FLIGHT

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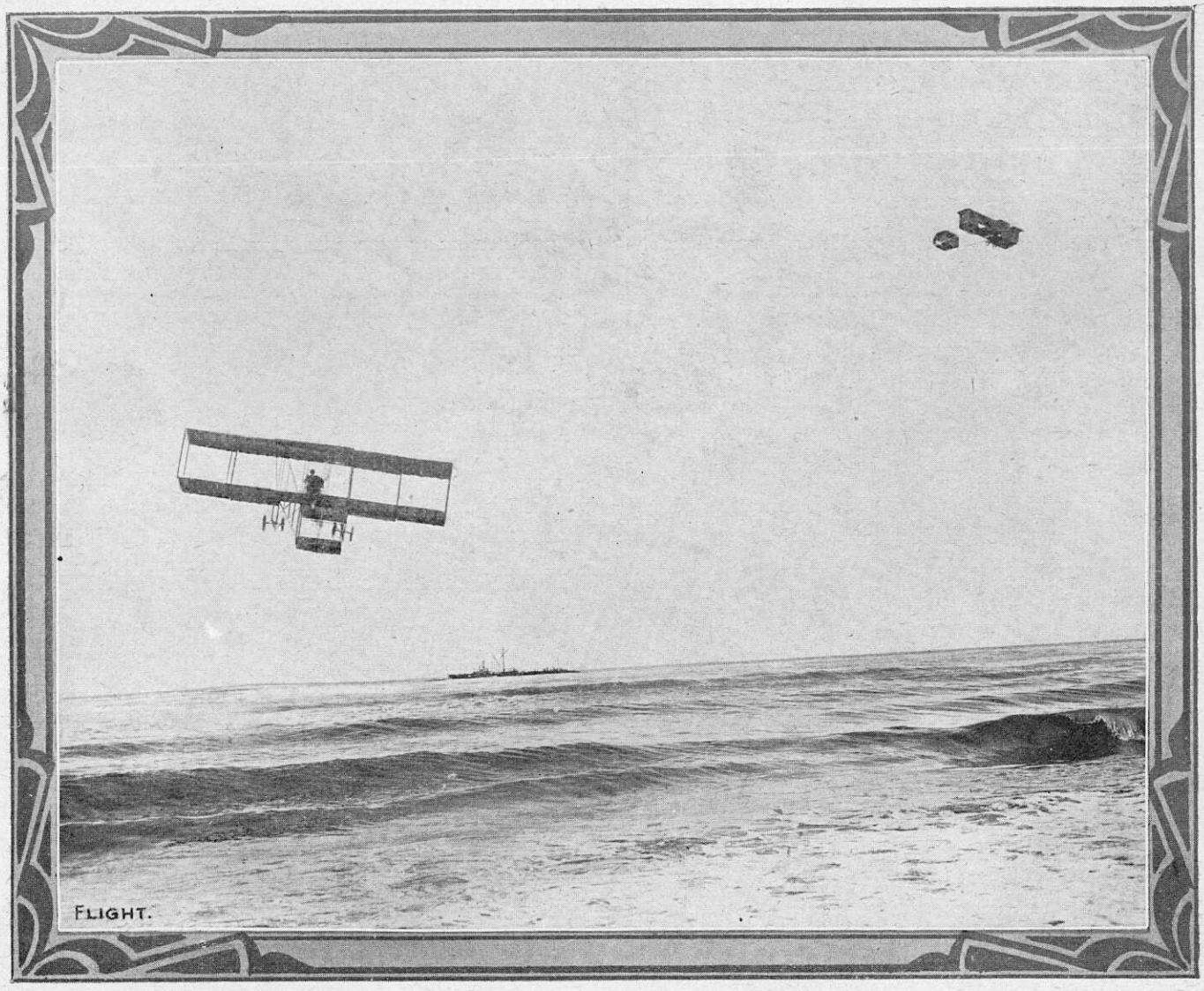


NICE FLIGHT MEETING.—Mr. A. Rawlinson, on the left, on his Henry Farman, and M. Rougier on his Voisin biplane, flying over the sea at Nice.

FUTURE AERONAUTICAL INVENTIONS.

By GRIFFITH BREWER.

THE reception accorded by readers of FLIGHT to my previous article, "Aeronautics for the Navy," encourages me to step still deeper into the future, and to suggest still further channels in aerial invention which are gaping ready to be filled by those who fly to-day, and who by giving thought to the various disadvantages which they themselves discover may let the world profit by their experience.

All new inventions, such as the telephone, the electric lamp, motor cars, steam boilers, &c., march through a steady development spread over many years, and do not rise suddenly to that degree of perfection which is necessary in order that they may take their place in our general daily life. The flying machine is no exception to this rule, and although to-day we see none but the hardy and venturesome trusting their lives on this new means of conveyance, I see no reason why, within our own time, invalids will not travel to Cairo by the aerial route, not only because it will be the quickest method of travel, but because it will be the safest and most free from the discomforts of movement and vibration which are inseparable from the land and sea transit of to-day.

At a height of 5,000 ft. the air moves steadily, with few varying currents, and it may be taken that at this altitude the volume or bulk of air moves as smoothly as the flow of the tide. Flight is not limited to one plane, but to innumerable planes from 1,000 ft. to, say, 10,000 ft., and vessels travelling in various directions will be confined in their progress to various altitudes, thus enabling innumerable machines to travel in the atmosphere without risk of collision. It therefore follows that practical aerial navigation is open very largely to automatic control in a way that could not be adopted on land, and could not with safety be applied to marine navigation. Consequently we may appropriately consider what lines the development of the flying machine may follow in its march towards its ultimate sphere of usefulness.

Automatic Vertical Steering.

An arrangement whereby a flying machine may be automatically kept at a given altitude without requiring constant attention is an essential improvement which must be introduced before flying enters the realm of practical navigation. The necessity of guiding the machine or vessel to right or left in order to reach a given destination, and making allowances for the direction and varying force of winds which tend to drive the machine away from its course, are quite sufficient to engross the attention of the navigator without requiring his constant attention to adjustments of direction in a third dimension. When once this automatic adjustment or maintenance of a given altitude is secured, the duties of the aerial helmsman will be brought into line with similar duties on a steamship, and the vertical steering would only require attention when bringing the vessel from one altitude to another, such as would be necessary in landing or starting, or in rising temporarily to avoid mountains. A means for effecting automatic vertical steering was designed and patented some years ago by Sir H. S. Maxim, the apparatus employed being composed of a sealed elastic box working on the principle of an aneroid barometer, the movement of a diaphragm on the box operating steering vanes. By this means, as the machine rises into more rarefied air, the elastic or flexible box expands, and its diaphragm communicates motion to a horizontally arranged plane, and turns the same to a downward direction. This turning is continued by the continued movement of the diaphragm until the machine is caused to travel downwards, and the box being then carried into denser air contracts and acts in the reverse direction, preventing further descent. This patent has expired, so it is open to anyone to experiment and devise a means of automatic vertical steering operated by alterations of air pressure. The steering of a flying machine up or down to maintain an approximately constant altitude may be one solution of the difficulty, or it may be found most desirable to set the machine so as to run through the atmosphere with the planes maintained at a constant angle of incidence to the air through which it travels. This is a line of experiment originating with the Brothers Wright, who have patented a means of vertical steering governed by the movements of an approximately horizontal vane which moves up or down as the wind strikes its lower or upper face respectively. By adjusting the angle of the vane slightly up or down the machine may be caused to automatically soar on a gradual incline or it may be set to run in an approximately horizontal line. This method of vertical steering has the advantage over the pressure method of enabling the vertical steering to take into account local vertical air currents and so maintain the balance of the machine; and it also has the power of equalising the effect of alterations of engine-power by using up surplus power for mounting upwards and by steering the machine downwards so as to utilise gravity as a propelling force when the power of the engine is cut off or dangerously diminished. Both lines of experiment have their merits, and it rests with the man who actually flies to discover which, if either, is the best, or whether a combination of the two would be most desirable. Whatever device is invented it must be designed in detail to be of any value; mere shadowlike schemes which do not admit of adoption without the exercise of further invention on the part of others, although they may be interesting, cannot be classed as the useful culmination of inventive thought.

Automatic Horizontal Steering.

Although it is not essential to the useful development of the dirigible balloon or flying machine to steer to right or left automatically, it would be extremely desirable to be able to do so in order to reduce the duties of navigation to the simplest. It is of the utmost importance to keep the crew of the aerial vessel as small in number as possible, in order to gain in efficiency by utilising the weight saved for the carriage of propulsion fuel, or for the carriage of passengers or goods. In the early years of aerial navigation, this limiting of the crew will be of such importance that a simple means of automatic or practically automatic steering will be worth the efforts of the most skilled brains.

There are two methods which naturally occur to one, as methods which can be worked upon in obtaining that control of the steering apparatus, which will save the navigator from the need of constant attention. The first is by electrically-operated means in which the current for moving the steering apparatus is governed by the movements of a compass. The power of movement of a compass is certainly extremely slight, and it will require most clever design on the part of the

inventor to so multiply the power available as to govern the flow of the current required. A steering device efficiently controlled by a compass would be of infinite value to an aerial vessel, because at a given altitude there would be no risk of collision with other vessels going in other directions at different altitudes; besides the limits of vision being so much greater in the air than at sea, an occasional glance at the compass control and in the direction of travel would be safe, whilst at sea such occasional attention might be insufficient. Besides the problem of automatic steering of an air vessel travelling in undisturbed air is much more simple than that of steering a steamship, which is thrown off its course by every wave it encounters.

The second means of steering, which, however, is only partially automatic, would be by gyroscopic control. This, of course, is easier to deal with than the compass control previously suggested, but it could only be relied on to maintain the direction for a given time. Gradually errors would creep in, which as they increased would require correction. Gyroscopic steering has already been used in guiding torpedoes in order to keep them constantly travelling in the direction of the object aimed at, so the work already accomplished in this direction should be carefully studied by any who would experiment on these lines, before setting out to invent on this partially covered field.

The Aeroplane Engine.

Many makers of internal-combustion engines have already given their attention to fulfilling the requirements of the flying machine builder. There is, however, ample room for additional attention being given to this vital factor in mechanical flight, and that indefatigable scientist. Mr. Patrick Y. Alexander, has drawn attention to this requirement by offering a prize of £1,000 for an engine fulfilling the needs of the aerial navigator.

The most important quality of an engine for use on an aerial vessel is reliability, because the day is past when extreme lightness was essential to actual flight. It is of course desirable to construct the engine as light in weight as is consistent with proficiency in running power, but it is far preferable to employ a few extra pounds of useless metal than to have some parts built with an insufficient margin of strength; for remember, that the breakdown of the engine during flight reduces the aeroplane at best to a glider, and the dirigible to a most unwieldy drifting balloon. The detail requirements of the engine for aerial craft are somewhat beyond the scope of the present article; but if the aeroplanist is sufficiently mechanically inclined to design an engine to suit his needs, let him keep reliability as the leading feature, and if he can then devise the motor with rotary parts instead of reciprocating parts, he will confer a boon, not only on his fellow aviators, but on all who use internal-combustion engines.

Better still, to invent a means of direct propulsion from the expansive force of vapour combustion acting directly on the air itself. The method of utilising the force of the petrol explosion in the machines of the present day consists in receiving the force of the explosion on a piston whose reciprocation is converted into a rotary motion by the connecting-rod and crank, and then either directly or indirectly a propeller is rotated for the purpose of converting the rotary force back to direct horizontal force. As at least 50 per cent. of the force is lost at each conversion, it is obvious that a direct-acting propulsion motor which secured a thrust equal to a quarter of the energy given by the combustion of the fuel, would eclipse all methods hitherto known of air propulsion. The estimate of loss of 75 per cent. only of the power is too liberal when put into actual practice, as can be proved any day when one observes four men holding a wheel-supported aeroplane against the effort of propulsion of a 50-h.p. motor. The realisation of direct propulsion by the force of the explosions impacting against the air to the rear of the machine, does not appear impossible of realisation. The propeller is only an instrument for pushing a column of air in a rearward direction; if, therefore, the fuel to be burnt could be ignited and ejected towards the rear of the machine in such a manner that its force were directed against and received by the air itself, the result would be the same as that of a similar column of air propelled rearwards by a screw propeller or other indirectly operated mechanism. Mr. Patrick Y. Alexander has already drawn attention to the advantages to be gained by this direct method of propulsion, and I have no hesitation in urging those who are disposed to take up the research for a more satisfactory propelling force, to investigate the field of direct reaction of expansive combustion most carefully.

Driving-gear to Propellers.

The gear for transmitting and controlling the power from the motor to the propellers is a feature that the inventive aeroplanist will do well to keep in mind. The simplest form of drive is, of course, when there is only one propeller employed which is mounted on the motor-shaft. This, however, has the duplex disadvantage of necessitating the rotation of the propeller to be equal to that of the motor, and also in taking the air from or driving it to the centre of the machine where the engine, crew, and other wind obstructors are mostly collected. The first of these disadvantages has been reduced by introducing spur-gearing between the motor-shaft and the propeller-shaft, thus losing, however, the charm of the direct-drive. In using two propellers, such as those employed on the Wright biplane, they perform their work in freer air, and consequently thrust with much greater efficiency. This is one of the reasons why the Wright machine has been able to accomplish flights with such small power. It is of the utmost importance, however, when two propellers are employed, that both should be driven evenly, and if one propeller stops that its twin propeller should be stopped also. The gearing, therefore, should either be infallible, or an automatic cut-out should be applied so as to stop both propellers should one fail. The use of two propellers opens the door to a wide field of experiment in the steering and balancing of the machine. It is obvious that if one propeller thrusts more vigorously than its fellow, it will turn the machine towards the side where the thrust is weakest. The interposing of a differential gear between the motor and the two propellers, in a similar manner to the balanced driving-gear on a motor car, would enable the propellers to be rotated so as to balance one another. By braking one propeller the other would work more vigorously and steer the machine towards that side on which the propeller is retarded. The same effect could also be gained by altering the pitch of the propellers relatively to each other during flight, so as to obtain different degrees of thrust on different sides of the machine. It is impossible to foreshadow exactly how the driving-gear problem will ultimately be solved, but the above should be sufficient to indicate where the practical aviator may advance the art in devising improvements primarily intended for use on his own machine.

Alteration of Supporting Surface.

A sailing vessel has its sails so arranged that their area may be increased or reduced at will in order to suit the strength of the wind that may be blowing. The necessary supporting surface of a flying machine depends on its speed of propulsion, less surface being required when travelling fast through the air than when moving comparatively slowly. If some means can be devised for increasing and reducing the supporting surface, aeroplanes will be given a wider range of speed than if dependent on a fixed area of aeroplane surface.

Floats for Support on Water.

