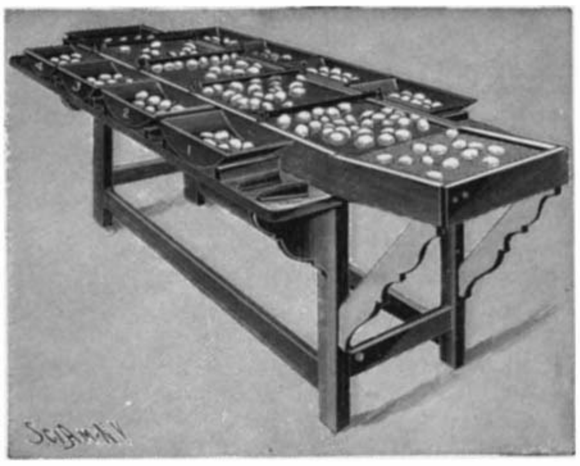
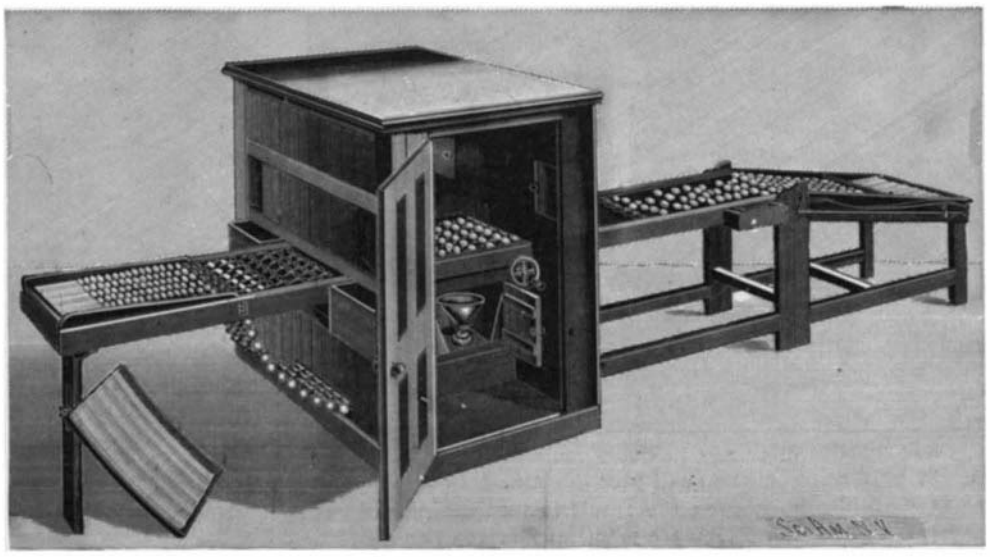
THE EXAMINATION AND SORTING OF EGGS.

The egg is to the kitchen what verbs are to speech. It is the necessary adjunct of the majority of sauces, of all thin stews, and of a large number of side dishes. It is, in addition, a nutritious food that passes through the digestive tracts without fatiguing them, and that becomes assimilated in our organism without leaving any residue therein. It contains within itself all the elements of our meals and constitutes a true bill of fare in miniature, in which bread and cakes are represented by the glucose and extractive matters, in which the albumen takes the place of a roast, in which butter abounds in the form of fatty matter, in which the chlorides, lime, magnesia and iron are not wanting, and in which occur in small quantities the lecithine and phosphates that concur in the development of the bones. It is, upon the whole, a complete aliment which, like milk—and, in many respects, like the grape—affords, without resistance to digestive action, the materials that enter into the composition of the blood.

