SCIENTIFIC AMERICAN

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CAISSON FOUNDATION PIERS OF THE AMERICAN SURETY COMPANY'S BUILDING IN NEW YORK CITY.

The people of New York City have become very familiar with modern tall office buildings, the number of which is increasing every year, a type of buildings which bids fair to become the rule among down town structures. A new structure for the American Surety Company, designed by Bruce Price, the well known architect of this city, has been commenced on the corner of Broadway and Pine Street, and already the operations on the foundations have attracted much attention from passers-by. These works, conducted by the engineering firm of Soysmith & Co., of this city, we have selected for illustration, as giving a good idea of the most advanced methods of caisson construction for city buildings.

The building, of which we give a small cut, is to be twenty stories high. Its weight is to be carried on thirteen brick piers, the general plan of which can be seen in our perspective cut. To the right is Broadway, with its stream of pedestrians, wagons and cable cars, while old Trinity, on the opposite side, gazes down on the beginning of a building ultimately to surpass its spire in height.

Referring again to the cut of the foundation, the tops of the piers are seen carried up to their final level. Under each pier is a rectangular caisson of half inch steel seven feet in internal height, and with its outside wall carried up two feet further. From the caisson top a working shaft of steel three by five feet in area rises, and on top of this air shaft is placed the air lock, contained in a cylinder six feet in diameter and ten feet high.

The process of sinking the foundation is as follows: The caisson is established in place, and the ground beneath is dug out and drawn up through the working shaft in buckets. Concrete is laid on top to the depth of two feet within the upward extension of its

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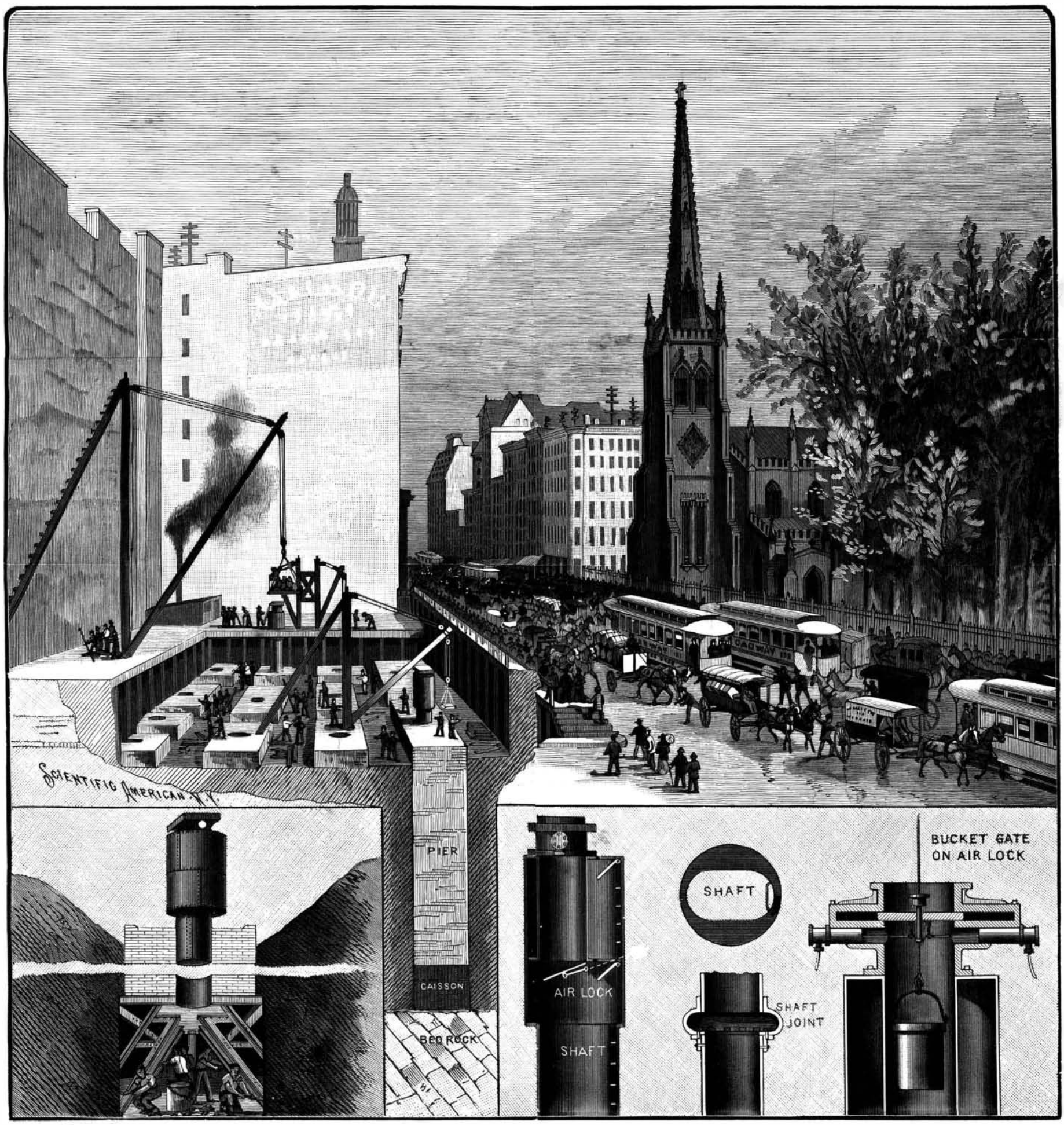

