working upon a complicated pattern, the foreman of the loom—a boy about fourteen years of age—walks up and down, calling out, in a curious monotone, the number of stitches and the colors of the threads to be used. The Persian rugs and carpets are made by hand throughout, and none but vegetable or natural dyes are employed. It is to this fact that the longevity and durability of the Persian rugs are attributable, especially in connection with the colorings.

HOUSE BOAT "LOUDOUN."

The illustrations of the house boat "Loudoun," designed by Lewis Nixon for his own use, show what can be accomplished in the way of providing a floating home by one who knows just what is needed.

The "Loudoun" is 130 feet over all, 17 feet beam, and draws 6 feet. She is of steel up to 4 feet above the water, and wood above this. There is an unbroken upper deck 110 feet long enclosed by a netting rail and covered over by double awnings, the lower one blue, to do away with the glare of the water on bright days. The steel hull is divided into six water-tight compartments.

The living quarters are forward, arranged something like an apartment on shore. There are four large sleeping rooms, two bath and toilet with hot and cold salt and fresh water, a commodious dressing room, a parlor, and a dining room.

Back of the dining room the pantry extends across the vessel, and is the dividing line from the crew's quarters. The engine is forward of the boiler, so as to keep the heat away from the owner's quarters. There are no air-ports in the staterooms, as windows are used throughout. The owner's stateroom has six windows and four doors opening into it.

The vessel is driven by a triple-expansion torpedo-boat engine, having cylinders 10, 15 and 25 inches by 15-inch stroke, steam being furnished by a Roberts boiler. The after end has the deadwood cut away, the shaft being supported by a strut, such excellent maneuvering power being thus obtained that the vessel will turn in her own length.

The crew have an after deck covered with a blue-lined awning, which is 12 by 17 feet. The galley and pantry are bright and well ventilated, and the floors of both are covered with white tiles.

There is a large dynamo supplying electricity for a number of specially-designed lights, a storage battery supplying light after the owner retires, thus avoiding noise or vibration.

The anchors are raised by a steam windlass.

The "Loudoun" has proved herself an excellent seaboat and makes frequent trips to Newport and points along the Sound. She was designed to take advantage of the water facilities of New York—the Staten Island kills, upper and lower bays, the Horseshoe, Gravesend Bay, the Hudson and the Sound.

Ten men are carried in the crew—a master, chief engineer, two firemen, a chef, messboy, two stewards and two deckhands.

The "Loudoun" was named after the county in Virginia in which Mr. Nixon was born.

While nominally of 10 knots speed, the "Loudoun" often distances boats claiming a much higher rate of speed.

She can carry 14 tons of coal, and uses, in ordinary cruising, about a ton and a half a day. The tanks contain 15 gallons of water.

A NEW BOOK LAMP.

An exposition dealing with the prevention of seasickness is being held at Ostend, Belgium, and a large variety of appliances, remedies, etc., are exhibited.

AN ADJUSTABLE ELECTRIC BOOK LAMP.