The newly-laid egg is entirely filled with yolk and white enveloped by a fragile shell. It is at this moment that it possesses its highest alimentary qualities. These it would be capable of preserving indefinitely, if the tightness of the shell equaled that of a metallic box. But, unfortunately, such is not the case. The calcareous shell is provided with pores, through which is soon established a cross circulation of water and microbes. The water leaves the albumen and passes to the exterior in the form of vapor, while legions of bacteria enter and fill the air chamber formed by evaporation. This latter causes the egg daily to lose, on an average, half a grain of its weight. We can assure ourselves of this by immersing it in a quart of water containing four ounces of salt. On the first day, it will descend to the bottom; on the second it will not sink to so great a depth; on the third, it will remain near the surface; and, beginning with the fifth, it will project above the surface so much the more in proportion as it is older. Such behavior of the egg in salt water may, up to a certain point, be used as a means of control. The loss of weight would not be of so much importance if it did not keep pace with the entrance of microbes. Now, it is precisely the injurious action of the latter that restricts our consumption of so valuable a food material. Many people, not very sure of the age of the eggs exposed for sale by grocers, prefer to do without them rather than run the risk of being deceived in their purchase. The egg trade, as it is carried on to-day, especially in France, leaves much to be desired. The production of eggs, too, is, as a general thing, the result of chance. Upon farms, hens lay just about as they please, and the person who derives the greatest advantage therefrom is not the farmer, but the egg collector—an individual who leads a nomad life and who makes a business of profiting by the labor of others. In his daily travels among the farms, he collects the eggs in small quantities and then unites the products of his peregrinations and ships them to the agent of a central market. Many of these markets, in turn, make shipments to Paris. In the Central Halles of Paris the newly received eggs are at once examined by transparency. This operation is performed by a corporation of ninety-two examiners, with a foreman and several assistants. The function of these men, who are placed under oath, consists in examining the eggs in the cellars of the Halles, one by one, through the transparent light of a lamp, in order to separate the bad from the good ones. For counting and examining 1,000 eggs they receive 17 cents. It will be seen that the route followed by the egg from the farm to the market is not very direct. And yet, how much money would be made and how great services would be rendered, should small and large producers group their merchandise and send it directly and regularly to the large centers.



APPARATUS FOR CLASSIFYING EGGS.



APPARATUS FOR EXAMINING EGGS.

The benefits of co-operation applied to the egg trade appear in a striking manner in the results obtained in Denmark. The Danish producers have founded everywhere throughout the country co-operative associations that propose to furnish fresh eggs, of good quality, for exportation. The majority of the producers are enrolled therein. Regulations of remarkable ingenuity assure the regularity of the operation of such associations. For example, in order to ascertain by what member a bad egg has been delivered, it is required that the shell of every egg shall bear the name of the producer marked with a rubber stamp. Large numbers of depots are established near the railways, and to these every producer is obliged to bring his eggs at least three times a week. The deliveries at each depot are controlled by a special employe, who has the right to refuse eggs that are several days old. The others are classified according to their size. This double operation of examination and classification is effected automatically by means of a very ingenious apparatus, which consists of a dark chamber for the examination by transparency, and a long table provided with bars for the classification.

An endless, jointed, metallic belt carries the eggs in the first place into the dark chamber, where they are examined by means of a lamp, and then to the table, where they are classified. With this apparatus five girls can classify and pack 12 cases of 100 eggs in 13 minutes. The English have improved this machine by separating the examination from the classification. The first is effected in the box shown in the figure. The eggs, placed in a slightly inclined receptacle, enter cups jointed to the endless belt. This latter, in carrying them into the boxes, gives them a rotary motion. The belt is actuated by a small handwheel placed to the right of the examiner. To the left of the latter there is a drawer designed for the reception of the defective eggs. Owing to such an arrangement, the eggs are examined very rapidly.

