THE NEW AIR SHIP OF M. DE SANTOS DUMONT.

BY FRANCIS P. MANN.

M. de Santos Dumont recently finished the new air ship with which he is to compete for the Aero Club prize of 200,000 francs offered by M. Henry Deutsch, of Paris. It will be remembered that according to the conditions of the prize, aeronauts are to start from the grounds of the Aero Club in the Bois de Boulogne, and take their balloons around the Eiffel Tower, returning to the starting point within half an hour. The new air ship as it appears completed is represented in the illustrations; the gasoline motor is seen in front, as well as the gearing by which it drives the shaft of the screw. The aeronaut sits in the saddle and starts the motor by means of a pedal and chain gear, as in the case of a motor cycle. The upper cylinder contains the gasoline for the motor, and in the lower is a reservoir of water which is used as ballast. The capacity of the balloon is 334 cubic meters (11,795·21 cubic feet) and the motor gives 10 horse power. The surface of the balloon is 292 square meters (3141·9 square feet) and its total length 28½ meters (193·48 feet) with 5·6 meters (18·368 feet) diameter at the middle, giving thus a cross sectional area of 24 square meters (238·24 square feet). The mechanism is suspended 5·3 meters (17·384 feet) below the center of the balloon. Japanese silk is used in the construction of the balloon, which weighs 57 kilogrammes (125·4 pounds) including the weight of the inner air chamber, which has a volume of 35 cubic meters (1236·025 cubic feet). The weight of the ropes, etc., including the guide rope, is 6 kilogrammes 13 pounds), and that of the mechanism 160 kilogrammes (352 pounds). The screw is made of aluminium and steel, covered with silk to enable it to cut the air with the best effect; it weighs 27 kilogrammes (59·4 pounds), and makes 180 revolutions per minute. At the rear of the balloon will be noticed the rudder, which has a surface of 6½ square meters (70 square feet); and is operated by ropes from the car. At the top of the balloon is a valve having a diameter of 40 centimeters (15·6 inches) which is used for the escape of the hydrogen; below are two automatic valves which permit the escape of the hydrogen at pressures of 18 and 15 millimeters (0·7 and 0 58 inch) of water. The inner air chamber is used to preserve the shape of the balloon by compensating for the escape of hydrogen; it has an automatic valve which allows the air to escape at a pressure of 9 millimeters (0·35 inch) of water; it is filled by a rotary pump, which drives air into it as the hydrogen in the outer chamber escapes. The pump is connected with the motor and has a capacity of 3 cubic meters (105·45 cubic feet) per minute, at a speed of 3,000 revolutions.

The motor is of the two-cylinder type, somewhat the same as is used on gasoline motor cycles; the spark for ignition is produced by an induction coil. The motor gives 1,500 revolutions per minute, and this speed is reduced by gearing connected with the shaft of the screw. The illustration shows M. de Santos Dumont mounted upon the saddle; he uses his feet to start the motor and also to work the guide-rope and the weights used to balance the air ship and to cause it to ascend or descend; the hands are thus left free for the other manipulations. The envelop is constructed of Japanese silk, and varnished by a special process. The experience of M. de Santos Dumont with his previous air ship led him to prefer this to all other coverings on account of its uniform structure.

A number of different types of air ships have been constructed before reaching the present model; the last type was somewhat larger, the balloon having 500 cubic meters (17,667·5 cubic feet), while the present balloon has but 334 cubic meters (11,795·21 cubic feet); this reduction in size is due to the fact that the former was inflated with illuminating gas, but in the latter hydrogen is used, which has a greater lifting power. In the former air ship a 3 horse power motor was used, with a speed of 8 miles per hour; the present motor, of 10 horse power, gives a speed of 20 miles per hour. The weight of the present air ship, including the aeronaut, is 350 kilogrammes (770 pounds), that of the former being 250 kilogrammes (550 pounds).