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walls, and on this brick work is laid. As fast as it sinks the brick work is built over it, so that it is continually subjected to an increasing pressure. Pig iron is sometimes piled on to increase the weight. As it goes down, a new section of working shaft has from time to time to be added. A peculiar form of coupling is used for the joint between the shaft sections, illustrated in one of the small cuts, which will be found self-explanatory. By the use of the return flange seen on the upper section, tap bolts can be used for fastening the sections together, which bolts are put in place from the inside of the shaft. Until water is reached, all is clear sailing, but as soon as the caisson reaches water, which it does about twenty feet down, air pressure has to be applied.

Accordingly the air lock is fastened to the top of the shaft, and thenceforward for the rest of the descent air is pumped in under pressure. Looking at the drawing of the section of the air lock proper, on its right hand will be seen two doors opening downward, while a ladder runs down its side. Through these doors the workmen enter. For entrance the lower door is closed, the compressed air is allowed to escape and the upper door is opened. The person entering goes into the small chamber, the upper door is closed, compressed air is gradually admitted, and when the full pressure is reached the lower door is opened and the way is opened for descent to the caisson beneath. To the left of the division of the air lock just described is a special section devoted to the extraction of material. This is really a separate air lock, complete in itself. Its lower end is closed by a door opening downward, similar to those already described, while its upper end is closed by two heavy doors sliding horizontally, fitting airtight as near as can be, with rubber packing, and operated by pneumatic pistons and cylinders. These constitute the bucket gate and are illustrated in detail in the sectional drawing in the right lower corner of the cut.

They are two heavy sliding doors, air-cushioned as they open, and worked by the two pneumatic cylinders as shown. Where they join in the center is an opening which grips a cable tube provided with a stuffing box, such as is used on a steam cylinder, through which stuffing box a hoisting cable works. The operation of drawing out a bucket of earth is as follows: The bucket being filled by the men in the caisson is drawn up, while the upper sliding doors are closed, and the lower door is opened. The rope working smoothly through the tightly packed stuffing box, draws the bucket up into its section of the air lock, hardly any air escaping. The lower door is then closed, the sliding doors are opened, and the bucket is drawn out into the open air and emptied. As it rises, the doors being opened, the tube carrying the stuffing box goes with the rope; when lowered, the tube is brought back into its place between the sliding doors. As they are closed, gripping the tube, the air is readmitted to the section, the lower door is dropped and the bucket descends. The air lock which we have just

AMERICAN SURETY COMPANY'S BUILDING, NEW YORK CITY.

described is of the Moran patent, Mr. D. C. Moran being in charge of the operations on the ground.