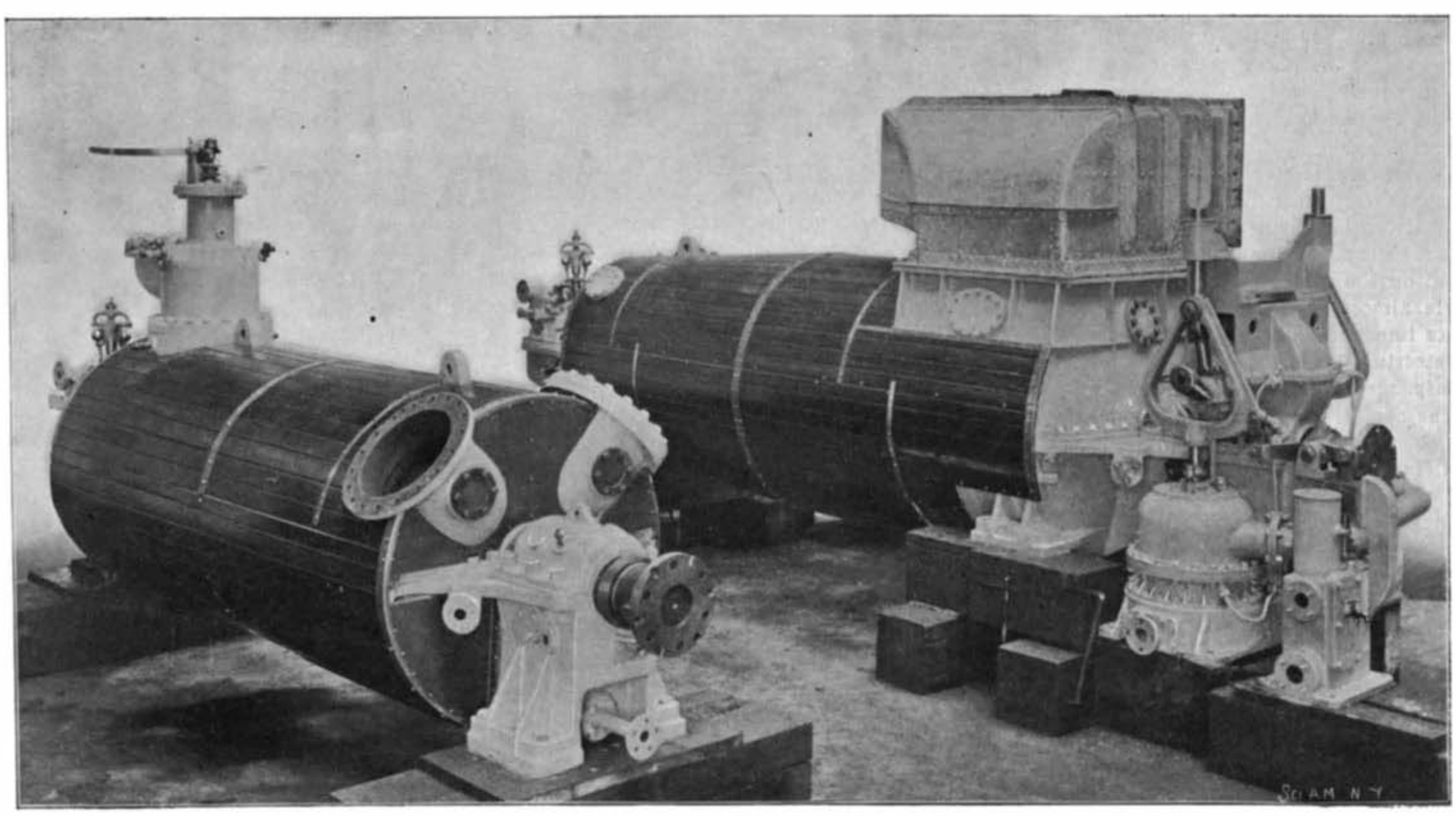
The operator, instead of examining the eggs one by one through the light, has merely to cast a glance at the rows that are passing over a lamp, in order to eliminate the bad ones and leave the others. The belt, continuing its motion, leaves the box with the examined eggs, and discharges the latter on the other side of a long inclined table.

