

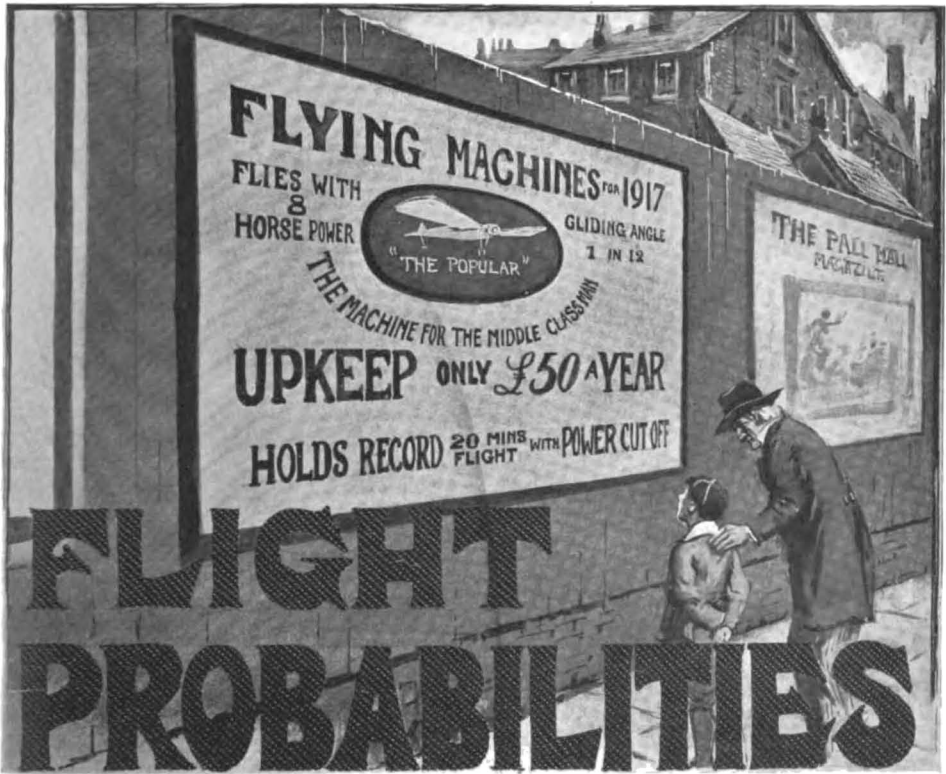
PALL MALL MAGAZINE. *An aeroplane service between outlying stations in the Colonies.*

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BY CHARLES C. TURNER.\*

*In this article the writer deals only with developments that are within sight and actually within our grasp—many of them, indeed, definitely planned by those behind the scenes.*

ILLUSTRATED BY DUDLEY TENNANT.

**E**SSENTIAL considerations in estimating future progress are the distance and duration of non-stop flights. These will steadily increase, and will not be measured by the endurance of one man, for we shall have machines in which

