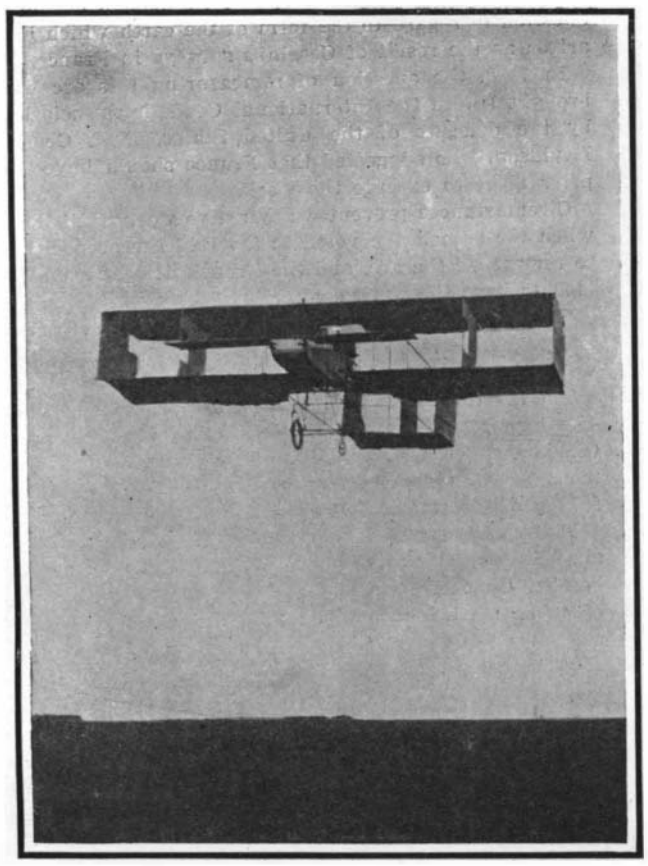
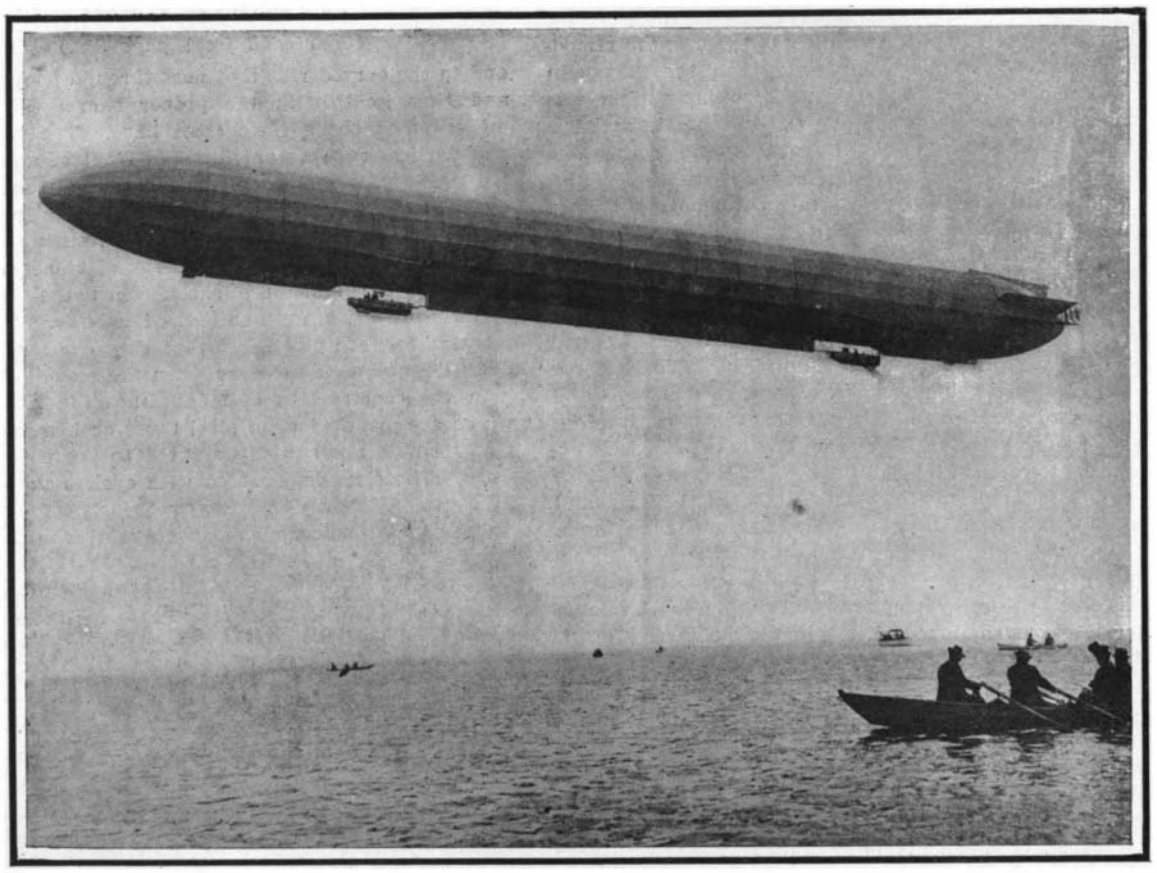
THE LATEST EUROPEAN AIRSHIPS AND AEROPLANES AND THEIR PERFORMANCES.