The classifying apparatus is very simple. It consists of an inclined table, one of the extremities of which has a certain length of its surface covered with felt. It is here that the eggs are deposited, to be afterward slid over the glass surface of the table. The latter is provided here and there with parallel bars that arrest the different sized eggs upon their passage. The girls who slide the eggs over the table remove those that lodge between the bars and place them in special receptacles that flank each of these spaces. The manufacturers of the new apparatus claim that four girls can classify and pack with it 1,440 eggs in 10 minutes.

The Danish depositories provided with such apparatus are capable of rapidly and surely inspecting the eggs that are brought to them by producers and of shipping only fresh and perfect ones to London. They are, moreover, held responsible to the consumer and are heavily fined in case of shipment of defective eggs. The English highly appreciate the results of a so well-appointed organization. The Danish shipments to London are daily increasing, especially to the Aerated Bread Company, which has more than four hundred creamery establishments in the English capital.—For the above particulars and the engravings, we are indebted to La Nature.

THE TURBINE ENGINES OF THE "KING EDWARD."

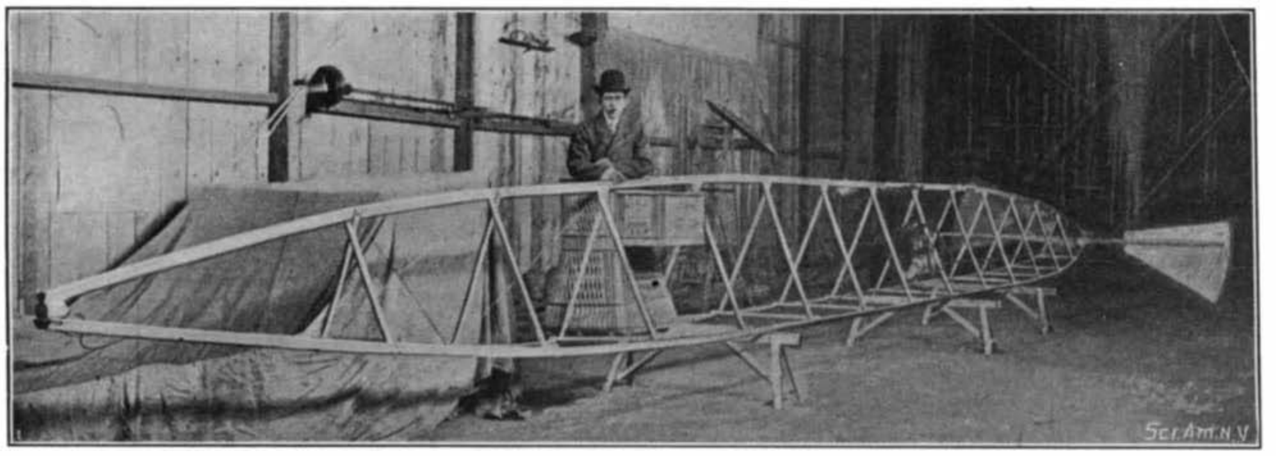
The success of the turbine-propelled passenger steamer "King Edward," which on its trial trip achieved a speed of 20.5 knots an hour marks another step in the development of this most efficient form of steam motor. Although the practicability of driving a passenger ship successfully and economically by the steam turbine was a foregone conclusion in the minds of those who have any knowledge of naval architecture and steam engineering, it cannot be denied that the success of the "King Edward" will have an important effect in the great world



THE HIGH PRESSURE, AND ONE OF THE LOW PRESSURE TURBO-MOTORS OF THE "KING EDWARD."

of finance, which, after all, has the last word on the question as to whether an invention shall become a great commercial success.

Messrs. C. A. Parsons commenced the manufacture of steam turbines some sixteen years ago, and in the interim they have applied them with the greatest success as a steam-drive for electrical generators. At the present time the turbines installed in electrical work represent an aggregate of between 140,000 and 150,000 horse power.