If a satisfactory arrangement of floats could be devised, aeroplanes would at once be provided with plentiful starting and landing places. Every pond and river would become an aerodrome! The difficulties in the way of the satisfactory solution of this problem appear to be many. The floats must be of such a character that the necessary speed through the water may be obtained to enable the machine to attain flight, but this should be quite possible, because the amount of immersion will decrease as the speed increases. The resistance to propulsion should not thererore become prohibitive. If the floats do not make a sufficiently extended base, the floating aeroplane will be liable to capsize, and in an arm of the sea or harbour, where waves from a passing steamer may cause the floating aeroplane to roll, the extended planes may dip in the waves which would put them to sufficient strain to cause a general wreck.

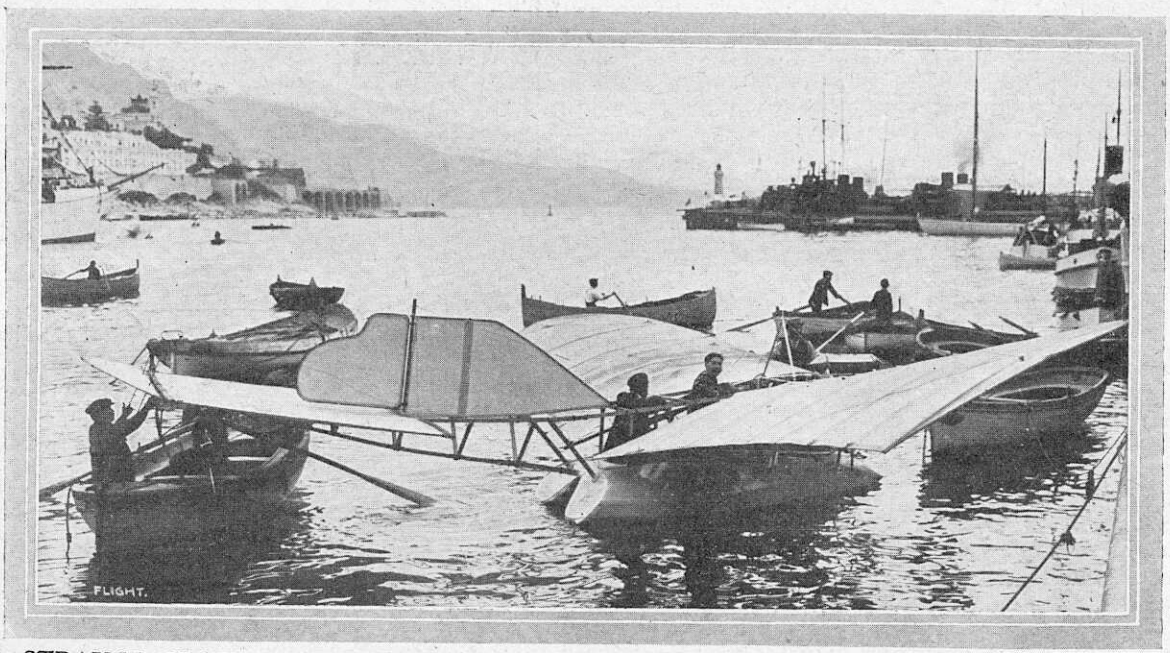
Launching and Boarding Apparatus.

A tremendous field is open to the experimenter in devising a convenient means for enabling an aeroplane to be launched from and subsequently be taken on board a ship at sea. It is, perhaps, needless to point out that such facilities would be of incalculable value for the Navy, and even the mercantile marine would find plenty of use for such a speedy means of communication with the shore.

The dirigible balloon of to-day can carry the weight of many people besides the necessary fuel for propelling the vessel to a considerable distance. It would therefore be possible for the millionaire to travel in comfort in an enclosed compartment from London to the Riviera through the atmosphere on a calm day, without having to submit to the vibration of the train or the pitching of the steamboat. Hitherto no millionaire has yet been found to inaugurate this luxurious means of transit, and the ordinarily rich man is not rich enough to do so. There must be many people, however, who tour in motor cars, and who would welcome the delightful change from the dusty roads to the sparkling air, where there are no corners to be turned nor new metal to be ground over, and I can see no reason why in the near future, the more enterprising of the motorists should not abandon the macadam for the ether, by the adoption of the aeroplane. Do not think that we have arrived at anything like finality when only half-a-dozen men in England have flown their five miles or so. These are only the pioneers, like the men who first attempted the feat of motoring from London to Brighton, some of whom only succeeded in negotiating Westminster Bridge.

The aeroplane may not improve at the same rate as the motor car improved, but in the end it will outstrip it. I am even so convinced of the inevitable triumph of the aerial car, that I would not invest my savings in railways because of the future shrinkage of the passenger receipts when every traveller who is in a hurry will travel direct to his destination, without having to wriggle his way through all sorts of towns and villages he has no desire to see, simply because both rail and road go that way and no other.

It rests with the pioneers of flight in Britain, to so develop the aeroplane and the dirigible balloon, that they may be brought within the sphere of general practice, even as the motor car builders of England have brought their cars up to the level, and in some cases beyond the standard, of those in the country of the motor car's birth. We shall then have one more triumph to add to an already splendid list of great improvements.



A STRANGE CRAFT IN THE HARBOUR AT MONACO LAST WEEK.—This novel aero-hydroplane is fitted with a 50-h.p. 3-cyl. Anzani motor.

FLIGHT

THE COOLING OF AN AEROMOTOR.

By H. S. ROWELL, A.R.C.Sc. (Lond)., Wh. Sch.

The efficient cooling of an aero motor has a very great influence on the reliability of running obtained.

This statement may seem too obvious for publication, but few people seem to have a just appreciation of the effects of uneven or irregular cooling and the consequent distortions produced.

It must be evident that with a cylinder of unsymmetrical form, uneven cooling may lead to a non-circularity of cross-section or lack of axial straightness. Such distortions as these would clearly tend to interfere with the smooth working of the engine and might cause breakdown.

How can we secure efficient and uniform cooling?

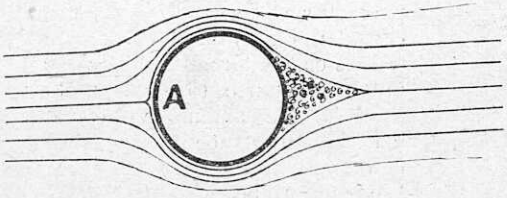


Fig. 1.

What we must do then is to render the conditions round the cylinder more symmetrical. Fig. 2 shows diagrammatically an arrangement designed to give more even cooling; J and J^1 are jets (moving with the engine) which direct streams of comparatively cool air on the rear parts of the cylinder. The resistance of these jets to motion should not be very great.

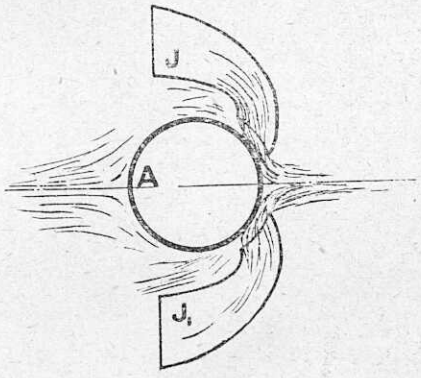


Fig. 2.

The methods of cylinder cooling usually employed differ chiefly in the jacket medium used; broadly speaking these are three:—

(*a*) air, (*b*) water, (*c*) oil and other liquids. The third class is one which is not yet developed. Regarding the other two classes it might be well to mention that of about forty different types enumerated in Mr. Critchley's paper ("Proceedings of the Institution of Automobile Engineers," November, 1909) three-fourths are water-cooled and the remainder air-cooled. Of these air-cooled motors some are of the Gnome type in which the cylinders rotate bodily round the crank-shaft as a centre.

Why, then, do we find air-cooling so unpopular, in spite of the undesirable weight which water cooling entails? Fig. 1 gives us an idea of the conditions prevailing round a cylinder cooled by the passing air.* It is seen that the leading side, A, is in contact with a continually changing mass of air, while the opposite side is in contact with a mass of dead air, so to speak, which is changing comparatively slowly, and which is, moreover, warmed by the air flowing past from the region of A.

Of water cooling we need say little here. The rate of change of density of water with regard to temperature, at the temperature of a petrol motor jacket, is considerable, and hence we have very vigorous convection of the cooling water. Thus, no great variation of temperature—from point to point of the cylinder—can last very long. The temperature being fairly uniform, the cylinder retains its original form, or nearly so.

With regard to the use of oil and other liquids as cooling media, little can be said of a definite nature from the point of view of practical experience.

The chief physical properties to be desired in a cooling medium are: low specific gravity, high diffusivity, and high convectivity.

By diffusivity we mean the ratio of specific conductivity to the specific heat or thermal capacity per unit volume; and by convectivity we mean the power of conveying heat by virtue of motion *in* the fluid.

Convectivity is largely dependent on the variation of density produced in the liquid by changes of temperature.

A little reflection will serve to show that the higher the diffusivity and convectivity are, the more effective as a cooling agent will be each pound of liquid. Oils and such liquids would probably be more convenient than water for thermostatic arrangements, and thus we might be able to keep the cylinder at some definite desired temperature more easily with oil than with water.

* The more elaborate systems of air cooling—involving the use of a fan and air channels—which have become so popular in America, are omitted here as being inconvenient of application to the aeromotor.

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TOURING BY BIPLANE.

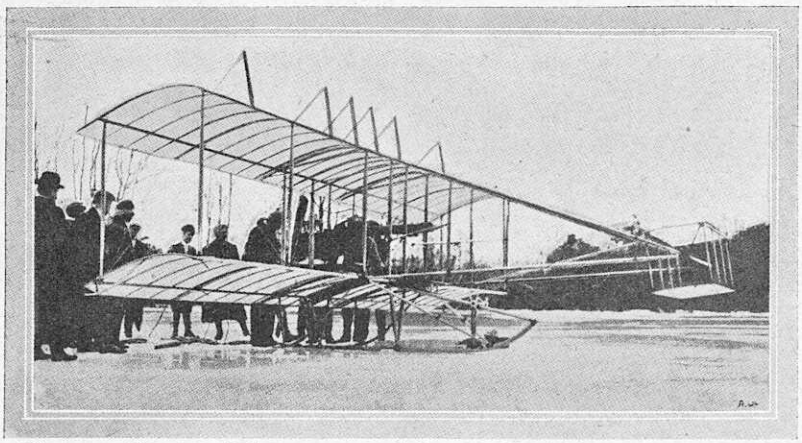
Mr. Henry Farman has added yet another exploit to those which already stand to his credit by flying with a passenger from his new aerodrome at Beauce to Orleans. About 6.30 on Sunday evening Mr. Farman invited M. Robert Caudvilliere to take his seat in one of the new Farman machines which have been specially built for passenger carrying, and with all the necessaries for camping, the two set out on their excursion. Between Toury and Artenay the main road was followed, and then a beeline was made for Orleans, where a landing was effected in the Chevinny Camp, not far from the city. The machine was then anchored for the night, after its flight of 50 kiloms.

On Monday Paulhan set out alone to continue the journey to Blois, but owing to the direction of the wind he altered his course and eventually landed at Arcis-sur-Aube, the distance flown being between 180 and 190 kiloms., a world's record for cross-country flying.

On the following day Paulhan continued his journey, having Chalons as his objective, and he landed there after a flight of 1 hr. 10 mins., the 80 kiloms. being traversed without a hitch. Most of the time, as in his flight on the previous day, Paulhan kept at a height of 300 metres, although once or twice he soared to just about twice that altitude. Altogether in the three days the machine covered about 320 kiloms., or well over 200 miles, approximately the distance from London to Manchester. It was, therefore, excellent training, in view of Paulhan's early attempt to win the *Daily Mail* £10,000 prize.

THE HERRING-BURGESS BIPLANE.

HERRING, who was formerly associated with Curtiss in the construction of a biplane, has recently been working in conjunction with Messrs. Starling and Burgess in the production of a new type of machine that is mainly interesting for the manner in which it has been sought therein to obtain lateral stability without infringing the Wright system of control. An injunction was obtained by the Wrights against the Herring-Curtiss Co., it will be remembered.



The new Herring biplane, a special feature of which is the series of six triangular fins on the top plane for maintaining lateral stability.

In the Herring-Burgess biplane the principle adopted by Voisin, of using side-panels, has been introduced in modified form. Instead of turning the main-planes into a large box-kite by putting side panels between the struts, the panels are set like fins above the top deck. There are six such fins, each of triangular form, which stand up about three feet above the surface of the plane. The object of these fins is to resist the capsizing tendency by virtue of the air pressure acting on their surfaces when the machine slips sideways.

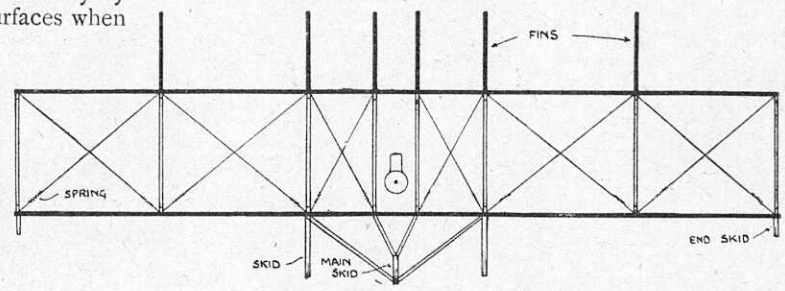
The Stability Fins.

The principal object of placing the fins above the upper deck has been to secure an ascentric disposition of the centre of pressure and the centre of gravity whereby the restoring couple is in the nature of a pendulum, the fins affording the necessary abutment on the air to enable the centre of gravity to swing back into place. The practical value of these fins remains to be proved, and especially will the effect of their position in respect to the centre of gravity be watched with interest. The necessity of forming a couple of some sort as a means of restoring lateral equilibrium is obvious, but this Herring-Burgess device is certainly rather a singular combination of dynamic and static forces.

On the part of the fins we have a potential force of the dynamic kind, that is to say, the value of the fins as an abutment strictly depends on their lateral motion through the air. Either the machine must slip sideways or the wind must blow upon the fins from the side, and only when this condition obtains can the fins offer the desired abutment that will enable the centre of gravity to swing back into its proper position relatively to the centre of supporting effect. The value of the weight of the machine as a factor in restoring equilibrium is, however, a fixed quantity for regarding the apparatus as a pendulum; in principle, the time of the oscillation is proportional to the square root of the length between the centre of gravity and the point of support. In practice, the point of support represented by the vertical fins has a lateral movement of its own in the same direction as the swing of the pendulum, and it would appear as if the actual time of recovery is likely to be a variable quantity owing to the difference in the actual lateral speed of the fins through the air under the changing conditions of wind and other fundamental factors. The question of oscillation past the normal position would seem to be another serious consideration in this system.