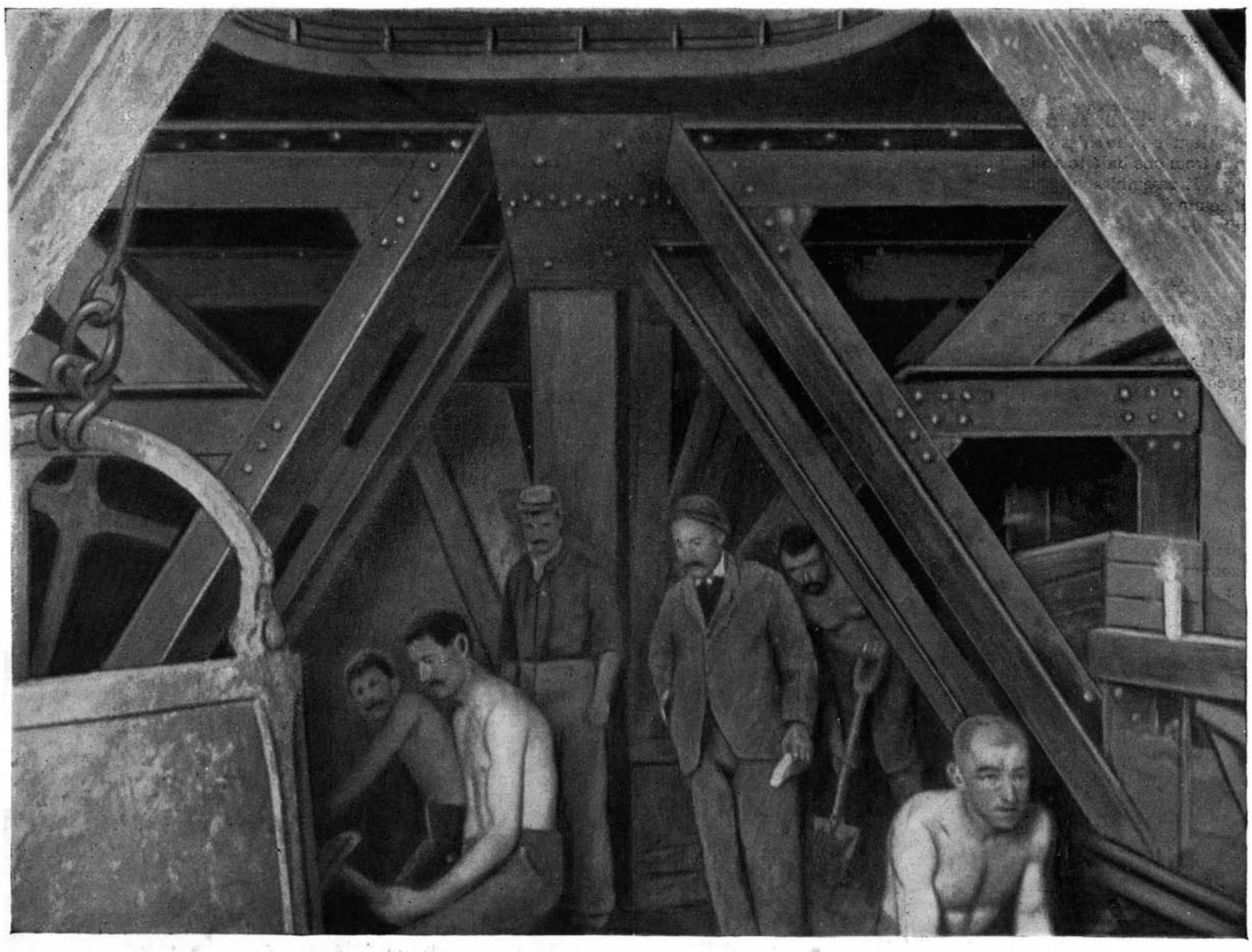
Our large cut shows the scene within the caisson. It is a reproduction of a very remarkable and unique photograph taken by us by flash light, while the caisson was under pressure, the men being many feet beneath the ground. In the lower left hand corner of the large cut is given a view of the general relations of caisson with pier, shaft and air lock. The caissons are carried down 70 feet from the street level to the bed rock. Each one after reaching its position and being established on an excavated bed in the stone is filled with concrete. As much as 52 feet of descent has been accomplished in one week on one of the piers. The general disposition of the piers and their size is regulated by the consideration that no greater strain than fifteen tons per square foot shall be imposed upon them by the weight of the superstructure. By beams and cantilevers the weight of the building is made to come as nearly as possible over the center of the piers.

