

**THE INTERNATIONAL KITE ASCENSIONS.**

BY S. P. FERGUSON, OF THE BLUE HILL METEOROLOGICAL OBSERVATORY STAFF.

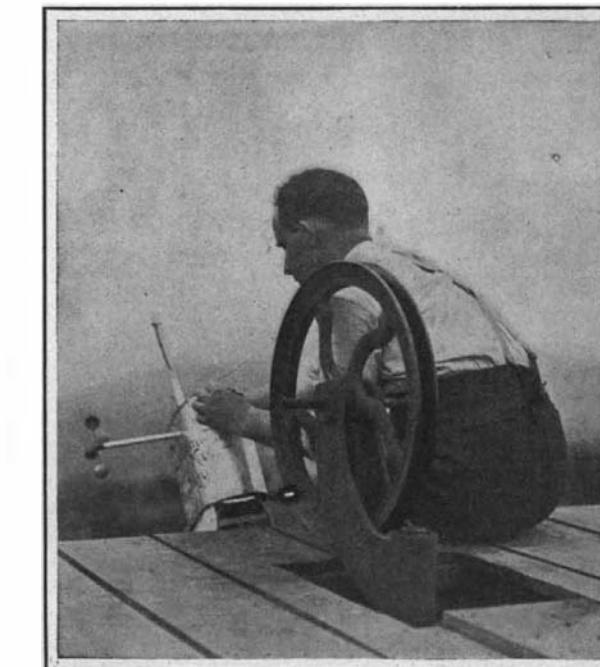
At the present time the rapidly increasing attention given to the science of aeronautics is manifested not only in experimental study of aerial navigation, but in the use of aeronautical apparatus, such as balloons and kites, in systematic studies of the atmosphere. Much interest has been shown in the international balloon and kite ascensions made during the week ending with July 28, and as the purpose of this work does not appear to be very generally understood a brief account thereof will be given in this paper.

The successful introduction of the *ballon-sonde* (or unmanned balloon carrying registering instruments only) in 1892, and the application of the modern kite in 1894, gave a great impetus to meteorological research and it is easily understood that there should be uniform rules for the employment of these methods.

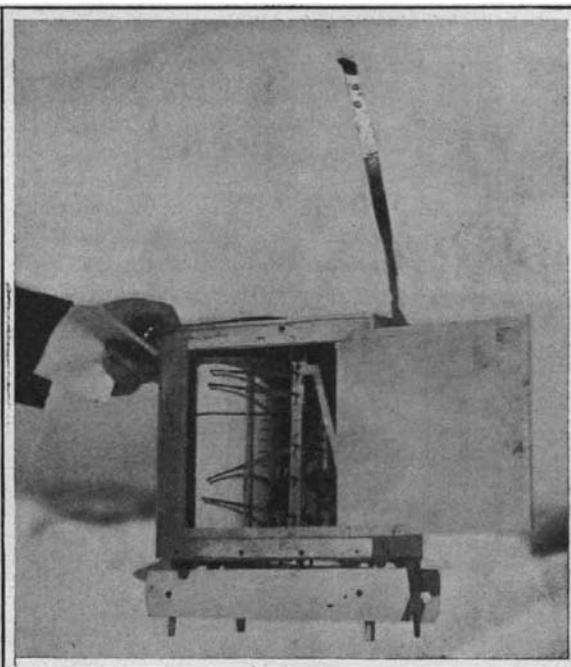
M. Wilfred de Fouvielle, of Paris, whose valuable co-operation in the first experiments with *ballons sondes* is well known, was the first to propose international co-operation in the exploration of the air, and at the International Meteorological Conference in Paris in September, 1896, at the instance of members interested in meteorological aeronautics the following resolutions were adopted by the assembly:

"1. The Conference recognizes the great importance of aeronautical investigations for meteorological science and expresses the desire that scientific ascensions should be encouraged and multiplied.

"2. The Conference expresses the wish that scien-



Mr. Ferguson Fastening a Meteorograph to a Kite Line.



