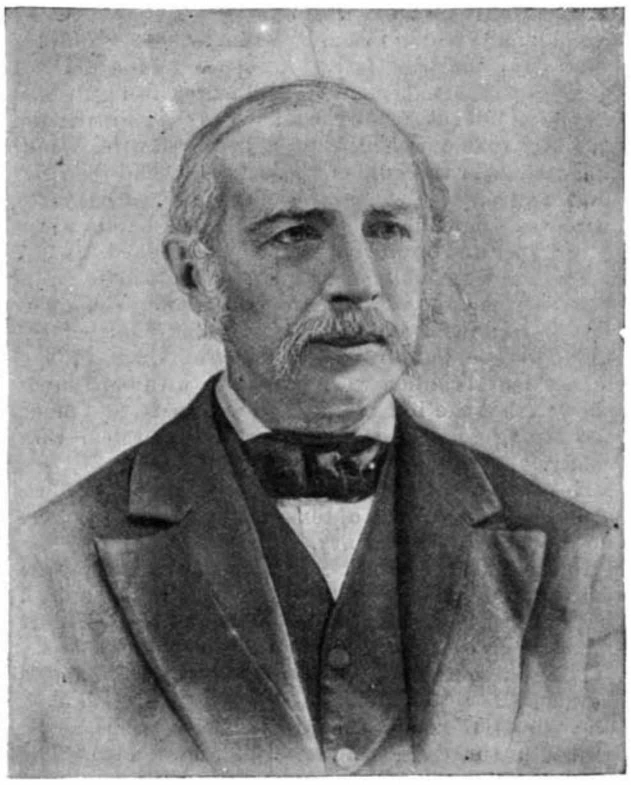
CHRISTIAN HENRY FREDERICK PETERS.

Professor Peters was born in Coldenbuttel, in the Duchy of Schleswig (then a dependency of Denmark), on September 19, 1813. He was educated at the University of Berlin, where, in 1836, he received the degree of doctor of philosophy, and then spent some time in study at Copenhagen. In 1838 he accompanied Baron Sartorius von Walthershausen to Sicily, where, until 1843, he was engaged in making a survey of Mount Etna. Owing to the death of Walthershausen, the survey was never finished, but the published results of the work are said to afford the most exhaustive description that has ever been given of any mountain. At the close of this work he was engaged at Naples on the topographical survey of the Sicilies, but soon retired to join the revolutionary forces. He served under Garibaldi, and was made major in the artillery for bravery on the field of battle. Twice he was severely wounded, and when the movement collapsed, a price was set upon his head by the government. He was obliged to live in the woods for weeks, with hardly any food and no shelter, to escape capture and execution. Eventually he escaped on a small brig to Turkey, and there devoted himself to the pursuit of his chosen science. A few years later he made the acquaintance of George P. Marsh, the United States minister in Constantinople, by whom he was persuaded to come to this country. His letters of indorsement from scientists abroad, including one from Von Humboldt, secured for him an appointment in 1853 in the United States Coast Survey, and at first he was stationed at the observatory in Cambridge, Mass., but later was assigned to work at the Dudley Observatory, in Albany, N. Y.

In 1858 he was called to Hamilton College as the first director of the Litchfield Observatory in Clinton, N. Y., and thereafter remained connected with that institution until his death. In 1867 Edwin C. Litchfield, of Brooklyn, N. Y., presented the college with the sum of $30,000 to endow a chair of astronomy, and Dr. Peters was at once chosen to that place.