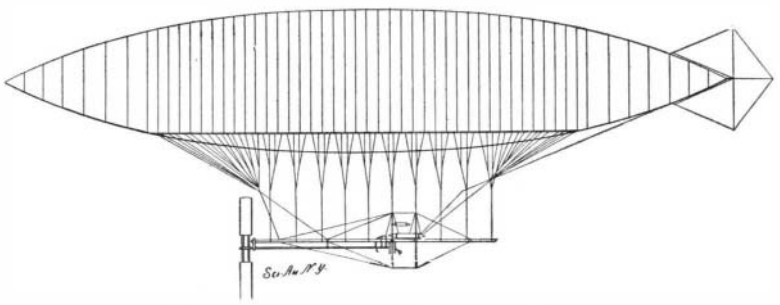
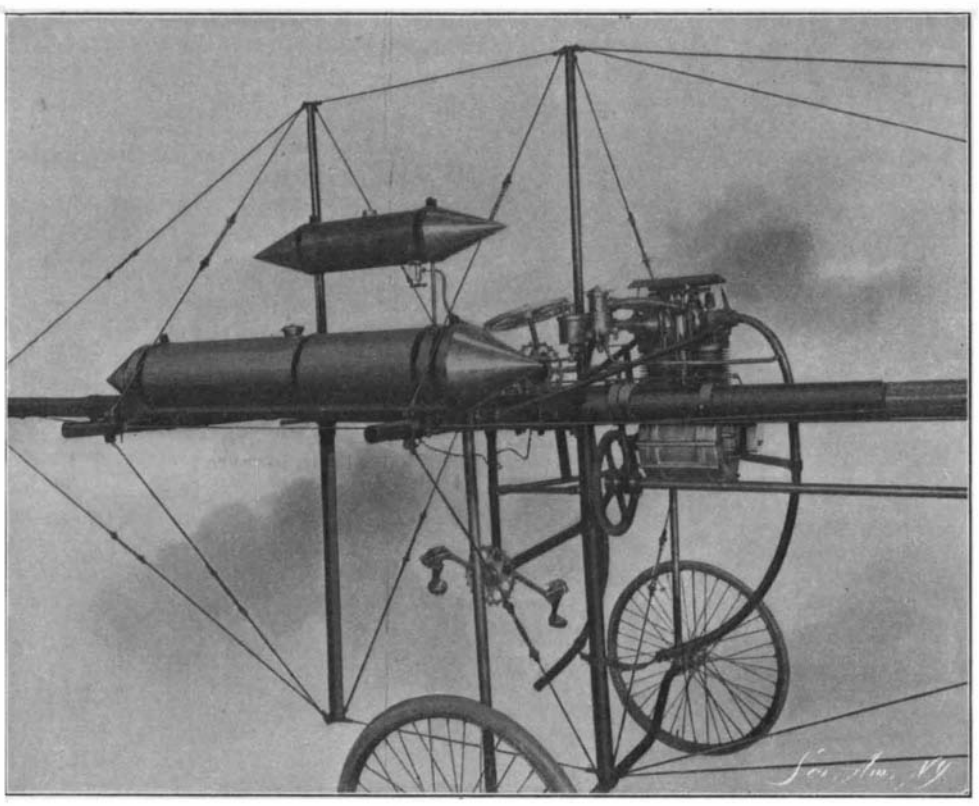


Diagram of the Santos Dumont Air Ship.

According to the conditions of the contest, the competitors are allowed two periods each year to make the trial, these being the first two weeks of June and September, making ten periods in all during the five years. M. de Santos Dumont considers that these seasons are not the most satisfactory for the trials, on account of the wind which prevails at these times in Paris; in the first part of June the weather is changeable, and variable winds are likely to be encountered, and in September, the equinoctial storms. The trials should, naturally, be made in the most favorable weather, as even at best, the problem of steering a balloon is a difficult one; it is expected, however, that the present balloon will stand a certain amount of wind. With a balloon of the ordinary form, M. de Santos Dumont had an accident at Nice a few months ago. The wind came up suddenly, and the balloon was driven against the trees; this wind was followed by a violent storm. The uncertain air currents are thus one of the factors to be considered in the problem. The rules stipulate that twenty-four hours' notice should be given by a competitor who wishes to start, but this puts him at a disadvantage, for owing to the constant changes in the condition of the air it is generally impossible to determine what is to be expected at the end of that time; generally, the ascension is decided upon only two or three hours before the start.



Detail View of Engines, Tanks and Controlling Gear.

