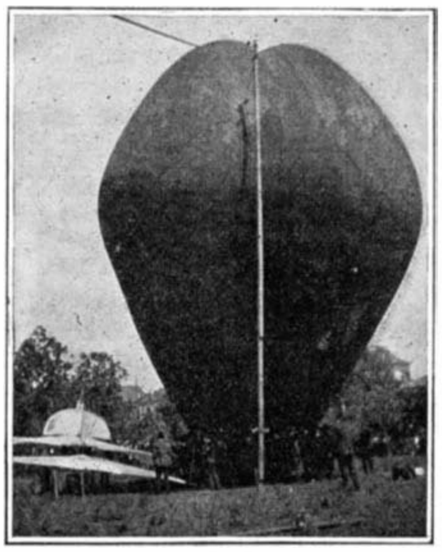
THE MONTGOMERY AEROPLANE.

The first public trial test of the Montgomery aeroplane "Santa Clara," named after the college in which the inventor is professor, took place on Saturday, April 29, in the presence of a large number of invited guests and the representatives of many of the great newspapers of the country. The event was coincident with a regularly observed anniversary of


Balloon and Attached Aeroplane Ready to Start.

the college, which annually draws together the alumni and many distinguished officials of church and state.

The Montgomery aeroplane had heretofore made four experimental flights at a little hamlet named St. Leonards, located in the Santa Cruz Mountains to the west, but only in the presence of the inventor, the Rev. R. H. Bell, the aeronaut, and a few farmers. The public was excluded, the private tests being for the benefit of the inventor only, and for an obvious purpose. The same aeroplane was used in each trial, and without modification in construction. Its form and details were unchanged. The experience gained while conducting the early experiments enabled the inventor to determine the best methods of guidance, and to familiarize the aeronaut with the conditions required for successful flight, as well as to inspire him with personal confidence.

The day which was to introduce the new aeroplane to the world officially was in every respect perfect. A light six-knot breeze came out of the north, and the sky was beautifully clear. The sun shone bright. A better day never was known, even in Santa Clara. The necessary aids and appliances were simple and even elementary, and consisted only of a gigantic hot-air balloon, by which the aeroplane was to be elevated. As soon as the great bag began to expand, preparations for the flight were rapidly made. Prof. Montgomery and the intrepid aeronaut, who certainly had most at stake, superintended every detail, intent that no accident should mar the perfect symmetry of the conclusive trial as announced. Minutes progressed, the great balloon was tugging at its full strength, as if anxious to pull itself away from the many hands which detained it. The preparations were at last complete. The aeronaut took his position astride a small carpet-covered saddle, his feet hanging unsupported, his hands clinging to the bracing wires. "All ready!" shouted the professor. "Let go!" was the signal, and at a bound the huge bag quickly sprung a hundred feet in the air, the aeroplane, like a great bird, dangling below. Higher and higher soared the balloon, the gymnast in the saddle having recovered from the momentary thrill of his sudden elevation, and anxious, apparently, to assure the breathless crowd below that his iron nerve had not deserted him and that his composure was undisturbed. To convince, the man clinging to the machine attempted a few acrobatic feats, but they seemed artificial and forced, and subsided at last into a waving of hands. The spectators were cheering vociferously as the balloon ascended rapidly until the form of the aeronaut grew indistinct at the great height.

The ascent continued as long as the hot air could carry the balloon, which was fully 4,000 feet above the ground. The estimate of the operator coincides with this figure. Then the aeroplane was released by cutting the connecting cable, and suddenly dropped, perhaps a hundred feet, when it quickly regained its equilibrium, and floated with the air current. The flight was deliberate, and the descent gradual. A piece of paper dropped from an elevation on a still day might indicate the nature of the flight as it seemed to the spectator.

The operator, in order to demonstrate his supreme control, caused the machine to describe circles, to raise itself, to back and to go forward, and to perform difficult evolutions, which were convincing that the control of the aeroplane in its gradual descent was well within the power of the will of the aeronaut.

