before loading on board the planter. Quickly the men in the small boat make their connections. Meanwhile the planter backs slowly away and drops the mine. The work so continues until the third mine of each group of three is dropped overboard. Then at a signal from the planter, the men in the small boat containing the triple junction box drop the box overboard. We have now planted one of the small groups of three mines with its triple junction box. After all have been so planted the signal is given, a last rigid inspection is taken, and overboard goes the grand junction box. It only remains to collect all buoys, and the grand group is ready for the enemy's fleet.

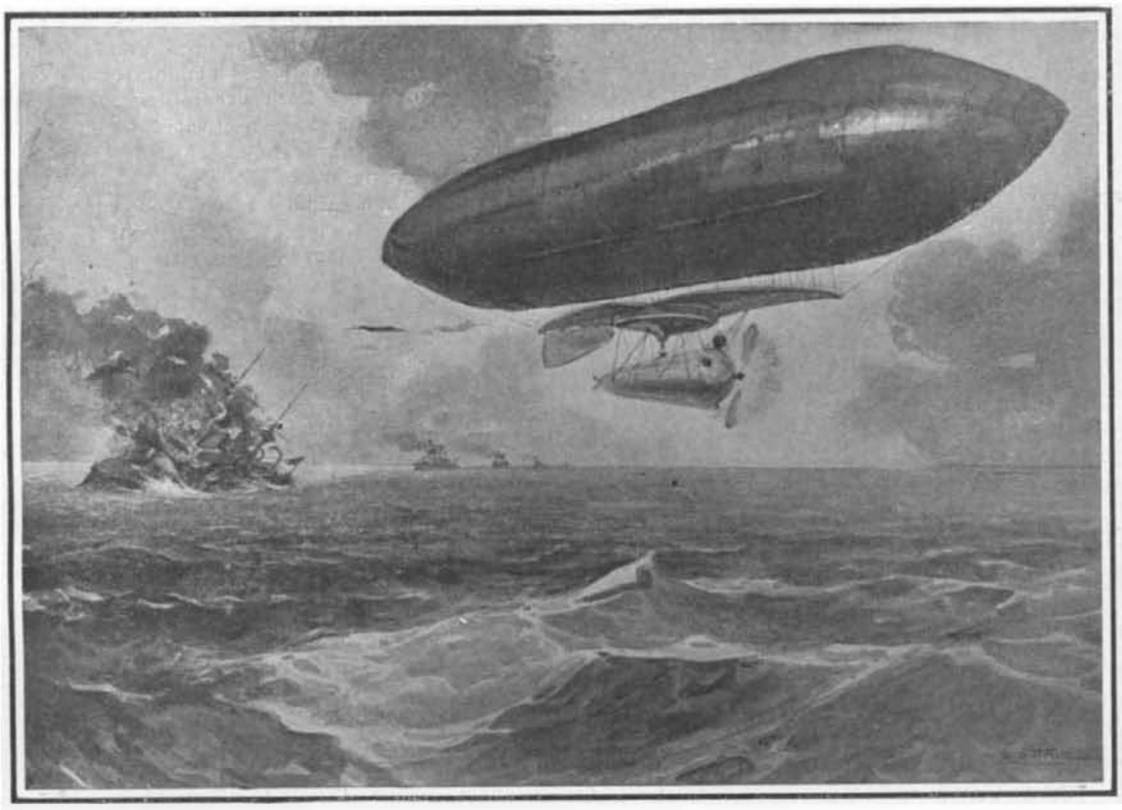
By an ingenious arrangement, one mine, three mines, or the whole grand group can be fired at once, either from the operating room ashore or by contact with a ship, all at the will of the operator. For quick execution, reliability, and absolute destructive power, we do not believe the equal of the American submarine mine exists in the world.

AEROPLANES AND MOTORS AT THE FIRST PARIS AERONAUTICAL SALON.

The new aeronautic industry has already assumed such proportions in France, that the first Aeronautic Salon was held recently in the Grand Palais at Paris. The Salon was held in conjunction with an exhibition of commercial motor vehicles, which also proved very interesting to the public.