As noted in our issue of October 31, Count Zeppelin, on the 23d ultimo, brought out his fifth airship for its first trial. One of our illustrations shows this huge air craft undergoing its first trial. The new airship is the remodeled "Zeppelin III." of 1906, which, before the building and operation of the fourth airship last year, had shown remarkable results. It has been lengthened out 8 meters (26¼ feet), and, because of its smaller diameter than the No. 4, Count Zeppelin has used two 85-horse-power motors in place of the 110-horse-power engines that were on the later airship. The remodeled No. 3 has the same inclined stabilizing planes attached to its sides at the rear that were first tried out upon it and afterward used in a modified form upon the No. 4, but in place of the very large vertical rudder the latter had at its rear end, small triple vertical rudders only appear to be used between the stabilizing planes on each side. A three-surface horizontal rudder is used on each side



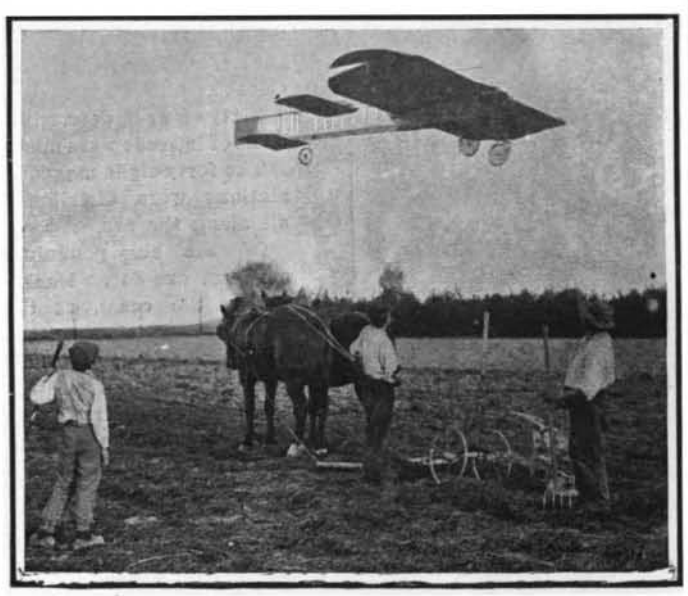
Farman's aeroplane flying across country.

Note the vertical partitions connecting the planes. These have been added recently.