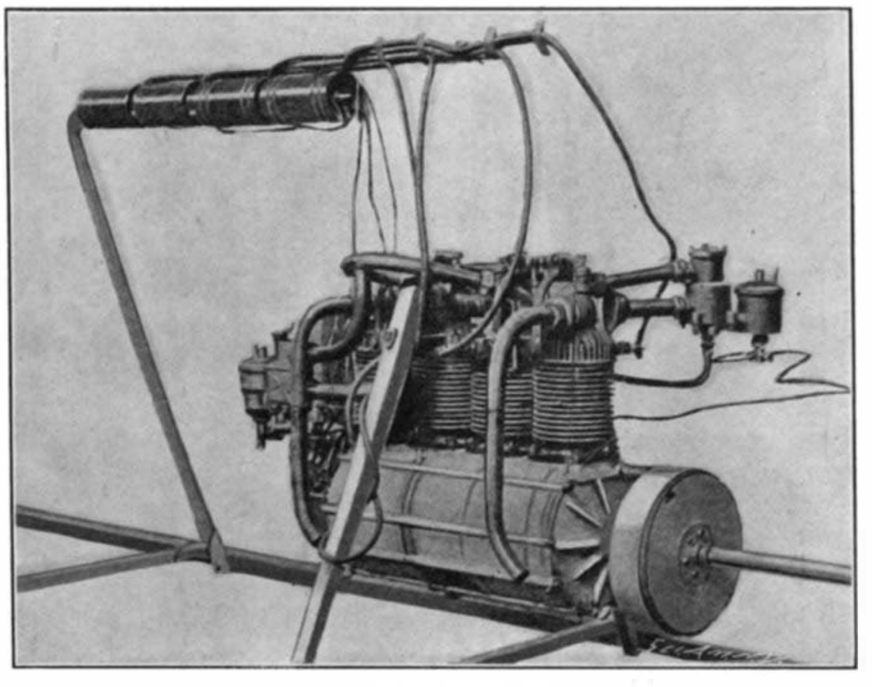


THE FRAME OF THE "SANTOS-DUMONT," SHOWING THE HELIX AND THE BASKET CAR.

The successes achieved by the steam turbine ashore have been repeated afloat, the fastest steam-driven vessels in the world being propelled by Parsons' turbines. In 1897, the "Turbinia," a 40-ton yacht, made a speed on her trial trip of 34½ knots an hour, and later the "Viper," a 370-ton torpedo boat, maintained a mean speed of 36.58 knots an hour during a one-hour trial under English Admiralty conditions of weights and measurement. During these trials the "Viper" showed a coal consumption, per indicated horse power, which was within the guarantees of the contract. The economical operation shown by some of the larger turbines is truly extraordinary, and altogether surpasses the best results achieved by reciprocating engines. The largest size turbines yet constructed are two of 1,000 kilowatts output, built for the municipality of Elberfeld, Germany. During a test by Profs. Schroter and Weber, at an overload of 1,200 kilowatts, a full steam pressure of 130 pounds at the engine, and 10 deg. C. of superheat, the engine driving its own air pumps, the consumption of steam was ascertained to be at the rate of 18.8 pounds per kilowatt-hour. Comparing this result with the best results obtained with reciprocating engines, and taking the highest record of ratio of electrical output to the power indicated at the steam engine, namely 85 per cent, the figure of 18.8 pounds per kilowatt in the turbine plant is equivalent to a consumption of 11.9 pounds per indicated horse power per hour. Although such high efficiency is not to be expected in a marine plant, there is no doubt that the turbines of the "King Edward" will show a great advantage over marine engines of the same power.