It is claimed that the fins will not offer much resistance to straight flight, and possibly the amount would be of no material importance if the machine always flew strictly in the eye of the relative wind. We cannot believe, however, that any fixed surface on a flying machine can have an actual neutrality to the relative wind for more than a small fraction of the whole duration of flight, and when a surface presents an angle of incidence the question of aerodynamic resistance must be considered, and may quite well become a factor of material importance, not only as a resistance but as a disturbing influence on normal stability.

It would appear, from the arrangement of the fins, that they could be constructed so as to fold up, but nothing of this sort has, so far as we are aware, been attempted, nor do we imagine that there would be much advantage to be gained by the complication.



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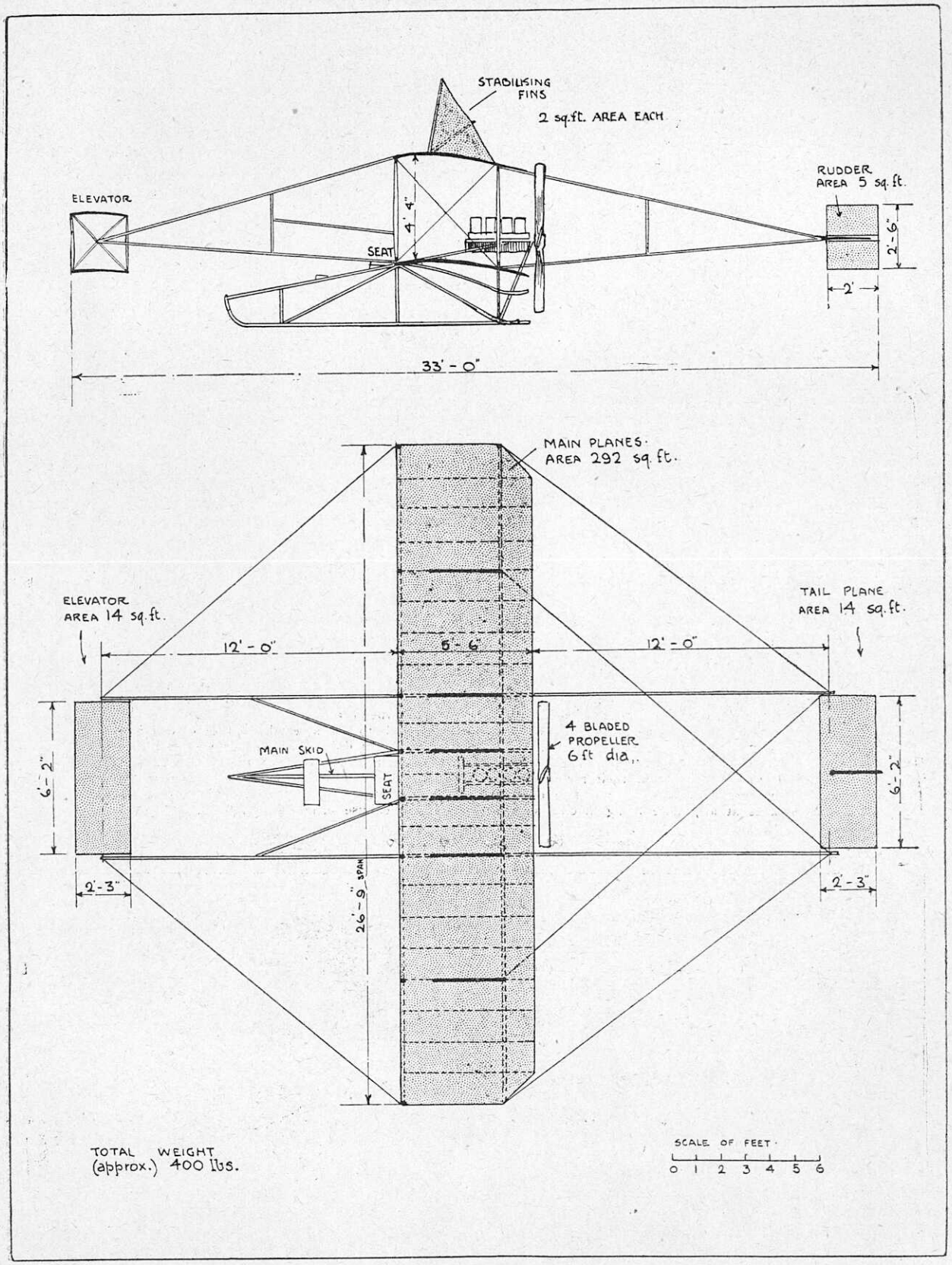
THE HERRING-BURGESS BIPLANE.—Diagrammatic sketch, showing the fins from in front.

Shielding Effect.

Another point to which we should like to draw attention in connection with these fins, is the difference in their spacing apart. For constructional reasons they have been situated coincident with the main-spars, but we are rather inclined to think that the two central fins might have been omitted without a very serious loss in the effective value of the surface area. One of the most important series of experiments that has so far been conducted by Dr. T. E. Stanton at the National Physical Laboratory related to the shielding effect of one surface placed in front of another (see "Flight Manual," Note 15). It is, of course, true that the relative wind on



THE HERRING-BURGESS BIPLANE.—Side elevation and plan.

the fins of the Herring-Burgess machine will always blow obliquely, owing to the forward velocity of flight on the part of the machine as a whole being compounded on the lateral slip, but for all that the question of interference should not be overlooked.

The Skids.

The general appearance of the machine is shown in the accompanying photograph, and the leading dimensions in the full-page drawing opposite. We have endeavoured to give reliable dimensions on the drawing, but the information is unfortunately not altogether corroborative from different sources. In the photograph, the machine is illustrated on the ice, and the arrangement of skids shown in the drawing is especially designed for work under these conditions.

It will be observed that there are some features of similarity between the Herring-Burgess machine and the Curtiss biplane illustrated in FLIGHT, Vol. I, p. 389, but the similarity hardly extends further than mere appearances. The Herring-Burgess biplane is rather a short span machine, and the aspect ratio of the planes is under 5. The decks are mounted on the frame with a much greater angle of incidence than they had in the Curtiss machine. It may also be observed that the engine is situated further back so as to avoid cutting a notch in the trailing edges to clear the propeller.

The control is effected by two levers and two pedals. The right and left-hand levers operate the steering rudder and the right-hand pedal controls the elevator. The left-hand pedal controls the engine throttle.

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THE GOVERNMENT AND AIRSHIPS.

ON Wednesday of last week, Lord Montagu of Beaulieu in the House of Lords asked the Government how many aeroplanes and airships were available for naval and military use now, and how many would be available for use in twelve months time. He said he feared the Government hardly appreciated the growing importance of the subject, and went on to outline the advances made during the past year, both with aeroplanes and dirigibles, and also with armament for such craft. He contended that we could only meet this new form of hostile weapon by a weapon of a similar kind. Guns of position or movable guns would, he feared, be a very weak defence, and if the Government thought otherwise he trusted they would get rid of the idea at once. It was our duty to construct a fleet of these machines at least as great as that possessed by any other Power.

Lord Lucas thought he would be a bold man who would describe these machines as weapons of offence at the present stage of their development. They were very much in their infancy, and we, as well as other countries, were simply experimenting now. The Government were by no means unaware of the importance of the question, and of what had been done by other countries; but at the same time they felt that it was quite possible to make as much real progress by studying the great and complex scientific problems which were involved in the question as by spending a great deal of money in making experiments on a very big scale. The matter was considered by the Committee of Imperial Defence last year, and the authorities were now carrying out their recommendations as to dirigibles. They were not at the present time dealing with the question of aeroplanes at all, those being machines used by private individuals. There was not the scope for private enterprise in the development of dirigibles that there was in the case of aeroplanes, and the Government thought the best policy as regarded the latter was to watch what private individuals were doing, and take advantage of the results attained. They could not do that in the case of dirigibles.

Next year there was to be constructed for the Government one large rigid dirigible, and possibly a second. As to non-rigid dirigibles for Army purposes, there was "Baby II," and a new one was under construction, and ought to be ready within the next twelve months. There were also two airships coming over from the Continent. Both would be tested when they arrived, and it was understood that if the test of one was satisfactory the machine would be presented to the War Office, and if the test, price, and other conditions were satisfactory in regard to the second the War Office would secure it. They ought, therefore, to have four Army dirigibles within the year. The Government were spending considerably more this year than ever before on aeronautics, the estimates showing £35,000 in respect of the Navy and £71,000 in respect of the Army—total £106,000. Although the Government had not now got, and were not proposing immediately to buy, a very large fleet of dirigibles and aeroplanes, they were not doing nothing, but were working very hard along carefully-defined and practical lines, and were waiting for the time when the science of aviation should have reached a point at which they could definitely say that dirigible balloons and airships were of real practical use for military purposes.

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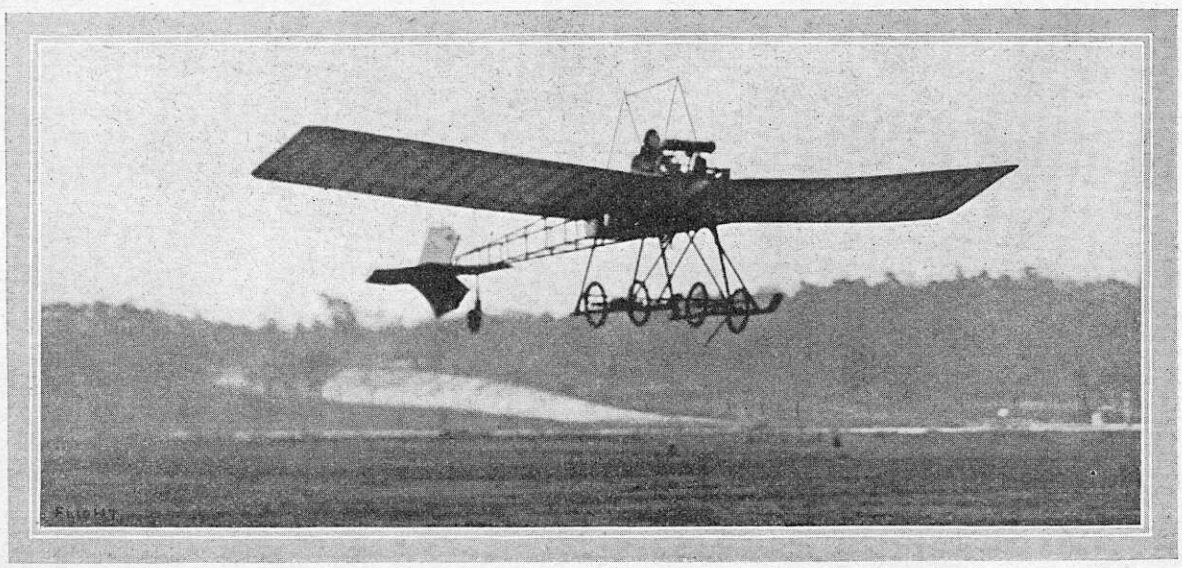
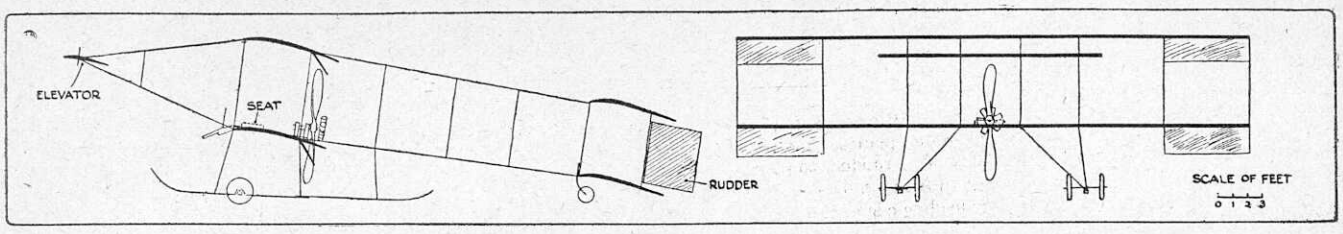


The Hon. Alan Boyle flying at Brooklands on his Blériot monoplane. On Wednesday Mr. Boyle was out for sport, and made an excellent flight at a height of about 70 feet.

FLIGHT

Flyer Silhouettes From Olympia.

THE HENRY FARMAN BIPLANE.



Leading Particulars of the Henry Farman.

General Dimensions.—Areas—Main planes, 450 sq. ft.; elevator, 27½ sq. ft.; rudder, 17 sq. ft.

Lengths.—Span, 34 ft. 8 ins.; chord, 6 ft. 6 ins.; camber, 4½ ins., situated about 19 ins. from leading edge; gap, 6 ft.; skid track, 8 ft. 8 ins.; overall length, 43 ft.

Engine.—50-h.p. Darracq.

Propeller.—Chauvière; diameter, 8 ft.; pitch, 4 ft. 9 ins.

Weight.—Machine, 616 lbs.; engine, 234 lbs.; driver, oil, petrol and water, 200 lbs.; total flying weight, 1,050 lbs.; loading (all weight supported on main planes), 2·3 lbs. per sq. ft.

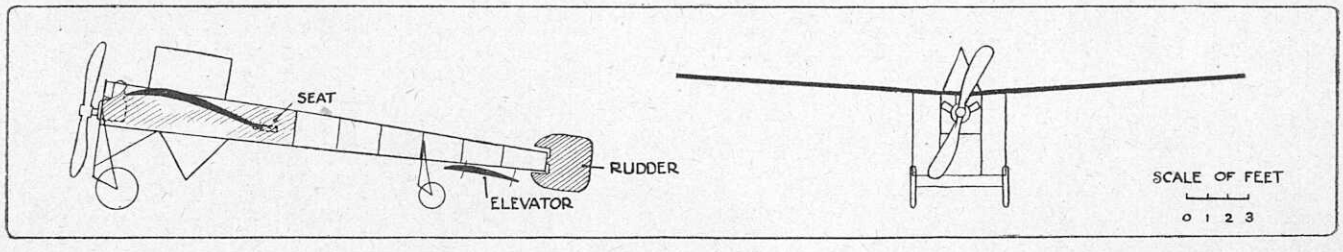
Speed of Flight.—55 m.p.h.

System of control.—Balancing flaps, rudder and elevator.

Price.—£1,050.

Since our description of this machine in Flight of October 16th, 1909, the only important alteration has been the addition of a hinged flap at the rear of the upper tail plane. This flap is interconnected with the elevator, and is so arranged that its trailing edge is raised simultaneously with the leading edge of the elevator. When the elevator is tilted to raise the front of the machine the flap on the tail forces the tail downwards, and thus assists in overcoming the relatively great inertia to vertical movement on the part of the tail. In any machine of this type the elevator itself is materially hampered in its action owing to the adverse leverage through which it has to operate upon the tail. The Farman biplane is introduced in this country by A. Rawlinson on behalf of Messrs. Darracq. The engines fitted are all 50-h.p. Darracq motors of special design. Farman himself used, as our readers will remember, a Gnome engine on this machine.