Soon after his settling in Clinton he began that work with which his fame is so justly connected—the observation of the zone stars and placing them on charts. In this direction it is said that he accomplished more than any other astronomer. At the time of Herschel not over 20,000 stars were registered, and this number was increased to 50,000 by Lalande, while Dr. Peters proved and registered more than 112,000, including stars as minute as the thirteenth magnitude in his scheme. It was in prosecuting this work, which is his distinguishing contribution to astronomical science, that he also became famous as a discoverer of planetoids. While examining stars to determine their place, a strange star would be observed in the field, and which, if after-calculation confirmed the record that no star existed in that particular spot, would be reported as a newly discovered asteroid. Forty-eight of these discoveries are credited to Dr. Peters, which is a larger number than any other astronomer can claim. On the night of July 31, 1872, and again on the night of June 3, 1872, he discovered two of these planetoids. His last discovery was on the night of August 25, 1889, when he found asteroid No. 287. From his first computation it appeared that a portion of the new asteroid's orbit was within a portion of the orbit of Mars, and while subsequent calculations made this theory doubtful, still it is probably the nearest asteroid to the sun yet discovered. The largest number of these found by him in a single year (1879) was eight, and a computation of the aggregate surface of forty of them indicates an area of 266,978 square miles, or about that of the State of Texas. Dr. Peters fixed the locality of the zodiacal stars upon charts which give an accurate picture of the parts of the sky that they depict, and which will serve hereafter as a sure basis for studying changes in the heavens. Twenty of these, under the title of "Celestial Charts," were published by him, at his own expense, in 1884, and a second series was completed and ready for the press in 1888, but have not been published.

For ten years Dr. Peters made a daily observation of solar spots, making a record of nearly 14,000 spots, but he never published his results, which still remain in the safe of the Litchfield Observatory. Every observation has a drawing showing the position of the spot as proved by calculations at the time when seen. This work is believed by astronomers to have been the most valuable of his researches, especially since stellar photography makes easily possible the star charts upon which he spent so many years.



CHRISTIAN HENRY FREDERICK PETERS.

Under the auspices of the regents of the University of the State of New York he determined the longitude of several places in this State, including the western boundary. Dr. Peters had charge of a party that observed the solar eclipse of August 7, 1869, at Des Moines, Iowa, and in 1874 was chief of the expedition sent to New Zealand by the United States government to observe the transit of Venus on December 9 of that year. By means of double image micrometers he measured the apparent diameter of Venus, thus determining the real size of the planet with an error of probably not more than 1-300th part of its value, and also secured 237 photographs of that shy planet. Of his work at that time it was said: "There is no need of other observations. Dr. Peters has accomplished all that was to be done." He was less fortunate in the second transit of Venus, on December 5, 1882, for clouds hid the planet during the time when the observation had to be made; and likewise in 1883, during the occultation of Jupiter, a phenomenon of centuries, a similar fate befell him. But he accomplished much, and of him it has recently been said: "The reputation of this learned man fills the world, and not only that, but it is written upon the stars themselves."

An unfortunate controversy marred the last two years of his career. He sought the aid of Chas. A. Borst, in the preparation of a "Star Catalogue," and the latter, with his sisters, spent several years in computing the results, also aiding in the researches necessary to its completion. Ultimately Mr. Borst claimed that the work was his own, and in that opinion he was sustained by several distinguished authorities, including Simon Newcomb and Asaph Hall, of the U S. Naval Observatory in Washington, D. C. The case went before the courts, and a decision was rendered awarding the "Star Catalogue" to Dr. Peters as being his property, with interest on its value, and six cents damages to carry costs. It is understood that an appeal will be taken against this decision by Mr. Borst.