A Meteorograph Which Records Temperature, Humidity, Wind Velocity, and Height.

"3. At the present time the Conference cannot recommend either special methods or particular instruments, but it desires that, so far as possible, iden-

fications, especially those which are made in simultaneous ascensions, is of capital importance.

"5. It is desirable that observations in captive balloons, which are not manned, should be systematically made.

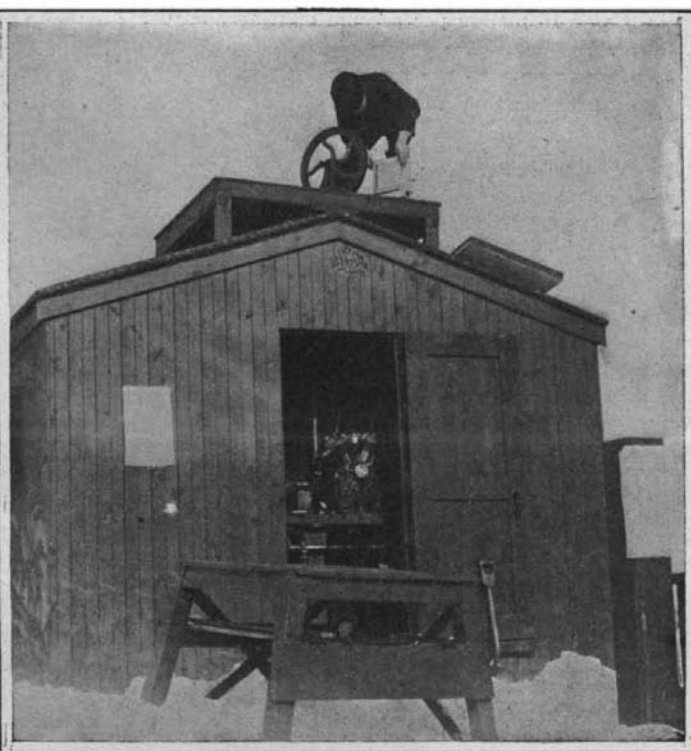
"6. On account of the satisfactory results which have been attained at Blue Hill with kites carrying registering instruments up to 2,000 meters, it is desirable that similar investigation be undertaken elsewhere."

Afterward, to further these resolutions, the following provisional aeronautical committee was named by the International Committee: MM. Hergesell, Erk, and Assmann, of Germany; Cailletet, de Fouvielle, Hermite, and Jaubert, of France; Pomortzeff, of Russia, and Rotch, of the United States. Later, the International Commission for Scientific Aeronautics was organized, consisting of persons actively interested in scientific aeronautics and having for its object the investigation of atmospheric conditions up to the highest limits attainable with kites and balloons. Prof. Hergesell, chief of the weather service of Alsace-Lorraine, was elected president. Meetings of the commission were held once in two years until 1906, when it was voted to meet once in three years. The Permanent International Aeronautical Committee was founded by a resolution of the International Aeronautical Congress held at Paris in 1900, in order to carry out the expressed wish of the Congress to advance the progress of aeronautics by scientific advice and the study of methods and apparatus. The members are prominent aeronauts, engineers, and meteorologists, chiefly from European countries. The American members are Prof. A. L. Rotch, director of Blue Hill Observatory, and Mr. Octave Chanute, of Chicago.

The practical work of the International Commission began shortly after its organization with simultane-



Measuring the Altitude with the Theodolite.