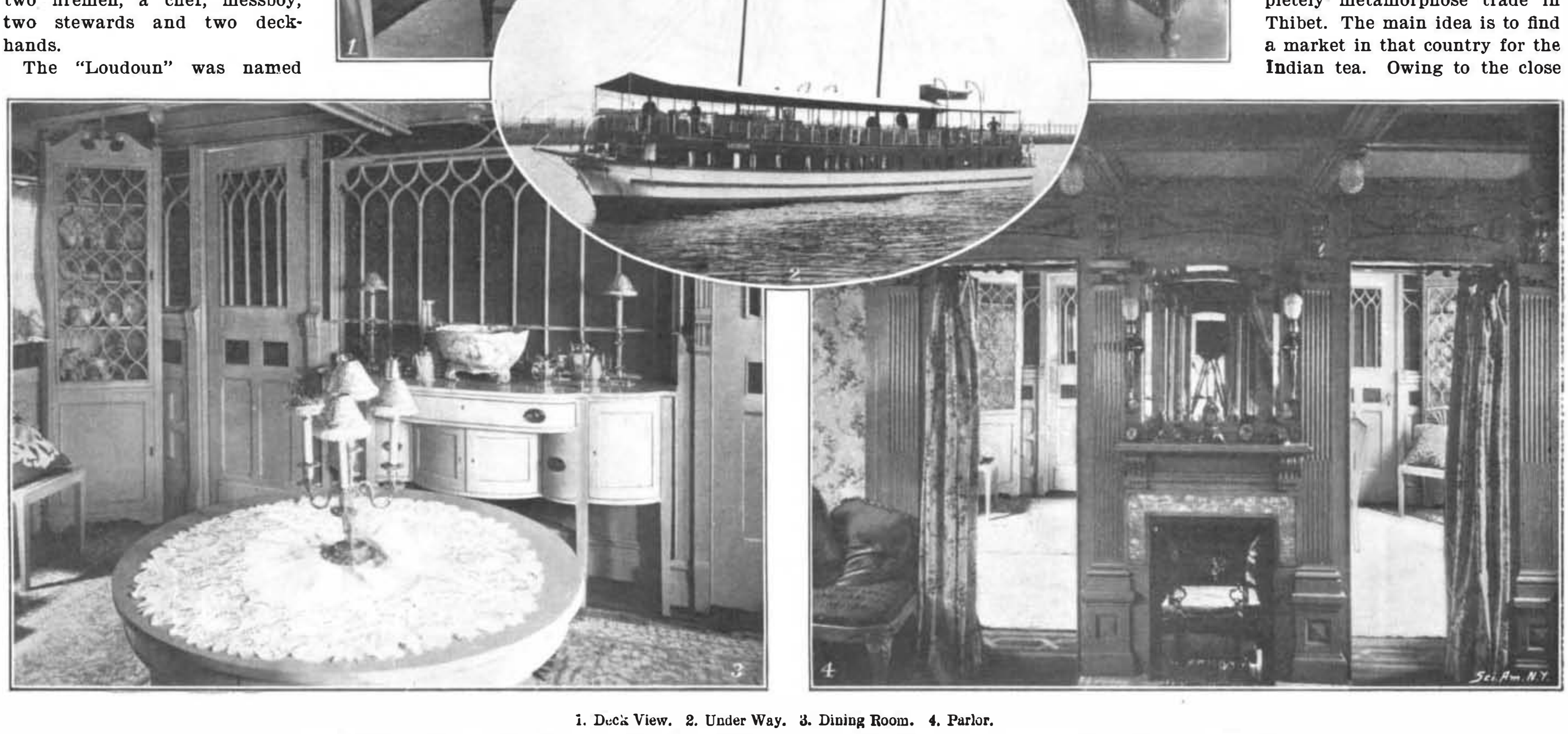
Our illustration shows a miniature portable electric lamp supported on a series of light, flexible metal links, held in whatever position they are placed by the friction of the connecting pins at the joints, and having at one end a spring clamp sufficiently large to slide over a book cover or some other thin article for a support. From the lamp attached to the opposite end run two wires to a small dry or storage battery, which may be carried in one's outside pocket or placed upon an adjoining table, or in the lap of the person reading. In the case of a newspaper, the clamp may be adjusted to the forefinger of one hand and the light of the lamp projected upon such portion of the paper it is desired to read, both hands holding the paper. The small reflector throws the light onto the book or paper and screens it from the eye. The wires are connected to the battery by the usual thumb-screws, or by simply slightly screwing or unscrewing the small lamp bulb; this latter plan is much quicker and easier.

The convenience of this lamp is self-evident, particularly so in warm weather, when reading in the house is uncomfortable; lawns and piazzas may be then resorted to without fear of the light being blown out by the wind. It is also useful for amateur photographers in supplying a ready light for changing plates or developing, and for travelers, in cars, boats or hotels. Nurses find it convenient for use in darkened rooms. It can also be used with advantage in many other ways.

Where the electric current can be had, special sockets or connections are provided, so that the lamp can be used without the battery. Duplicate batteries are supplied, which can be connected as soon as one gives out, or storage batteries can be easily recharged. We are informed that this novel lamp device has recently been introduced by the Portable Electric House Lamp Company, at 10 Cortlandt Street, New York.

Communication with Thibet.