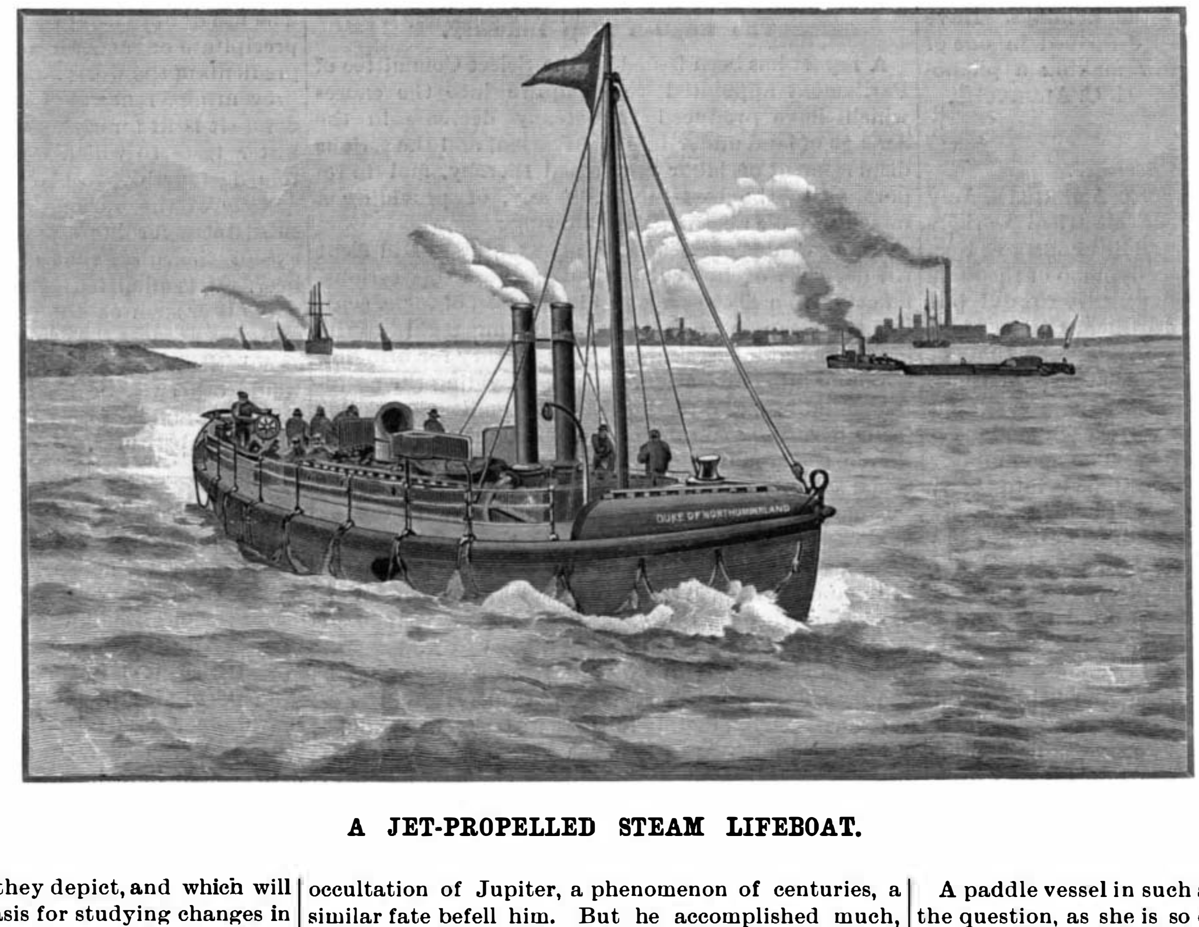
Dr. Peters was a member of both foreign and American scientific societies, and in 1876 was elected to the National Academy of Sciences. He attended the International Congress of Astronomers, held in Paris during April, 1887, under the auspices of the French Academy of Sciences, and at that time was made a chevalier of the Legion of Honor by the French government. The results of his researches were published in various scientific journals, but chiefly in the *Astronomische Nachrichten.*

Although a specialist, Dr. Peters was learned in many branches of science, and was a linguist of rare ability. This knowledge made him a favorite at social gatherings. He never married, and his habits were simple to the extreme. Among the students he was known as "Twinkle," but he was a strict disciplinarian, and always demanded that the dignity of his office be respected.

On Friday, July 18, he asked the college janitor to arrange the college astronomical apparatus so that he might make some observations during the evening. The next morning they found him seated on the stone steps leading to Hungerford Hall, where his apartments were. In the night death had come to him, and when daylight broke his soul was far away in the heavens among, those starry bodies whose study had ever been his constant delight while he was on earth.