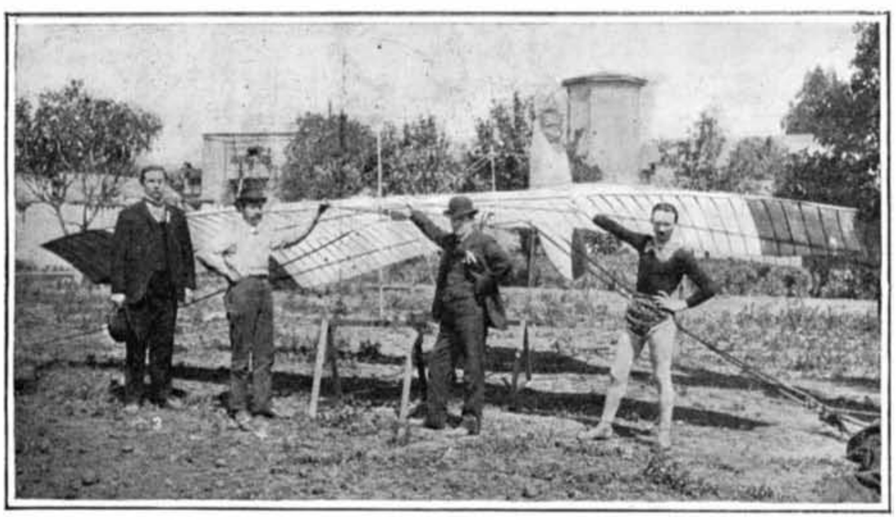
The gliding flight of the aeroplane, from the moment of its release from the balloon to the instant of its return to earth again, appeared to the writer like the action of a huge bird on the wing. Persons who have watched the motions of vultures in southern latitudes, know that for long periods these birds will poise high up in the air, and float backward and forward without the flutter of a pinion. To these birds of carrion is given the most graceful and effortless powers of flight, and the aeroplane seemed to imitate the same movements; to follow exactly the deliberation and grace of the vultures in its flight through the air. From the moment the aeroplane left the earth until it landed in a wheat field, three-quarters of a mile away, perhaps twenty minutes elapsed. The ascent started at 11:13 o'clock, and flight concluded at 11:32. The landing was effected with the most perfect ease; the aeroplane emerged from the trial without a scratch. The orders of Prof. Montgomery to the aeronaut were to land at a certain designated spot in a certain field to the southeast of the college grounds. This is exactly what the operator succeeded in doing. In appearance the aeroplane is a light framework of hickory braced in its different sections by light piano wire supporting two wings, 24 feet in length from tip to tip, covered with thin muslin. Together, the wings have a surface of 185 square feet.

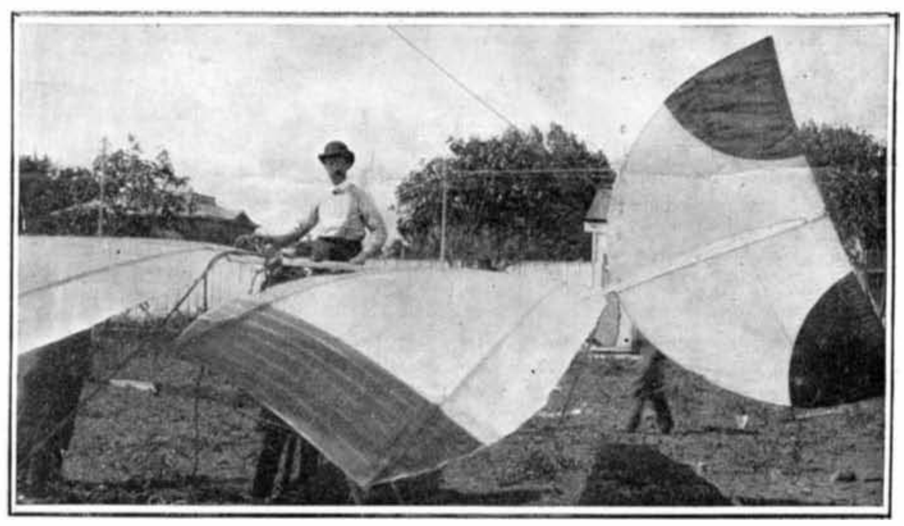

Aeroplane Attached to Balloon.