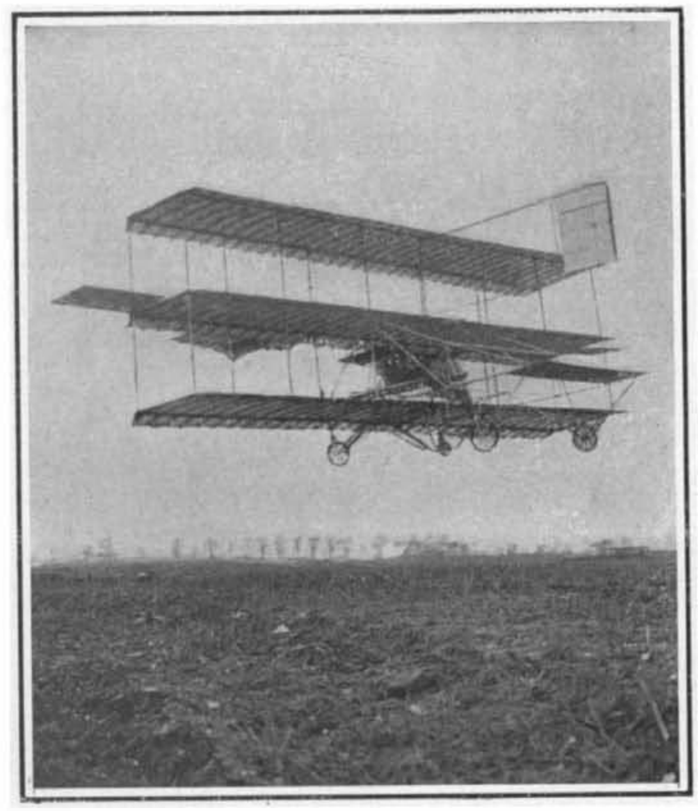
In our illustrations this week we show some of the new aeroplanes which have recently been brought out in France, and several of which were exhibited at the Salon.

The aeroplane of greatest interest is the new double-surface Bleriot machine, shown herewith. Bleriot, it will be remembered, is one of the most thorough and daring experimenters in the art of aerial navigation. He has built numerous machines, among them several of the Langley following-plane type, with which he made successful flights. Latterly he has experimented with monoplanes, as the monoplane is a more advanced



An aerial torpedo dirigible attacking a warship at sea.

In illustrating the use of a novel type of dirigible the artist has forgotten the vulnerability of this huge ship of the air.

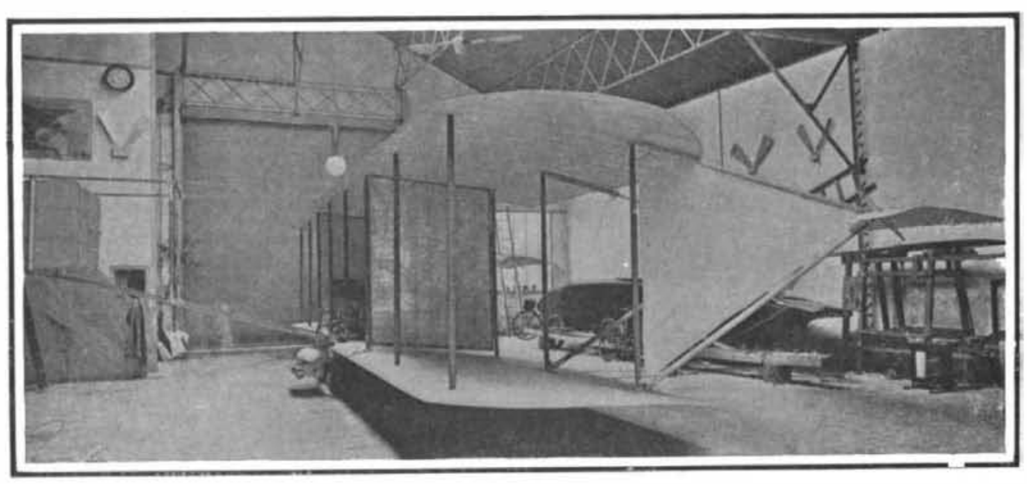


The Vaniman triplane in flight.

The vertical and horizontal rudders in front, the movable wing tips at the ends, and the stabilizing tail behind are all clearly shown in this photograph.

