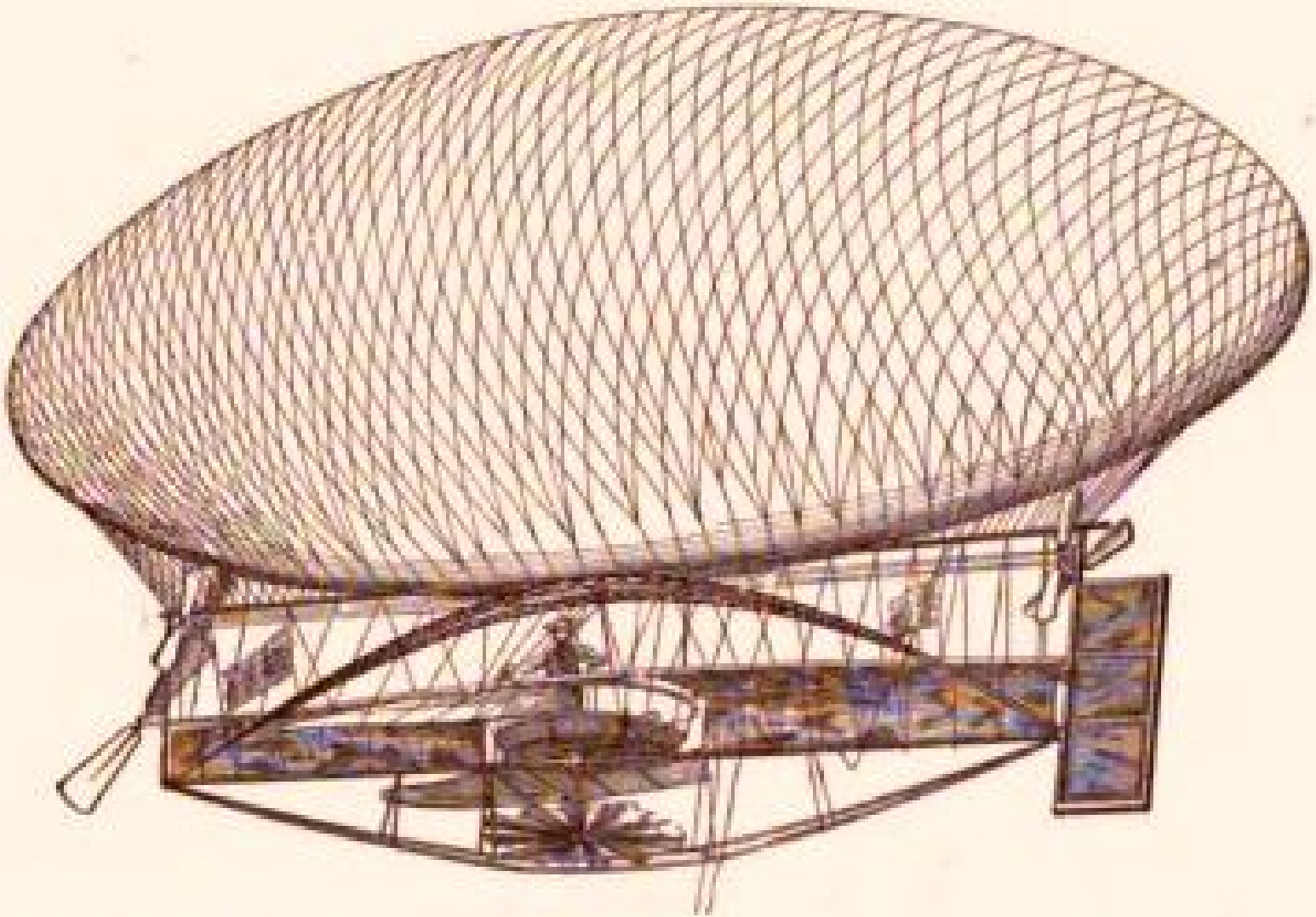

SCIENTIFIC AMERICAN

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