THE BLÉRIOT "CROSS-CHANNEL" MONOPLANE.



Leading Particulars of the Blériot, "Cross-Channel" type.

General Dimensions.—Areas—Main planes, 193 sq. ft.; fixed tail, 18 sq. ft.; elevator, 18 sq. ft.; rudder, 5½ sq. ft.

Lengths.—Span, 28 ft. 8 ins.; chord, 6 ft. 8 ins.; camber, 5 ins., situated about 20 ins. from leading edge; leverage of rudder, 17 ft. 6 ins.; skid track, 5 ft.; overall length, 24 ft. 9 ins.

Angles.—Incidence, 9 degrees; dihedral, 1 in 33.

Materials.—Timber, ash; fabric, Continental.

Engine.—25-h.p. Anzani.

Propeller.—Chauvière; diameter, 6 ft. 7 ins; material, walnut.

Weight.—Machine, 318 lbs. (approx.); engine and propeller, 142 lbs.; driver, oil, petrol and water, 200 lbs.; total flying weight, 660 lbs. (approx.); loading (all weight supported on main planes), 3·4 lbs. per sq. ft.

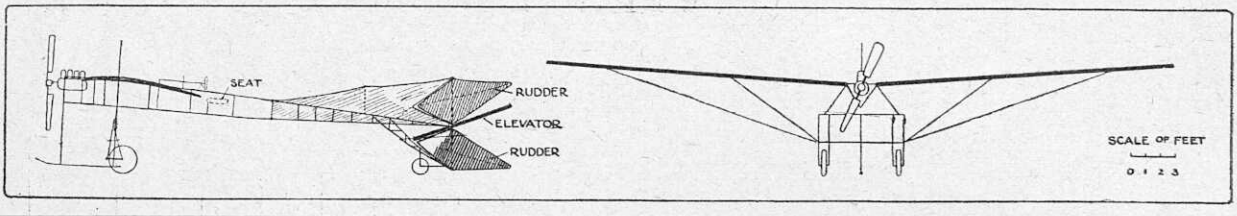
Speed of Flight.—40 m.p.h.

System of Control.—Warping of main planes, rudder and elevator.

Price.—£480.

Genuine Blériot machines were exhibited on three stands, those of Blériot, Ltd., of Long Acre; L. Blériot, of London and Paris; and the Aeroplane Supply Co. The essential difference between the 1910 model and the cross-Channel type, of which it is otherwise an exact copy, lies in the method of attaching the main spars of the wings to the body. The front spar now terminates in a circular section spigot that is held in a tubular steel socket. The rear spar is still held by a bolt, but the bracket to which it is attached is more simple in design. For further particulars of this machine we would refer our readers to a full description that appeared in Flight of July 31st, 1909. A minor detail of the 1910 model that differs from the cross-Channel design is the use of elastic springs in the cross ties behind the hubs of the wheels and on the vertical columns of the chassis frame.

THE STAR MONOPLANE.



Leading Particulars of the Star Monoplane.

General Dimensions.—Areas—Main planes, 290 sq. ft.; fixed tail, 28 sq. ft.; elevator, 20 sq. ft.; rudder, 20 sq. ft.

Lengths.—Span, 42 ft.; chord, 8 ft. to 6 ft. 6 ins; camber, 4 ins., situated about 24 ins. from leading edge; skid track, 5 ft.; overall length, 32 ft.

Angles.—Incidence, 6 degrees; dihedral, 1 in 13.

Materials.—Timber, ash throughout; fabric, Dunlop.

Engine.—40-h.p. Star.

Propeller.—Star; diameter, 6 ft. 6 ins.; pitch, 4 ft.; material, aluminium.

Weight.—Machine, 395 lbs.; engine, 155 lbs.; driver, oil, petrol and water, 200 lbs.; total flying weight, 750 lbs.; loading (all weight supported on main planes), 2·5 lbs. per sq. ft.

Speed of Flight.—36 m.p.h.

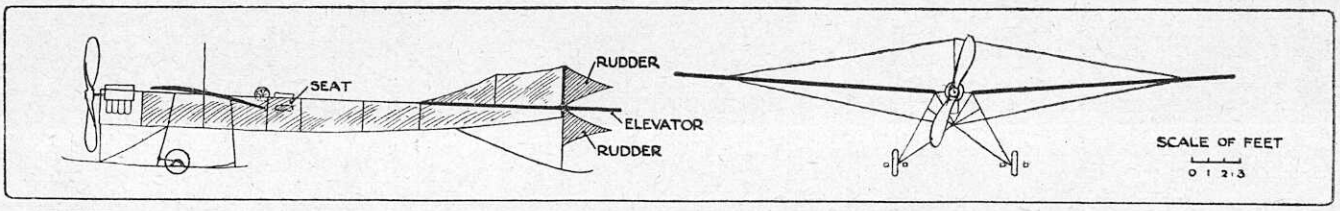
System of Control.—Entirely by helicoidal movement of rudder and elevator.

Price.—£450.

THE most important and interesting feature of this machine is the method by which it is controlled by movements of the tail planes. There are four movable tail planes, all of them identical in shape and area, two of them normally horizontal and two vertical. The vertical pair when moved together act as a rudder, and the horizontal pair similarly perform the purpose of an elevator when moved together. Provision is, however, made for moving the tail planes in different directions, the pilot being able to move all four simultaneously and equally so that they are arranged in the form of a helix. That is to say, suppose the upper rudder plane has its trailing edge moved over to the right, then the trailing edge of the lower rudder plane will be moved over to the left; the right hand elevating plane will have its trailing edge depressed, and the left hand elevating plane will have its trailing edge raised. The air pressure acting upon each plane separately has the resultant that forms a torque or twisting action upon the body of the machine, the direction of which will be anti-clockwise, or left-handed, for the case stated above, when looking at the machine from behind. That is to say, the effect of arranging the planes as above will tend to lower the wing situated on the pilot's left.

The relatively low price of this machine is also a feature. It has been designed by Granville E. Bradshaw. Another interesting detail of the Star monoplane is the chassis, which represents a very simple form of "A" frame, the sloping members being carried to an apex to which the main wings are trussed. The machine is mounted upon a pair of wheels, but there is a central skid that takes the load in the event of a severe shock. The method of suspending the wheels somewhat resembles the Blériot system, but has been carried out on an altogether different scale. With the exception of the struts between the wheel hubs and the spring buffers, almost the entire chassis is made of timber. The main frame of the machine forms a triangular box-girder, as on the Antoinette monoplane, and the arrangement of the tubular radiator at the side of the body is also similar. Altogether this machine gave evidence of being one of the most carefully thought out designs in the Show.

THE GREGOIRE-GYP MONOPLANE.



Leading Particulars of the Gregoire-Gyp Monoplane.

General Dimensions.—Areas—Main planes, 244 sq. ft.; elevator, 20 sq. ft.; rudder, 8¼ sq. ft.

Lengths.—Span, 34 ft.; chord, 7 ft. 4 ins.; camber, 4½ ins., situated about 27 ins. from leading edge; skid track, 5 ft. 6 ins.; overall length, 34 ft.

Angle.—Incidence, 6° 40′.

Materials.—Timber, ash and hickory; fabric, Gregoire.

Engine.—40-h.p. Gregoire-Gyp.

Propeller.—Diameter, 7 ft.

Weight.—Machine, with engine, 620 lbs. driver, oil, petrol and water, 200 lbs.; total flying weight, 820 lbs.; loading (all weight supported on main planes), 3·4 lbs. per sq. ft.

Speed of Flight.—45 m.p.h.

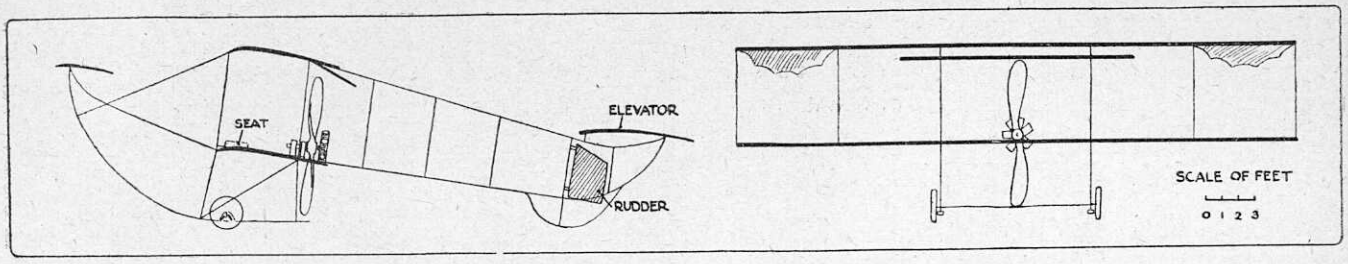
System of Control.—Warping of planes, rudder and elevator.

Price.—£850.

MONOPLANE of modified Antoinette type, mounted on a massive but strong and light "A" chassis with ski and wheel attachment. The feature of the power plant is the fitting of a 40-h.p. Gregoire engine upside down. Lubrication is effected by means of a pump forcing castor oil direct to the crank-shaft bearings. It is claimed that with proper fitting pistons there is no greater liability to soot the plugs through an excess of oil passing the pistons than occurs with the engine in an upright position. Wing warping, with tail and elevator control, is accomplished by side wheels and pedals, as on an Antoinette monoplane.

FLIGHT

THE SOMMER BIPLANE.



Leading Particulars of the Sommer Biplane.

General Dimensions.—Areas—Main planes, 456 sq. ft.; tail, 67·5 sq. ft.; elevator, 45 sq. ft.; rudder, 9 sq. ft.

Lengths.—Span, 34 ft.; chord, 6 ft. 8 ins.; camber, 4 ins.; gap, 6 ft.; skid track, 9 ft.

A BIPLANE of the Farman type characterised by a monoplane tail and a very small biplane rudder situated immediately beneath the tail plane. The machine is mounted upon wheels and skis, the latter members being carried right forward to join the outrigger upon which the elevator is mounted. As on the Farman biplane, lateral equilibrium is maintained by the manipulation of flaps inset in the trailing edges of the main planes. These flaps, however, are of different shape to those used on the Farman machine, and they are only introduced into the upper deck.

An important characteristic of the Sommer biplane is the mounting of the tail plane so that its angle of incidence can be altered during flight. For this purpose a wheel is provided adjacent to the pilot's left hand. The control of the elevator and the balancing flaps is accomplished by a single vertical lever situated immediately in front of the pilot's seat. The control of the rudder is effected by a pivoted foot-rest. These latter features are similar to the original Farman design.

Some of the minor details of construction on the Sommer biplane are very interesting. The machine is mounted on a wheel and ski chassis, and only one pair of wheels is used, these being mounted on a tubular steel axle that passes between the skis to which it is lashed by elastic springs. The wheels are mounted inside the skis, and have a certain amount of lateral freedom upon the axle. Their normal position is defined by buffer-springs situated on either side of each hub. The axle is trussed by wires passing through holes drilled near the periphery of a disc mounted on the centre of the axle. The principal struts used for attaching the skis to the main spars of the machine have rubber pads inserted under their lower extremities in order to deaden the shock.

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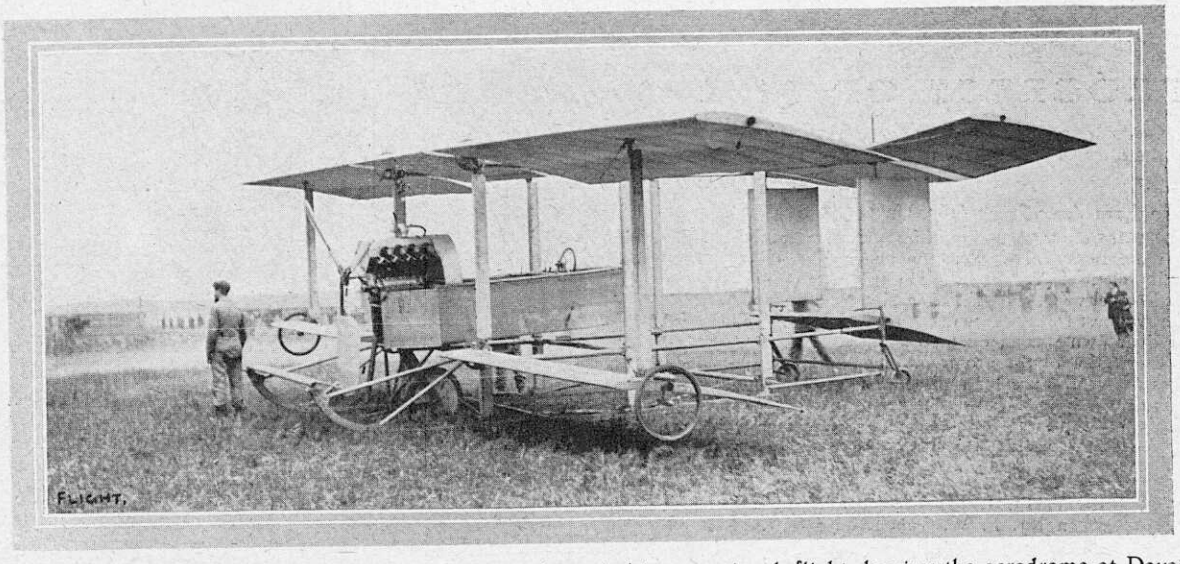
BREGUET FLIES ACROSS COUNTRY.

USING his No. 3 biplane, Breguet on the 11th inst. succeeded in making a splendid cross-country flight. Rising from the Brayelle aerodrome he twice flew round the ground and then steered a course for Arras, about 20 kiloms. away, over which he turned for the homeward journey. The complete journey of 40 kiloms. occupied 28 mins., and, although it was not officially certified, the speed attained was in the neighbourhood of 80 kiloms. an hour. On Tuesday Bregeut met with a nasty accident. He was flying at a height of about 20 metres when the machine suddenly capsized—owing, it is said, to a propeller-blade breaking—and fell to the ground. The aviator was rendered unconscious by the fall, but according to the latest reports is not seriously injured.



The Louis Breguet biplane, upon which he last week made his sensational flight, leaving the aerodrome at Douai and flying over the streets and buildings of the town, then returning to his starting point, after covering about 12½ miles in about 13 mins.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Committee Meeting.

A meeting of the Committee was held on Tuesday, the 19th inst., when there were present:—Mr. Roger W. Wallace, K.C., in the chair, Mr. Griffith Brewer, Mr. Ernest C. Bucknall, Col. J. E. Capper, C.B., R.E., Prof. A. K. Huntington, Mr. C. F. Pollock, Sir Charles D. Rose, Bart., Mr. Stanley Spooner, and Harold E. Perrin, secretary.