The wings are fixed on the exterior circumference, but hinged to the light frame on the inner sides. Their shape is parabolic. A rudder, movable, consisting of two half-spherical surfaces, is placed at the rear. Its purpose is to raise or lower the entire machine during its flight. The weight of the flying machine itself is 42 pounds; as the aeronaut weighed 156 pounds, the total weight carried can be readily computed.

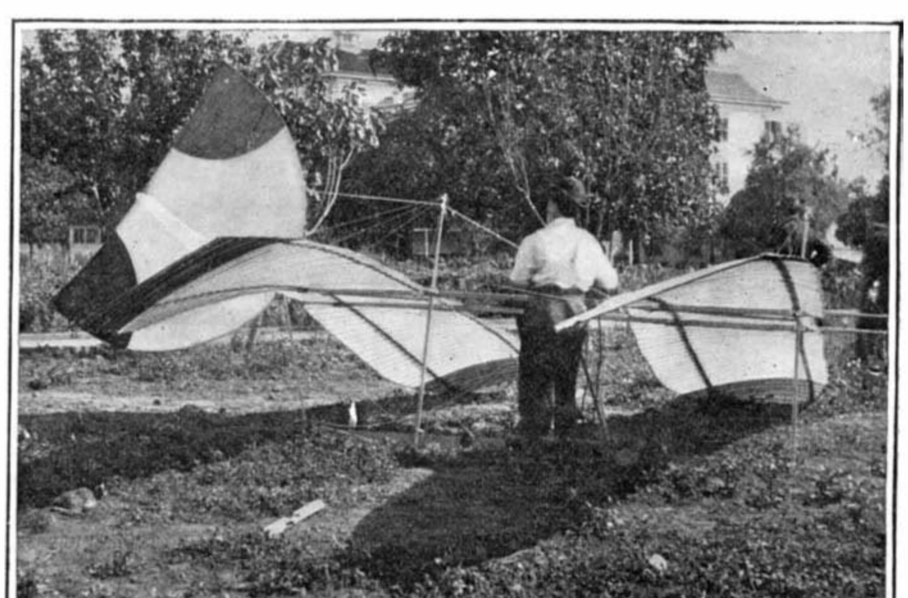
The technical description of Prof. Montgomery's aeroplane is as follows:

Prof. Montgomery has, for over twenty years, been a student of atmospheric phenomena, and his researches have led to the discovery of certain laws

