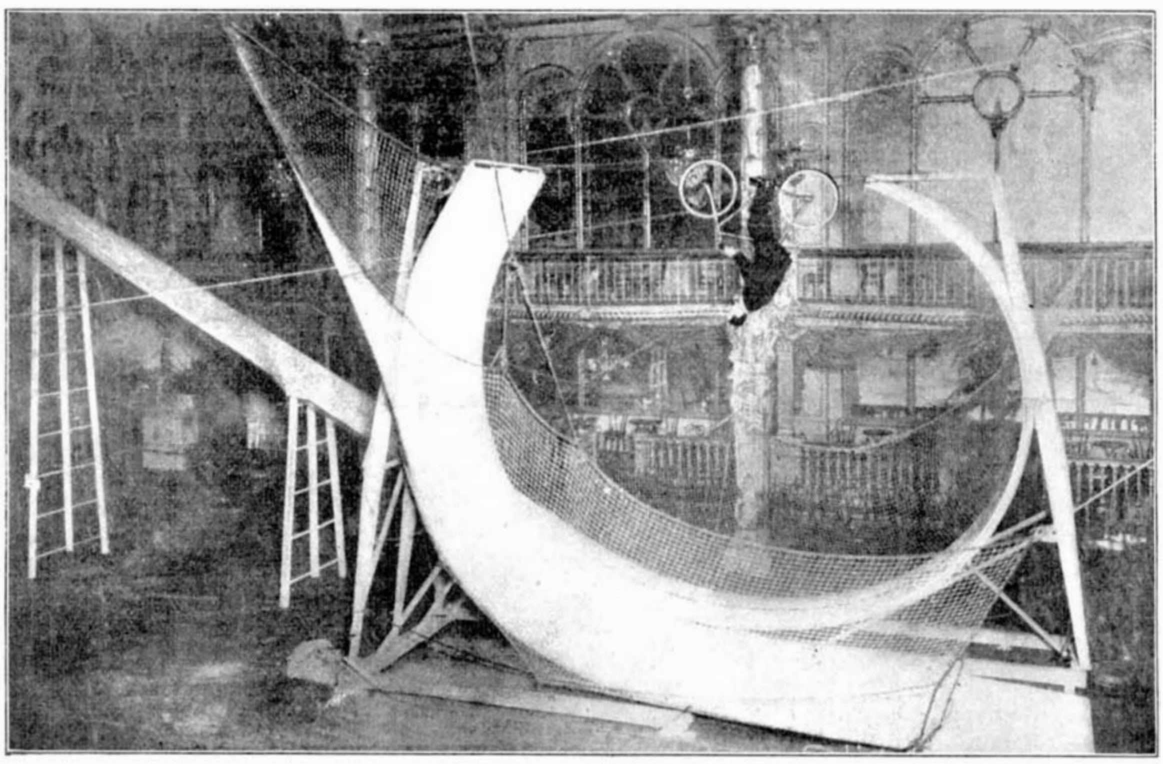
disappears below the surface. We steer by the compass now till we think we are within range. The torpedoes in all three tubes are ready for firing. The omniscope man is peering into the instrument as we rise slightly for a final observation. The sailors on the enemy's deck, as seen through the "full size" lens, do not quite fill the measured space on the ground glass. "Two hundred yards more to go; 10 degrees more to starboard," says the man at the omniscope, as the top of the instrument again plunges below the surface. The course is changed as directed. A minute later the captain gives orders to the man at the torpedo tubes to make ready, and in 15 seconds more the order comes to fire. The torpedo is launched, and we rise sufficiently to see its effect. A glimpse through the omniscope shows this to be *nil*. The vessel is well within range, and it seems as though she must certainly have been struck. Another torpedo is launched and is seen to bob up at the enemy's stern. A hail of rapid-fire shells comes very near hitting the omniscope, and warns us that we are seen. Down we go again, aiming straight for the battleship. With the electric motors running at their highest speed, we hold our course for between two and three minutes, all the time going deeper, as shown by our depth gage. Now we rise again quickly. We have passed under the battleship. The crew are ready with the rear torpedo, and the moment the omniscope emerges, the observer orders a sharp turn to port. As the boat answers her rudder, the order to fire goes to the engine room. With a whirring noise, the rear torpedo leaves its tube, and a moment later we rise to reconnoiter.