New Members.—The following new members were elected:—

S. T. Ellice-Clark.	Vivian M. Studd.
George Higgs.	Edward T. Sturdy.
W. E. McArdle.	Col. Walter Thornton.
Sydney E. Smith.	Duke of Westminster.

Bournemouth Aviation Meeting.

The Royal Aero Club, in conjunction with the Royal Automobile Club, have arranged to take the Hotel Burlington, at Boscombe, for their respective members during the aviation week. It is a first-class hotel, standing in 7½ acres of ground, which extends almost to the sea. The accommodation has been taken from July 11th to 16th, inclusive. As there is a large demand for rooms, members are requested to make early application to the Secretaries of either Club.

Aviators' Certificate.

The Royal Aero Club of the United Kingdom will grant certificates in accordance with the rules of the Federation Aeronautique Internationale to aviators who comply with the following rules:—

RULES.

1. Three separate flights must be made, each of 3 miles round a circular course without coming to the ground. These flights need not necessarily be made on the same day. On the completion of each flight the engine must be stopped in the air, and a landing effected within 150 yards of a given spot previously designated by the candidate to the Official Observers.

2. Each of the three trials must be vouched for by officials appointed by the Royal Aero Club, and a certificate obtained for each flight. All trials to be under the control of, and in places agreed to by, the Royal Aero Club.

3. Before being allowed to compete for certificates, candidates must, if called upon, satisfy the Committee of the Royal Aero Club of their ability to fly 500 yards, and of making a gliding descent with the engine stopped.

4. All attempts must be made between sunrise and sunset, and suitable previous notice must be given to the Secretary of the Royal Aero Club.

5. The Royal Aero Club declines all responsibility for any accidents, or any damage that may occur to the aviators, their machines, or to any third parties during or in connection with the qualifying tests of the candidate.

6. Candidates desirous of qualifying for certificates must make application on a form provided for that purpose. Expenses incurred, if any, must be borne by the candidates.

7. The Committee of the Royal Aero Club will decide if the candidate has qualified for a certificate, but reserves the right to refuse the same or withdraw the same at any time without giving reasons.

8. Foreigners belonging to a country represented on the Federation Aeronautique Internationale can only receive a certificate from the Royal Aero Club after having obtained the consent of their national sporting authority, as approved by the Federation Aeronautique Internationale. A certificate may be granted to a foreigner whose country is not represented on the Federation Aeronautique Internationale.

9. The decision of the Committee of the Royal Aero Club in all matters connected with the trials is final and without appeal.

10. The Committee of the Royal Aero Club may in special cases waive any or all of the above rules, and grant certificates at its discretion.

Balloon Contests at Hurlingham.

The following Balloon Contests have been fixed for Hurlingham:—

May 28th ... Hare and Hounds Race. Trophy presented by Hon. C. S. Rolls.
June 22nd ... Hedges Butler Challenge Cup Race.
July 2nd ... Point to Point Race for the Mortimer Singer Cup.
July 23rd ... Perimeter Race. Cup presented by Mr. Griffith Brewer.

Members will be admitted to Hurlingham on the above dates free on presentation of their membership cards.

Members wishing to take part in any of the events should make application to the Secretary.

Aviation Lantern Slides.

The Royal Aero Club have now acquired a large collection of lantern slides dealing with aviation, and members can hire these at a fee of £1 1s. for a period not exceeding three days. They include all the latest machines and pictures taken at aviation meetings in England and abroad. Application for hire should be made to the secretary.

HAROLD E. PERRIN,
166, Piccadilly. Secretary.

PROGRESS OF FLIGHT ABOUT THE COUNTRY.

(NOTE.—Addresses, temporary or permanent, follow in each case the names of the clubs, where communications of our readers can be addressed direct to the Secretary. We would ask Club Secretaries in future to see that the notes regarding their Clubs reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by first post Tuesday at latest.)

Birmingham Aero Club (165, HAMPTON STREET).

ENTRIES are now coming in from all parts, and the club exhibition at the Botanical Gardens, on 20th and 21st May, promises to be a first-class affair. In addition to the present 13 classes, the Central Novelty Co. are offering a silver trophy and bronze medal for the two best flights of model aeroplanes rising from the ground under their own power, open to amateurs only. Owing to some misinterpretation of the prospectus, competitors must note that the charges for entries are for *each* exhibit. The large and valuable list of prizes fully justifies this charge. As the last day for receiving entries is 30th April, all interested should lose no time, but forward stamp for full prospectus of the exhibition.

Coventry Aeronautical Society (18 and 19, HERTFORD STREET).

MR. JOHN V. PUGH presided at a meeting on Thursday, April 14th, when Mr. F. W. Lanchester gave a lecture on "The Stability of Machines in Flight."

Mr. Lanchester remarked that at the present time, amongst the various aeronauts employing the heavier-than-air machines, they had two schools, each of which was to some extent, they might say, enthusiastic in praise of its own methods. Those two schools were the schools of automatic stability and hand control, and were represented more especially by the Voisin type of machine and the Wright. Both those schools believed that their own methods were the best, and destined to eventually supply the solution to the problem of the command or the conquest of the air, as it was sometimes termed. Dealing with the respective claims on behalf of the Voisin and the Wright machines, the lecturer said that the Voisins contended that the machine should be automatically stable. The Wright Brothers, on the contrary, argued that since the aeronaut's skill was inevitably called into requisition sooner or later, it was better that he should be constantly in practice correcting the effect of aerial disturbances, so as to be less likely to be taken by surprise. Both arguments had weight, but the lecturer pointed out that the arguments in favour of automatic stability were overwhelming. He then proceeded to show the principles on which automatic stability depended both in the maintenance of longitudinal and lateral equilibrium, and demonstrated the points he made by experiments with mica models. In conclusion, the lecturer expressed the opinion that the future of flight lay in the employment of higher speeds as giving more complete

stability to a machine in flight, and rendering it in other ways less dependent upon weather conditions. The difficulties at present standing in the way of the realisation of such higher speeds as would be otherwise desirable, were the difficulties of supplying the necessary horse power within the weight disposable and in the difficulty of starting and alighting with present stationary mechanism and existing facilities.

At the close of the lecture, which was illustrated by a number of diagrams and accompanied by a series of experiments with models, a hearty vote of thanks was accorded Mr. Lanchester on the proposition of Mr. P. V. Vernon.

Kite and Model Aeroplane Assoc. (27, VICTORY RD., WIMBLEDON)

THIS association have arranged to hold the following competitions during the season :—

May 7th.—Competition for longest flight, open to all models made in the British Empire.

Competition for models driven by any power other than elastic.

Steering competition.

June 4th.—Competition for best kite of the year.

Gliding competition for models.

July 16th.—Youths' kite competition.

Youths' model competition.

September, date not fixed.—Model competition on new lines. Perhaps an inter-club competition will be held. Details of these and other meetings to be arranged will be published as soon as possible.

Oldham Aero Club (GARFITT STREET, OLDHAM).

THE club now rejoices in a combined workshop and meeting-room, in Garfitt Street, near the parish church. In the workshop are several models in various stages of construction, and a member's man-glider is being covered with fabric.

All the timber and the necessary bending of the same required in the construction of a full-size flyer has been generously promised by one of the vice-presidents, and members are asked to submit designs for this club machine.

Firms sending display cards will have them exhibited on the workshop walls, and any price-lists or catalogues received will be placed in the club's reference library. All such should be addressed to the secretary at above address.

Women's Aerial League (227, STRAND, W.C.).

THE Society of Arts was packed by an enthusiastic juvenile audience when Miss Gertrude Bacon lectured to the Boys' and Girls' Aerial League of the British Empire, on Tuesday, 12th inst. The meeting was organised by the Women's Aerial League, and Colonel H. S. Massy, C.B., was in the chair. Bruce Manning, one of the members of the League, brought a model which he had built himself, and the beautiful model presented as a prize to the Boys' and Girls' Aerial League for the model-building competition by Mr. Bragg Smith was on view.

Thursday, April 28th, 3 o'clock.—Meeting and tea, given by Miss E. Chapman, organising secretary to the Boys' and Girls' Aerial League. Lantern display by Colonel Massy, C.B., president of the Boys' and Girls' League.

Thursday, May 5th, 3 o'clock.—Fourth aerial tea. Criterion Restaurant. Hostesses : Lady Beachcroft and Miss Jones-Parry. Speakers : Rear-Admiral Sir Percy Scott, C.V.O., C.B., and Sir Melvill Beachcroft.

Wednesday evening, May 12th.—Meeting. Address by Mr. Blin Desbleds.

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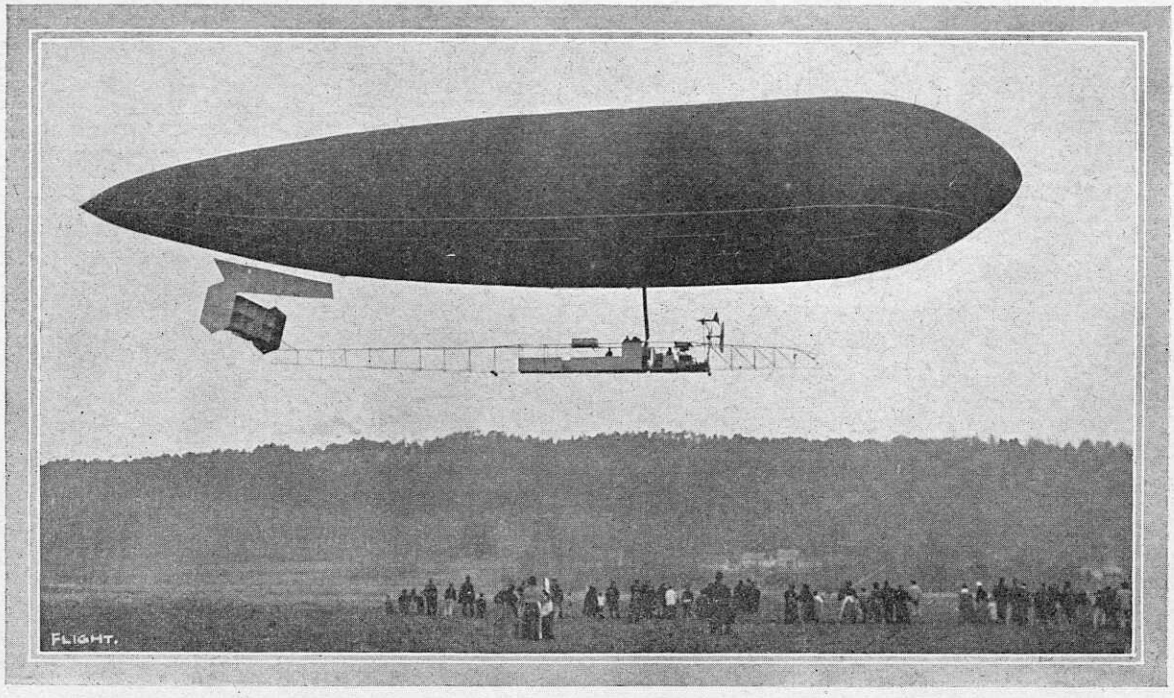
FURTHER TRIALS OF "CLEMENT-BAYARD II."

WHATEVER may be the outcome of the apparent misunderstanding as to the ultimate ownership of the French airship between M. Clement, the French Government, and the British Parliamentary Aerial Defence Committee, the slight mishap on Monday has, anyway, temporarily delayed the sailing of the "Clement-Bayard II" for London. A series of landing trials were carried out with the new Clement-Bayard airship, at Lamotte-Breuil, on Monday, and afterwards a short cruise was attempted, but only three miles had been covered when a derangement of the rudder caused a descent. The framework of the car was badly buckled at its rear end, and the airship was towed back to its shed by ropes. The four photographs which we publish this week give a very good idea of the new vessel and its special features which distinguish it from its predecessor and from the other types of French dirigibles. The length of the gas envelope is 251 ft., while its capacity is 247,000 cub. ft. The car is 157 ft. 5 ins. in length, and hangs 22 ft. 11 ins. below the gas-bag. At present the propellers are 14 ft. 8 ins. in diameter, but they are to be replaced by a pair of 19 ft. 8 in. propellers. The elevating planes at the rear have a supporting surface of 592 sq. ft.



General view of the new Clement-Bavard dirigible. It will be seen that rear external ballonettes, which were a feature of the original Clement-Bayard, have been replaced by a box-kite arrangement of steering planes.

THE NICE MEETING.

SPLENDID weather prevailed at Nice on Friday of last week, the opening day of the flying-week. Mr. Rawlinson was the first in the air, and created considerable sensation by his evolutions over the sea. Some successful flights were made during the day, of which the best was that of Effimoff, who covered over 130 kiloms.; while Chavez, who was also on a Henry Farman biplane, completed over 105 kiloms. Van den Born on a similar machine flew for 87 kiloms., the only other flight of any length being 15 kiloms. by Metrot on his Voisin. Several other competitors, however, including Rougier and Olieslagers, made short trials. Effimoff was also in the air longest on Saturday, when his best single trip was 81 kiloms., Van den Born being next with 41 kiloms., and Rougier on his Voisin third with 12 kiloms., Rawlinson being one less at 11 kiloms. Rawlinson also made another flight of 9 kiloms. at the end of which he fell into the sea, owing to catching the down draught from Effimoff's machine, which passed over him, but not, according to the rules, at a sufficient height. For causing this accident the only penalty inflicted on Effimoff was a fine of 100 francs and a reprimand for dangerous flying! Olieslagers made a short trial, during which he rose to a great height, and Latham, Duray and Rolls also were out for short flights. Competing for the speed prize, Effimoff completed the course of 6 kiloms. in 6 mins. 40⅘ secs. He also won the starting prize with passenger, the distance in which the machine rose being 70 metres.