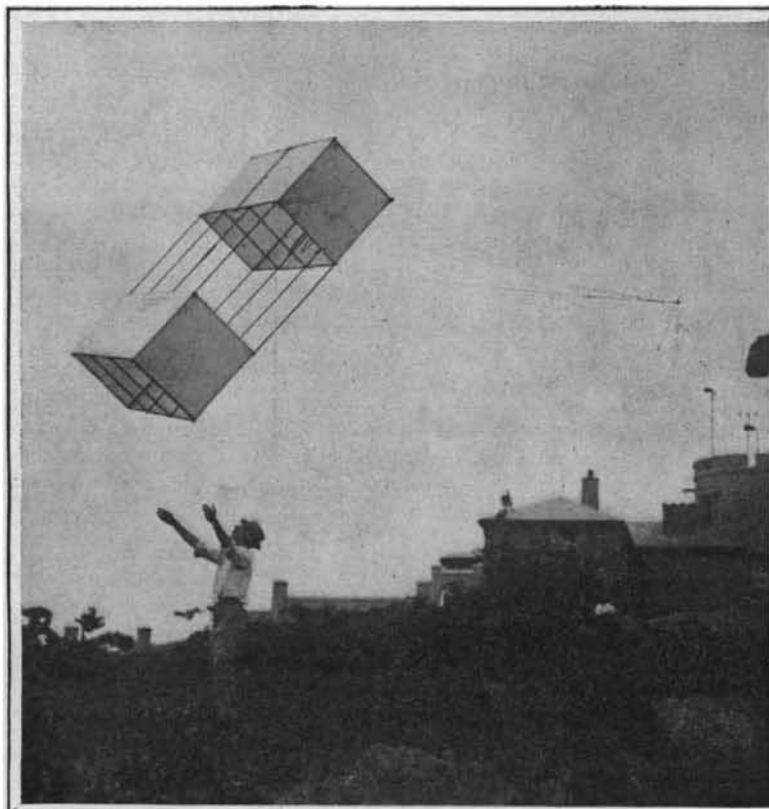


Fastening a Meteorograph to a Kite Wire.

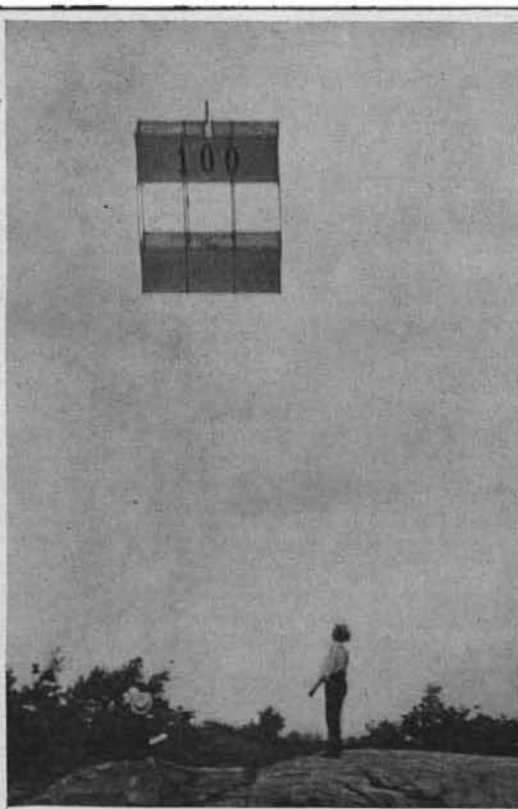
ascents, either with manned balloons or with pilot balloons, should take place simultaneously at the different stations.

tical instruments should be used during the simultaneous ascensions of pilot-balloons.

"4. The prompt publication of the unreduced obser-



Starting a Flight.



Box Kite Traveling Upward.



Catching the Meteorograph on Its Descent.

ous ascensions of manned and unmanned balloons at six European stations, but it has expanded until at the present time about twenty institutions and individuals co-operate in making ascensions, usually on the first Thursday of each month and occasionally on several successive days predetermined by the International Committee. Among the co-operating institutions are the famous Prussian Royal Aeronautical Observatory, where ascensions have been made daily for several years; the Deutsche Seewarte at Hamburg; the Observatoire de Météorologie Dynamique at Trappes, France; the Blue Hill Observatory, and the Mount Weather Observatory, the last two being the only institutions co-operating in the United States. The records and observations obtained are forwarded to the headquarters of the commission at Strasburg, and published in the Veröffentlichungen der Internationalen Kommission für Wissenschaftliche Luftschiffahrt, which is edited by Prof. Hergesell.

