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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.


## THE EARTHQUAKE DISASTER.

The stupendous earthquake disaster in southern Italy and Sicily is probably, in respect of the lives and property destroyed, the greatest tragedy of its kind that has happened in the history of the world. So complete has been the destruction in the area affected, and so large the number of municipal and other officials that have been killed, that it will be many days, and probably weeks, before accurate statistics of the loss can be drawn up. At the present writing, it seems to be pretty certain that from 150,000 to 200,000 lives have been lost. That the larger rather than the smaller figure may be correct, is suggested by the fact that in this, unlike other disasters of the kind, the figures first published proved to be far below rather than above the actual figures. History records only two disasters of the kind in which the total number supposed to have been killed was greater than that at the Straits of Messina. Even the frightful upheaval at Krakatoa, in the year 1888, involved the death of but one-third or one-fourth of the number of people killed in the present disaster. Fifty thousand souls were lost at the great earthquake at Lisbon, to which reference is so frequently made; and we have to go back to the year 1703 to find the record of a tragedy alleged to have been equal to this. It was in that year that 200,000 people perished in the earthquake at Yeddo. The greatest loss of life which history records is supposed to have occurred when Antioch was destroyed in the year 526. The tendency to exaggeration, however, which characterizes the chronicles of early history casts some doubt upon the magnitude of the figures both for the Yeddo and the Antioch disasters; and hence we are driven to the mournful conclusion that by the time the tale of destruction is complete, the Messina horror will prove to be the greatest of which history possesses any record.

The scene of the disaster is the stretch of thickly-populated and highly-developed country bordering on the narrow Straits of Messina, which run between what is popularly known as the "toe of the boot" of southern Italy and the neighboring island of Sicily. Like the stretch of coast line in which the disastrous San Francisco earthquake occurred, this region is one that has always been subject to heavy seismic disturbance. Not far from the straits, on the island of Sicily, is Mount Ætna, and at the northern end of a string of islands that stretches to the north of the straits is Stromboli. On the western shore of the straits is, or rather was, located the prosperous city of Messina, of 200,000 inhabitants, and upon the opposite shore was the city of Reggio, with 45,000 inhabitants. Scattered along the coast line and in the contiguous country are half a dozen towns with a population of from 1,000 to 14,000 souls, to say nothing of numerous smaller towns and villages, in which the ruin appears to have been complete. At the present time it is estimated that the loss of life in Messina is 90,000, in Reggio 40,000, and that the fatalities in the other smaller towns and throughout the country will bring the total loss up to between 150,000 and 200,000.

That the loss of life should have been so enormous is due to the circumstances, first, that the earthquake occurred in the early morning when most of the population, being within doors, was caught in the wreck of the falling buildings; secondly, that the earthquake was accompanied by a huge tidal wave which swept over the ruins of the devastated city and rolled for many miles inland over the lowland portions of the country; and, thirdly, that the crippled and entombed survivors of this double disaster were caught in the series of conflagrations which broke out immediately after the earthquake.

The terrific violence of this convulsion of nature, as shown by the fact that the relief steamers which hurried to Messina and Reggio describe the shore line on both sides of the straits as being so completely disrupted as to be beyond recognition, would point to the earthquake as being due to volcanic agency—a belief which is strengthened by the fact that the disturbance occurred in a district which includes three of the best-known volcanoes, namely, Ætna, Stromboli, and Vesuvius. Compared with the magnitude and the deadly nature of these natural phenomena, our knowledge of their causes must be confessed to be very limited. By some they are believed to be due to the generation of steam caused by water finding its way, under the enormous pressures which exist at the bottom of the ocean, down to the heated portions of the earth's interior crust, where the pressures engendered are sufficient to lift the superincumbent mass, or cause those sudden rearrangements of position which manifest themselves in the complicated and terrific oscillations known to us by the name of earthquakes. Another theory, based upon the fact that the disturbances occur generally along the line of chains of mountains, ascribes the earthquake to the gradual shrinkage of the earth's crust, and the resulting tangential pressures, which have manifested themselves in the wrinkling or crumpling of the earth's surface into mountain ranges. According to this theory, there is a readjustment under pressure along certain "faults" or lines of fracture in the earth's crust, such as occurred in the recent San Francisco earthquake. Yet another theory, which has been advanced in connection with the present disaster, is that the millions of tons of matter which are continually being broken down by denudation, carried to the ocean, and deposited in the form of silt, cause, in the course of ages, a shifting of the earth's center of gravity, and that the resulting stresses, acting upon the relatively thin crust of the earth, result in sudden movements of readjustment. It must be confessed, however, that the last theory seems scarcely adequate to account for such a terrific disturbance as that at the Straits of Messina.

The indications are that the line of the main fault passed beneath the straits, and that the movement was accompanied by an extensive subsidence. This is strongly suggested by the accounts of eye-witnesses which have come to hand. They describe the phenomenon of the tidal wave as being preceded by a considerable receding of the water, which, in some cases, was so great as to leave vessels resting upon the bottom of the bay. This was succeeded by a tidal wave described as being 40 feet high, which, approaching from the straits, swept far inland. A subsidence of the bottom of the straits would have exactly this effect. The water would first recede to fill the void, and then, as the sea rushed in from either end of the straits to restore equilibrium, its momentum would naturally carry it shoreward in the manner described.

## THE WRIGHT AND VOISIN (FARMAN) FLYING MACHINES COMPARED.

Prominent among the men whose names will always be associated with the first determination of the laws of flight is F. W. Lanchester, whose studies of the flight of birds, made over a quarter of a century ago, first attracted Prof. Langley's attention to the subject of mechanical flight. Hence, the paper read by Lanchester last month before the Aeronautical Society of Great Britain, in which he makes a careful comparison of the principles, properties, and relative efficiency of the aeroplanes used by the Wright brothers and that used by Farman and Delagrange, will be read with deep interest throughout the aeronautical world.