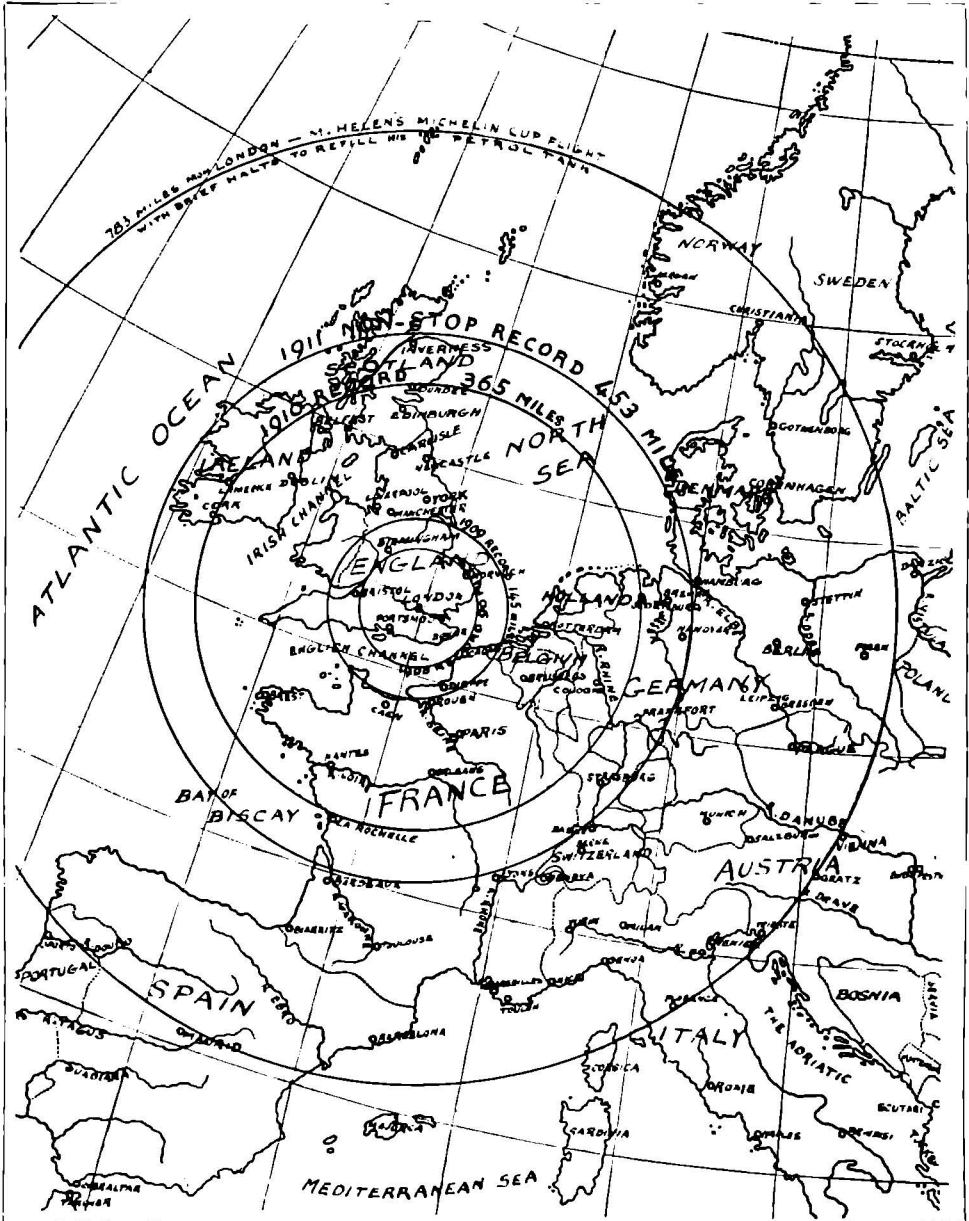
two pilots can take turns at the controls. The distance and duration records now stand at 452 miles, and 11 hours, 1 minute, 29 seconds. In two years the duration record has been nearly trebled; but it is impossible that the same rate of increase will be

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maintained. Fourteen or fifteen hours appears to be the utmost we can expect in the time I have indicated.

THE LIMITS OF SPEED.

Before showing the practical uses to which mechanical flight will be put,

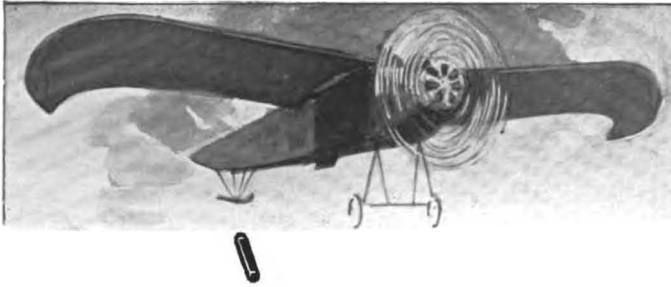


An outline map of England and part of Europe, with concentric rings, London being the centre, showing the limits of a journey by aeroplanes to-day."