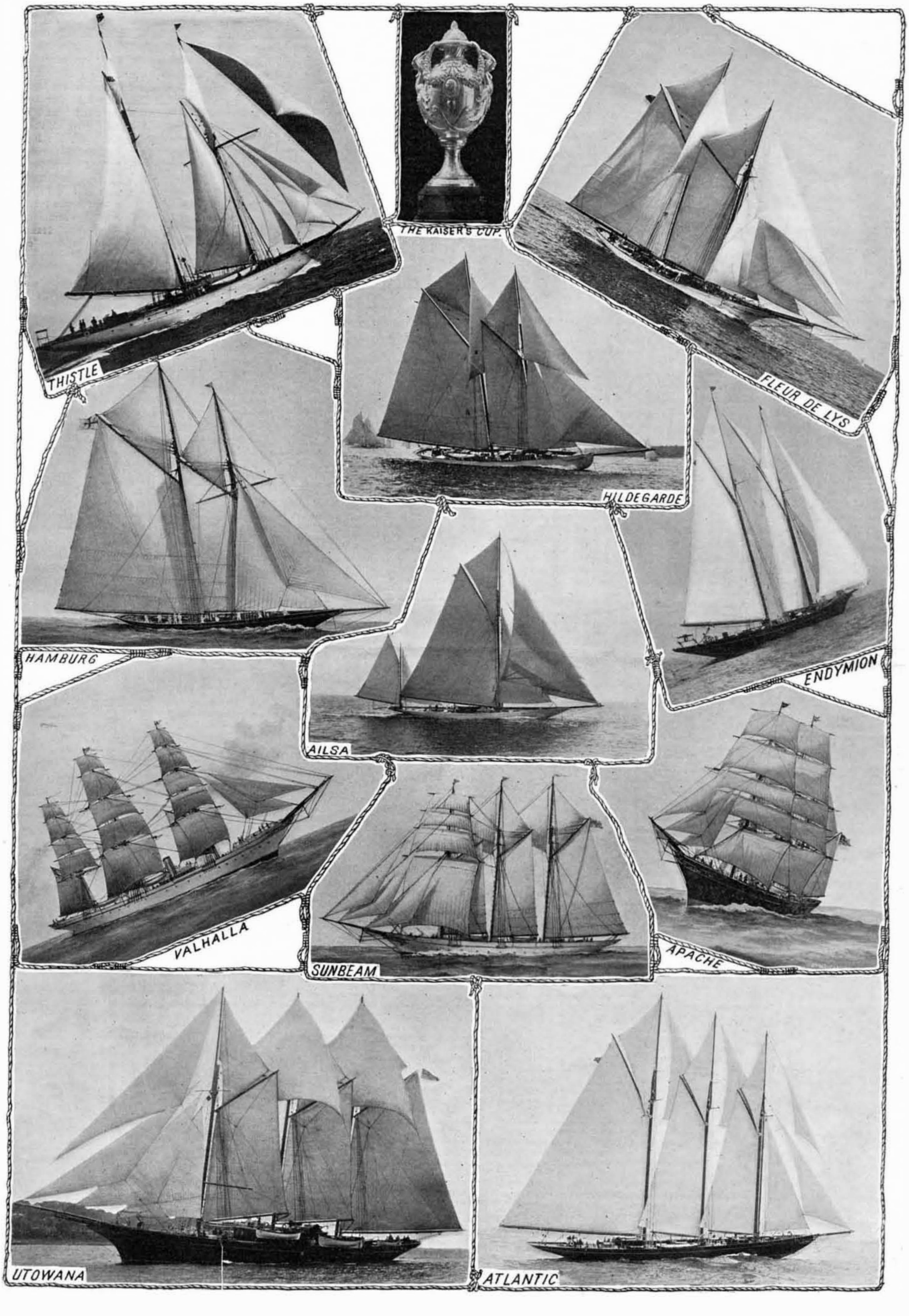

The Two Right-Hand Figures are Prof. Montgomery and the Aeronaut.


Aeroplane Showing the Tail.


Prof. J. J. Montgomery and His Aeroplane.


General View of the "Santa Clara."

THE MONTGOMERY AEROPLANE.



THE COMPETING YACHTS IN THE KAISER'S OCEAN CUP RACE.—[See page 402.]

governing the motion of air, which are at variance from those generally accepted by scientists. The construction of an airship in accordance with and adapted to these conditions has occupied his attention since 1884. His deductions, after being reduced to a mathematical formula, have resulted in the construction of the aeroplane "Santa Clara." Guided by the practical suggestions given by theories and experiments, the aeroplane used in the present work has been constructed. It consists of two wing surfaces, parabolic from the front to the rear edge, a flat tail, and a vertical keel. The two surfaces are so formed and placed that they lead to a uniform action in the building up of a general rotation, very much as if they were the front and rear portions of a large wing. To this extent they are the elements of a divided wing; yet, inasmuch as they are separate, they have independent modified forms and adjustments, the purpose of this arrangement being to obtain by the use of two points of support, fore-and-aft equilibrium, and yet retain the elements necessary for the production of the complete rotary tendencies in the air. The rear portions of the wing surfaces are hinged at the center, and free to drop from above, but are restrained in their upward movements by wires so adjusted that they may swing like the arms of a balance, yielding automatically to excessive air pressure on one side or to the effort of the aeronaut in contending with unfavorable gusts or directing its course. The relative adjustment of these edges is such that the control of the wings on either side may be similarly changed, or one side move in one direction while the other undergoes an opposite but reciprocal change. The tail or rudder is so placed relative to the rear surface that any change in its position immediately produces a change of pressure along the entire wing, thus meeting the requirements of fore-and-aft equilibrium, these requirements changing with variations of speed as the pressure on the surface moves toward the front edges with increased speed, and *vice versa*. The ventral fin serves partly to preserve the side equilibrium and is so formed and placed as to meet antagonistic requirements of pressure above and beyond the surfaces.