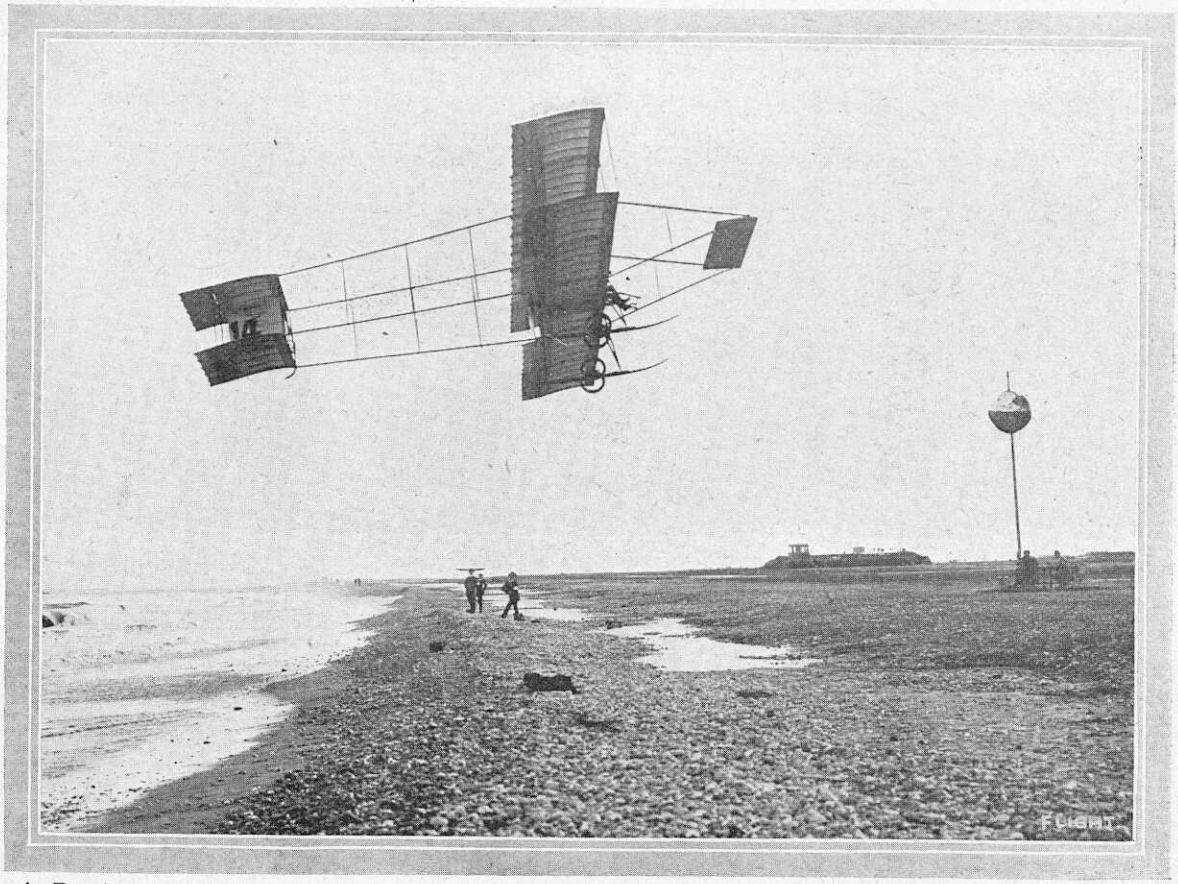
In spite of the fact that strong winds prevailed on Sunday, there was no lack of flying to interest the large crowds who attended the aerodrome, although no lengthy flights were made. In competing for the starting prize, Effimoff rose in 10·5 metres, and with a passenger in 20 metres. Chavez made the longest flight of the day, 82 kiloms. in 1h. 43 m. 58⅘s., but at the end of his fourth trip during the morning, this aviator made an involuntary landing in the sea, owing to his petrol supply giving out. The machine was badly damaged, but Chavez escaped unhurt. It is a little curious that each day there has been a mishap which has ended in a machine coming down in the sea. On Monday it was Rougier's turn. He was flying at a height of about 100 metres when apparently the machine was caught in a series of whirling currents of wind, which drove it down sideways. This movement Rougier was unable to correct, and the machine plunged into the sea.

The aviator was rescued after some minutes, and escaped with nothing worse than a bad cut on the face, but his machine was smashed.

The strong wind prevented very much flying, but Rolls, Latham, Effimoff, and Duray each made flights. For about a quarter of an hour the first three were flying at the same time, after which the Russian came down, but Latham and Rolls continued flying for half an hour.

The ball was opened on Tuesday by Grade, who had only received his monoplane on the previous day. His first trip was only of five minutes' duration, and no sooner did he come down than the other competitors were astir, and in quick succession brought out their machines. Effimoff, Van den Born, Olieslagers, Latham and the Hon. C. S. Rolls were all in the air one after another. The best flight was by Effimoff, who covered 43 kiloms. in 49 mins., while Van den Born's distance was 30 kiloms., Olieslagers' 25 kiloms., and Rolls' and Latham's 16 kiloms. each. Later Latham flew for 1 hr. 10 mins., while the Hon. C. S. Rolls completed a journey of 64 kiloms. Two splendid flights were also made by Van den Born and Effimoff with passengers, the former covering 62·708 kiloms. and the latter 58·5 kiloms. The accident of the day was to Grade, who, after being in the air for 10 mins., came down into the water, from which he was only rescued with difficulty.

At the end of Tuesday, Effimoff had been in the air longest, his total cumulative distance during five days being 614 kiloms., while Van den Born was second with 376 kiloms., Chavez third with 203 kiloms., and Latham fourth with 92 kiloms., while Olieslagers and the Hon. C. S. Rolls were fifth and sixth with 76 and 74 kiloms. respectively. For the *Tour de Piste* prize, Latham was first with 5 mins. 47 secs., while Duray was second in 6 mins. 5⅘ secs. For the starting prize Effimoff was in front, no one being able to better his start in 10·5 metres when flying by himself, and 11·65 metres when carrying a passenger.



Mr. A. Rawlinson during one of his daring flights on his Henry Farman on the opening day of the Nice Meeting.—In the distance, exactly over the heads of the three men on the beach, Olieslagers, on his Blériot monoplane, can be seen flying.

FLIGHT

AVIATION NEWS OF THE WEEK.

Mr. Cecil Grace at Eastchurch.

TWO very good flights were made by Mr. Cecil Grace on his Short-Wright machine, at Eastchurch, on Saturday last. First making a trip of 15 mins., Mr. Grace again went up, and, after circling round the flying ground for a few minutes, he passed over Eastchurch village, and then over Parsonage Farm, at which time an altitude of 500 ft. was reached. Mr. Grace ended by flying up Stansford Hill only a few feet from the ground, and landing at the summit. In the course of this second excursion he covered about 15 miles.

Mr. Weiss at Littlehampton.

HAVING taken his monoplane to Littlehampton, Mr. Weiss carried out several experiments on Saturday. After a flight of about two hundred yards the machine capsized, and the damage to the propeller, &c., prevented any further flying for the time being.

Mr. Thiersch at Erith.

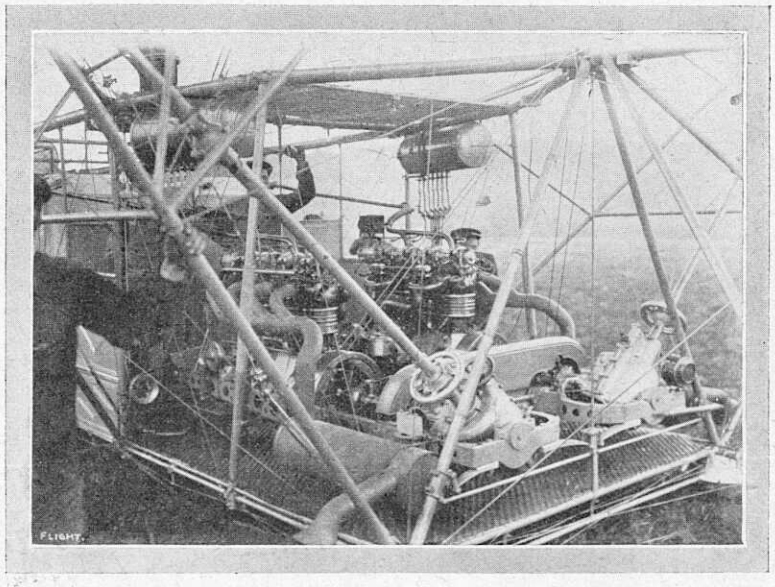
AFTER making several short flights with his new aeroplane over the Belvedere marshes, Erith, Mr. Thiersch made arrangements to make a long trial, but unfortunately one of the main wooden struts was smashed. This will necessitate the suspension of the experiments for several days.

Flyers at Brooklands.

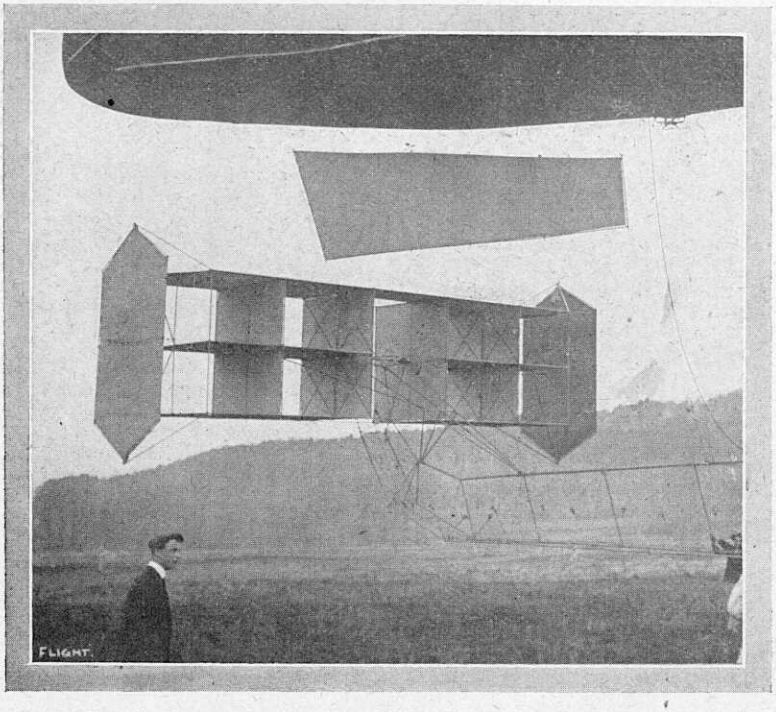
IT was reported some days ago that M. Dubonnet, on his Tellier monoplane, would be flying at the Brooklands meeting on the 27th inst., but although he hopes to be at Brooklands before long, M. Dubonnet will not be there next Wednesday. Several of the British aviators who are training there have, however, made good progress lately, and it is anticipated that there will be some good flying.

Filey Sands as an Aerodrome.

A GROUP of sportsmen in Yorkshire have entered into negotiations with a landowner for the erection of suitable sheds for aeroplanes just by Filey Sands, and for adequate arrangements for hauling the machines, &c., up the cliffs. It is claimed that Filey Sands are very suitable for flying, and permission is being sought from all the local authorities for flying practice to be carried on over the sands.



The "engine-room" on "Clement-Bayard II," showing the way in which the two 125-h.p. Clement engines are mounted on frames which are carried by leaf springs shackled to the frame of the car. In this view can also be seen the method of driving the propellers through bevel gears.



The arrangement on "Clement-Bayard II" of the steering planes which are mounted at the rear end of the framework of the car.

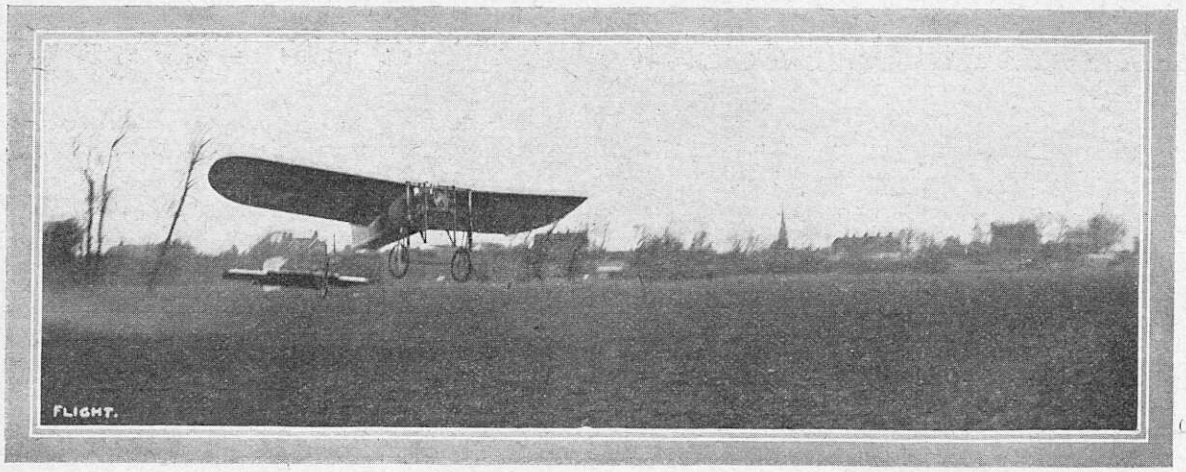
A Flying Week for Wolverhampton.

THE Midland Aero Club are hard at work on the organisation of a flying week which it is proposed to hold at the Dunstall Park Racecourse from June 25th to July 2nd. The meeting will of course be a national one, with special prizes for machines built in the Midlands.

Doings at Mourmelon.

The Henry Farman School.—On the 12th inst., in spite of a strong gusty wind, Capt. Dickson successfully made the necessary flights to qualify for the Ae.C.F. pilot's certificate, while Bruneau de Laborie covered six rounds of the course, equal to about 18 kiloms. On the 15th inst. Osmont flew for 28 mins., and on the 17th Lieut. Gibbs similarly made the qualifying flights for his pilot's certificate. The next day Lieut. Cammerman, on receiving the military H. Farman biplane, flew on it for half an hour; and Capt. Marconnet, on the same machine, carried a passenger during several short trips, sometimes rising to a height of 150 metres. Huis flew for 28 mins., while Herbster, who is now the instructor, was busy with no less than seven pupils. Altogether there were nine Farman machines being used.

The Voisin School.—Ravetto is one of the most promising Voisin pupils at the present time, and on the 12th inst. he flew for 45 mins., mostly at a height of 60 metres, while on the 15th inst. he twice flew for 20 mins. M. Colliex, the Voisin instructor, has now several ladies among his pupils. An exciting incident happened on Monday. Nieuport was making his trial flights for the Ae.C.F.



Mr. Radley in flight on his Bleriot monoplane over the Huntingdon Racecourse, now used as an aviation ground.

certificate when his machine caught fire. M. Nieuport, keeping his head, at once shut off the petrol and glided down to the ground, where he was able to put out the flames before any great damage had been done.

The Antoinette School.—Wachter, who has made splendid progress on the Antoinette monoplane, successfully made his qualifying trials for the Ae.C.F. certificate on the 13th, and since then he has turned instructor giving lessons to the other pupils at the school. On the 17th inst., Commandant Clolus made a couple of flights of 10 mins. each, during which he rose to a height of 30 metres.

Other Doings.—Morame on his Blériot has been making flights each day, and on Sunday was up for ten, fifteen, and twenty-two minutes, respectively, at an altitude of 100 metres. On Monday Peynet on the Saulnier monoplane made two long trials, one of forty minutes and another of thirty-three minutes; while Koechlin on his monoplane also flew for thirty-five minutes. Legagneux now has his Sommer biplane at Chalons, and flew for thirty minutes at a height of 100 metres on the 16th inst.