Differences in Human Nature.

One of the most striking things in all nature is the difference that exists between the various individuals of the same class. It is said that if our power of vision were sufficiently acute, we should perceive that not two blades of grass, no two grains of sand, no two drops of water were precisely similar. We know this to be true of everything which comes within the scope of our observation, both in the organic and inorganic world, and it is only reasonable to believe that the same law reigns through the entire universe. These differences become more obvious to us as we become more familiar with the type. We easily recognize the variations in the trees of the forest, in the birds of the air, in the beasts of the fields, in the features and forms of the men and women who surround us, and the oftener we observe them, and the more closely we scrutinize them, the greater is the diversity that we discover between them. When we know a person well it is impossible that we can mistake him for any one else; his peculiar expressions of face and form and manner are stamped upon our memory and excite our instant recognition.

No two minds run in the same channels, or think exactly each other's thoughts. Truth is many-sided, and multitudes of men and women stand still, viewing continually but one of her phases. Did they but move around her, changing their respective attitudes, they would appreciate one another far better. Excellent people sometimes regret that there are so many differences of opinion upon a single subject. If all were agreed, they say, how smoothly and harmoniously might all work together for the general good! They forget that, were this possible, there would be no consensus of truth, no gathering together of its many features, no comparison of its many aspects. It is just this mingling of sincere convictions that enables men to correct their fallacies, to retrieve their blunders, to arrive at something like wise judgment and correct conclusions. Yet we chafe and fret at these very differences, and attribute to them many of the evils which really belong to our unwillingness to recognize and accept them. Too often irritation, ill feeling, and even anger arise from this innocent cause. Interchange of opinion, whether in ordinary conversation or in discussions and debate, is among the most instructive and valuable means of forming true opinions, yet often it is poisoned by a dogmatism that will brook no contradiction and a temper which regards all dissent as a personal affront.—Philadelphia Ledger.

HOE'S American press was introduced into London in 1858.