By a change of form and position of the rear surface, the varied pressures necessary to the fore-and-aft equilibrium are developed, and the aeroplane may be caused to dart downward, move horizontally or rise, or to check its position suddenly. With proper manipulation, the machine travels in a wave line through the air, with a gradual descent, turning in circles to the right or left, as the form of the surface on either side is modified.

Owing to generally prevailing ideas on the subject of flight, many exaggerated opinions have been expressed since the first announcement of the experiments with the present aeroplane, which Prof. Montgomery does not sanction, as these may give rise to radical conclusions, and lead to disappointments. It is no doubt true that the experiments were of an extreme nature, for when the aeronaut, at an elevation of several thousand feet, cut loose from the balloon and trusted to the aeroplane, there were only two alternatives before him—a dash to the earth and a crushed and lifeless corpse, or a convincing success of the aeroplane.

In reference to the experiment which the writer witnessed under most satisfactory circumstances, the conclusion is that an advance has been established in the science of navigating the air, though that problem is not yet solved. A great step, in the opinion of the writer, a great leap forward, has been accomplished and maintained. It is but just to Prof. Montgomery and his distinguished coadjutor, the Rev. R. H. Bell, S.J., Professor of Physics in Santa Clara College, that no countenance has been afforded the extravagant declarations relative to the aeroplane which they have jointly conceived. An aeroplane has been constructed that in all circumstances will retain its equilibrium and is subject in its gliding flight to the control and guidance of an operator, but beyond this there remain two other obstacles which are to be overcome before navigating the air is either practically or commercially possible. There remains continuance in flight, as an essential, and lastly, the power of a machine to raise itself from the surface. The first principle has been solved beyond a doubt. The two remaining, perhaps the most difficult of all, await solution.

The Mine After Being Dragged Ashore.

Driverless Engine.

Germany possesses a miniature but most useful railway, to which no parallel is found in this country. Its peculiarity is that its trains have no drivers. It is used for carrying salt from the salt mines at Stassfurt. The trains consist of thirty trucks, each carrying half a ton of salt. The engines are electric, of twenty-four horse power each. As it aproaches a station, of which there are five along the line, the train automatically rings a bell and the station attendant turns a switch to receive it. He is able to stop it at any moment. To start it again he stands on the locomotive, switches the current and then descends again before the engine has gained speed.—Railroad Men.

In Golden Gate Park, San Francisco, there has been installed a large windmill of the familiar old Dutch type for pumping water. With the wind at ten miles an hour it develops 4.65 horse-power, and at thirty miles an hour the horse-power is 126. Its daily pumping record in June, 1904, ranged from 5,460 gallons to 371,397 gallons against a gage pressure sometimes of 32 pounds and sometimes of 53 pounds.

DESTROYING A RUSSIAN MINE.

The accompanying photographs give a fair idea of the appearance of the mines which the Russians are using to protect their harbors. These mines are usually held several feet below the surface of the water by heavy anchors, but on account of their buoyancy and the action of the tides and storms they frequently break their cables and become a floating menace to all shipping in the vicinity. It is known that scores of these deadly machines have broken adrift; and although several have been located and destroyed, there are many others yet afloat upon the high seas.