A Fall at Huntingdon.

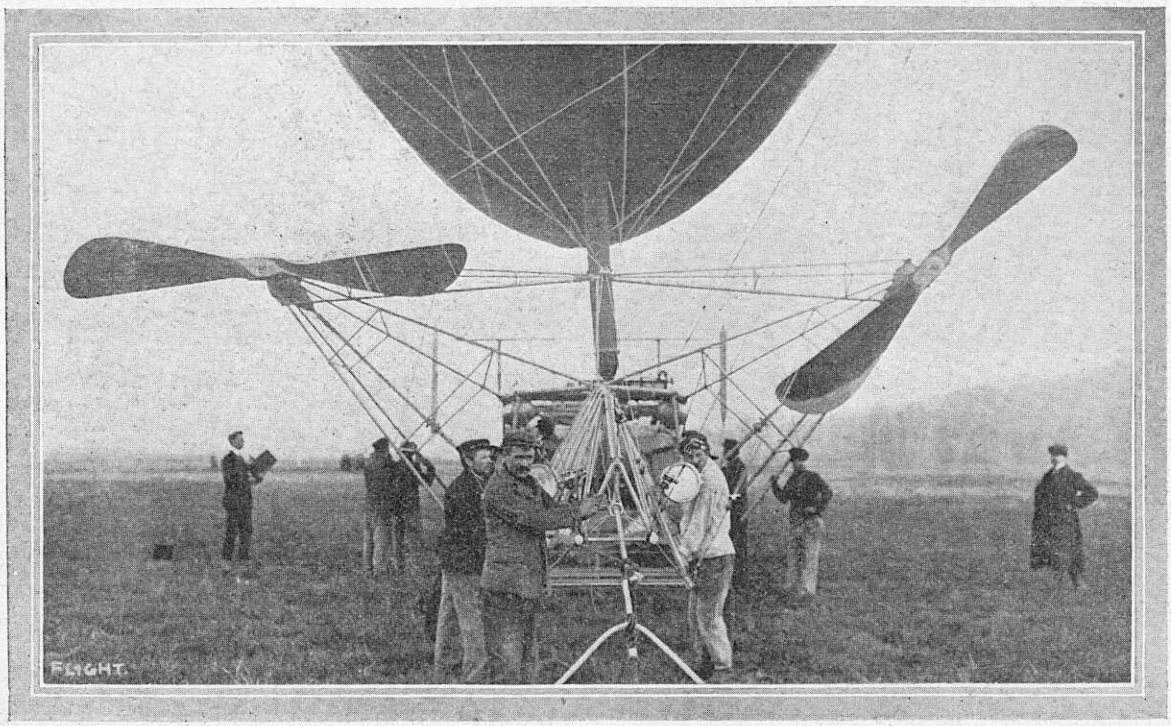
WHILE practising on the 14th inst., Mr. Radley had a fall on his Blériot monoplane. He was flying at a height of 20 ft. when the machine was caught in a sudden gust of wind, and before Mr. Radley could recover control of the machine it touched earth. The propeller and framework was damaged, but this was soon put right, and on Saturday Mr. Radley twice made a complete circle of the aerodrome, a distance of two miles, his altitude being about 40 ft. On Wednesday morning he flew 16 miles in 23 mins.

Cross-Channel Flying.

M. JACQUES DE LESSEPS has entered for the Ruinart prize, and announced that within ten or fifteen days he will attempt to fly on his Blériot monoplane from France to England, probably from Calais to Dover, and also fly back again not later than the following day. The Ruinart prize is of a value of £500.

A Flyer's Caravan.

ON Monday, Mr. Somers Somerset, who is practising on a Henry Farman machine at Chalons, surprised his fellow pupils by arriving at the camp in a fully-equipped gipsy caravan which he had purchased at a fair at Rheims. Mr. Somerset proposes to live in this house-on-wheels while he is taking his lessons, and thus be independent of anyone else. He hopes by this means to solve the early rising problem, in order to meet the new regulations which have been imposed by the military authorities.



The car of "Clement-Bayard II," as seen from in front, showing the arrangement of the framework carrying the propellers, which are driven through bevel gears.

The London to Manchester £10,000.

Just as we go to press we learn that there is every prospect of Mr. Claude Grahame-White, on his Henry Farman machine, making an early attempt to win the £10,000 offered by the *Daily Mail* for a flight, with two stops, from London to Manchester. It is possible that the "jump-off" will be *somewhere* in the neighbourhood of Wormwood Scrubbs, at 5 a.m. on Saturday (to-day).

M. Sommer and Pupils at Mouzon.

After successfully mastering the Henry Farman biplane, Frey is now taking lessons from M. Sommer, and on the 12th ult. flew for 5 kiloms. at Mouzon. On Monday Bouvier was up for 10 mins., with M. Demanest as a passenger; Amerigo for 35 mins.; Paillette made a trip of 25 mins.; while Mdlle. Dutrieux had so far progressed as to venture for 5 kiloms. alone.

Maurice Farman at Buc.

Several short flights of 200 to 500 metres in length were made, on the 15th inst., by the Marquis Pasqua, who is under tuition with Mr. Maurice Farman at Buc.

Rougier Tests His New Voisin.

With the object of testing his new racing Voisin biplane, Rougier paid a visit to Mourmelon on the 13th inst. Several short flights were made, a speed of 100 kiloms. an hour being reached at times. Whan he gets the 50-h.p. motor properly tuned up Rougier hopes to get still greater speed, and he will then try for the *Daily Mail* London to Manchester prize, if it be still open.

The Cyclone at Chalons Camp.

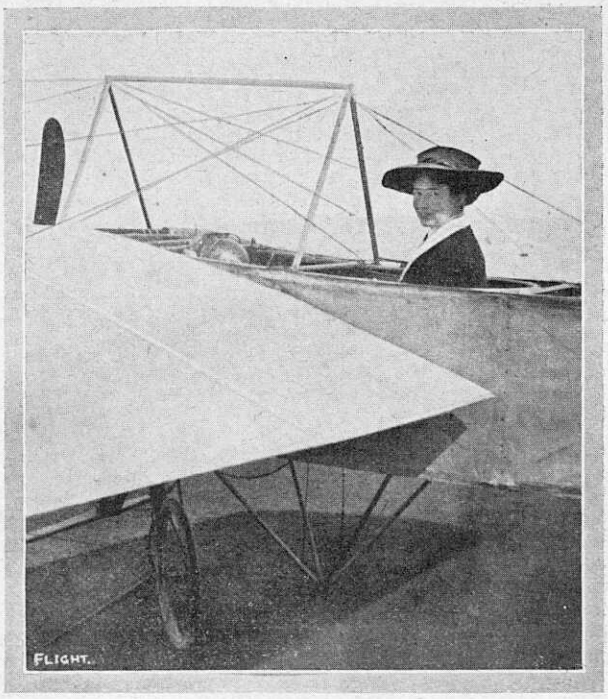
An extraordinary amount of damage was done by the violent cyclone which burst over Chalons Camp on Friday morning of last week. Several of the Farman sheds, as well as those belonging to M. Sommer, were blown down and the machines inside smashed, while the military airship shed in course of construction was completely demolished, three men, unfortunately, being killed by the falling structure. But for the fact that it was about lunch time, when the workmen and other people were away, the loss of life must have been much more serious. Altogether, a number of aeroplanes were smashed, and it is estimated that the damage amounts to about £20,000.

A German Six-Decker.

In the works of Pega and Emich, at Griesheim, there is under construction at the present time an enormous aeroplane, which has been designed to carry six to eight persons, and to be capable of remaining in the air for five hours at a stretch. It is fitted with six main planes, while the motor is of 80-h.p.

Trials with Parseval Monoplane.

After a week's trials, skimming on the surface of Lake Plau, in Mecklenberg, the two engineers who were testing the giant monoplane built by Major Parseval decided to attempt a free flight.



Countess Fitzwilliam in the pilot's seat of her husband's Blériot monoplane in the grounds of Wentworth Woodhouse, Earl Fitzwilliam's seat near Rotherham. Lady Fitzwilliam, who is a younger daughter of Lord and Lady Zetland, is Lady Mayoress of Sheffield for this year.

The machine had, however, only just got clear of the water when it was caught by the wind and capsized. The two occupants were rescued by a motor boat, and later the monoplane was towed to the shore and righted.

Santos Dumont at Madrid.

Last week M. Santos Dumont was staying for several days with friends at Madrid, and made several short flights on his little Demoiselle over the Hippodrome golf course.

Flying at Buenos Ayres.

Among the many flights made by Bregi recently on his Voisin at Buenos Ayres, one of the best was on the 18th instant, from Langchamp to Lugano, a distance of 30 kiloms., which won

MR. H. G. FERGUSON'S IRISH-BUILT MONOPLANE.—This photograph was taken in Masserene Park, Antrim, on the shores of Lough Neagh, after a successful essay by Mr. Ferguson. It will be noticed that the Automobile Association's well-known "A.A." badge adorns the prow of the machine. The four central figures are, from left to right, Mr. John Brown, the first Irishman to own and run a motor car in Ireland; Mr. H. Ferguson, the builder of the machine Mr. T. C. Percy, J.P.; and Mr. Francis Wilde, the Assistant Secretary of the A.A.

for him the Lornsquit prize. Aubrun was also flying on his Blériot, and Valleton took up a passenger for a short trip on his Farman. It is proposed to organise another flying meeting to be held at the end of May, at which the prizes will amount to about £7,000.

Developing Inventions.

THE "A.I.R." Co., successfully launched last week, and of which the full prospectus was published in our issue of April 9th, evidently fulfilled a public necessity, as we are informed by the secretary that already 60 inventions have been submitted for the approval of the various committees.

A New Wire Tightener.

IN the accompanying sketch is seen a very neat wire tightener, known as the "Raid," which is being placed upon the market by Messrs. Eyquem's Patents. It is made of steel throughout, and a

feature is that no lock-nuts are required, the screws being secured by split-pins, which pass through the centre slot. This arrangement is very neat and also quite effective, while the elimination of all lock-nuts renders it possible to make adjustments in minimum time without any bother.

Airship Garage Collapses at Munich.

A BAD accident occurred on Thursday of last week at Munich, when the garage in course of construction for the Parseval airship, which it is proposed to use for aerial excursions, collapsed. Two lives were lost, and eight other workmen were very severely injured. The disaster is attributed to faulty foundations and to the construction of the building being hurried too much. As a consequence, the commencing date of the excursions has been indefinitely postponed.

Prince Henry in "Kiel I."

THE dirigible, "Kiel I," built by Herr Steffen, made its third trial trip on the 13th inst., when Prince Henry of Prussia was among the passengers.

Aerial Torpedo Experiments with "Gross III."

DURING a recent long-distance flight the military dirigible "Gross III" carried out some experiments in the discharge of explosives in the form of aerial torpedoes, and in view of the results obtained the experiments are being continued.

A Balloon for the Pageant Master.

MR. FRANK LASCELLES, who is the master of the forthcoming pageant at the Crystal Palace, is to be provided with a novel conning-tower, for it has been decided that a captive balloon shall be acquired, and from this the pageant master will direct the movements by means of telephone communication and megaphone.

Balloon Struck by Lightning.

A PECULIAR catastrophe overtook a party of balloonists who ascended from Bitterfeld, near Berlin, on Saturday last. At the start fine weather prevailed, but after about five hours' sailing, when the balloon was over Eisenach, it encountered a thunderstorm, and a little further on apparently was struck by lightning. This caused the gas to explode, and the car of the balloon fell like a stone to the earth, killing the four occupants instantly. The passengers were Herr Luff, of Bitterfeld, Herr Leuchsenring, manager of the Parseval Airship Co. at Munich, and two residents of Leipzig.

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CORRESPONDENCE.

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents asking questions relating to articles which they have read in FLIGHT, would much facilitate our work of reference by giving the number of the letter.

NOTE.—*Owing to the great mass of valuable and interesting correspondence which we receive, immediate publication is impossible, but each letter will appear practically in sequence and at the earliest possible moment.*

TESTING AERIAL PROPELLERS.

[470] In pursuing a research in connection with aerial propellers, I have realised that models and small propellers do not afford sufficiently trustworthy data upon which to found serious conclusions, and that trials of various types and designs, carried out on a full working scale, are desirable.

On the occasion of the recent aerial show, accordingly, I issued a short circular in which I offered to test full-sized aerial propellers in a special installation I had lately set up at one of the London Polytechnics, and several makers and owners have availed themselves of the opportunity thus presented of learning the actual thrust and general efficiency of their propellers, at varying speeds and expenditures of power, as ascertained under severely scientific conditions.

The apparatus employed comprises an electro-motor working up to 24-h.p. at 1,050 r.p.m., mounted, together with a headstock, or bearing, carrying the propeller-shaft, upon a substantial platform swinging from the roof of a building. The power absorbed at various r.p.m. is measured by standard electrical instruments; the thrust effected (up to 300 lbs.) is read directly from a spring-balance; and the speed of rotation is observed by means of a tachometer.

The propellers so far tested include one furnished by the War Office, which had driven their dirigible balloon in its memorable voyage from Farnborough and across London. The tests themselves have been very interesting, for although it has happened in some cases that the efficiency has fallen short of what was predicted, it has been found sometimes that "the builders have builded better than they knew," as pressure-power curves have been obtained, which have ranged beyond what was expected. Lately, too, an additional point of much importance has received attention, and the different velocities of the air set in motion at various parts of the area swept by the propeller have been carefully measured by an anemometer. On plotting curves from the data furnished by these various investigations, reflections and suggestions of a most valuable character present themselves to all concerned.

No fee is expected in respect to making the tests; the owner of the propeller, moreover, is invited to be present and himself observe the results. The figures obtained are, of course, regarded as private and confidential if so desired, but it is hoped that the general fund of information may eventually be increased by means of contributions to the Press.

As the carrying out of these tests interferes to some extent with the prosecution of other serious work, I hope that correspondents will communicate with me immediately.

Propellers (up to 7 ft. diameter only, at present) must be sent direct to the South-Western Polytechnic, Manresa Road, King's Road, Chelsea, but letters should be addressed to me as below.

I should add that the face-plate at the end of my shaft is drilled and tapped to take a 1-in. bolt, and that the cost of any special fitting must be borne by the owner.

If a certified report of the test, illustrated by plotted curves, as mentioned, is required, a moderate fee will be charged.

93, Belsize Lane, Hampstead, N.W. J. A. MAYS.

April 13th, 1910.

FLYER DIMENSIONS.