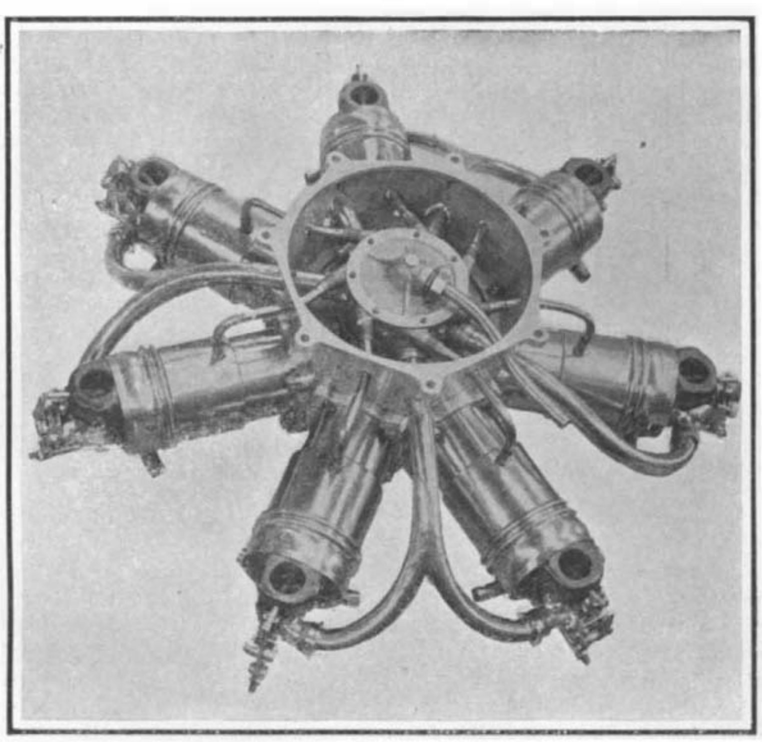
Melvin Vaniman at the control levers of his three-deck aeroplane.

The 4-cylinder motor and one blade of the propeller are seen back of the aviator. The radiator is also visible above the motor at the left.



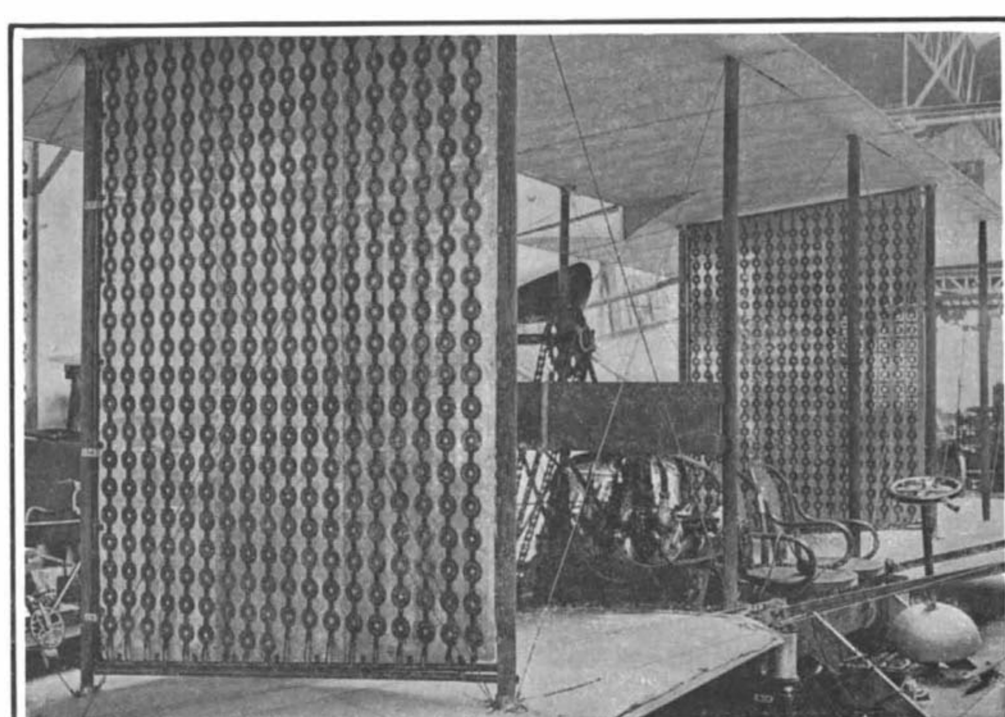
End view of the new Bleriot two-surface aeroplane.

The triple vertical rudders are seen in front (at the extreme left of the photograph) and the horizontal rudders on the end of the triangular partitions at the rear.