A JET-PROPELLED STEAM LIFEBOAT.

The Royal National Lifeboat Institution, after many years of effort, has at length succeeded in obtaining a lifeboat which may be mechanically propelled. At the beginning of 1888 a proposal for a steam lifeboat was submitted to the Institution by Messrs. R. & H. Green, well known shipbuilders at Blackwall, which, having passed through various modifications as the result of consultation with the committee and their professional officers, was accepted by the Institution, and a steam lifeboat, constructed of steel and propelled by a turbine wheel, has now been completed. Such a boat, if successful, will necessarily only be able to be used at a limited number of stations. Our engraving is from the *Illustrated London News*, and the accompanying particulars from the London *Graphic.* The details of this novel lifeboat, which has been named the Duke of Northumberland, and is to be stationed for the present at Harwich, are as follows:



A JET-PROPELLED STEAM LIFEBOAT.

Length, 50 feet; beam, moulded, 12 feet; breadth, extreme, 14 feet 3¾ inches; draught, loaded (extreme) with 3 tons of coal, 30 passengers, 9 crew, and full outfit, 3 feet 3 inches; displacement at this draught 21 tons; indicated horse power, 170. The propulsion is effected by a jet of water which issues from the stern, and which is impelled by a turbine wheel or pump.

It may be interesting to state the reasons for the decision given in favor of a hydraulic boat, as on the mere face of it the waste of power would appear to be a serious objection. This, however, is not really the case if the principle is compared with other methods of propulsion, and, as a matter of fact, there is no other possible way of accomplishing the task.

A paddle vessel in such a service is, of course, out of the question, as she is so easily disabled by the slightest obstacle, and under no circumstances could she be used as a sailing vessel.

A screw propeller in smooth water is the most efficient way of absorbing the power developed, but in heavy seas it would be continually out of the water, and half the time practically useless, to say nothing of the danger involved, for it must be remembered that the racing of the propeller is a most frequent source of danger in a screw engine, besides the risk of breaking the main shaft and consequent total disablement of the boat. Further, there is continual risk of fouling the screw with wreckage, or breaking it when taking the ground, and, lastly, the auxiliary power derived from the sails would be greatly reduced by the dragging of the screw propeller through the water.

Therefore both these types of steam vessels, admirable as they are in their own particular spheres, must be always impracticable for lifeboat service, and having this in view, it was considered that the hydraulic principle alone remained. This type, therefore, having been finally adopted, it only remained to fit the machinery into a vessel sufficiently strong, light, seaworthy, handy, and fast. Neither time, pains, nor expense was spared in order to obtain a boat with the greatest possible strength compatible with lightness. The very best steel procurable was employed in her construction, having been first submitted to the severest cold tests. The riveting is a special feature, being far in excess of that usually employed in torpedo boats and similar vessels. This is attested by the fact that in this little vessel, only 50 feet in length, there are no less than 72,000 rivets, exclusive of screw bolts and fastenings in connection with the machinery. The strength and seaworthiness is further amplified by a complete system of subdivision of longitudinal and transverse watertight bulkheads, giving in all fifteen watertight compartments, each of which can be rapidly drained by bilge pumps and steam ejectors.

Great attention was paid to insure stability, and several tests were made, one being of a very practical nature. All the weights were placed on board, and a heavy parbuckle was passed completely round the vessel. The end of this was fastened to a powerful steam crane furnished with a dynamometer, and the boat was then inclined until she lay entirely on her beam ends. In this position lack of stability would have been apparent by her turning completely over, which she was quite free to do, but so confident were the designers of the accuracy of their calculations (which showed that the boat possessed righting powers to 110°), that two members of the firm of contractors remained on board during the whole experiment.