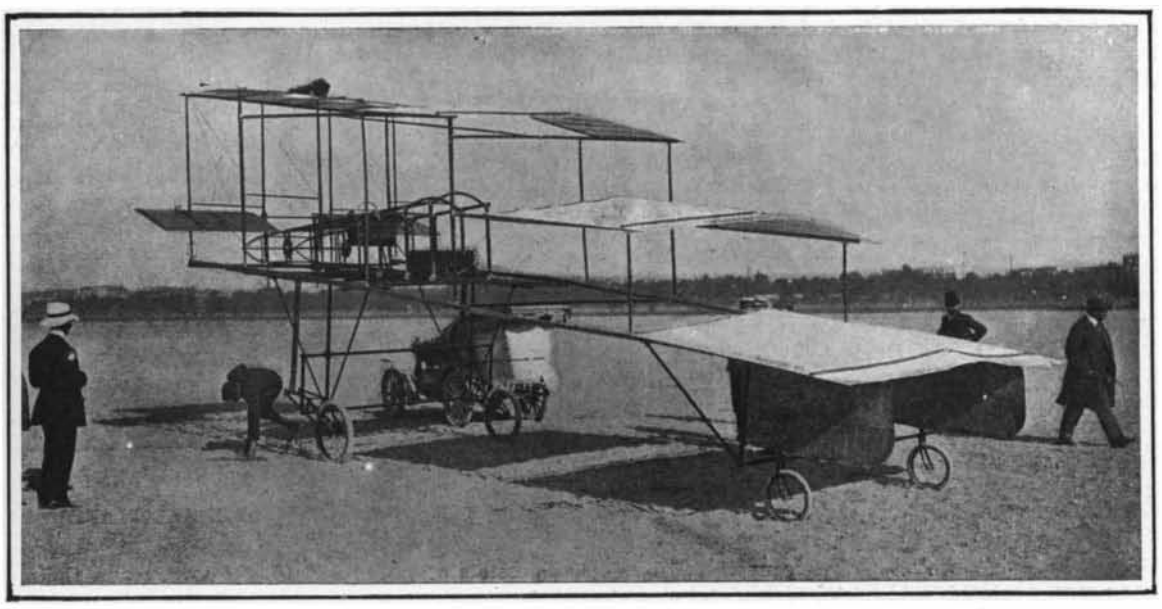
The latest Zeppelin airship--the remodeled No. 3—in flight above Lake Constance.

The large vertical rudder at the rear has been dispensed with and replaced by small triple rudders on each side.



Bleriot's monoplane on its nine-mile cross-country flight.

Despite numerous accidents, this machine has proved its worth by its flights across country and in a strong wind.