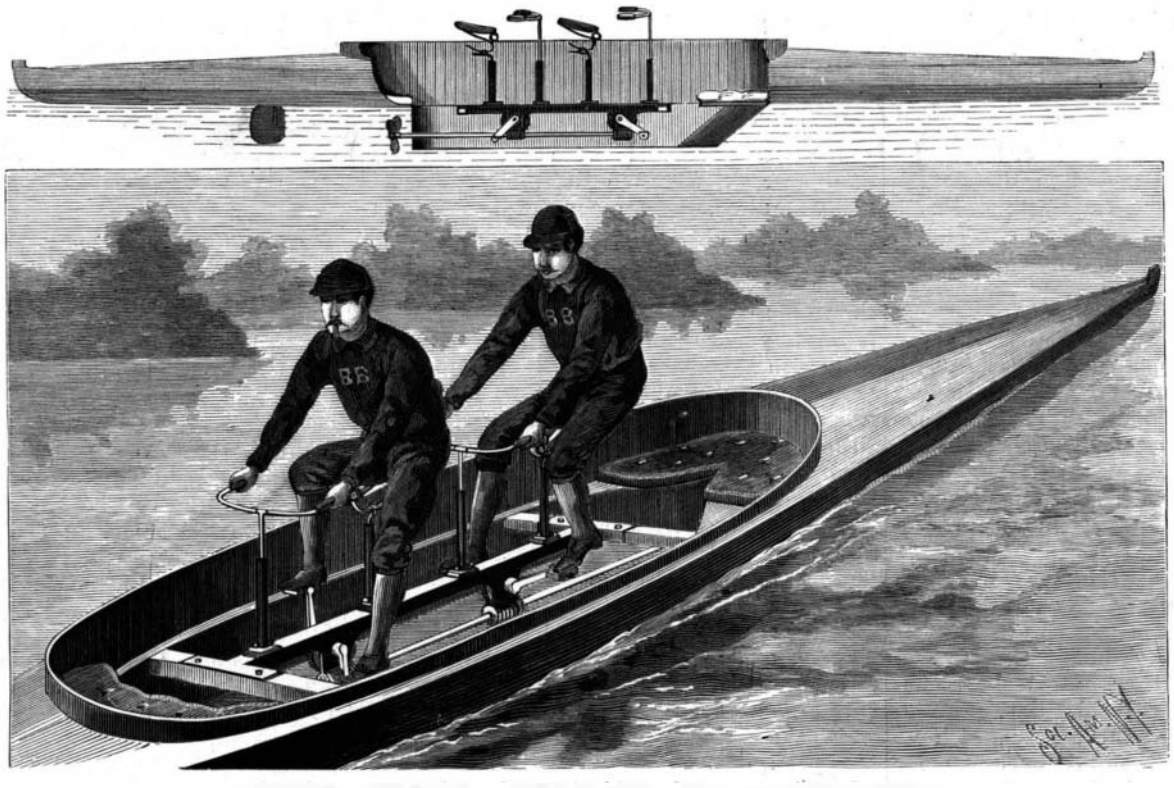
THE INTERIOR OF A CAISSON UNDER AIR PRESSURE.

Mirror Writing.

Many left-handed people, says the Lancet, have great facility in writing in this way, and it is really the natural way in which writing would be done with the left hand. It is taken advantage of by such as can use it freely and readily in writing, say post cards, for it is a simple and easy way of concealing the meaning, so long as those through whose hands the document passes are ignorant of the simple solution. For this it is only ncessary to hold it before a mirror, when the writing appears as ordinary left to right writing. Hence the name "mirror writing" is the one commonly applied to it. As regards its explanation, it is not easy to understand that mirror writing would be naturally used in writing from a copy, because even if it were, in an automatic way, a comparison of the copy with the original would at once show the difference; but, on the other hand, in writing without a copy the mental image will, in the case of one who reproduces it with the right hand, fall into certain lines and curves produced in a certain way, while if the left hand is used the lines and curves will naturally be written in the reverse way—the way easiest for the left hand. It may be asked, Why then does not every one who tries to write with the left hand not write mirror writing? This, we believe, depends upon the strong association which years of habit have formed between the mental picture of the word and its actual rerpoduction on paper, an association so strong that the mind, as it were, rebels and forces even the left hand to reproduce the familiar form. In left-handed people this reversed writing is, as we have said, not uncommon when the left hand is used. In a certain proportion of others who have never written with the left hand the attempt to write a given word with the left hand will naturally be made in the right to left and reversed form. Thus it is sometimes seen in the case of patients who, having lost the use of the right hand, in trying to write with the left naturally write mirror writing. But it is uncommon, as we have hinted, probably on account of the strength of the bond between the mental image and its concrete symbol.

OGDEN'S MARINE VELOCIPEDE OR BICYCLE BOAT.