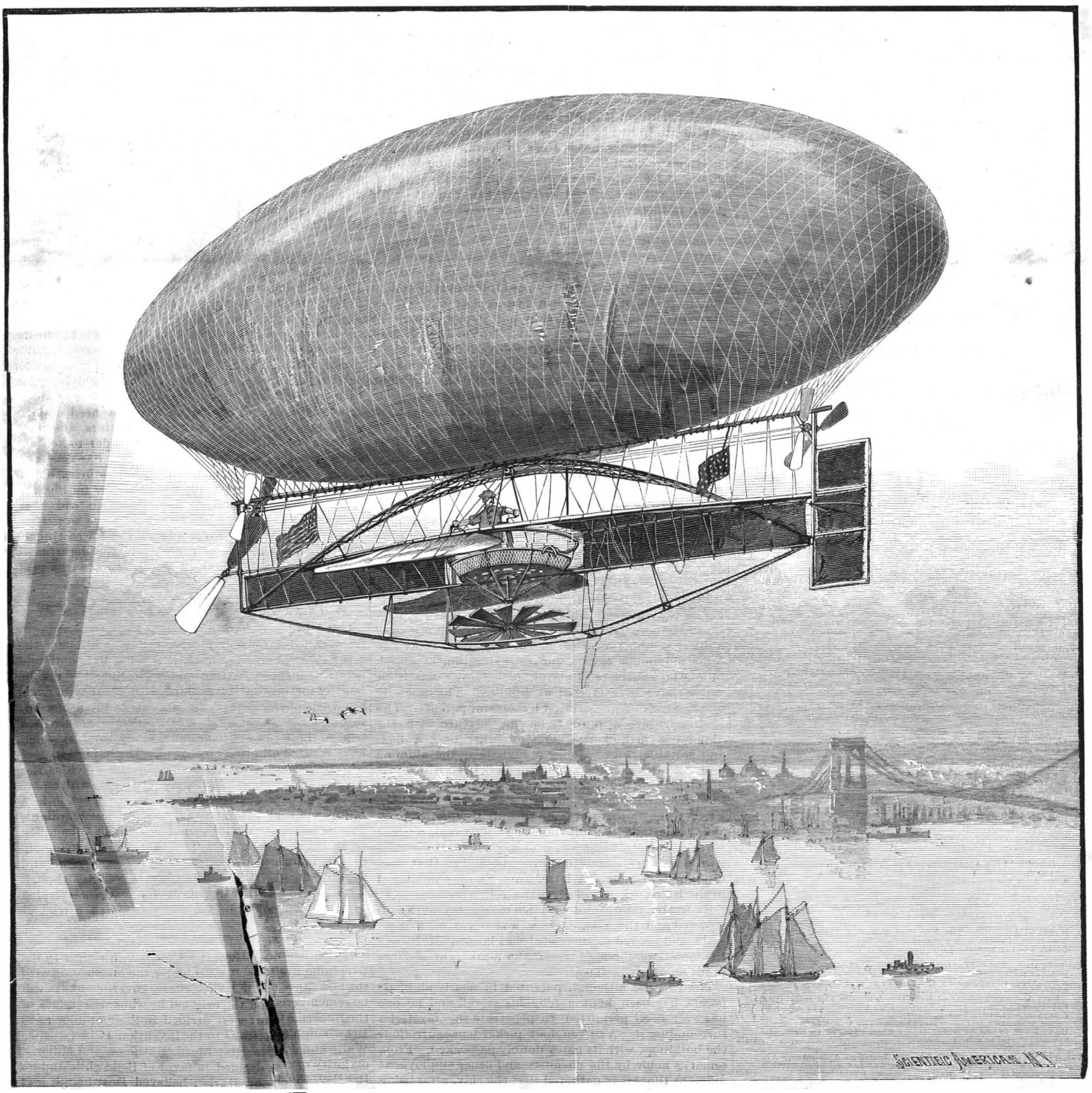
LOSS OF THE CAMPBELL AIR SHIP.