Although we might resume the attack, since we have two more torpedoes at our disposal, that is unnecessary, as the battleship has crowded on full steam and is making rapidly for the shore. She takes on a heavy list to port, and the evident intention is to beach her.

We decide to go inshore, therefore, and send word that we have captured our prey. By changing the inclination of the hydroplanes, we again rise and proceed under gasoline engine propulsion as soon as the sighting hood top is out of water. After a half-hour's run, we again submerge near a buoy, running down till our wheels strike bottom. More water is then let in the ballast tanks, which holds us there. Two men enter the diving compartment, and, after tightly closing the air-lock door, let in compressed air till the two pointers on the combined water and air gage match. The door is then lowered, and word is telephoned the engine room to go ahead slowly. The men watch the smooth, sandy bottom as the boat rolls over it on her wheels. In a few minutes the cable is found, hauled in, and connected to the boat's shore telephone circuit. The bow and stern anchor weights are dropped, and as the cables are paid out, we rise vertically to the surface. After telephoning ashore the results of our brief cruise, we drop the telephone cable, and, having blown out our ballast tanks and superstructure, we haul up the anchors. The engines are started and we steer for port, having accomplished our purpose. We do not know what our next expedition will be, but we can carry fuel enough for a cruise of 1,000 miles, should we be sent on a mission to the enemy's country, such as for cutting the cables of the mines in his harbors and blowing up his ships in their own ports.

The above description of a supposed trip on the "Protector" shows the many advances Mr. Lake has made in the art of submarine navigation. Very few of the feats performed by the "Protector" have been accomplished by previous types of this sort of craft, the operations of which have heretofore been confined to land-locked waters and have been carried on with considerable jeopardy to the crew. Boats of the Lake type, if built on a larger scale, can be made to carry fuel and provisions enough to cross the Atlantic, and in fact, to cruise anywhere that a torpedo boat is capable of going. Besides this, they would be capable of attacking an enemy unawares, and thus with a good chance of sinking him wherever on the high seas they might chance to meet, as well as of entering his harbors and cutting mine cables or doing any other work that can be accomplished beneath the surface.



THE LATEST AND WILDEST VARIATION OF "LOOPING THE LOOP."

### THE LATEST FORM OF "LOOPING THE LOOP."

"Looping the Gap" is the pleasantly suggestive name which has been given to a wild French variation of the American "Looping the Loop."

The apparatus is simply an ordinary "Looping the Loop" track, the upper segment of which has been cut out to leave a gap, across which the rider must leap as he whirls around the circle. The rider who trusts himself with foolhardy daring to this apparatus, and is nightly cheered at the Folies Bergères in Paris, is M. Ancilotti.

Considering this apparatus in the light of the laws of centrifugal force, it would seem as if M. Ancilotti ought to fly off at a tangent into space when he reaches the gap, instead of crossing the gap and landing safely on the other side. Still we have the London Illustrated News' statement that the rider does just what is claimed, to which journal we are indebted for our illustration and particulars.

### Peat Coal by Electrical Process.

The steadily growing consumption of fuel for the various purposes of manufacture, transportation, and domestic economy, together with the gradual but inevitable exhaustion of firewood in most civilized countries, have combined to give during recent years a new and important interest to the utilization of the vast beds of peat which have hitherto lain almost neglected in many portions of Europe and America. Peat in its ordinary condition contains about 80 per cent of water. All the earlier methods of utilizing it involved the elimination of this by air drying, which is tedious and uncertain in wet, cloudy weather, and practically ceases in winter. The problem has been, therefore, to devise a process which would carbonize and convert the substance of peat into coke or coal by the consumption of its gaseous elements, a process which should be self-sustaining, simple, and so cheap in operation as to produce carbonized peat at a cost below or not far exceeding the average price of bituminous coal.