As plainly shown in the illustration, this boat is propelled through the water in the same manner as one propels a bicycle on land. It is a recently patented invention of Mr. H. B. Ogden, No. 204 Carroll Street, Brooklyn, N. Y. The boat is a long, easy running one, with the propelling machine dropped through its bottom into a second very small brass boat or fin keel, large enough for the pedals. The main boat is divided off by bulkheads about one-third from each end, and decked over, so as to be non-sinkable in case of accident. The machinery itself is of the simplest form, as shown in the sectional view at the top, the pedal cranks turning a gear which meshes into a worm of long pitch on the screw shaft, and the steering being effected by a rudder connected with the forward handle. The inventor also provides for turning the screw shaft by means of a sprocket chain and gears if preferred, the pedals being set quartering, so that there is no center. The machine is geared so that the propeller turns 460 revolutions per minute with one stroke of the foot per second, a much less speed than is made by most bicycle riders. The advantages of the lower boat or fin keel are obvious, its buoyancy serving to lift the large or main boat so that the draught of the latter is very slight, while the weight in the fin keel serves as ballast. It also enables the work to be done with a short shaft, with few bearings and no vibrations, the riders sitting low and the propeller wheel being always submerged. The single boat is 18 feet long and the double boat 25 feet long, the latter having an extra seat at each end of the cockpit for passengers, but the boats may be built, if desired, to accommodate crews of six or eight or more.

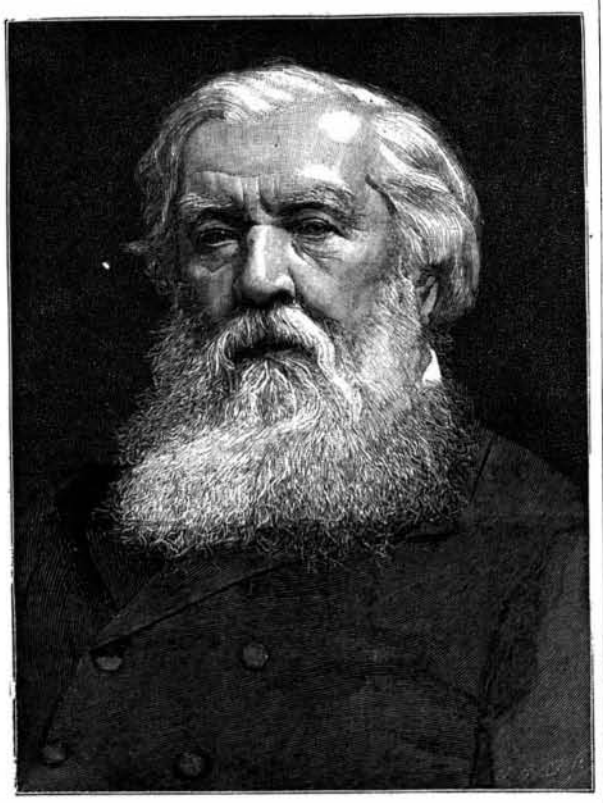


OGDEN'S MARINE VELOCIPEDE OR BICYCLE BOAT.

These boats are designed to furnish a delightful means of recreation and healthful exercise, as well as serve useful purposes. One can much more easily learn to run and manage a boat in this way than attain skill in riding a wheel on land. Especial advantages are claimed for these boats for gunning service, as they are quiet, may be run fast, and the hands may be freed to use the gun at any time.

SIR A. H. LAYARD, G.C.B.

Sir Austen Henry Layard, who died July 5 last, was born in Paris on March 3, 1817, and became famous as an Eastern explorer, a politician and a diplomatist. The London Graphic says, as a youth he was articled to a solicitor, but about the age of twenty-two he received the office of an appointment in Ceylon, and with a friend set out for India overland. At Jerusalem he parted with his friend and went on alone. He reached Bagdad, visited the great mounds under which



SIR AUSTEN HENRY LAYARD.