The map shows what this means in the way of non-stop journeys from London.

the limit of attainable speed must be considered. Now, speed can only properly be counted when it is made over a

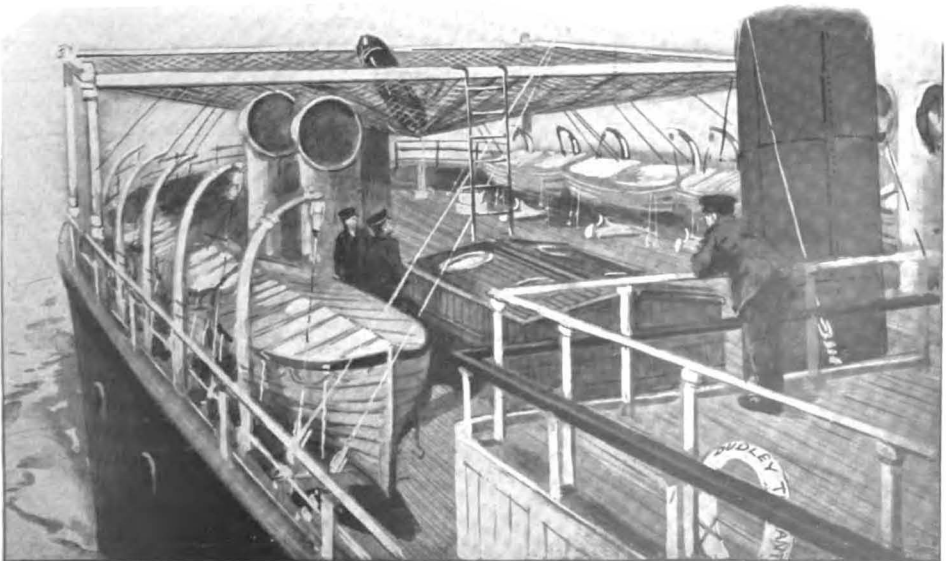
circular flight; that is, the machine returning to the point from which it started.



say, 95 miles per hour, an aeroplane would have to be made stouter; and increased stout-

ness means increased air-resistance; and air-resistance increases at a rate that is altogether disproportionate to the gain of speed. Instances of the collapse in the air of machines driven by 100-h.p. and 140-h.p. motors tell their own tale. Indeed, to an object moving swiftly enough the air presents a solid obstruction: the meteorite becomes incandescent, and is reduced to impalpable dust when it hurls itself against the atmosphere of our planet. A year ago someone prophesied that 1911 would see the 100 miles per hour flying machine. It was shown at the time that this was highly improbable; and no one can confidently foretell the 100 miles per hour machine even in the next five years. One difficulty is that

With a following wind a comparatively slow machine may make a very rapid journey in a straight line. For that matter, a round balloon with no independent speed at all has been known to travel at more than 100 miles per hour, thereby actually beating the speed record of the most powerfully driven aeroplane. So far, the record speed attained by an aeroplane out and home again is 83 miles per hour. This will only be beaten by very small and occasional increases. Even if it were an easy matter to make a machine driven by a motor of 200 or 250 horsepower, the difference in the speed thus obtained would be very little. To carry such an engine and to sustain the ordeal to its structure of flight at,



*Cylinders with late-fee letters being dropped on a mail steamer.*

of landing, which is a somewhat tricky operation with the racing monoplane of to-day. It is not so difficult, he it said, with the "star" machine of 1911—namely, the Nieuport, as it is with other fast monoplanes; but it is quite obvious that with machines of greater speed we shall have to have a contrivance by which, for landing, the speed could be reduced at will, and the wing surface at the same time increased, so that while being driven at less power the machine could approach the earth on a very gentle and gradual path. The variable-speed machine is, indeed, at hand; the complexity of structure that it will involve will, however, inevitably cause some moderation in the highest speed that would otherwise be attainable.