The Clement-Bayard 7-cylinder aeronautic motor.

This view shows the under side of the motor, the cover of the case being removed to show the pump.



Center of new Bleriot aeroplane, showing the motor, radiators, propeller, and steering wheel.

The two seats for the aviator and one passenger are also to be seen at the front, as well as the driving chain extending from the motor to the propeller at the rear. Note also the cylindrical shock absorbers at the front edge.

AEROPLANES AND MOTORS AT THE FIRST PARIS AERONAUTICAL SALON.

type of machine, with which it is possible to obtain the highest speed. On October 31 he made a cross-country flight of about 18 miles, including two stops *en route*, with his monoplane. On November 4 this machine was demolished, and its dangerous character was again shown. Since then he has constructed a new double-surface machine much like the Wrights', yet differing from it in several main features. Chief of these is the replacement of the front horizontal rudder by triple vertical rudders, and the use of separate single-surface horizontal rudders behind the main planes at a distance of several feet. These rudders are carried upon triangular vertical trusses, the outermost of which are covered with cloth. The horizontal rudders, when rigged behind the planes as Bleriot has arranged them, will doubtless be less efficient than if they were in front. Nevertheless, the aviator proposes to sit in a comfortable chair on the front edge of the lower plane, and to steer and control his machine by means of an automobile type steering wheel and a single lever beneath it. The two horizontal rudders, of 8 square meters (86.11 square feet) each, are so connected that a movement of the lever inclines one upward and the other downward a like amount; while pushing forward or pulling backward the steering column causes both to act together for directing the machine upward or downward. Turning the steering wheel operates the triple vertical rudders for steering to one side or the other.

Thus Bleriot accomplishes with but two auxiliary horizontal pivoted surfaces—the same number as has the Wright aeroplane—what the Wrights have to warp the main planes to accomplish, i. e., the maintenance of the transverse stability, in addition to carrying out the main object of these auxiliary surfaces, namely, the directing of the machine up and down.

As Farman has found the use of vertical partitions connecting the main planes to be advantageous, M. Bleriot has placed one of these on each side of the center part of his new aeroplane, in addition to the triangular vertical portions extending back from the rear edge at the ends. The two central partitions, instead of being made merely of cloth, are, however, constructed of sheet aluminium, and made to serve as radiators for cooling the water used in the jackets of the motor. Applied to each surface of the sheet aluminium are a large number of rings of small-sized tubing, connected together by flexible pipes. The cooling water is forced through the large radiating surface thus formed, by a suitable centrifugal pump.

The motor which will first be used on this new aeroplane is a 50-horse-power Antoinette of the 8-cylinder V type. Later, a 100 horse-power 16-cylinder motor may be tried. The 3-meter (9.8-foot) 4-bladed propeller is placed at the rear of the main planes, which are notched at their center rear edges to allow the propeller to be brought farther forward and to be supported on the central rigid part of the structure. This propeller is driven at 480 R.P.M. by a chain from the motor crankshaft. There is a speed reduction of about 3 to 1 from the engine to the propeller. From his experience with his monoplanes, M. Bleriot evidently believes that the gyroscopic effect of this large 4-bladed propeller will not be sufficient to cause trouble with his new double-surface machine.

The main planes of the Bleriot machine have a spread of 12 meters (39.37 feet), and their width from front to back is 2½ meters (8.2 feet). The total supporting surface of the two planes is 60 square meters (645.83 square feet). The weight is given as 480 kilogrammes, or 1,058 pounds, but as M. Bleriot expects to be able to carry two or three passengers, this would make a total weight of from 1,200 to 1,650 pounds. Two passengers are to be carried on the front edge of the machine, and two on the rear. The total length from front to back is 8 meters (26¼ feet). The machine rests upon three very small wheels equipped with large pneumatic tires. On account of the small diameter of the wheels, the lower plane is quite close to the ground, and it will be necessary to alight on an even keel in order not to damage this plane.