Shortly after 10 o'clock on the morning of July 16, Prof. E. D. Hogan, an aeronaut of considerable previous experience, made an ascent from Brooklyn in the air ship shown in the accompanying illustration. This air ship is the invention of Mr. Peter C. Campbell, of Brooklyn, and had as its most prominent feature an ovoid-shaped balloon, about sixty feet in length, made of fine Japanese silk, imported expressly for the work. Especial interest was felt in this ascension from the fact that it was claimed that the aeronaut would, with the various mechanisms provided, be able to control the movement of the balloon so as to practically navigate the air, moving in any direction with or against the wind, and at a greater or less elevation, as desired, an attainment which had, apparently, been achieved in some brief trials had last year at Coney Island.

The ascent was made from the works of the Nassau Gas Company, where a pipe from a large meter was connected with the balloon to supply the lifting power. The meter showed that 15,027 feet of gas was used, the balloon being filled at about 10 o'clock, when the ropes were tested and some sand bags attached to the network and placed in the car. Shortly after this Prof. Hogan entered the car and gave the word to "Let her go," when the ropes were cut and the air ship shot upward, amid the cheers of a crowd of spectators which had collected in the vicinity. The start was made in a southeasterly direction, owing to a brisk wind from the northwest, although the aeronaut was seen to be vigorously turning a crank which kept the steering apparatus and propelling wheels revolving rapidly, with the evident intention to compel the ship to face the wind. When about a mile distant, the large bottom wheel, intended to raise and lower the ship, became detached and fell to the ground. An hour after the start the air ship was seen to be under full way toward the Atlantic Ocean, on the south side of Long Island, and at an elevation estimated to be several thousand feet. The suspended car and attachments were reported to have had the appearance of being greatly disarranged, and it appeared as though a man was clinging to the netting of the balloon. At 12:30, or about two hours after starting, the air ship vanished from view. From this time the accounts of the voyage of the air ship are conflicting. A New York pilot boat reported sighting a big, yellow, oval-shaped balloon, dragging in the ocean, late in the afternoon of the 16th, 74 miles southeast of the eastern end of Long Island. Chase was given, but when within three-

(*Continued on page* 54.)



THE CAMPBELL DIRIGIBLE AIR SHIP RECENTLY LOST AT SEA.

LOSS OF THE CAMPBELL AIR SHIP.

(*Continued from first page.*)

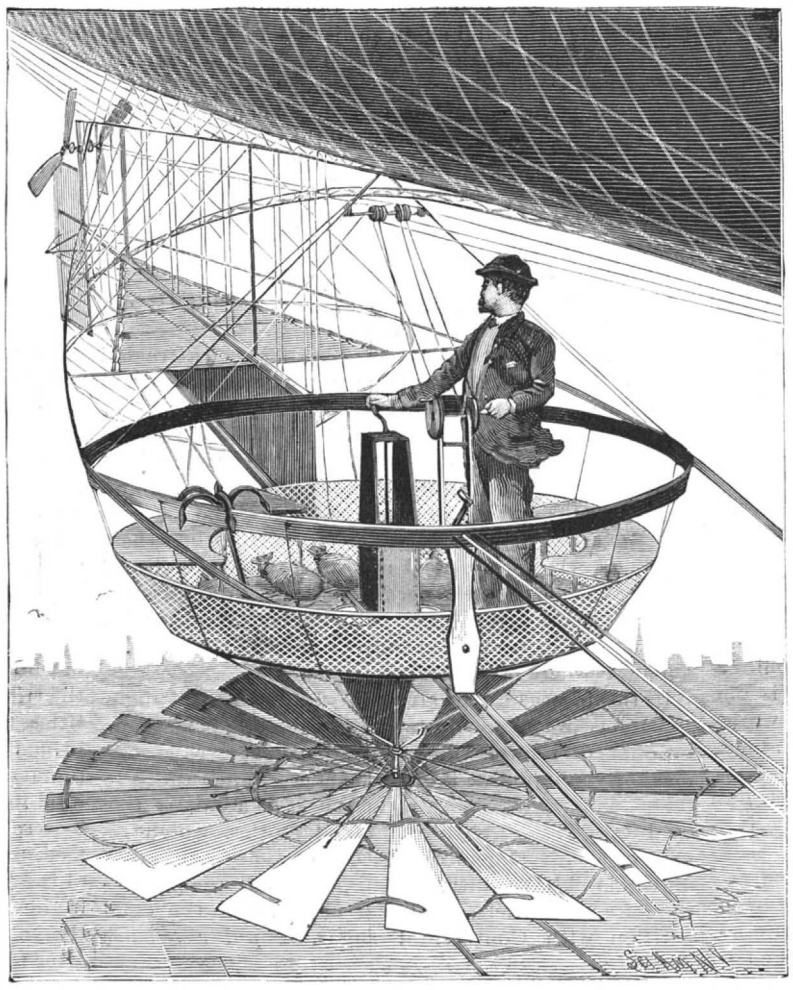
quarters of a mile the balloon broke away from the fastenings that were holding it down to the surface of the water and soared away to the southeast. The pilot boat found no trace of any car or any human being. There was also a report of an unknown balloon having been seen over Providence, R. I., on Tuesday evening, and a report that a balloon had been seen over Astoria, L. I., near where the air ship started, about midnight on Tuesday; but in neither case was there anything showing what had become of the aeronaut. Other indefinite reports mention a balloon having been seen at sea, but they are too vague to base any hope upon.