#### LATE-FEE TRANSATLANTIC MAILS.

One of the things that aeroplanes will be used for very soon is the carrying of mails, not as a mere curiosity or for charity, but as part of the regular mail-carrying organisation. For example, late-fee letters will be taken through the air from the shore to liners already on their way outward bound. This will supplement the existing supplementary late-fee postage, and the couple of hours' grace it will give will render it an extremely valuable convenience to business men and others. The mail bags will be dropped from the aeroplane into a commodious net on the deck. There will be no mere chance about the execution of this manœuvre, which will be done with precision and unfailing regularity with the aid of an instrument which I will presently describe. There will, of course, be occasions when the weather will prevent the aerial mail from starting, but these will be infrequent. In winds of not more than 40 miles per hour it will be done. In other words, it will be only less dependable than the tender, which sometimes is prevented by weather from going to sea, or even the liner itself which occasionally dare not make a scheduled call on account of bad weather.

The instrument which will make certain the depositing upon the liner's deck of a bag or cylinder of mails is a timing device which, taking account automatically of the height of the machine and its speed, and even of the deviation caused by a side wind, informs the operator of the exact moment when he must release, either by means of a foot-lever or by pressing an electric button, his package—probably a cylinder of leather—which will then be caught in the net. From 500, even 1,000, feet this could be done with precision. For an extra fee of sixpence per letter such a service would be so well patronised that it could be run at a profit.

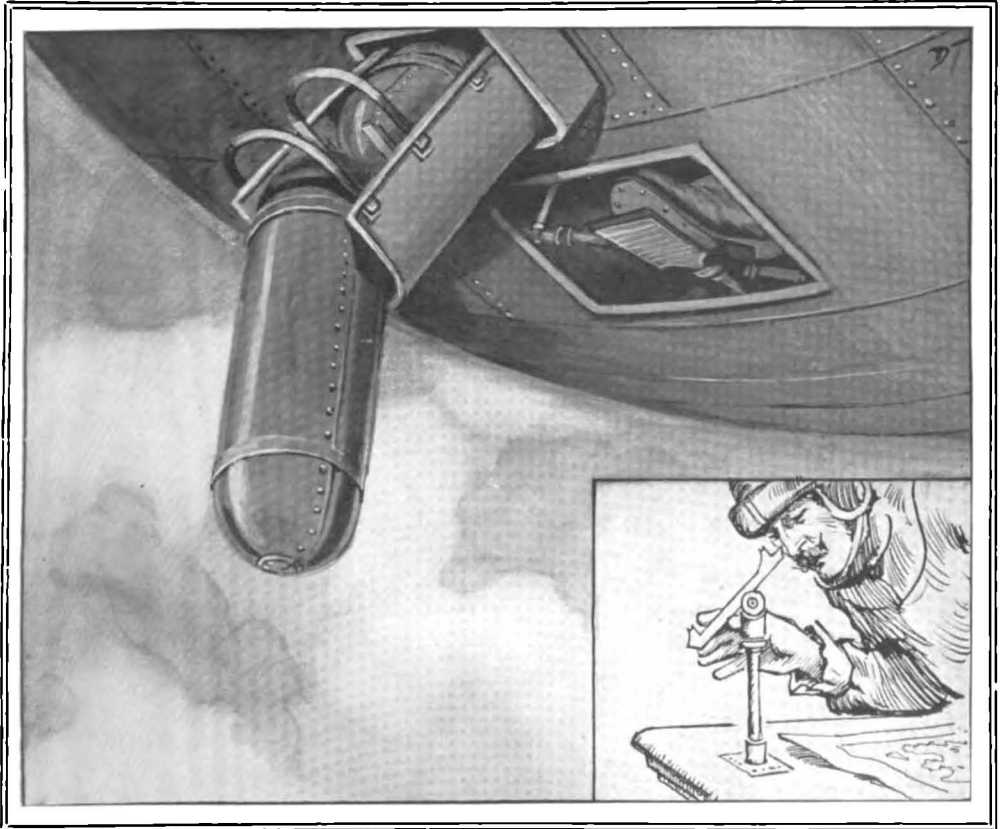
From the timing instrument used in the mail service, obviously it is a very short step to dropping explosive missiles with precision upon an enemy. The bombs that could be dropped from an aeroplane are not just yet likely to be large enough to do extensive damage. They might be 12 or even 20 pounds. They would consist of a high explosive in a thick casing, round in shape. At the moment of their release by the operator a safety plug would be automatically withdrawn, with the result that upon striking earth, or even water, they would explode. The safety plug, which is familiar to all artillerymen, would render their transport by the aviator a perfectly safe operation, and with the plug in they would stand quite a lot of rough usage without exploding. Now the material damage that could be caused by such projectiles is not great. Fragments of the case would be sufficiently heavy to knock a man down, and even to kill him; but as a means of slaying such projectiles cannot be regarded very seriously. For that matter, all artillery used in land warfare produces curiously little effect compared with the energy expended in it. But the aeroplane bomb would have a demoralising effect, especially upon raw troops; and it could be used to stampede camps at night. Occasionally the gear of a gun might be put out of action, and probably incendiary bombs could be employed with effect.