The improvements that Bleriot has made upon a machine of the Wright type have caused this to assume a very businesslike appearance. The new machine has sufficiently large radiators to allow it to run for an indefinite period; and the only limit to the length of time it should be able to remain aloft, should be the amount of fuel that can be carried. The 50-horse-power 8-cylinder motor consumes much more fuel per hour than does the 4-cylinder, 25-horse-power motor of the Wright aeroplane, so that in this respect the Wrights doubtless still have a decided advantage. It has yet to be shown, too, whether the combined horizontal rudders and wing tips in the rear will be as efficient for maintaining the transverse equilibrium of the aeroplane as is the Wright system of warping the main surfaces. Bleriot has had considerable experience with movable wing tips upon his monoplanes, however, and he doubtless did not adopt this system without knowing that it would work fairly well.

Another new machine which has recently flown successfully in France is the three-decker of Melvin Vaniman. This is not the first aeroplane of this type to be experimented with, but it is, we believe, the first one which has made a really successful flight. On December 18 last, above the parade ground at Issy-les-Molineaux, it flew a distance of 150 meters (492 feet). Although the aeroplane is mounted upon four wheels, M. Vaniman nevertheless uses the Wright brothers' system of starting from rails; but in his case a track is laid for the aeroplane to run upon, instead of making use of a single rail and a special carriage. The aeroplane rose by its own power, and how well it behaved in the air can be seen from our illustration. The Vaniman three-decker has both its horizontal and vertical rudders placed well out in front. The horizontal rudder is about on a level with the middle plane, while the vertical rudder is placed between this plane and the upper one well out in front, and a tail with horizontal and vertical surfaces is placed on the same horizontal line at the rear. There are also auxiliary planes or wing tips at the ends of the middle plane, for the purpose of maintaining the transverse equilibrium. The machine is equipped with an 8-cylinder Antoinette motor of from 60 to 80 horse-power. The two-bladed propeller is direct-connected to the crankshaft. A pair of horizontal radiators are mounted on a level with the top of the motor, one on either side of it. The aviator sits on a seat arranged in front of the motor, and controls the rudders and equalizing planes by two levers. The distinctive feature of this aeroplane is the fact that the framework is constructed of steel tubing. It is the first successful French machine having its framework made of this material. The advantages of the triple-surface aeroplane consist chiefly in the shortening of the planes, and thus in the making of a less cumbersome machine. Compared with the Farman or the Wright aeroplane, Vaniman's machine is several feet shorter in width. As can be seen from the photograph, it is a very symmetrical and rigid appearing structure; and we have no doubt that before long a machine of this type will make successful and extended flights.

The motor which we illustrate is the new Clement-Bayard, 50-horse-power, 7-cylinder aeronautical engine, which has recently been brought out by the Clement firm. The seven cylinders, each of which is provided with a copper water jacket, are evenly spaced about the central crankcase, and have their connecting rods attached to a single crank. Our photograph shows the under side of the motor, which has a centrifugal pump attached to the lower end of its crankshaft and arranged in a casing, the cover of which is removed. This centrifugal pump forces water to the bottom of the water jacket of each cylinder, there being seven separate outlets from the pump for this purpose. Just above the pump there is an annular mixing chamber, from which four large pipes run to the cylinders. Three of these pipes are branched, so that they supply six of the cylinders, while the fourth one (shown at the right) supplies the seventh cylinder only. The carbureter is placed at one side of the casing, the pipe connecting it with the mixing chamber being seen within this casing, to the right of the uppermost cylinder in our illustration. The inlet and exhaust valves are mechanically operated by a rocker arm and single push rod for each pair of valves. The push rods are worked by a cam ring that is concentric with the crankshaft, and that is driven at half the speed of the latter through an idle lay shaft. A high-tension magneto is placed above the cylinders and is gear-driven from the crankshaft, while on the upper end of the lay shaft just mentioned there is a distributor for supplying current to the spark plugs.

The drawing which we reproduce shows the way in which naval warfare will yet be carried on, according to those most interested in the lighter-than-air type of aerial craft. The dirigible seen in the foreground has discharged a torpedo from its torpedo-shaped car with disastrous results to the warship. The particular feature of the dirigible shown in our illustration is the placing of the torpedo-shaped car quite close to the gas bag, and the suspending of this car from a sort of hot-air turbine, by which the car can be swung in any direction when it is desired to fire at the enemy. This dirigible is a recent French invention, which the enthusiastic inventor believes will soon revolutionize warfare on the sea.

Further particulars of the Paris Aeronautic Salon, together with photographs of some of the noteworthy machines there exhibited, will be found in the current issue of the Supplement, which also contains a very good article upon aeroplane construction.

Cash Prizes for Aeroplane Flights in America.