Nineveh lay hid, and wandered all over Babylonia and Persia. In 1843 he was asked by the British consul at Mosul to take some dispatches to Constantinople, and in that city he met the great Sir Stratford Canning, who offered him an attachéship, and sent him back to explore Nineveh. His first work, "Nineveh and Its Remains," was published in 1848, and in 1853 he published his book on the journeys undertaken for the trustees of the British Museum, "Discoveries Among the Ruins of Nineveh and Babylon." All this time he was an unpaid attaché at Constantinople, but in England he found himself a lion, and on his return he held the under-secretaryship for foreign affairs under Lord John Russell for a few weeks in 1852. In the same year he was elected Liberal M.P. for Aylesbury, and during the Crimean war was one of the members who strenuously opposed it, even going out to the Crimea to see the hostilities for himself. In 1855 he refused to serve in Lord Palmerston's ministry, but in the following year accepted the under-secretaryship for foreign affairs for the second time. In 1857 he went to India during the mutiny, re-entered Parliament in 1860, and for the third time became foreign under-secretary in 1861, an office which he held until Lord Derby's government was formed in 1866. In 1865 Mr. Gladstone made Layard chief commissioner of works, and in 1869 sent him as envoy extraordinary to Madrid. He was still there when, in 1877, Lord Beaconsfield sent him as ambassador to Constantinople, and when Mr. Gladstone returned to power in 1880, Sir Henry, who had been made a G.C.B. just before the Berlin Congress, retired into private life. Since that time Sir Henry lived chiefly in Venice, where he had a wonderful collection of pictures, and took an active interest in the Venetian glass manufactory. He was of Huguenot extraction and was president of the Huguenot Society, formed at the bi-centenary of the Revocation of the Edict of Nantes.

The Telautograph.

The wires between St. Margaret's and the general post office, London, were, a few days ago, used for the purpose of some experiments with the telautograph—the invention of Prof. Gray, of New York. The Electrical Engineer, London, says: The experiments took place between the general post office, London, and Cable Hut, St. Margaret's Bay, through which the London and Paris telephone passes. Special instruments were fixed at both ends, and as this was the first time that long distance experiments in telautography have taken place in this country, they were watched with unusual interest. The results were good, the messages transmitted being, in every respect, most successful, and the instruments working without the slightest hitch over a distance of 83 miles. Messages were both sent from and received at St. Margaret's Bay. It will be remembered that the principle of the instrument is that it automatically records a facsimile of the writing contained in messages. In the experiments on Sunday the receiving pencil recorded with ease and clearness different handwritings, giving thick and thin strokes, dotting i's and crossing t's correctly. In this connection Mr. Armytage Bakewell writes: "It has been stated that the recent experiments in the transmission of autographic messages by electricity between St. Margaret's Bay and London were the first which have been made in this country in long distance telautography. Will you allow me to point out that this is a mistake, as more than 40 years ago the copying electric telegraph, invented by the late Frederick Collier Bakewell, successfully transmitted autographic messages between Brighton and London. Invisible messages, which could be rendered legible by the recipient, were also transmitted by that system. Great interest was taken by the late Prince Consort in my father's invention, and the inventor had the honor of exhibiting the instruments and of explaining their mechanical and electrical details to His Royal Highness at Buckingham Palace. The copying electric telegraph was subsequently exhibited at the great exhibition of 1851, and received the highest award, viz., the council medal."

Compressed Air Street Cars.

In a paper recently read before the French Society of Civil Engineers, M. Chatard presented data concerning the compressed air street car traction system now being installed by the Compagnie Generale des Omnibus de Paris on three of its most important lines, namely that running from the Louvre to St. Cloud, a distance of about 6½ miles; that from the Louvre to Sevres and Versailles, about 12 miles long; and that from Vincennes to St. Augustin, about 6 miles long. In the case of the first two lines trains of three cars each will be hauled by compressed air locomotives, while in the other motor cars will be used to which, when the volume of traffic requires it, a trailer can be added. For the first mentioned lines there will be one main power station supplying compressed air to two locomotive charging stations through 2½ inch pipe line. The charging stations are about 1⅓ and 2½ miles distant respectively from the power station. The latter is equipped with seven air compressors and a battery of eight boilers, besides an air accumulator outfit. The system to be followed is that of Mekarski, which has been in successful operation on the Nantes lines for the past fifteen years. The Vincennes-St. Augustiu line will have two power stations at different points along its length, one containing three compressors and the other four. All three lines will soon be in operation.