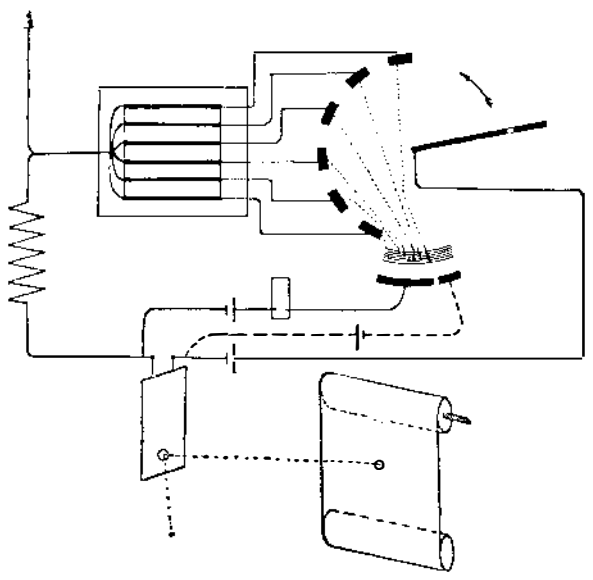
In the future a system will be completed whereby those living in nearby cities and towns of New Jersey, as well as those arriving from distant points by the steam railways terminating at the New Jersey water front, will be enabled to reach the very center of either up-town or down-town New York by safe and comfortable access, at a great saving of time, and freed from the dangers and uncertainties due to fog and ice, or the many other hazards incident to a crowded waterway.

AN APPARATUS FOR OBSERVING AND AUTOMATICALLY REGISTERING THUNDERSTORMS.

An apparatus intended for observing and automatically recording thunderstorms was recently described by Prof. A. Turpain to the French Physical Society. It consists of a set of seven coherers of graduated sensitiveness, connected with an antenna. One of the coherers, viz., the most sensitive, is placed in a circuit closed through a Claude relay, while the remaining coherers, which are of gradually increasing sensitiveness, are arranged in open circuits, so that their sensitiveness is reduced in a constant proportion.

As an atmospherical discharge acts on the apparatus, the starting coherer (not shown in the diagram) produces a current serving to disengage the apparatus, when a rotating commutator driven by a weight is allowed to perform a whole revolution and to return to its zero position. During the time the commutator is rotating, the connection of the antenna with the coherers is discontinued, thus avoiding any influence of atmospheric discharges, liable to interfere with the records. The duration of the rotation is by the way reduced to a minimum.

While performing its revolution, the commutator



AN APPARATUS FOR RECORDING THUNDERSTORMS.

will perform the following operations: 1. It will introduce successively the six coherers of graduated sensitiveness into the circuit of a highly sensitive galvanometer, allowing the successive deflections of the latter to be recorded photographically on a moving sensitive plate. 2. It will decohere the coherers on which a hammer acts during a sufficient interval of time. 3. It will throw a checking current of opposite direction to the recording current into the galvanometer through the coherer. This current enables the decohering of the coherers to be checked, thus ascertaining whether the ensuing records are to be counted.

The intensity of electrical discharges of atmospheric origin is thus automatically and successively recorded by the number and magnitude of the deflections registered, thus enabling the intensity of the discharges during a thunderstorm to be recorded from a distance, in terms of time. A Richard recorder enables the moment of the discharges to be registered as they follow one another.

The Current Supplement.

The current Supplement, No. 1553, opens with a splendid article, very fully illustrated, on the Just process of making dry milk. How carbon rods and plates can be made at home, is told in an instructive article by the late George M. Hopkins. Capt. R. H. Bacon, of the British navy, writes on the causes of accidents to submarine boats, a subject which is of considerable importance to naval men when the frequency of accidents to submarines is considered. Prof. John Stone Stone contributes an excellent discussion of interference in wireless telegraphy. A novel coil-clutch reversing gear is described by the English correspondent of the Scientific American. The turbine steamer "Manxman" is equipped with an electric steering gear which is decidedly novel from many points of view. The gear is very fully described. Dr. William Stirling writes thoughtfully on breathing in living beings. Everything connected with Japan has a heightened interest for us at present. For that reason an article on Japanese heraldry in the Supplement is particularly timely. The article is well illustrated with Japanese heraldic devices. Sir William Crookes concludes his paper on diamonds.