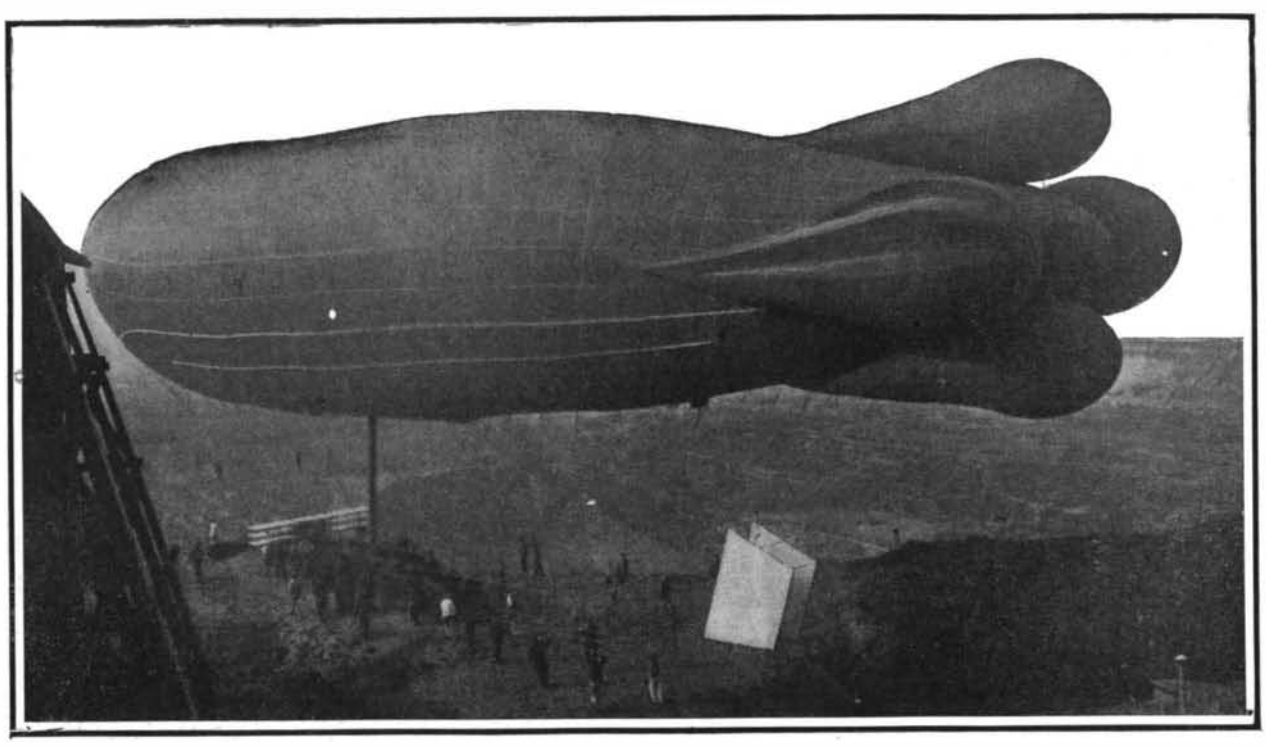


Three-quarter rear view of the Witzig-Lioré-Dutilleul aeroplane.

Note the step-like arrangement of the surfaces, with the horizontal rudder in front and the twin vertical rudders at the rear.

The Clement dirigible sailing over the Madeleine in Paris on its initial trip.

Note the aluminium cabin in the body framework.



The new Clement airship, showing the peculiar tail, the propeller, and the horizontal and vertical rudders.

During its maiden voyage on October 29, this new airship, piloted by M. Kapferer, carried seven people from Sartrouville to Paris and back at a speed of between 25 and 30 miles an hour.

SOME NEW AND IMPROVED FOREIGN AEROPLANES AND AIRSHIPS.

of the bow also. Among the new features is a telegraph line connecting the two cars.