[471] I wish to call your attention to the fact that the authors of "Design and Construction of Aeroplanes" have made two errors in their tables of aeroplane dimensions, namely, with reference to the Wright biplane, of which the h.p. is stated to be 15, and also to the smaller Blériot monoplane, where the writers seemed to have confused the cross-Channel type with another and larger machine, and in others the dimensions given differ from those I have seen, but which are right I do not know. Mr. W. S. Flight, in to-day's issue, states that the speed of the Dumont monoplane is only 40 m.p.h., but surely this is under-estimated. According to Mr. Flight's efficiency formula, comparative smallness of area heightens the efficiency of the machine, which is surely not as it should be, for, as Sir Ray Lankester has pointed out in the *Daily Telegraph*, the smaller the actual size of the object the greater the relative density of the medium which surrounds it. Therefore, in a given medium a small object is more readily supported than a larger one of the same form, so that a man who flies a large aeroplane accomplishes a more difficult feat than a person who pilots a small one.

I wonder whether the horse-powers of the respective engines are calculated by the same formula, but perhaps someone can enlighten me on this point.

Willesden. DAVID LUCKING.

HEAVY MODEL MONOPLANE.

[472] In your issue of February 5th, Mr. G. Mackay asks what is the greatest possible weight for a model monoplane of 1½ sq. ft. supporting surface. The following may be of use to him :—

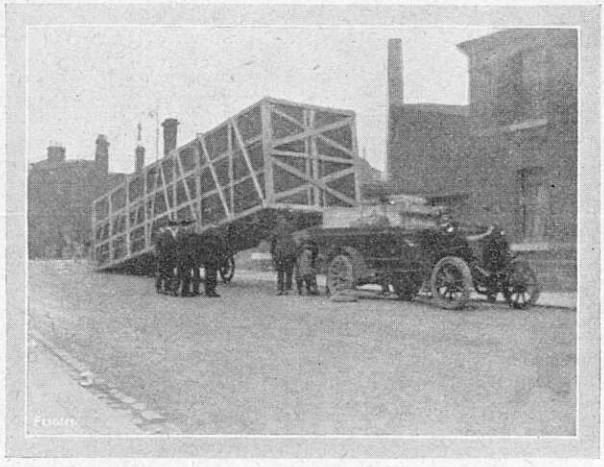
A small Clarke flyer, which is a fairly swift model, carries 6·8 ozs. per sq. ft. Mr. Montford Kay states that his models carry ⅓-lb. per sq. ft. Mr. Twining reports having obtained a lift of 4·4 ozs. per sq. ft. at 15 m.p.h. Assuming that the lift of an aeroplane varies as V^2, this gives a lift of 7·8 ozs. per sq. ft. at 20 m.p.h., which is about as fast as a small model can be make to travel, according to Mr. Twining.

This last figure gives Mr. Mackay's model a weight of 12 ozs. approximately. Hoping this may assist your correspondent. About 20 strands of $\frac{1}{16}$-in. square elastic should be plenty to drive an 8-in. Cochrane propeller.

Hampstead. B. G. Benson.

TRANSPORTING FLYERS.

[473] Enclosed herewith please find photograph that may be of interest to many of your readers. It represents a biplane, belonging to the Hon. C. S. Rolls, being removed from Olympia to the Isle of Sheppey. The case is 40 ft. long by 8 ft. 6 ins. by 8 ft. 4 ins., and the weight of same about 28 cwt. The 60 miles were covered in



8½ hours without a hitch, although we believe it was the largest ever removed over English roads, and no trouble was felt in passing through London and taking the many sharp corners. The lurry is a 18-h.p. Ryknield, loaded with parts and packing-cases. The biplane was carried on a specially-built platform on two wheels, fitted with pneumatic tyres. We are making a special feature of the removal of aeroplanes to any part of England.

Balham High Road. French's Garage.

THE RIGHT CLASS OF WORKMAN.

[474] In reference to the above, I am greatly pleased, in fact, proud, of the manner in which your correspondent, Mr. John W. Gordon (443) so ably upholds the high-class ability of the coach-makers as craftsmen, and, being myself one of the real "old-fashioned" road-carriage body builders, cordially endorse from a thoroughly practical point of view all that gentleman says, and gladly add much more than he has said on this all-important matter. And while bowing with all due courtesy to, and respect for, all other trades, pattern-makers included, and their various craftsmen, I venture to state that there is no other trade in existence which requires so much close and careful attention to the smallest detail of construction as is, and always has been, exacted from the practical coachmaking hand, and further, there is no other craftsman whose working education is required to be so wide and universal at their trade as his.

From the start he has to be most intimately acquainted with the intention of his drawings in minute detail and measurement (I am dealing now with the "body-maker," but the same in degrees applies to all the branches down to the labourer); then comes judgment and arrangement of different kinds of wood for different parts and purposes, intimate knowledge of these woods for their separate duties and places, their symmetry of shape, completeness of finish, and finally to harmonise in sequence with the painters, trimmers (*i.e.*, upholstery), leather workers, and finishers, in fact all other departments. Add to all this the highly-trained and educated ideas of the employers themselves, who constantly aim at turning out the "next thing" better than the "last," and who are constantly giving out the latest and the best to their men to work to, and leave neither "stone" nor "sand" unturned to get something better if possible, and still add the fact that coach and motor-making craftsmen as a body are always more or less above the average of intelligence (or they would be useless). Then, I maintain, Sir, you have in them the finest and most complete set of capables for the construction of the flying machine, which above every other practical object requires the very highest and best combination of intelligence and ability obtainable.

To some unacquainted with the *personnel* and the objects of the trade named (coachmaking), the above statements may seem over-drawn, but I can assure them these statements are facts, and are well within limits, as I have been in personal contact with numbers of my *confrères* in all the departments, and I have never yet met a man who, fairly good at this trade, but he was able to tackle successfully other work of a kindred or abstract type with credit to himself and satisfaction to his employers. Hence I cordially echo Mr. John W. Gordon's admirable reminder, "Don't forget the coachmakers," for they are, in my humble opinion, pre-eminently the craftsmen most suited for the highly scientific, comprehensive, and delicate production of flying machines, and in whose hands I myself would always feel perfect confidence and safety.

Newport Pagnell. Henry Bath.

"PROPELLERS" AND "TRACTOR-SCREWS."

[475] Could you oblige me by inserting in FLIGHT the difference between "propellers" and "tractor-screws," as I am ignorant as to the difference.

Maida Hill, W. F. Adams.

[A propeller is situated behind, and, therefore, pushes the machine; a tractor-screw is placed in front, and, therefore, pulls the machine through the air.—Ed.]

MODEL FRAMEWORK CONSTRUCTION.

[476] Will Mr. J. H. Wilkins (322) be good enough to tell me how he makes joints with the dowel sticks (which I presume are round) he uses. I have used them, joining by drilling one piece and sharpening the other, but find this method unsatisfactory.

In a new model I am building I intend to use shellac proofed calico for wings, as I think it will fasten without the aid of camber stays, thus cutting down the weight. Can any reader who has tried same give any advice?

Denton. Alfred Allen.

AN AERIAL PADDLE.

[477] With reference to letter No. 305 on page 66 of your issue of January 22nd, 1910, *re* an "Aerial Paddle."

Mr. E. Simkins writes that he would be pleased to demonstrate this to readers feeling interested, by appointment. I should be obliged if he would let me have his address in order that I may make an appointment with him, as I feel sure I can also greatly interest him.

I take this opportunity of informing you that your paper has been the means of saving me a lot of time, worry and money; it keeps one informed of what is being done and thereby prevents other people from making the same thing.

Wishing your paper every success.

City Road, N. J. D. Holland.

[478] Many thanks for your kindness in publishing our letter. We have tried the propellers (Letter 305) again with the planes attached as a self-propelled machine, and with the blades opening to give a little lift as well as propulsion. We got a considerable lift in a very high wind, as the area is about 72 sq. ft. It is a good start.

I may say since the advent of your valuable paper I have had some considerable success with my models which I was unable to obtain before. Again thanking you for your kindness.

Highgate, N. E. Simkin.

THE DIHEDRAL ANGLE.

[479] *Re* your article on "The Dihedral Angle Problem," I should like to bring to your notice the following points, which might throw some light on the subject :—

In Fig. 1, R is the resultant of the two normals, P_1 and P_2, which, if the aeroplane is travelling at a fixed speed, is a constant force, varying in its direction, as the machine heels over one way or the other. (This assumes that, for a given speed, the normal to any "plane" is constant, whatever the position of that plane in space.) R is, of course, equal and opposite to g, the force of gravity.

In Fig. 2 the machine is shown heeled over to the left. There are two constant forces acting, R and g as shown; and if these are resolved, we get a resultant, K, which causes the machine to move bodily sideways and downwards.

This tendency brings new pressures to act on the planes, which causes the machine to right. If this theory is correct, we at once get a number of interesting features.

Whenever the machine is out of the horizontal we get a bodily

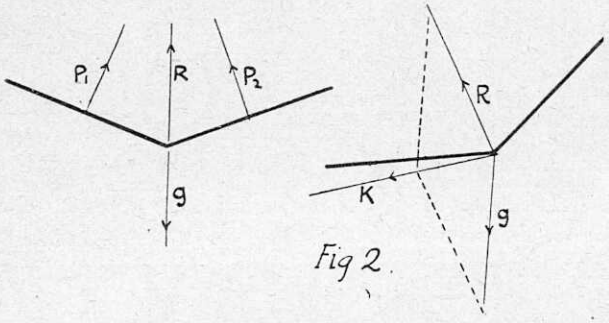


Fig 2.

movement, equivalent to "leeway." In making a sharp turn, the force, K, tends to counteract any centrifugal force.

And finally, whenever the machine is out of the horizontal, we get a tendency to fall.

I should be very much obliged if any of your readers, who have actually flown, could bear out this idea from practical experience.

Newquay. C. R. L. KENWORTHY.

LANGLEY'S ERROR.

[480] I read with considerable interest your remarks on the "Law of Flight Resistance," published in No. 65 of FLIGHT, and as there seems to be some doubt as to what this consists of, I should like to explain the law briefly, taking a Blériot monoplane as an example. The total resistance to an aeroplane in flight may be divided into three components:—

1. The dynamic resistance.
2. The frame resistance.
3. The skin-friction.

I do not propose to go into detailed calculations here, but it can be shown clearly that the skin-friction is exceedingly small in comparison to the other two parts.

On the authority of results actually attained, it can be assumed that the total thrust given off by the propeller when the machine is flying at 38 m.p.h. is about 110 to 120 lbs., while the flying angle at that speed will be about 3°—certainly not less. Since the dynamic resistance is the total weight multiplied by the tangent to the flying angle, we have $760 \times \tan. 3^\circ = 40$ lbs.

In FLIGHT, No. 20, page 285, is given a table of skin-friction resistances for various speeds. Taking the total surface as 400 sq. ft. (100 sq. ft. being allowed for framework) and the speed as 38 m.p.h., we get as the skin-friction $400 \times \cdot0125 = 5$ lbs.

By subtracting the dynamic resistance and the skin-friction from the total thrust, we obtain the frame resistance $110 - (40 + 5) = 65$ lbs.

From this it will be seen how small the skin-friction is in comparison to either the dynamic resistance or the frame resistance, and it is easy to understand how Professor Langley came to the conclusion that the skin-friction could be neglected within (as he expressed it) the range of his experiments, as the difference would be quite within the error of the instruments used to measure the resistance. J. G. NYBORG.

[The gist of our correspondent's letter is contained in the last paragraph, which relates to Professor Langley's conclusions on the subject of skin friction. Mr. Nyborg has already expressed his views on the subject of what Langley meant in his experiments in aerodynamics (*see* FLIGHT, Vol. I, p. 368), and we on our part have already replied to the points raised in an article that appeared in FLIGHT, Vol. I, p. 357.

Mr. Nyborg here seeks to differentiate between the skin friction and frame resistance—or, as it is called by Lanchester, edge effect—and by showing how small the actual skin friction is for a given machine, to prove that Langley was justified in saying it was negligible within the limits of his experiments. The point at issue on the subject of Langley has always been whether Langley did or did not believe that the inverse square law of aerodynamic resistance constituted the sole law of any importance on the subject of aeroplane flight.

Langley said "in actual horizontal flight it cost absolutely less power to maintain a high velocity than a low one." It is very difficult to reconcile such a statement with any suggestion that his meaning was merely that skin friction had a negligibly small value within the limits of his experiments. Nor is the suggestion strengthened by differentiating between skin friction and edge effect, for the important point is the recognition of the law of head resistance as varying as the square of the speed. It is immaterial how small the actual numerical values happen to be within the limits of any particular experiment or on any particular machine; if they obey the direct square law they are always potentially great in the event of an increase in speed, consequently it could not possibly follow that it would cost "absolutely less power to maintain a high velocity than a low one."—ED.]

SANTOS DUMONT MONOPLANE.

[481] Will you (through the columns of your valuable paper, FLIGHT) be good enough to give me full drawings and constructive details of the mechanism operating the warping of the wings on the Santos Dumont monoplane?

Shrewsbury. W. F. G.

[We would refer our correspondent to FLIGHT, Vol. I, pp. 603 and 619.]

DIARY OF FORTHCOMING EVENTS.

British Events.

1910.	
April 26	"Classification of Models in Competition." Mr. P. K. Turner. Aero Models Assoc.
April 28	Minor Meeting Aeronautical Society.
May 3	"Supporting Surfaces and Propellers." W. G. Aston. Aero Models Assoc.
May 7	Model Competition. Kite and Model Aeroplane Assoc.
May 10	"Points on Construction and Design." Mr. T. W. K. Clarke. Aero Models Assoc.
May 14–21	Huntingdon.
May 28	Balloon Race, Hurlingham.
June 4	Kite and Glider Contests. Kite and Model Aeroplane Assoc.
June 4–11	Doncaster.
June 25–July 2	Wolverhampton.
July 2	Balloon Race, Hurlingham.
July 16	Kite and Models Competition. Kite and Model Aeroplane Assoc.
July 11–17	Bournemouth.*
July 23	Balloon Race, Hurlingham.
July 28–Aug. 3	Lancashire.
Aug. 6–13	Lanark.*
Aug. 15–20	Lancashire.

Foreign Events.

1910.	
April 10–25	Nice.*
April 30–May 5	Tours.
May 1–8	Seville.
May 10–16	Berlin.
May 14–22	Lyons.
May 15–22	St. Petersburg
May 17	Palermo.
May 20–30	Verona.
June 5–12	Vichy.
June 5–15	Budapest.
June 26–July 10	Rheims.*
July 24–Aug. 10	Belgium.
Aug. 25–Sept. 4	Deauville.
Sept. 8–18	Bordeaux.
Sept. 24–Oct. 3	Milan.
Oct. 18–25	St. Louis. Gordon-Bennett Balloon Race.
Oct. 25–Nov. 2	America. Gordon-Bennett Aeroplane Race.

* International.

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