## MAKING WAR INTERESTING.

While on the subject of warfare, reference may be made to the use of the aeroplane for scouting. Even the aeroplane of to-day is so strikingly successful that it bids fair to revolutionise warfare. As an aid to artillery practice one of its chief uses has already been found. The trouble with modern artillery is that the commanders of a battery cannot see the effect of their

assembly of his officers, said to them, "Gentlemen, this is the greatest advance ever made in artillery practice."

But we are looking forward over the next five years ; and we have ready to our hand the instrument I have already indicated for timing the release of a bomb or a cylinder containing any article, so that it can fall on any given spot. What this means to artillery practice and to all other operations in



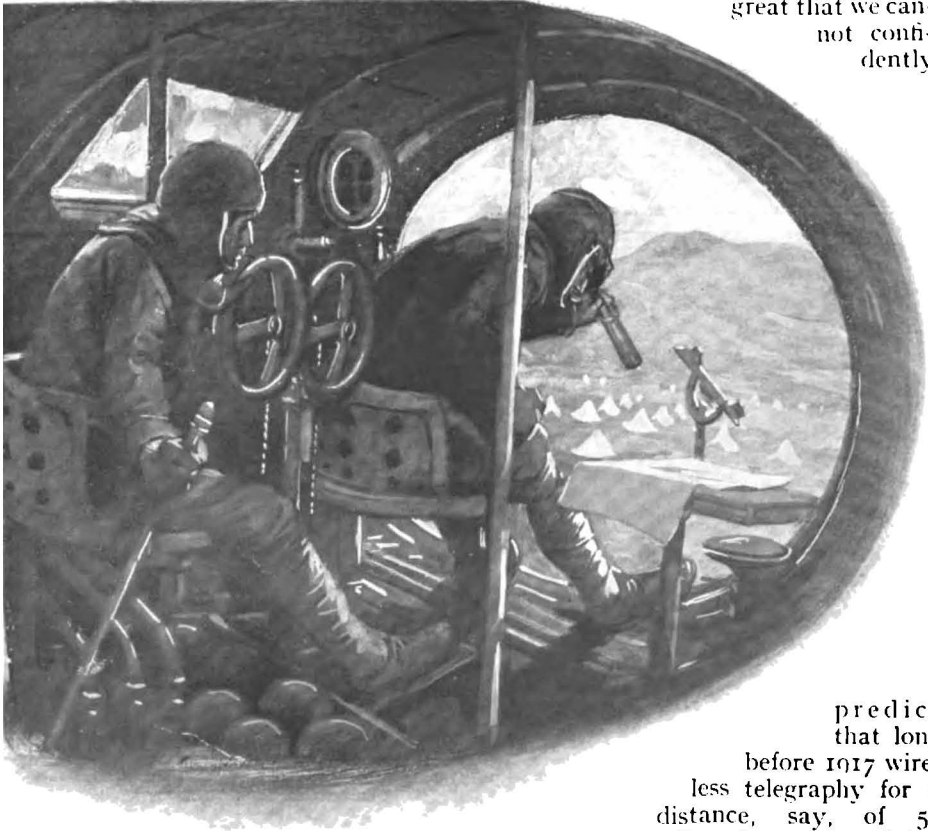
*Dropping the mail cylinder with foot lever. Inset shows the operator taking sight for timing machine.*