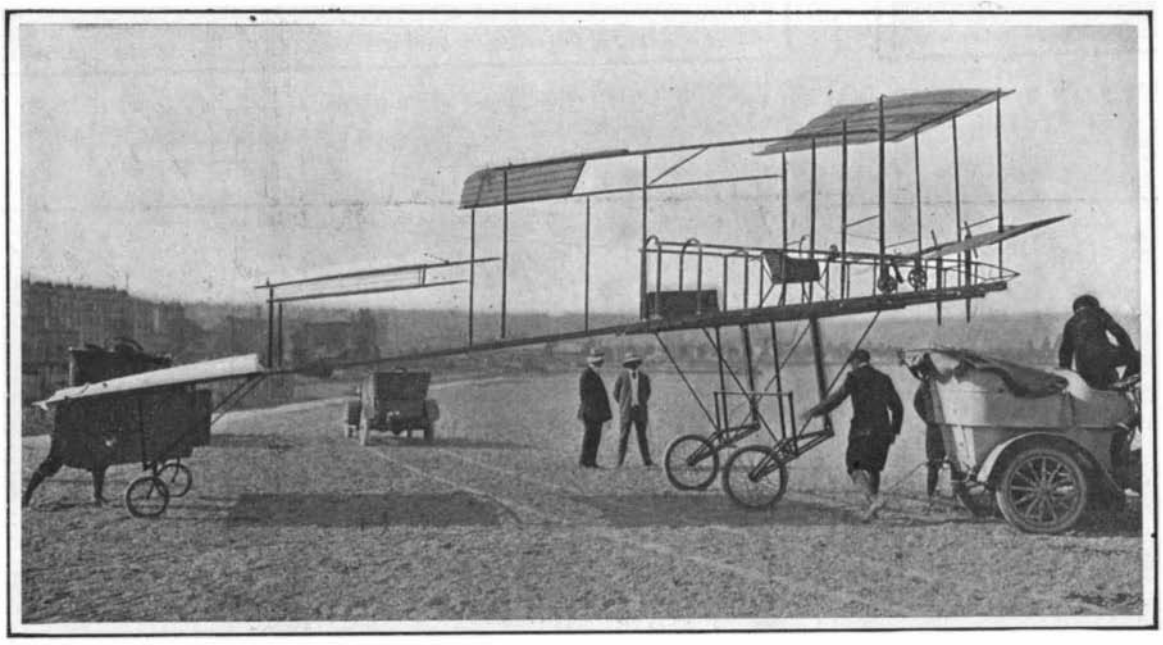
A few of the recent flights of the remodeled airship are enumerated below. The first was made on October 23, when the airship flew over Lake Constance and the city of the same name about four hours. On the next day a flight of two hours was made, and on Sunday, the 25th of October, another two-hour flight much more remarkable than the one of the previous day was carried out. According to experts, the remodeled vessel operates even better than the "Zeppelin IV." On the 26th of October a three-hour flight was made, but one of the motors did not operate satisfactorily. The following day, Count Zeppelin took Prince Henry of Prussia with him for an extended flight, which lasted six hours. A trip was made to the Falls of the Rhine, and the airship developed a speed of 50 kilometers (31 miles) an hour. Several days after, on November 7, Crown Prince Frederick William accompanied the Count, and made a trip to Donaueschingen, Baden, where the Emperor arrived by rail shortly after the arrival of the airship. The Emperor conversed with his son through a megaphone, and afterward the Crown Prince returned in the airship to Friedrichshafen. Emperor William himself expected to make a trip in the airship on the 10th instant, but instead he watched it from the lake, and at the termination of the flight he conferred upon Count Zeppelin the order of the Black Eagle, in recognition of his achievement. At the present time there has been raised by popular subscription in Germany, for the construction of Zeppelin dirigibles, $1,378,334. This gives a good idea of the decided success Count Zeppelin has finally met with among his countrymen.

The other dirigible which we illustrate is the "Clement-Bayard" of M. Clement, the well-known automobile manufacturer of Paris. This airship has been constructed for the personal use of M. Clement. It is 56 meters long (183.6 feet) by 10.58 meters (34.7 feet) in diameter, and it has a capacity of 3,500 cubic meters (123,602 cubic feet). The body framework is 28½ meters (93½ feet) long, made of steel tubing. A triple-surface horizontal rudder is placed at the forward end of the body framework, and a 5-meter (16½-foot) propeller is at the extreme front end. The 120-horse-power Bayard-Clement motor is mounted on springs, and drives the propeller 380 R. P. M. by reduction gearing. Every conceivable kind of indicating apparatus has been fitted. For example, there is a tachometer which gives the number of revolutions of the motor at every instant. For the convenience of the passengers a closed cabin of sheet aluminium has been provided. A specially noticeable feature of this dirigible is the peculiar tail, which consists of four club-shaped gasbags placed beside the reduced rear end of the main envelope. This form of tail has been found to work quite satisfactorily, and to give the balloon a considerable degree of stability. M. Clement expects to use this airship in making excursions to his country place.