Cash prizes to the amount of $1,200 for aeroplane flights were announced last week. The first to be offered was $200 by the magazine Aeronautics for a flight of one-half kilometer. Subsequently Mr. C. F. Bishop, president of the Aero Club of America, offered four prizes of $250 each to the first four aviators who fly one kilometer. The latter flights must be officially controlled and must be made by a machine that has never before flown this distance officially.

THE SCIENTIFIC ASPECT OF EARTHQUAKES AND VOLCANOES.

BY W. J. MURRAY.

The dreadful natural tragedy enacted at the extreme south of Italy and the eastern coast of Sicily cannot fail to awaken the heartfelt sympathy of the whole world for the ill-fated victims of probably one of, if not the most appallingly destructive earthquakes in the annals of seismic disturbances throughout the world. The latest accounts estimate the loss of life at 170,000 to 200,000 people, and it is much to be feared that the total number when fully ascertained may turn out in excess of these figures.

We surely have here the evidence that in the play of cosmic forces nature recks little of consequences. The terrible catastrophe on the shores of the straits of Messina has as little interest for the universe at large as the destruction of a microscopic infusorium or of the smallest bacillus. Both events happen through the operation of a mechanical necessity which throughout nature takes no cognizance of sentient beings, their feelings and their interests.

That from the human point of view, earthquakes are an evil goes without saying; and the worst of it is that it is quite impossible to prevent them, and almost equally impossible to avoid them.

Earthquakes and volcanoes, while different in their localities and modes of manifestation, are undoubtedly due more or less to a common natural cause, viz., the gradual cooling, and consequent shrinking or contracting, of the earth's crust, taken together with the fact of the great body of intense heat in the interior of the earth. A very high temperature must exist at a depth of even a small fraction of the earth's radius. At the depth of say twenty miles, the heat is so great that the most refractory solids, whether minerals or metals, would at once yield if they could be subjected to such temperatures in our laboratories. But none of our experiments can tell us whether, under pressure of thousands of tons on the square inch, the application of any heat whatever would be adequate to convert solids into liquids. It is, therefore, doubtful whether the terms solids and liquids are at all applicable, as we understand them, to materials forming the interior of the earth. As to the immediate cause of earthquakes, there is considerable difference of opinion, as is always the case where a natural problem presents itself for solution outside the domain of what are termed the exact sciences. In all probability, an earthquake is one of the necessary consequences of the gradual cooling of the earth. As the terrestrial heat is gradually declining through its radiation out into space, it follows that the bulk of the earth must be gradually shrinking.

No doubt the diminution of the earth's diameter from this cause must be small, even in a long period of time. But the shrinking is nevertheless continually in operation, and accordingly the crust of the earth has from time to time to accommodate itself to the fact that the whole globe is slowly but surely getting smaller. It follows from these considerations that the rocks forming the earth's crust over the surface of continents, islands, and under the beds of the ocean, must have a declining acreage year after year. So that of necessity the rocks must compress either continuously or occasionally; and their yielding will usually take place in regions where the earth's crust happens to have least power of resistance.

The acts of compression may be and usually are irregular, with small successive shifts; and though the displacement of the rocks in these shifts may be actually small, yet the pressures which the rocks are subjected to are so great that a very small shift may correspond with a very great terrestrial disturbance.

Suppose that there is a slight shift in the rocks in each side of a crack or fissure at, say, a depth of ten miles, where the pressure would be about thirty-five tons to the square inch. Even a slight displacement of one extensive surface over another, the sides being pressed together with a force of thirty-five tons to the square inch, would be an operation accompanied by violence greatly exceeding that which we might expect from so small a displacement, if the forces concerned had been only of more ordinary magnitude. It can be readily understood that these violent movements under the surface of the earth must cause great changes and commotion over-ground, resulting in the wholesale destruction of houses, villages, and even large cities, and in frequently great sacrifice of human life.

When an earthquake occurs under the floor of the sea, at a great distance from land, it does little harm; but when it happens near the shore, as it did a few days ago, on the coast of Southern Italy, it causes great damage and loss of life. When the disturbance occurs under the bed of the sea, the waters above it become uplifted, and the shock spreads outwardly. As the waves approach the shore, the friction or drag on the sea bottom decreases their speed, but greatly increases their height. On a low-lying coast such waves (usually miscalled "tidal waves") are generally