The latest step forward in this branch of industry appears to have been made in England, where at the works of Messrs. Johnson & Phillips, at Charlton, in Kent, there has been exhibited during the past fortnight an electrical process for converting ordinary peat into firm, smokeless steam coal at a cost which promises to bring the product far within the industrial price limit of steam fuel in Great Britain and Continental Europe. From the numerous and elaborate report in the English press the following description of the apparatus employed and its method of operation has been derived:

The peat is cut and excavated by machinery, loaded into dumping cars which convey it from the bog to the plant, where it is packed into rotary iron cylinders of a peculiar construction. The cylinders being rotated at high velocity, the centrifugal pressure, aided by an interior beating device, expels all but a small remnant of the 80 per cent of water which the material originally contained. Electrodes connected by conductors with a dynamo are then inserted in the cylinders in such a manner that the mass of centrifugally dried peat becomes the medium through which is completed the circuit between the electrodes. The resistance offered by the peat, like the filament of an incandescent lamp, generates heat which carbonizes the material, producing a mass of disintegrated black globules, which retain all the valuable elements of the original material. This part of the process, which depends largely upon the conductivity of the peat, may be promoted by moistening the mass with certain cheap liquid chemicals, the use of which is covered by the patent.

From the cylinders the carbonized material passes to machines, which knead it into a putty-like mass, which is then pressed into briquettes or left to dry and harden in masses, which are broken into lumps, screened, and graded like ordinary coal. Among the special advantages claimed for this method is the fact that the electrical current converts but does not destroy any of the valuable elements of the peat, whereas coking by fire heat expels a large percentage of these elements in the form of gases, which, being either wasted or burned as fuel beneath the retorts, are lost from the composition of the ultimate product.

Briquettes produced by this method can be compactly stowed on shipboard or elsewhere; they are practically smokeless, leave no clinkers whatever, and, according to English press reports, have the high thermal value of 9,000 British units. The cost of a plant capable of treating 100 tons of peat per day is stated to be £4,000 ($19,466). The actual cost of producing a ton of peat fuel by this process is stated to be 5s. ($1.21), equal for all steam-generating purposes to a ton of South Wales steam coal, which costs at the mouth of the mine 8s. 4d. ($2.02). These are given as the economic results in a location where the electric current used by the process is generated by steam. In districts where generators can be driven within a working radius of peat bogs by water power, the cost of production would be proportionately reduced.

There are in New England and in the Middle and Western States vast beds of peat that have been heretofore left neglected as waste material in the economy of nature. In Alaska and on the islands which lie along its shores—where the limited supply of coal brought from British Columbia sells for $25 per ton and men perish from cold for want of fuel—there is a practically unlimited supply of peat of the best quality, all of which would be available as fuel if carbonized and converted into coal or briquettes. No process which includes air drying or works the peat at ordinary temperatures would be practicable there for more than a small part of each year—the brief arctic summer of that northern clime. If those vast deposits of fuel material are ever successfuly utilized, it must be by some process similar to those herein described, whereby the peat is quickly machine dried by means independent of sun or wind and then carbonized by heat that can defy even the cold of an arctic winter. This electrical method will be first tried on an industrial scale in Ireland, an island which, with a total area of 32,393 square miles, has 2,830,000 acres of peat.

### A Successful Experiment with a Motor-Driven Aeroplane.

On December 17 the Messrs. Orville and Wilbur Wright made some successful experiments at Kitty Hawk, N. C., with an aeroplane propelled by a 16-horsepower, four-cylinder, gasoline motor, and weighing complete more than 700 pounds.

The aeroplane was started from the top of a 100-foot sand dune. After it was pushed off, it at first glided downward near the surface of the incline. Then, as the propellers gained speed, the aeroplane rose steadily in the air to a height of about 60 feet, after which it was driven a distance of some three miles against a twenty-mile-an-hour wind at a speed of about eight miles an hour. Mr. Wilbur Wright was able to land on a spot he selected, without hurt to himself or the machine. This is a decided step in advance in aerial navigation with aeroplanes, and it is probably due to the increased degree of controllability resulting from the Wright brothers' novel form of horizontal rudder, which is a small guiding aeroplane placed in front of, instead of behind, the aeroplane proper. A well illustrated description of the Wright aeroplane appeared in our February 22, 1902, issue. The present aeroplane has the very large surface of 510 square feet, making its apparent entire controllability all the more remarkable.

Practically all the grading for the intramural railway at the World's Fair grounds has been finished. The road will be ready for operation by January 1.