An interesting endeavor is being made by a syndicate to establish trade communication with Thibet. Under existing circumstances, commercial relations with this seclusive country are almost impossible, owing to the lack of transportation facilities of any description. As a solution of the difficulty, private enterprise is suggesting the construction of a rope aerial tramway from the summit of the Jalep Pass to the railway in the plains, and already a section of the country has been surveyed. The line will probably be carried on to Yatung, a distance of six miles by trail, but which is only three miles as the crow flies. The ropeway, when completed, will be forty miles in length, and will constitute a record in this means of transit. The engineering obstacles that have to be surmounted are numerous, but the syndicate are confident of success. If completed, it will completely metamorphose trade in Thibet. The main idea is to find a market in that country for the Indian tea. Owing to the close



1. Deck View. 2. Under Way. 3. Dining Room. 4. Parlor.

THE HOUSE BOAT "LOUDOUN."—LENGTH, 130 FEET. BEAM, 17 FEET. DRAFT, 6 FEET. SPEED, 10 KNOTS.

proximity of the tea gardens and the cheap means of transit promised over this ropeway, Indian tea planters will be able to produce very cheap bricks. But other difficulties present themselves, which will serve to militate against the realization of such a scheme. Importing tea is tampering with the coinage, since it is said to be a government monopoly, and is used in lieu of money payments. The various kinds of bricks are generally regarded as legal tenders. It is considered, however, that once the Thibetans are persuaded that the importation of tea is to their interest, they will purchase it, and all other difficulties will disappear. The people of that country will buy anything that is cheap. Taste is a matter of secondary importance to them. In making or brewing tea, these people mix the leaves with a quantity of butter, which greatly improves it; soda, to extract the color from the leaves and sticks; salt, sprinkled in according to taste, and the whole concoction is then boiled, churned, and served, and on a cold day is stated to be extremely refreshing.

THE CROTON DAM FOR THE WATER SUPPLY OF NEW YORK CITY.

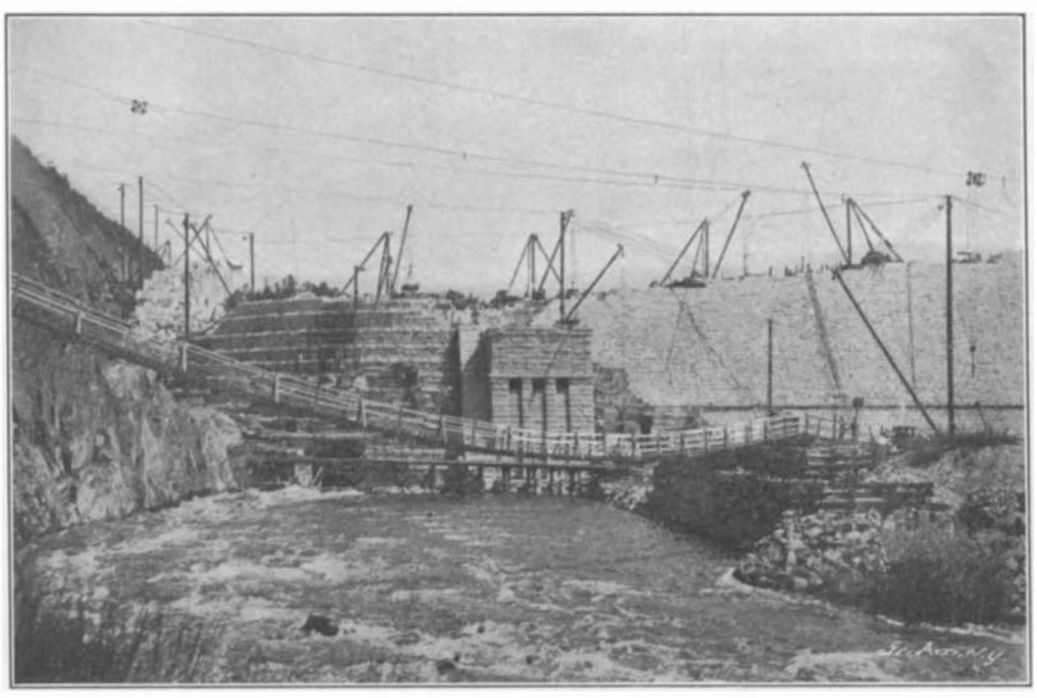
Since our last notice of the construction of the Croton Dam this important work has been carried along to a point which enables one to get a very fair idea from photographs of its imposing proportions. The main masonry portion of the structure has been carried up to an average height of about 140 feet above the original bed of the river, and toward the southern end the top course of masonry has reached the level of the bottom of the series of arches upon which the overhanging roadway will be carried, this level being about 18 feet below the parapet.