As we have recently illustrated and described the "King Edward," we will merely reiterate her general features. She is 250 feet long, 30 feet wide, and her molded depth is 10 feet 6 inches to the main deck. The propelling machinery, of which we present photographic illustrations (the photographs being taken while the motors were in the erecting shop), consists of three steam turbines working compound. They are placed in the ship side by side, and each operates a separate shaft. The center is the high-pressure, and the two on the outside are the low-pressure turbines. Steam is admitted first to the high-pressure, where it is expanded five-fold. Then it enters the two low-pressure turbines, where it expands twenty-five-fold, the exhaust passing directly to the condensers. The total ratio of expansion, it will be seen, is 125-fold. In addition to the low-pressure turbines on the two outer or wing shafts, there are additional turbines, placed inside the exhaust ends of the low-pressure turbines, which are used in going astern. There are in all five propellers—one upon the center high-pressure turbine shaft, and two upon each of the outer low-pressure shafts, the outer shafts being used in going astern. The feed pumps are driven by separate engines, as are also the forced draft fan and the circulating pumps for the condenser. The main air pumps are worked by means of worm-gearing from the wing, or outer, shafts, the details of one of these pumps being shown very clearly in our illustration. In addition, there are auxiliary air pumps which are driven by the circulating pump engines. These are used for emptying the condensers of water when they are not in operation. The boilers are double-ended, of the return-tube type, with four furnaces at each end.

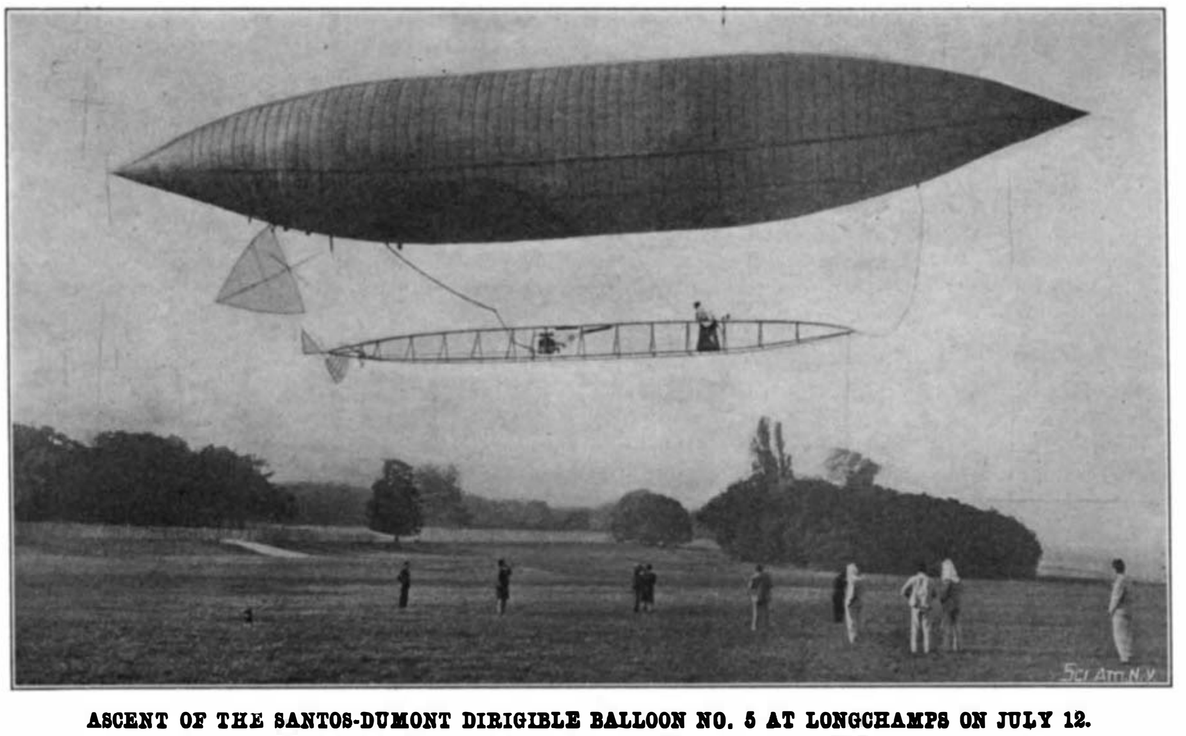
The motors, the condensers full of water, the steam pipes, the auxiliaries, the shaft, propellers, etc., weigh altogether 66 tons; and as the indicated horse power on the trial trip is estimated to have been 3,500, it will be seen that the engines compare favorably with engines of the standard reciprocating type. They are exceedingly light for the power they develop, the weight per indicated horse power being only about half that which is common to the engines of the paddle boats which are ordinarily used in the service for which the "King Edward" has been designed. On the trial of the "King Edward" on the Firth of Clyde, a speed of 20.5 knots an hour was registered as the mean of several runs over a measured mile. The mean revolutions were 740 per minute, the boiler pressure 150 pounds to the square inch, and vacuum 26½ inches, the pressure in the stokehole being equal to one inch of water. The new vessel is considerably faster than any of the river steamers of her class engaged in the same work, her speed exceeding that of her competitors by about one and a half knots per hour.



