The Mastery of the Air.

A Record of the Achievements of Science in the Realm of Aerial Navigation.

PART II.

In 1903 the men with means had taken the hint of Dr. Bell, and a machine of full size was constructed on the lines of the model which had flown so successfully. The United States Board of Ordnance found 50,000 dollars, and the Smithsonian Institute devoted a considerable sum of money. It was two years before this machine was constructed. The great difficulty was to find a motor light enough to give it the speed on which its relative buoyancy so greatly depended. Langley went to all the workshops in Europe without success, and coming back to the States finally managed, with the assistance of American engineers, to design an adaptation of the gasoline motor, weighing less than 4 lbs. to the horse-power. It was of five cylinders, there was no appreciable vibration, and it was of 50 h.p. There was an idea that in the contruction of the wings it would be better to favour the principle of the box kite—used afterwards by Santos Dumont, as will be noticed presently—instead of the single aeroplane as used in the model. But it was ultimately, and naturally, concluded to abide by the conditions of the model which had done so well in the air. Among improvements effected was the construction of hollow wooden ribs for the frame work, which were found to be each as strong relatively and as light as the quill of the Harpy Eagle, which is the strongest and lightest in nature.

After these delays, the inventor flattered himself that he had at last a machine perfect in every respect, and prepared to launch it from the houseboat with his aeronaut, Professor Mason. The launch proved his undoing. For the sake of the larger size of the machine it had to be taken down the Potomac to where the river was three miles broad The idea was to give it a course worthy of its perfections But there came storms and fogs; the first delaying the launch and destroying the boats and material collected for the great event; the second deteriorating the fabric and the more delicate parts of the machinery. The gasoline motor required constant repairs, and the ribs—that fine discovery of the constructor who had gone straight to the book of nature—became utterly unreliable He had not penetrated the secret of nature's oiling or of her various protections against damp and changing temperatures. The day came at last in August of 1903. Everything was ready, every one was in his place, the photographers swarmed at every coign of vantage. The engineer took his station, and the word was given to "let go" The machine began to glide, and at once it became evident that something was wrong. Before anything could be done the machine started head downwards and plunged into the sea, to be presently picked up seriously damaged. Something had caught the fore part of the gear and dragged. Then came the equinoctial gales and the time for operating in the broad part of the river went by. In November they got the machine patched up and determined to rig up a temporary make-shift in place of the carefully planned elaborate launch-ways provided for the August performance. The fact was that the large sums of money provided had got near their end, and it was clear to all that unless something were done there would be no hope of more. But the temporary makeshift proved no better than the elaborate plan. Again the machine was caught, this time at the stern, and again it plunged into the waves and was again most seriously damaged. Happily there was no loss of life. With this incident all hope passed away of further finance, and Langley's aerodrome was relegated to the failures of history. Public opinion declared that the machine had failed through defects in design. But the inventor proved in a somewhat elaborate and certainly very cogent paper that the fault lay entirely in the launching. This, however, was the greatest possible condemnation, for no machine could survive the proof of its inability to raise itself in the air. The story of this machine is placed after that of the Henson machine for purposes of comparison. It is necessary to return to the chronological order

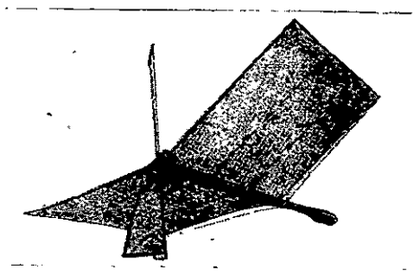
MISCELLANEOUS INVENTORS.

In 1857 a Frenchman named Breant designed a pair of valvular wings of 108 sq. ft. of area These were to be attached to the arms and legs of a man. But it never got beyond the paper stage, probably because the difficulty of inducing any human creature to take the risk proved insuperable

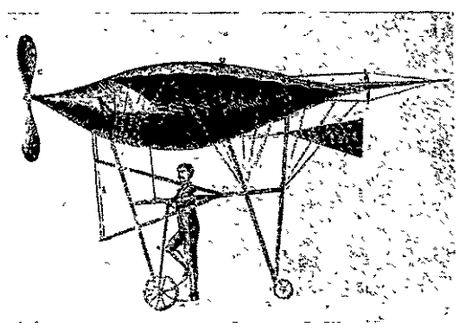
In the early seventies M Dienaide published a monograph giving illustrations of fifty-three machines designed to fly.