Two of the photographs reproduced herewith show Farman's remodeled aeroplane and the latest Bleriot monoplane in full flight. The Farman machine has been changed by the placing of vertical partitions at the ends of the main planes and by the moving of the partitions that were formerly on each side of the center part to points about half way between the center and the ends of the main planes. M. Farman has also fitted horizontal auxiliary planes or shutters to the rear edges of both the upper and lower planes. The angle of these shutters can be varied to tilt up the machine when turning a corner. After making the sensational cross-country flight mentioned elsewhere, Farman, on October 31, won the "Prix de la Hauteur" of the Aero Club of France by flying over a line of captive balloons placed at a height of 82 feet.

The Bleriot monoplane has not been changed very much of late. The movable wing tips are still used on the ends of the plane, and there is but a single horizontal rudder below the rear end of the body framework. A small additional plane is fitted above the body framework toward the rear. These rudders and movable wing tips apparently work very well, since M. Bleriot was able, on October 22, to drive his machine against a strong wind of between 25 and 30 miles an hour. The speed of the machine itself is about 37 miles an hour.

The other aeroplane we illustrate is a new type, in which the surfaces are arranged in a series of steps. This aeroplane is known as the Witzig-Dutilleul. It has a total surface of 50½ square feet, and is to have a 50-horse-power Antoinette motor. No experiments of any account have as yet been made with it.



Side view of Witzig-Lioré-Dutilleul aeroplane, showing step-like arrangement of the following planes.

AN AEROPLANE FACTORY.

(*Concluded from page 356.*)

and to the curved ribs that pass through pockets in it, and thus hold it in the proper curve which it is desired that the surface shall have. The horizontal and vertical rudders are fitted in front of and behind these planes, the former being mounted at the forward end of the body framework, and the latter in the box tail at the rear.. The main frame is supported upon a chassis of steel tubing by means of two long coiled springs that absorb the shock when the aeroplane alights upon its pneumatic-tired wheels. The two front wheels are pivoted so that they can assume any direction and act as casters when the machine alights.

In the construction of monoplanes the ribs of the wings are mounted upon steel tubes or I-beams of aluminium that are suitably secured to the body framework. The cloth is provided with eyelets and is laced in place.

One of our photographs shows a workman mounting the six planes of Farman's "Flying Fish" aeroplane upon the body framework. The planes can be set at varying angles, and the proper angle for them will be determined by experiment. The factory has a laboratory, in which experiments are made to determine the best form of aeroplane, the curves of the surfaces, and the resistance of the planes and of the framework. In constructing an aeroplane, use is made as much as possible of the different light metals and their alloys. Ordinary steel tubing is used for the planes, while for the propeller shafts and the blades nickel steel, offering the greatest resistance for the least weight, is employed. All pieces working under compression are made of aluminium, in order to diminish the weight. The propellers, in particular, are very carefully constructed. The hub is made of cast steel, and to it are clamped the steel arms, which are forgings of very high resistance. To these arms are secured aluminium blades. When one notes that this mass of 2.3 meters (7½ feet) diameter revolves at from 1,000 to 1,400 revolutions a minute, one can see that it must be exceptionally strong. At 1,335 revolutions per minute the end of one of the blades travels through space at the rate of 525 feet a second (350 miles an hour) and the blade itself is constantly under a centrifugal force of nearly 9,000 pounds, tending to project it outward.

The motor is one of the most important parts of the aeroplane. Heretofore Voisin brothers have used only the Antoinette motors of the 8-cylinder V type; but lately they have adopted the "Vivinus," or the motor of the Belgian Société Metallurgique. This latter motor, which is the one used on the Goupy, Florio, Moore-Brabazon, Farman ("Flying Fish" for two passengers), and De Caters aeroplanes, is a 50-horse-power, lightweight, automobile motor weighing about 300 pounds. Whatever motor is adopted, the installation of it requires only a few days. In fact, a complete aeroplane can be constructed in about a week's time. The cost of one of these machines in France is $4,000, half of which is represented by the motor. Very probably, however, the cost will be reduced as the machines come into more general use, for in reality, the materials used and the work necessitated in their construction are less than in the case of an automobile.