In the construction of this air ship the car is suspended from the balloon through an intermediate rigid bar extending over and from end to end of the car by means of suspending cords from the frame of the car to the bar, which are made fast also to the harness or netting of the balloon. The center of the car is circular in shape, and has a circular seat with arched guards reaching upward to the bar above. Extending fore and aft is a vertical keel, made of light framework, supporting a web of woven material. Nearly all of the framework of the car and its attachments was of wood and rattan, iron being very sparingly used, while the principal shafts and rods were hollow, and a thin fabric was used in the rudder and wings. The entire cost of the air ship is said to have been about $3,000.

Upon the two sides of the car are hinged wings so adjusted to the car as to allow a vertical movement at right angles, the position of these wings with regard to the horizontal plane being governed by guy or sheet ropes, one set of these ropes passing from the upper and the outer surface of the wings to the upper part of the arched guards and to the bar above, and the second set to the lower part of the car. Both fore and aft of the circular body of the car, and projecting laterally from the keel, are arranged triangular guide wings hinged to the keel, and normally standing out from it in a horizontal position, but capable of being swung downwardly with the upper part of the keel as an axis. At the forward end of the car and its keel is hinged a vertical rudder, after the manner of the rudder of a boat, but of a size to extend both above and below the body of the car. This rudder is controlled by a crosshead and tiller rope extending to the center of the car. At the rear end of the car, and with its axis in line with the axis of the car, is mounted a propelling wheel, the driving shaft of which is made to extend forward and into the center of the car, where it terminates in a crank by which the propelling wheel may be rotated. Beneath the car is a second propelling wheel, more especially designed to control the ascent and descent of the ship; it is mounted upon a vertical shaft extending upward through the bottom of the car, and also fitted with an operating crank.

It was the intention of the inventor that the balloon should be of such size, as compared with the weight of the car and its propelling and steering apparatus, that its buoyancy, when filled with gas, would just counteract or balance the force of gravity on the complete device, so that only a small power would be necessary to overturn this balance, and raise or lower the machine in the air. Between the bar and balloon, and attached to both, is a web to assist in guiding the machine when moving in a horizontal direction, after the manner of the keel of a boat. Two oars are also provided to facilitate landing, and they are made in fan shape, with long handles, to work against the air when but little power is needed. To assist in turning the ship around quickly a propeller is worked from the fore part of the car, and one at each end of the rigid bar. Two anchors are provided, one for each end of the keel, from which they are suspended by cords running over pulleys to the center of the car, where they are attached to a small windlass. All of the machinery is worked from the center of the car.