The most notable of these was the invention of M. Villeneuve, for twenty years secretary to the French Aeronautical Society. He had a device for the supply of steam by hose from a stationary boiler—a bright idea for getting over the weight difficulty. But he succeeded so well that, when he turned on the steam, the machine became so lively that he was seized with a panic and shut off the steam in a hurry. His machine came down with a smash, from which it never recovered.

The next machine noted—outside the ruck of the above mentioned fifty-three flyers was Hargraves' aeroplane, which saw the light in 1890 and caused much interesting speculation in the New South Wales capital. His first effort was the screw-propelled aeroplane of the illustration. It weighed two pounds and was driven by the contractile power of forty-eight elastic bands geared in tension It propelled itself 120 feet at an expenditure of 196 foot pounds. His second effort was the aeroplane of the second illustration. The machine consisted of a tube two inches in diameter, 48½ inches long, weighing 19½ ounces, of a cubic capacity of 144 6 inches, supplied with paper wings; the machine and wings together having a total area of 2344 sq. ft. The air in the tube was compressed to 230 lbs. to the square inch, and the weight of the machine was 2.53 lbs. The total weight of the engine was only 6½ ounces; the cylinder had a diameter of 1½ inches, with a 1½ stroke of piston In an experimental trip the machine flew 368 feet horizontally at an expenditure of 870 foot pounds of energy.



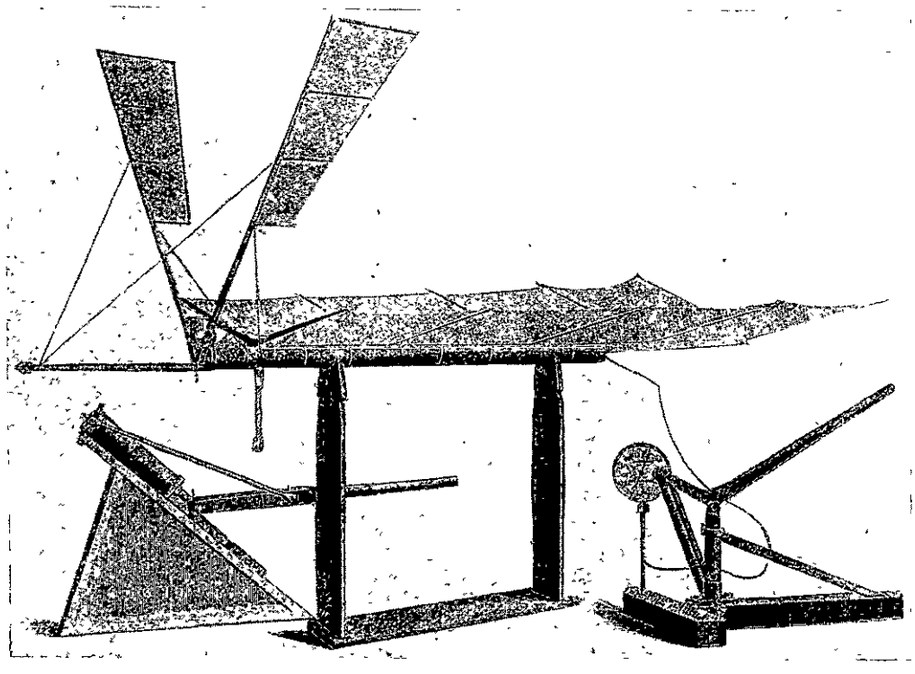
HARGRAVE'S AEROPLANE: FIRST MODEL.



GOUPIL'S FLYING MACHINE.

M Trouvè came next with a toy bird which he made to fly 80 yards by a series of powder explosions, each causing the wings of the bird to flap and propel it through the air. From the first there was nothing to win the respect of practical men in that machine. For practical flying-machines the inventor proposed to derive most of the motive power from the atmosphere by taking up a supply of compressed hydrogen only. This, when mixed with a due quantity of air, forms an explosive mixture, which M Trouvè expects some day to use. He may be heard of again; but it is unlikely as a flyer.

M. Goupil in 1883 constructed a machine weighing 110 lbs.; it had a spread of canvas giving a supporting area of 290 sq. ft. and was 26 ft. in length by 20 in breadth. Experiments showed that it would lift a total of 440 lbs., or 330 lbs in addition to its own weight, provided the speed of the wind did not exceed 20 ft. per second—25 miles per hour. Above that the machine became unmanageable. "It unfortunately happened," says the official chronicle, "that the



HARGRAVE'S SCREW-PROPELLED AEROPLANE: 2ND MODEL.