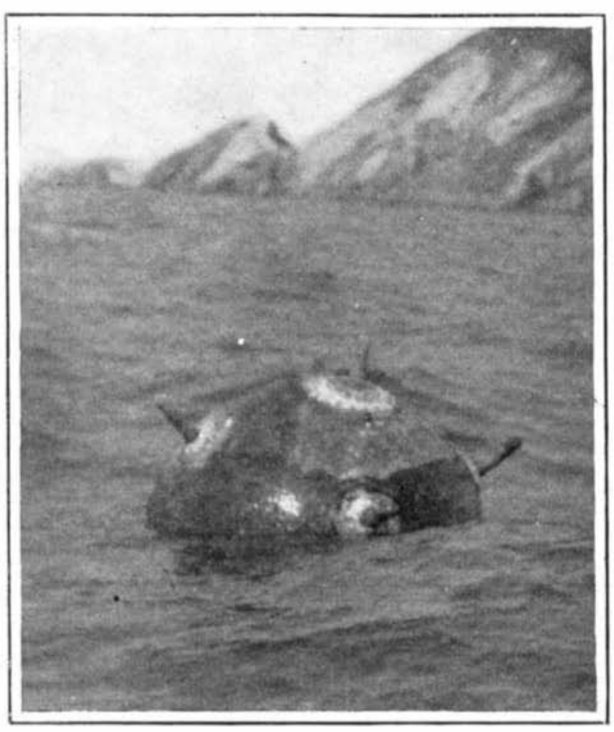
This one had undoubtedly broken loose from its moorings at or near Port Arthur, and been carried by wind and tide to the harbor of Chefoo, China, where it was found. The discovery was reported to the commanding officer of the U. S. S. "New Orleans," who promptly ordered an officer to go out with a party and destroy the floating danger.

Wishing to investigate the construction of the mine more closely than could be done while it was floating, a long line was attached to it, and from the safe side of a high bank on one of the small islands in the harbor, it was hauled to the beach and up out of the water. The party then went out several hundred yards from shore and after several attempts succeeded in striking the mine with a shell fired from a one-pounder mounted on the bow of the steam launch. The mine, however, could be exploded by electricity only, and although the shell tore a hole through the casing, the guncotton charge remained intact. Through the opening thus made the electrical connections were cut, and the mine rendered practically harmless.

Each of the lead spines on the outside of the mine incloses a thin glass bottle containing acids, and when the spine is bent by collision with a ship or other floating body, the bottle is broken and the acids emptied into a receptacle containing zinc-carbon elements. The combination instantly produces an electrical current and the spark ignites a fulminate detonator, which in turn explodes the main charge of about 250 pounds of wet guncotton.

After the mechanism had been carefully examined electrical connections were laid from the mine to the lee side of the bluffs which are seen in the accompanying photographs and the charge exploded from a safe distance.

This Russian mine may be compared with the Japanese mine which was illustrated in the issue of the Scientific American of March 11 of this year. In the Japanese mine, the firing arrangement consisted of a ball carried on a flexible vertical rod, provided with a contact disk which, when the mine was struck, came in contact with a ring of metal and closed the electrical circuit, thereby detonating the mine. The chief interest in this Russian mine lies in the contact mechanism, which would not appear to have been very effective, at least in this particular mine, inasmuch as when the mine was dragged ashore, the lead spines must have been bent and the glass bottles broken without causing the firing mechanism to operate. During the Spanish war, immunity from disaster from submarine mines, in the case of at least two of our warships, was due to the fact that the contact fingers or triggers, which should have detonated the mines, were so incrusted with marine growth and otherwise out of order, that although the mines were struck and roughly handled, one of them being torn adrift by the propellers of the "Texas," no damage was done.



Drifting in Chefoo Harbor.

American Officers Examining Shothole in the Mine.

DESTROYING A RUSSIAN MINE.

Incandescent gases under slight pressure give light composed of lines, but under pressure a continuous spectrum.