The Long-Distance Balloon Race from Liege.

The recent long-distance balloon race from Liege resulted in a victory for the English competitor, "Vivienne III.," carrying Mr. Leslie Bucknall and Mr. Stanley Spencer. Owing to the unpropitious weather only three vessels started. The English aeronauts had an adventurous journey, the most remarkable circumstance being that for the major part of the journey an altitude of over 16,000 feet was maintained, which constitutes a record height for a balloon under such circumstances. At the time of the ascent the wind was blowing at 30 miles an hour, but the aeronauts decided to reach a high altitude quickly so as to get above the clouds into an anticipated stronger wind. This was reached at 9,000 feet where a terrific wind velocity was encountered, and even at the maximum altitude attained (16,000 feet) the wind was blowing at 50 miles an hour. At 9,000 feet the aeronauts had an unusual experience. At the ascent the wind was blowing from the northeast, but at 9,000 feet the aerostat began to lurch and oscillate most violently, as it had entered a current blowing from the southwest at 50 miles an hour. As the balloon passed from one current to the other there was a violent shock, causing it to heel over to an alarming degree, while the aeronauts, with the car almost horizontal, had to cling tenaciously to the car until it once more regained its vertical equilibrium in the higher current. Even at the altitude of 16,000 feet the aeronauts could distinctly hear the clanging of machinery and the roar of the blast furnaces when passing over the Belgian and German iron districts. At nightfall the aeronauts descended below the clouds to ascertain their bearings, as they were traveling rapidly toward the North Sea. They discerned below a large city, and deeming it wise to descend, as they were uncertain of their true position, came to earth near a small village which proved to be Julich in the Rhenish provinces. Owing to the cross air currents, they had crossed and recrossed the River Rhine during the journey. This proved to be the greatest distance covered by a balloon in the race.

A Stock-Broker's Wireless Automobile Telegraph Station.

Considerable interest has been aroused in the latest development of the wireless telegraph, which, according to newspaper accounts, consists in the installation of an apparatus of this character in the automobile of Major W. R. Wetmore, a wealthy resident of New York city and of Allenhurst, N. J. The object of the experiment is to enable Major Wetmore, who, while largely interested in active stocks, is fond of making short trips about New Jersey in his touring car, to keep in constant touch with his brokers in the city.

The wireless transmitting station is located in the railway depot at Allenhurst, and from here the messages are relayed to and fro between the automobile and New York, the regular telegraph agent acting at the same time as wireless operator.

While the apparatus is rather crude, it is claimed that messages can be sent for distances of several miles, and that even then the signals are clearly heard. The receiving and transmitting antennæ consist of wooden uprights and cross-bars, strung with copper wire. They are secured respectively to the roof of the station and the top of the covered touring car. The rest of the apparatus differs little from the usual small outfits. Ordinary telephone receivers are employed for hearing the telegraphic signals.

Artificial Pumice Stone.

While emery is used for polishing tools, polishing sand for stones and glass, ferric oxide for fine glassware, and lime and felt for metals, pumice stone is more frequently employed for polishing softer objects. Natural pumice stone presents but little firmness, and the search has therefore been made to replace the natural product with an artificial one. The Schumacher factory at Bietighein, Germany, has produced an artificial stone by means of sandstone and clay, designed to be used for a variety of purposes. No. 1, hard or soft, with coarse grain, is designed for leather and waterproof garments, and for the industries of felt and wool; No. 2, hard and soft, of average grain, is designed for work in stucco and sculptors' use, and for rubbing down wood before painting; No. 3, soft, with fine grain, is used for polishing wood and tin articles; No. 4, of average hardness, with fine grain, is used for giving to wood a surface previous to polishing with oil; No. 5, hard, with fine grain, is employed for metal work and stones, especially lithographic stones. These artificial products are utilized in the same manner as the volcanic products. For giving a smooth surface to wood, the operation is dry; but for finishing the product is diluted with oil.