The Croton watershed, which lies 35 miles north of New York, has a catchment area of 362 miles, an average yearly rainfall of 46 inches, and an average yearly flow of 135,400,000,000 gallons. The present water supply of New York is conveyed from the old Croton Reservoir by two conduits known as the old and the new aqueducts. This reservoir, which lies some 6 miles from the mouth of the Croton River, has a capacity of 1,000,000,000 gallons. It was built half a century ago, and although it sufficed for the population of 350,000 of that day, it has for many years proved inadequate to the needs of the rapidly growing metropolis.

The new Croton Dam, which forms the subject of our illustrations, is being built across the Croton Valley at a point 3¼ miles below the old dam. The great reservoir which it will form will extend some 15 miles up the Croton Valley and will include the old Croton Reservoir. Since the completion of the latter several additional storage basins and smaller reservoirs have been constructed in the various valleys of the Croton watershed, and the contents of these, combined with that of the new reservoir which is now approaching completion, will give to New York city a total water supply of 75,000,000,000 gallons.

The great dam consists of three portions. The first 400 feet on the southern side of the valley is an earth dam with a thin, interior, masonry core wall; then follows the masonry dam which is 650 feet in length and extends to within 200 feet of the northern side of the valley, where the dam swings around in a broad curve and extends up the valley parallel to the hillside for a distance of 1,000 feet, finally turning into a junction with the natural rock of the bluff. This 1,000 feet forms the spillway and will be more than sufficient to take care of the greatest possible floods and cloudbursts of the watershed.

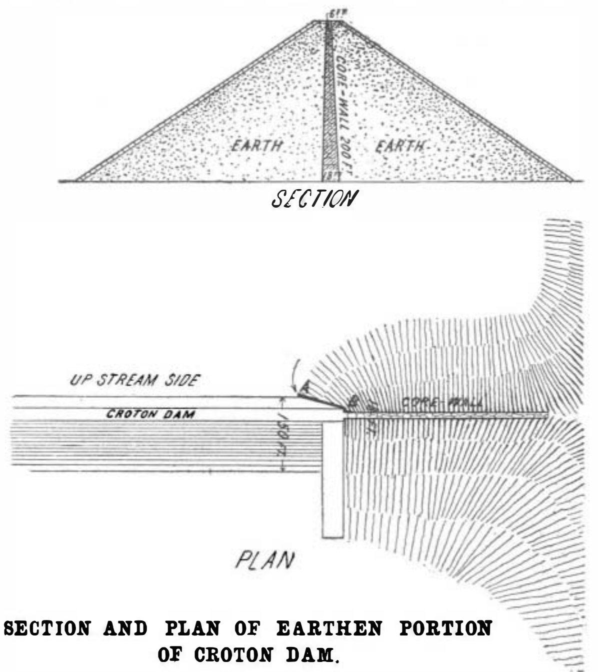
The construction of the dam necessitated an enormous amount of excavation, before rock bottom of a sufficiently firm and homogeneous character to support a structure of this size could be found. The huge trench was carried down to a maximum depth of 131 feet below the original bed of the river, the width of the trench at the lowest point being about 250 feet. The work of excavating was commenced in 1892 and completed in 1896, and during this period 1,100,000 cubic yards of material was removed. The cross-section of the masonry dam shows the upstream face to be approximately vertical, the down-stream face having a slope of about 50 degrees. As fast as the masonry was built in place, the excavated material was refilled until the original level of the bed of the river was reached, and at the present time about 134 feet, or two-thirds of the masonry, is buried out of sight.



VIEW LOOKING UP THE TEMPORARY CHANNEL, SHOWING SPILLWAY AND HEADGATE.

When the dam is completed to its full height, it will rise 160 feet above the old bed of the river, or practically 300 feet above the lowest foundation course.

Two hundred feet from the north cliff is located the gatehouse, in which are three 48-inch pipes, through which the Croton River will flow during the completion of the dam. After its completion they will be used in emptying the reservoir for purposes of inspection. As will be seen from our illustrations, this gatehouse is located at the southern end of the spillway, which is carried around through an angle of 90 degrees,



SECTION AND PLAN OF EARTHEN PORTION OF CROTON DAM.

until it is approximately parallel with the northern slope of the valley. The exterior face of the spillway is formed in a series of deep steps, with a rise of 8 feet, and over these steps the surplus water will flow during heavy freshets. The accompanying illustration is taken from the artificial channel which was formed along the northern side of the valley for the purpose of conveying the Croton River past the dam. An arched culvert has been built at the river level for the passage of water during the construction of the spillway.