**Kites.**—At all of the co-operating stations some modification of Mr. Clayton's form of the Hargrave kite has been employed almost exclusively. Apparently, no other has been found to possess the strength, stability, and efficiency necessary for continuous experimenting in all conditions of wind and weather, although many efforts have been made to develop a kite less complex and less expensive to construct.

The kites usually employed weigh from 350 to 850 grammes per square meter of lifting surface, which varies from 3 to 7 square meters, according to the size of the kite. Generally, they are made with flat lifting surfaces and when secured by a short line fly at an altitude of 53 to 57 deg. The practice, followed at Blue Hill and Berlin, of employing rigid curved lifting surfaces in the front cell increases the weight slightly, but there is a great gain in efficiency, the altitude reached averaging between 60 and 66 deg. The kites are sometimes made to fold up, which is very advantageous when broken parts are to be replaced or the kites are to be moved a long distance.

**Line.**—Steel music wire only is employed for the main line and in some instances this material has been substituted for the flexible cables and blocking cord heretofore employed for secondary lines. The plan, first adopted in 1891 by William A. Eddy, of New York, of making the main line of pieces of different sizes, the strength increasing from the outer end toward the reel, has been very generally employed.

**Reel.**—The reels employed vary considerably in design but, in most of those in use, the line is stored on a large drum whence it is drawn by the pull of the kites, and on which it is rewound at the end of an ascension, by means of a suitable motor. Devices are provided for registering the pull of the kites and the length of line in use, also in some reels strain pulleys are employed to relieve the storage drum of excessive pressure. Strain pulleys are injurious to the line and reels fitted with them can be operated only by skilled engineers; for these reasons they have been abandoned at Blue Hill. The highest efficiency is obtained when the reel is always under perfect control and can be started, stopped, or reversed quickly in response to any of the ever varying requirements of kite-flying.

**Meteorological Instruments.**—Most of the recording instruments now in use are modifications of the well-known Richard patterns, the more recent departures from the original construction having been made for the purpose of securing greater sensitiveness and smaller weight. Usually four elements—wind velocity, pressure, temperature, and humidity—are recorded. The instruments are frequently tested to determine the scale-values of the different elements and are always carefully compared with standards in suitable conditions of exposure before and after each ascension.

**Observations.**—The heights reached are mostly determined from frequent observations of the kites by means of a transit, except when the kites are hidden by clouds or darkness, in which cases the heights are obtained from the record of barometric pressure. Meteorological data are obtained at many different times and heights in order to ascertain progressive and non-periodic changes in each element as well as the distribution in a vertical direction. An immense amount of material is being accumulated for study and the discussion of this is adding very greatly to our knowledge of the processes of the atmosphere; also, in time, there is reason to expect practical benefits in the form of increased accuracy in forecasting the weather.

During the present year, in addition to the regular monthly ascensions, there were planned three groups of ascensions, one occupying six days ending with July 27, one of three days' duration in September and another in December. It is yet too early for news of the European ascensions, and, as the Blue Hill records have not been reduced, it is possible to give only a very general statement of the results. Kite flights were obtained on July 22 between 3:15 and 5:45 P. M. to a maximum height of 1,000 meters; July 24, 6:40 P. M. to 10:30 P. M., probable height 2,500 meters, but instrument was lost and has not been found; 26th, 3:20 to 3:40 P. M., 500 meters; 27th, 6 to 8:50 P. M.,

2,000 meters; 29th, 2:30 to 6:30 P. M., 1,300 meters. On other days the conditions were unfavorable, chiefly because of calms, and no flights were possible. The records do not indicate any unusual or very remarkable phenomena unless we except the very high wind velocity (23 meters per second) recorded at a height of 2,000 meters on the 27th.