The Wright Machine.—The Wright machine, designed and built by the famous brothers of that name, weighs complete, with operator aboard, 1,100 pounds; has a total supporting surface of about 500 square feet; and its maximum velocity is 40 miles per hour. The aerofoil (sustaining surfaces) consists of two equal superposed members. The auxiliary surfaces include a double horizontal rudder and two vertical fins in front and a double vertical rudder astern, whose total area is about 150 square feet. The four-cylinder motor, weighing about 200 pounds, drives two propellers and develops 24.7 brake horse-power at 1,200 revolutions per minute.

The Voisin Machine.—The machine used by Farman, Delagrange, and others should be known by the name of MM. Voisin, who, with their engineer M. Colliex, are the designers and builders. It weighs, with operator aboard, 1,540 pounds; has 535 square feet of supporting surface in the aerofoil and tail; and its maximum velocity of flight is 45 miles per hour. Unlike the Wright machine, it is provided with a large number of vertical surfaces, for controlling flight and giving lateral stability, whose area is about 255 square feet. It is propelled by a single screw driven by an 8-cylinder, 265-pound motor, giving 49 brake horse-power at 1,100 revolutions per minute. Mr. Lanchester attributes the great difference in the weight of the machines, the Voisin being 40 per cent heavier than that of the Wrights, largely to the fact that the former is fitted with a four-wheeled chassis, as compared with the light pair of wooden runners used by their competitors.

Comparison of Horse-Power.—On the question of the great excess of horse-power of the Voisin over the Wright machine, 49.2 as against 24.7, Mr. Lanchester says that in addition to being considerably less efficient in its screw propeller—a tax paid for the constructional advantage of a direct drive—the Voisin aeroplane is also slightly less efficient, its gliding angle being not quite so good as that of the Wright machine. He considers that the explanation may be found in the fact that the gliding surfaces of the Voisin type are wider in proportion to their length; but we think he comes nearer the truth when he draws attention to the fact that the machine has relatively greater idle surface subject to skin friction. The following table gives the sum total of the resistances overcome by the pounds-thrust of the propellers, as estimated by Mr. Lanchester:

| | Wright. Pounds. | Voisin. Pounds. |
|---|---|---|
| Skin friction .................. | 40 | 60 |
| Struts and wires.............. | 30 | 20 |
| Aeronauts, motor, etc.......... | 20 | 10 |
| Radiator and tanks............ | 5 | 25 |
| Alighting gear ........ .. | .. | 10 |
| Sustentation (power-expended aerodynamically) .......... | 60 | 100 |
| Pounds-thrust of propellers.... | 155 | 225 |
| Efficiency of propulsion........ | 0.63 | 0.54 |
| Gliding angle (calculated).... | 7 deg. | 7 deg. 40 m. |

The statement of the author of the paper that Mr. Wilbur Wright has said in conversation that he makes "no allowance for skin friction, believing it to be negligible," is surprising, and we feel satisfied that, in this respect, Mr. Wright must have been either misunderstood or misquoted.

Longitudinal and Lateral Stability.—It is when we come to questions of stability that the widest differences are found between the two types of machine. Wilbur Wright has stated that, as far as the Wright machine was concerned, stability depends entirely on the skill of the aeronaut; and, if he is correctly reported, he does not believe in the possibility, under ordinary weather conditions, of safety being achieved by the inherent properties of the machine. "Sooner or later the fatal puff must come that will end a flight." Pro. Lanchester says that his own observations of the flight of the Wright machine fully confirm the above statement. Voisin, on the contrary, in designing his aeroplane intended that it should be automatically and inherently stable, and Lanchester considers that by the provision of a tail he has succeeded in this. He believes that the disposition of the parts of the Voisin machine are such as to give stability; since it complies with the following conditions: First, the pressure is less per foot on the tail than on the main aerofoil, so that the attitude of the aerodrome to its line of flight is one of stable equilibrium; second, the areas and disposition of the surfaces, the amount of inertia, the velocity of flight, and the natural gliding angle are related to comply with the equation of stability, so that any oscillation in the vertical plane of flight does not tend to an increase of amplitude. Observations of the two machines under flight indicate that the Voisin requires less manipulation of the horizontal rudder than does the Wright brothers' machine.

Any advantages that the Voisin may have over the Wright in the matter of inherent longitudinal stability, we are inclined to think, are fully compensated by the greater lateral control secured in the Wright machine; for by twisting the wings Wright has the lateral stability under direct control. This provision is employed to neutralize the influence of sudden wind gusts, and to prevent the machine from canting over too much when turning; but no special mechanism is provided on the Voisin machine to prevent excessive canting. Consequently, Farman and Delagrange, as Lanchester observes, commonly turn in a leisurely manner under an easy rudder, whereas "Wright frequently performs sensational evolutions, turning with his machine canted 30 degrees on a radius of perhaps not more than 60 or 70 yards." In view of these facts, we cannot understand how Lanchester should be of the opinion that in the Voisin machine "the lateral stability leaves little to be desired." Summing up the comparison, the author of the paper is inclined to think that "the Voisin machine has the advantage, as containing more of the features that will be embodied in the flying machine of the future." He believes that the secret of stability is contained in the one word *velocity*, and that until it is possible to obtain higher speeds of flight, we cannot hope to see the flying machine in everyday use. The Scientific American is of the opinion, however, that the machine of the future will be of the Wright type; but provided with automatic means for the control of both longitudinal and lateral stability.