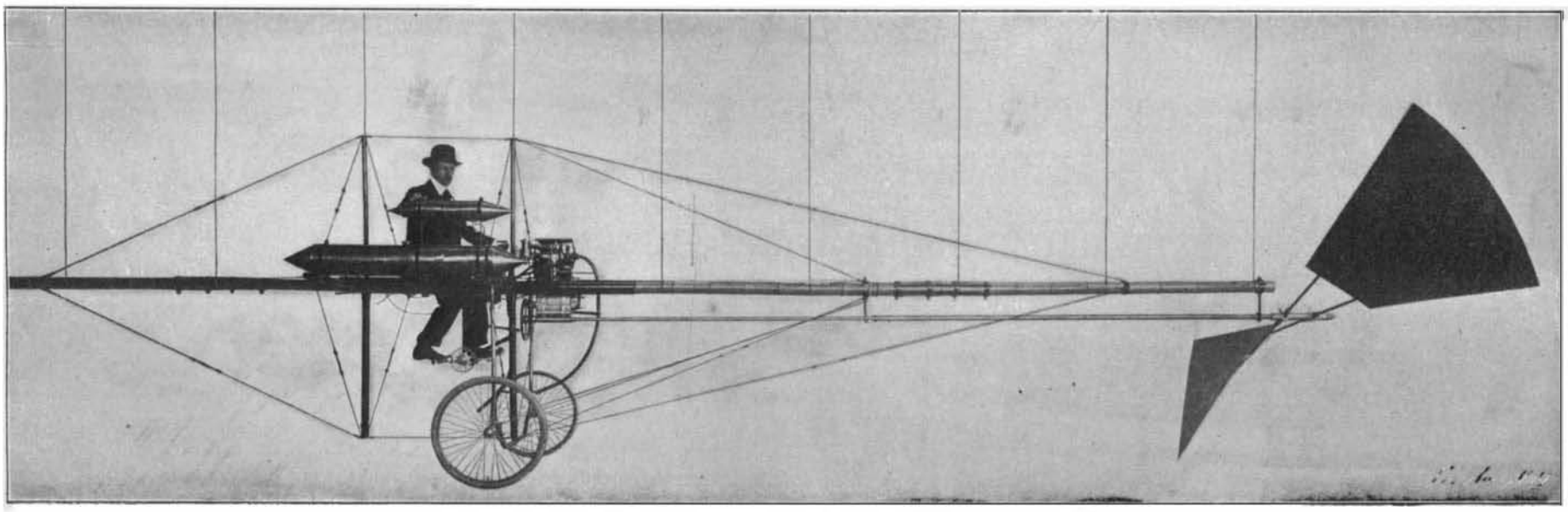
How Machinery Saves Labor.

The Evening Telegram, the other afternoon, summed up the savings in three industries by the substitution of machinery for hand labor as follows. It might equally well have included one hundred as the three named. Forty years ago, when one man was engaged in perforating bank checks, he took 750 hours to do 150,000, at a labor cost of $150; while now, with machinery, six men are employed, but do the work in nine hours and fifteen minutes, and although they get about double the wages per hour, the labor cost is only $1, instead of $150. Again, in ruling paper, the worker using quill and ruler, seventy years ago, took 4,800 hours to do work now done by machine in two and three-quarter hours. The old-time workers got $1 a day, now the two men employed earn $7 per day between them, and yet the labor cost of producing a given quantity is 85 cents against $400. It is easy to understand from this how it is possible to use so much more material and to keep a great army of workers going instead of an individual.

In boot making, machinery is now extensively used, making 100 pairs of men's cheap grade boots in 154½ hours, against 1,436¾ by hand, while the labor cost is reduced from $400 to $35. In women's boots the case is equally marked, for instead of one man being employed to do everything, there are 140 engaged, each on a different machine operation; but not only is the time taken to 100 boots reduced to less than a tenth what it was, but the cost is also reduced. Thus, what was accomplished in ten hours to thirteen hours forty years ago, is now done in an hour.

Again, in bread baking, less than a third of the time is now taken. One thousand pounds of dough for biscuits is rolled, cut and prepared for baking in three hours and fifty-four minutes, as against fifty-four hours by hand.

A NEW electric railway has been opened in St. Johns, Newfoundland. There are 7 miles of track and 20 cars. As the traffic increases the line will be extended to the suburbs. The current is generated nine miles from St. Johns. There is a chain of four lakes, and from the outlet of the last runs a flume which is built along a steep hillside for 3,300 feet until it disappears in a tunnel cut 350 feet through a bluff of solid rock. At the end of the tunnel was erected a huge sluice box of timber, to the bottom of which is fixed a steel tube 6 feet in diameter. Through this the water flows 185 feet to the power house. The capacity of the plant is 1,600 horse power, but the flume is of sufficient capacity to drive another plant of the same size.



General View of the Suspended Truss, Showing the Aluminium Propeller.

SANTOS DUMONT AIR SHIP—A COMPETITOR FOR THE GRAND PRIZE.