THE 16 HORSE POWER FOUR-CYLINDER SANTOS-DUMONT MOTOR.

THE SANTOS-DUMONT BALLOON.

The balloon of M. Santos-Dumont, which made a successful trip across Paris, as recorded in the SCIENTIFIC AMERICAN for July 27, is the fifth which he has built, and we are now enabled to give some detailed views of this remarkable airship. The balloon proper is cylindrical and is covered with silk, its extremities being pointed. It is 111 feet long, and its cubical capacity is 19,300 feet. Suspended by piano wire some 35 or 40 feet below the balloon is a light framework whose profile very much resembles that of the balloon proper. The framework is triangular in section, and is formed of three long pieces of wood, secured at the end and strengthened by cross-bracing and steel wires. This framework supports a four-cylinder, sixteen horse power motor of the Dion-Bouton type, the fuel reservoir, the shaft and the propeller. The engine is placed well toward one end, and the aeronaut rides in a light basket at the other end. Here he has under his control all of the machinery for maneuvering the balloon, also the ballast and the guide-ropes. The respective positions of the various weights were determined after many experiments, and its equilibrium is perfect. This assures its horizontality and an equal tension on the suspenders. This explains why the aeronaut is so far separated from his motor. The propeller, 14 feet in diameter, is composed of two vanes of wood and steel, covered with silk and highly varnished; it attains a speed of 150 turns a minute. The steering device is of silk and is placed between the balloon and the framework above the propeller. The balloon is inflated with hydrogen, and in order to maintain at all times a tension on the envelope—that is to say, perfect inflation—a compensating balloon filled with air is placed in the interior. This is inflated automatically, as required, by a small compressor actuated by the motor, the air being conducted to it by tubing. A guide-rope is suspended under the framework, and with its aid the necessary inclination is obtained to effect the movements of ascent and descent. Such, in brief, is the apparatus and method employed by M. Santos-Dumont. After his slight mishap on the day of his remarkable trip on the 13th of July, M. Santos-Dumont repaired the damage, and on July 29 he made another ascent. He had arranged to make his promised trip over Paris in the afternoon, but was obliged to abandon the idea, as he found that the motor was working badly. In order, however, not to disappoint the numerous visitors to St. Cloud, he gave a maneuvering exhibition over the Bois de Boulogne. Several ascents were made, and the guide-rope frequently caught in the trees, but it was released without any harm being done. The visitors were all astonished at the marvelous control the inventor had over the balloon. The motor is still giving him trouble, and on his last trip the screw was frequently at a standstill. The balloon's great size and the absence of landing platforms help to make the ascents and descents diffi-



ASCENT OF THE SANTOS-DUMONT DIRIGIBLE BALLOON NO. 5 AT LONGCHAMPS ON JULY 12.