The International Commission also publishes observations made at mountain observatories, those of the Sonnblick, Brocken, Puy de Dôme, and others having co-operated. In this country Mount Weather (526 meters) and Blue Hill (195 meters) are the only mountain stations contributing records throughout the year. With the kind co-operation of Mr. Frank H. Burt, editor of *Among the Clouds*, the writer has obtained records on the summit of Mount Washington, N. H. (1,916 meters), during the international ascensions of August 29, 30, and 31, 1905, September 6, 1906, and July 22 to 27, 1907. These observations were undertaken primarily for the purpose of comparing the conditions on the summit with those of the free air by means of kites flown at Twin Mountain near by. The work of the last expedition to this vicinity having ended on July 20, Prof. Rotch co-operated in extending the kite flights to cover the week ending with the 27th and obtain comparisons during the International series of ascensions, the experiments being conducted by Mr. Clayton. Perhaps the most interesting result of this work is the confirmation of the first comparison of wind velocities on Mount Washington made in 1905, which showed a higher velocity on the mountain than existed in the free air. On July 20 the wind on the summit was 23 meters per second, while in the free air it was 16 meters per second, or nearly 30 per cent lower.

#### Engineering Notes.

A series of tests was recently made upon a steam turbine connected with a dynamo at the Schlesienschen Kohlen und Kokswerken, in Germany, the turbine being designed to give 1,000 horse-power. The consumption of steam is found to be 7.98 kilogrammes (17.19 pounds) per kilowatt hour at full load on the dynamo, and 8.77 kilogrammes (19.63 pounds) per kilowatt-hour at half load. The steam worked under a pressure of 7.5 atmospheres, and was superheated at 300 deg. C. In the surface condenser the vacuum lay between 90 and 93.5 per cent. As regards the consumption of steam in the turbine, this was found by weighing the condensed water in the usual way. The momentary variation of speed which was due to a complete removal of the load (by cutting the current of the dynamo) was 5.5 per cent, and the permanent speed variations did not exceed 2.5 per cent under the same conditions. The variations of voltage on the dynamo without regulation of the current in the fields or of the speed of the turbine were found to be 11.6 per cent for a sudden discharge of the load, and 8.5 per cent when the load was abruptly thrown on. A test of an overload up to 952 kilowatts on the dynamo during a period of one hour gave very satisfactory results. The economy of steam realized by the use of the steam turbine instead of the former steam engines, reaches as high as 14 per cent at full load and 24 per cent at half load.

Sewage disposal works consisting of septic tanks and percolating filters have recently been opened at Macclesfield, England, in place of the chemical precipitation system formerly employed, says the *Engineering Record*. The tanks used for precipitation have been enlarged and others built, so that the total tank capacity is now equal to the dry-weather flow for one day. The septic sewage passes from them to four percolating filters, each 120 feet in diameter and of 6½ feet average depth. These filters have concrete floors somewhat inclined from the center toward the circumference for drainage purposes, and their walls are constructed of brick reinforced by four 2 x ½-inch steel bands. Headers have been admitted in the wall at frequent intervals for aeration purposes, and the openings at the floor level left in this way also served for drainage. Broken stone is used for the filtering material. The septic sewage is distributed over each filter by four revolving arms pivoted at a center pier and arranged to be driven by the head of the sewage as it reaches them or by an electric motor. The effluent from these filters is conducted to a secondary filter, 408 feet long and 107 feet wide, which consists of 1 foot 9 inches of broken clinker with a surface layer of fine pottery saggars. The effluent from the percolating filters is distributed over this bed by means of half-pipe channels on its surface and is drained from it through perforated pipe in the bottom. If so desired, the effluent from the secondary filter can be run over a tract of land, but ordinarily it will be discharged directly into a neighboring river.