The well, perhaps the most important feature to a shipwrecked crew, is capable of comfortably accommodating thirty passengers, and is situated abaft the machinery space. The bottom and sides of this well are furnished with ten large freeing valves, which will promptly clear it of water in the event of its being flooded. It is surrounded by substantial teak lockers, forming seats, and its deck is covered with teak gratings. Under this deck are two water tanks, holding one ton each, and which represent the weight of a shipwrecked crew. When leaving for a wreck they will be full, but on returning the water can be pumped out if necessary by the donkey engine.

A number of visitors, among whom were Mr. Charles Dibdin, the secretary of the Lifeboat Institution, and Capt. the Hon. H. W. Chetwynd, R. N., Chief Inspector of Lifeboats, recently made a trip from Blackwall in the new boat, with a view to inspecting her capabilities. The measured mile sea trials gave a mean speed of 8·424 knots. Tests were also made with her maneuvering power, which proved to be remarkably good, both by rudder and turbine. Going at full speed, she made with rudder a half circle in thirty-five seconds, and the full circle in fifty seconds. Going slowly, with rudder and turbine, she made the full circle in forty seconds, and with turbine alone in fifty-two seconds. By working the levers on deck the boat was brought from full speed to a dead stop in thirty-two seconds, and from a dead stop to full speed in four seconds.

These tests, which were conducted with the greatest accuracy, proved conclusively how entirely the vessel is under the control of the officer on deck, without necessitating any communication with the engine room.

THE ELECTRIC RACE COURSE.

Whatever may be the opinion that is held as to horse races and their moral influence, it is none the less certain that they offer an irresistible attraction to a large number of persons, and that this growing passion prevails equally in all the degrees of the social scale. Bold innovators have seen a vein to be exploited in the racing mania, and the game of the miniature horse race, an always popular pastime at bathing resorts, is only one of the more happy forms given to true races with a view of prolonging the excitement of betting, of the unexpected, and of chance, at times when genuine racing could be done only with difficulty and would attract too small a number of persons. The electric race course that we are now going to present to our readers occupies a place just between genuine races and the miniature horse race. It is, in fact, a happy alliance of genuine races, the game just mentioned, hobby horses and electricity. Taken as whole, it consists of a certain number of hobby horses, half natural size, each moving over a circular track under the influence of an individual motor and receiving the current of a single generator, but in an independent manner, thus securing a perfect autonomy to each courser, qualified, moreover, by the surveillance of the electrician who directs the steeds and makes a sort of despotic anarchy of them. The horses are ridden by children and even by grown persons, and it is in this that they resemble hobby horses, although the possibility of imparting different speeds to them permits of their being passed by competitors and of passing the latter in turn, thus increasing the excitement of the riders. Bets may be made, of which the chances are just as certain as those of the play of odd and even upon the numbers of the hacks traversing the boulevards.

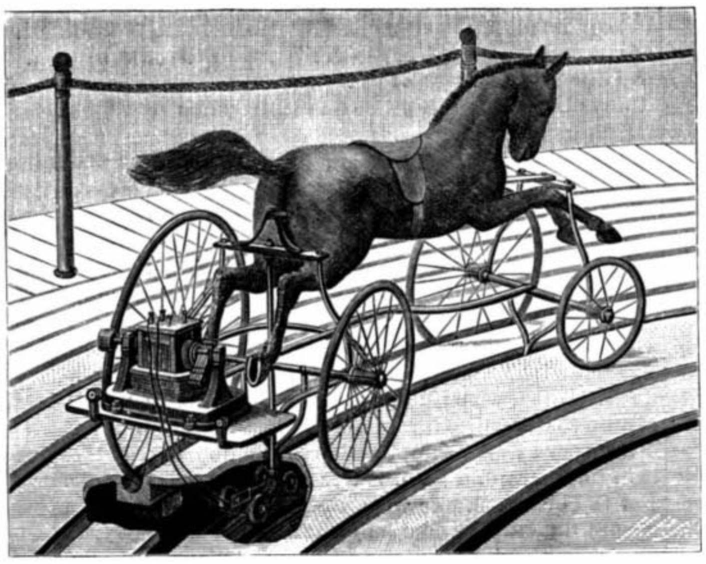


Fig. 2.—MECHANICAL HORSE.