We have already alluded to the fact that the southerly 400 feet of the Croton Dam is built on an entirely different system from the remaining portion. It consists of an interior core wall 18 feet in thickness at the base and tapering to 6 feet at the top, backed on both the upstream and downstream sides by a filling of earth with a slope in each case of 2 to 1. As will be seen from the accompanying plan there is no gradual merging of the masonry into the earth dam, but the change from one to the other is extremely abrupt, the masonry narrowing suddenly at the base from 150 feet to 18 feet. The masonry dam is homogeneous throughout. By virtue of its great mass, the careful selection of the materials which have been built into it, and the thorough bonding of the masonry, this portion is practically a monolithic structure. Its failure could only take place by its sliding forward, or by its being bodily overturned about its toe. The stability of the earth and core-wall portion of the dam is dependent upon its mass and the impermeability of the core wall. The earth dam, being built up in layers and each layer carefully rolled, is supposed to be impervious to water, the masonry diaphragm being introduced merely to make certainty sure. So long as the great mass of the earth dam is dry, its stability is certain, its great weight being sufficient to prevent its sliding bodily forward under the horizontal component of the pressure of the water. The very existence of the core wall, however, is an admission of the possibility of the saturation of the earth, and should this saturation on the upstream side take place, there would exist the following unfavorable conditions: the total weight of the core wall per linear foot would be about 200 tons, while the horizontal water pressure resulting from the saturation of the earth on the upstream side would amount to 550 tons to the linear foot. So long as the wall remained intact and watertight, the downstream mass of earth might prove sufficient to hold the dam in place, but should, as is altogether likely, cracks develop in the wall and the water cut through, it is certain that this portion of the dam would eventually be carried bodily away.

Moreover, the danger of water getting in between the upstream bank and the upstream face of the core wall is greater than might appear at first sight; for it will be seen that the slope of the earth embankment at the point of juncture of the core wall and the main masonry dam is carried around in the form of a section of a cone and overlaps about 300 feet on the main structure. As the latter will have no settlement whatever, and the earth dam will be constantly settling during the first three or four years, there will be every opportunity offered for water to work in along the face of the masonry dam at *A B* and find a lodgment against the upstream face of the core wall.

These considerations have led the commissioners in charge of the construction, acting on the advice of their chief engineer, to appoint a board of experts to investigate the subject and determine whether, even at this late hour, it would not be better to remove the core wall altogether and continue the masonry dam entirely across the valley, thus providing a homogeneous structure from abutment to abutment. The change advocated may mean a delay of from nine to twelve months, and an added cost of about $500,000; but in view of the vast importance of the new reservoir, and the necessity of providing absolutely against any possible failure, and the water famine which would inevitably follow, it is to be hoped that this committee will report in favor of the proposed change.

Liquid Oxygen for Aeronauts.

BY OUR ENGLISH CORRESPONDENT.

An apparatus for the purpose of supplying aeronauts with pure oxygen when poised at a high altitude where the extreme rarefaction of the air renders them liable to asphyxiation, has been devised by a Frenchman, M. L. Cailletet. When aeronauts experience the nausea arising from rarefied air, they have recourse to the oxygen bag by placing the tube in their mouth. M. Cailletet considers this unnatural, since we are accustomed from birth to breathe through the nose, and he contends that when inhaling oxygen through the mouth it does not accomplish its object. His device for solving this difficulty consists of a double glass bottle containing liquid oxygen, and closed by a stopper through which two tubes pass. One of the tubes terminates above the surface of the oxygen, and it is provided on the exterior with a rubber weight, by means of which it is able to exercise atmospheric pressure on the liquefied oxygen. The other tube is made of lead and reaches to the bottom of the oxygen. The upper end of this second tube is connected with a vaporizer, comprising a very small boiler constructed of seven copper tubes communicating with each other. Owing to copper being a good heat conductor, the liquid oxygen, through the action of the rubber weight, is transformed into gas, and passes into a rubber reservoir which is fixed in the car of the balloon. From this reservoir extends a flexible tube communicating with the respiratory apparatus, which consists of a small metal mask protected externally with velvet to protect it from the cold. This mask only covers the mouth and nose in much the same way as the Fleuss apparatus is attached to the diver's face, being maintained in position by rubber bands. The gaseous oxygen in the reservoir is conveyed through the flexible tube to this mask and the aeronaut is enabled to breathe as comfortably as if he were inhaling the ordinary atmosphere.

A telephone cable has been laid through the Gothard tunnel.