Users of gas engines on a large scale are commencing to realize that the heat carried away by the exhaust from gas engines amounts to about one-third of the total heat generated, and that the exhaust gases, being at a temperature of about 1,000 deg. F., are

capable of raising a large amount of steam, provided that a boiler suitable for the purpose is installed. According to the *Railway and Engineering Review*, such boilers are now being placed on the market. They should be placed as near to the engine cylinder as possible, and they consequently form a perfect exhaust silencer. When the gases have passed through the boiler they escape into the atmosphere by a pipe which is free from the usual nuisance of heat and noise. Inasmuch as gas power has not so far been favorably considered in many plants because of the need of the exhaust steam from steam engines for special purposes, there is now a chance for the adoption of the exhaust gas boiler to raise steam for heat or other purposes, while the motive power is gas, and thus a double measure of economy and usefulness is attained. In one factory in England these boilers are generating steam from the heat of the gas engine exhaust gases equivalent to the steam generated by 70 tons of coal per week.

The last link of the system of underground railroads promoted in London, England, by the late Charles T. Yerkes was opened to the public June 22. The new line, which connects the northern suburbs with the heart of London, is eight miles long. It was begun in 1903, runs on an average 60 feet below the surface, and cost \$25,000,000. A party of financiers and officials attended the opening ceremony. The public was permitted to travel free during the afternoon and evening, and was given souvenirs of the opening of the road. The Yerkes idea of underground transportation for London is now fully realized. Moreover, the general trunk system which he projected has been supplemented until underground London is honeycombed with tubes giving quick and comfortable service in all directions. Mr. Yerkes' first work was to electrify the old steam, shallow railways extending up and down the Thames and around the crowded district on the central north. Then he built the Waterloo tube under the Thames, between Paddington station and the Elephant and Castle. This line cost \$25,000,000 to construct the eight miles of its length. The total number of deep-level tubes is eight and the capital invested is now \$150,000,000. The annual passenger accommodation is 600,000,000. The average depth of the stations is 60 feet. That at Finsbury Park is only 20 feet, while those at Covent Garden and Hampstead are 123 and 185 feet respectively.—*Railway and Engineering Review*.

#### The Winner of the Hower Trophy for Automobile Runabouts.

After a successful three days' journey from New York to Buffalo, the 30-horse-power White steam runabout was finally declared the winner of the Hower trophy. The 35-horse-power Stoddard-Dayton gasoline runabout, which was tied with the White steamer when the competition for the Glidden trophy terminated in New York, after making two successful runs from New York to Albany and Albany to Syracuse, finally broke a spring during the trip to Buffalo and arrived 35 minutes late. On account of the consequent penalization of the gasoline machine, the steam machine was declared the winner. The cars covered a total distance of over 2,000 miles on some of the worst roads in the country, and it is worthy of notice that these two machines were the only runabouts in a company of thirteen that started, to finish the 1,570-mile tour with a perfect score and then to continue 400 miles further. These extra 400 miles were covered at a speed of about 18 miles an hour.

Of the cars which contested for the Glidden trophy, one, a 16-horse-power Reo, immediately after the termination of the tour, made a 330-mile trip in 25½ hours elapsed time, from New York city to Cape Charles, whence it was ferried to the Jamestown Exposition. The average speed in this case, including all stops, was about 13 miles an hour. This shows the car was still in good condition after its long and strenuous journey in the Glidden tour.

#### The Wright's Aeroplane to be Tested in France.

As already noted in a previous issue, the Wright brothers have been in Europe with the idea of selling their aeroplane to one of the European governments. According to a recent cable dispatch, they have made an arrangement with Senator Henri Deutsch de la Meurthe and the French government, as a result of which they will soon make a demonstration for some officers of the military balloon corps and two engineers appointed by M. Deutsch. Their aeroplane is said to have been shipped to France from their home in Dayton, Ohio, about the middle of last month.

**Butter or Cheese Color.**—I. Nine parts of annatto (Orlean) extract and 1 part of saffron are digested with 100 parts of fresh olive oil for two hours in the water bath, and after settling for eight days, filtered.

II. Etheric Orlean extract 10 parts, fresh salad oil 500 parts. Over the Orlean extract in a bottle fresh salad oil is poured and finally dissolved by shaking or by heat, the bottle being frequently dipped into hot water.