The Arc of Peru.

The committee of the French Academy of Sciences having scientific control of the French geodetic operations on the equator has reported the completion of the remeasurement of the historic arc of Peru.

This arc was measured by the French (1736-1743) and used in connection with a similar arc in the Arctic regions, also measured by the French, to decide a question in regard to the form of the earth which had arisen as the result of Cassini's surveys in France.

In 1889, the question of remeasuring this arc was brought before the International Geodetic Association by the delegate of the United States, Prof. George Davidson, who suggested that France should have the prior right to execute the work.

Circumstances prevented any active work until 1898, when the association voted in favor of the proposition to remeasure the arc, and the French delegates undertook to have the work done.

Officers of the Geographic Service of the French army left Paris for Ecuador in May, 1899, and the work was continued until completed.

The arc extends from Tulcan, Ecuador, Lat. +0 deg. 48 min. 25.6 sec., to Payta, Peru, Lat. —5 deg. 05 min. 08.6 sec. and the work accomplished in the remeasurement may be summarized as follows, viz.: Seventy-four geodetic stations. Three base lines measured.

Eight differences of longitude determined between stations at Tulcan, Piular, Quito, Latacunga, Riobamba, Cuenca, Machala, and Payta. The first five of these stations are distributed along the northern section of the arc, the sixth at the middle of the southern section, the seventh on the coast at the same latitude as the sixth, and the last at the end of the southern section, on the coast. The comparison of the differences of longitude, geodetic and astronomic, between the stations at Machala and Payta and the station at Cuenca will throw light on the form of the geoid, as the first two stations are on the coast and the third is in the inter-andine region.

Six azimuths were determined, namely, at Tulcan, Piular, Quito, Riobamba, Cuenca, and Payta.

Sixty-four determinations of latitude were made.

The forty-eight magnetic stations were distributed all along the arc.

Of the six pendulum stations, one is at Machala, on the coast, at the point where observations for longitude were made; one at the foot of the western Cordillera, near Chimborazo; one, at an elevation of 4,150 meters in the western Cordillera; two, in the inter-andine region at Riobamba and Quito; and one at an altitude of 1,800 meters in the plain of the Amazon on the eastern slope of the eastern Cordillera.

Of the two lines of levels of precision, one runs from the Riobamba base line to Guayaquil and to the tide gage at Salinas on the Pacific coast and the other from the southern base line to the tide gage at Payta, the two lines covering a distance of 410 kilometers.

The preliminary computations are far enough advanced to assure the value of the observations. The closure of the triangles and the agreement of the computed and the measured lengths of the base lines compare well with the results obtained in the revision of the meridian of France.

The publication of the results of the work will be regarded as an important event by geodesists throughout the world.—Abstract from Science.

A new and peculiar use for electricity has been found. The city of Zittau possesses extensive and beautiful forests, in which such depredations have been made by the larvæ of the "nun" moth that it has been found necessary to cut down all the trees over large tracts. Last summer the electric light was enlisted in the warfare against the insects. On the roof of the city electrical station were mounted an exhaust blower and two powerful searchlights, the beams of which were directed to the forest five miles away. The hoped-for result followed. The moths flew by the thousand toward the searchlights but, before they could reach these, they came within the field of action of the blower and were carried away to destruction. In one night 66 pounds of moths were destroyed in this way, in addition to the great numbers of moths which found death in the electric arcs of the street lamps, from which the globes had been purposely removed.

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Henry Farman making the first cross-country flight that has ever been accomplished with an aeroplane. The 17 miles between the military camp at Chalons and the city of Rheims, France, were covered in about 20 minutes.

A NEW ERA IN AERIAL NAVIGATION.—[See pages 350 and 357.]