Mr. Salle's race course constitutes an interesting application of the carriage and of the distribution of motive power by continuous currents. The installation realized at Nice (shown in Fig. 1) comprises a 12 horse power gas engine that actuates a Rechniewsky dynamo with double winding, which sends the current into six electric motors of a power of 1,000 watts each, mounted in derivation upon the machine and setting in motion a horse on wheels whose speed, starting and stopping, is, for each one, entirely independent of all the others.

About the motor and dynamo there is nothing peculiar. The electric motor—a dynamo of small size—is arranged behind each horse (Fig. 2). When the circuit of the dynamo is closed, all the horses start at once and take on relative speeds that are so much the greater in proportion as the circle upon which they are placed has a greater radius. The speed of each horse, moreover, can be regulated at will by means of a rheostat interposed in its particular circuit. An interrupter permits of stopping any horse whatever without interrupting the movement of all the others. All the motions are controlled from the post of the electrician, who, standing upon a lateral stage, overlooks the entire track, and can watch and regulate what takes place upon it, for, upon a horizontally arranged board, he has all the maneuvering pieces necessary for the play. These pieces are, in the first place, a main commutator that cuts the circuit from all the horses at once, then six individual commutators for each of the horses, six rheostats interposed in the respective circuits of the six motors and permitting of regulating the angular speeds of each horse, and finally an exciting rheostat of the dynamo machine that permits of varying the speeds of all the motors at once in the same ratio.

It is, therefore, possible, by maneuvering these different pieces, to regulate the general or particular gait of each horse, and to stop any one of the horses almost instantly if an obstacle falls upon the track or if one of the riders becomes suddenly indisposed.

The driving of the motive wheel by the motor is done by direct contact. To this effect the large wheel is provided with a rubber tire, against which the pulley of the motor bears. The friction thus obtained is sufficient to carry along the vehicle, which, with the rider, weighs a little less than 650 lb. The mean speed is 13 feet per second, but the horses placed at the circumference can obtain a speed of 16 or 18 feet, a velocity that is not prudent to exceed, nor even reach, on account of the difficulty the rider would have in holding himself in equilibrium and the feeling of dizziness that he might experience.

The vehicle upon which each horse is mounted merits special mention, because of the arrangements made to prevent upsetting. Each of the four wheels has a different diameter. Their two axles converge toward the center of the circular track upon which each horse moves, and the axis inclines toward the center.

Each pair of wheels, therefore, constitutes a true rolling cone whose apex passes through the central point of the track situated upon the horizontal rolling plane. The inequality of the wheels naturally makes it necessary to employ but a single driving wheel, and to mount the four wheels loose upon the axles. Owing to these arrangements no tendency to derailment has shown itself, even with speeds of 22 or 16 feet per second upon curves of 13 feet radius.

Fig. 1.—ELECTRIC RACE COURSE AT NICE.

Two small rollers placed upon the track tend to prevent an upsetting under the action of a lateral thrust or a strong impulsion. The track consists of a single tram rail, with which engage the two external wheels. This rail serves as a guide and suffices to prevent derailment. The current is led to each motor by two rollers moving over two circular metallic bands in direct communication with the poles of the dynamo, through the intermedium of the maneuvering board, thus permitting of varying the speed of each of the horses, and even of stopping the latter by interrupting the circuit.

In a course organized with a view to betting, we proceed as in the miniature horse race. The six racers having been started at full speed, the current is suppressed from all the horses at the same instant. They continue to roll by virtue of the velocity acquired, and stop successively in variable positions on the course. It is the horse that stops nearest the goal, but does not get beyond it, that wins the race.

Such are the principal arrangements of the electric race course that was operated at Nice last winter. Mr. Salle, in the presence of the success obtained, is con-