In the trial of the Campbell balloon at Coney Island last summer, it was apparently very easy to control and direct its course as desired. The balloon first ascended about three hundred feet, then was brought down to be photographed, afterward ascending to about five hundred feet, where it was brought to a standstill, then it was started on a short excursion and again brought back to the starting place, sailing part of the time nearly straight against a light wind. After this the balloon was propelled around very nearly in a circle, and seemed to be completely under the control of the aeronaut, Mr. James Allen, of Providence.



CAR OF CAMPBELL'S AIR SHIP.

The aeronaut, E. D. Hogan, was born in Canada in 1852, and at the age of 16 made his first balloon ascension at Jackson, Mich. It is said that he has made over 200 ascensions. Last year he was accustomed to ascend twice a week from Rockaway Beach to a height of some 5,000 feet, from whence he dropped to the ground by means of a parachute. Both the balloon and the parachute were made by himself, the balloon being inflated with hot air.

RECENT DISCOVERIES IN THE NEBULÆ BY MEANS OF PHOTOGRAPHY.

BY EDWARD S. HOLDEN, LL.D., DIRECTOR OF THE LICK OBSERVATORY.

It is not so long ago that it was pronounced to be "impossible" to photograph the nebulæ at all. The enormous improvement in the sensitiveness of photographic films within the past few years has permitted wonderful advances. Some of the results of such work are so recent that they are known only to the readers of scientific journals, and they are so important that I wish to exhibit them here to a wider circle.

The very first photograph of a nebula was taken in September, 1880, by the late Dr. Henry Draper, at his observatory at Hastings on the Hudson. In 1881 he obtained, with an exposure time of 104 minutes, a picture of the nebula of Orion which showed stars that were fainter than the faintest visible to the eye in his telescope (a refractor of 11 inches aperture, made by the Clarks, of Cambridge), and which displayed essentially all the details in the nebula which I had been able to make out with the much larger telescope at Washington (26 inches aperture). Moreover, my work at Washington required years, while his was done in one night. This photograph of Draper's led the way, and showed what might be expected from future work of the same sort. Draper's early death closed his series of studies in this path. His researches were taken up by Mr. Common, of London, who built a 3 foot reflector for the purpose, and who succeeded (in 1882) in making a magnificent picture of the *Orion* nebula.

Mr. Roberts, of Liverpool, using a reflector of 20 inches aperture (and of short focus), has made a series of pictures of this nebula also, which serves to show the law according to which it is built up. His series begins with a negative exposed for five seconds only. This exhibits the central bright stars of the nebula and a small portion of the brightest nebulosity. Successive pictures with exposures of 30, 60, 180, 360 seconds show more and more of the nebula itself, and the last one gives all of the object which can be seen in a powerful telescope.

Not only is everything visible, but it is permanently registered, and the six minutes of exposure have sufficed to make a map for which a year's work might be necessary if done with the eye alone.

Other photographs of 15, 30, 81, 210 minutes show more and more of the nebula and extend its limits over vast spaces.

The various photographs of the series, taken together, establish the order of brightness of the different parts of the nebula and give a set of lines of equal light by means of which its structure becomes more intelligible.

It is of Mr. Roberts' recent wonderful photographs of the nebula in *Andromeda* that I wish more particularly to speak. This great nebula is just visible to the naked eye and is mentioned in Sufi's Uranometry (about 900 A. D.) and is a well known object to possessors of small telescopes. Little was added to our knowledge of the nebula until Professor Bond at Harvard College observatory made a careful study of it in 1848. The nebula was shown to have an immense extent, and the most curious feature exhibited was the presence of two long straight vacant spaces or canals extending through most of the central portions. The work of Professor Bond was repeated with the same telescope about 1874 by M. Trouvelot, and his elaborate drawing is reproduced in our Fig. 1.

Fig. 1.—THE ANDROMEDA NEBULA. DRAWN BY L. TRØUVELOT (1874).

Little can be added by the eye to this splendid picture. Small details can be corrected, but it must be accepted as a substantially correct representation of what the eye sees with even a very large telescope.