fire. More often than not they cannot actually see the object against which their shells are being hurled. With an aeroplane, however, a trained observer can see where the shells are falling, and he can report from time to time to battery commanders. This was actually done during artillery practice in France last summer, and with so much success that the Artillery General of the First Army Corps, addressing an

the field can easily be foreseen. The trained officer taken aloft as a passenger by the aviator will observe the effect of the firing, and will make notes, and even draw sketches. He will enclose these in cylinders which, for this purpose, might be furnished with bright-coloured streamers so that they could readily be seen on the ground, and without even having to land he could inform his friends of the progress of

operations, and without loss of many seconds could return and make further observations. He could even enclose

sed by an arrangement carried within the dimensions of the machine itself. There are certain difficulties, but none of them are so great that we cannot confidently



*A military aeroplane on scouting duty.*

rolls of photographic films in the cylinders, and these could be quickly developed and enlarged—a matter of only a few seconds with the well-appointed travelling dark-rooms which a well-equipped army would possess.

I have said nothing about wireless telegraphy, because experiments in despatching wireless messages from an aeroplane in flight have so far been only partially successful. By carrying a long length of wire hanging below the machine some success has been obtained; but this is a clumsy device attended by certain dangers. I have, however, seen a contrivance by means of which the suspended wire is super-

predict  
that long  
before 1917 wire-  
less telegraphy for a  
distance, say, of 50  
miles from the flying  
machine will be possible.

#### TOURS BY AIR AND WATER.

The hydro-aeroplane is already an accomplished fact. We have machines that will rise from and descend upon either land or calm water with equal facility, and on the latter float indefinitely. Not within five years will such machines be capable of use in a choppy sea, but they will be so far developed that their landing and floating carriages will be able to bear the strain of slightly disturbed water. Therefore, hydro-aeroplane tours along the coast in the summer time will be most delightful experiences. The hydro-aeroplane, in certain circumstances, will take on supplies of petrol as re-

quired from boats, and the spirit will probably be pumped direct into the petrol tank.

In picturing the machines of next year and the year after, we may quite safely reckon upon them being driven by motors furnished with silencers, which will, by muffling most of the noise of the engine, take away one of the objections to the aeroplanes of to-day, especially from the military point of view. Machines also are certain to be able to be started from the pilot's seat, thus removing the disability they are now under, when they happen to descend in a desolate part of the country and there is no one at hand ready to give a turn to the propeller, an operation, moreover, for which the services of the mechanic, rather than those of any casual passer-by, are to be preferred. The Etrich monoplane,

pendent of outside help. Nobody but an acrobat would attempt to start his machine by turning the propeller himself and then climbing to his seat before the machine gathered great speed. This, indeed, would be impossible on a biplane; but I have seen a monoplane pilot actually succeed in doing it. Needless to say, machines will generally be more comfortable; monoplanes in which the pilot is seated over the wings will be provided with transparent sections in front and below him, so that he will be able to see what is beneath him instead of, as in many cases at present, having more than half the landscape blotted out from view.

#### SIGNALS, MAPS, AND DIRECTION MARKS.

Flying by night, which hitherto has only been occasionally ventured, and



"The hydro-aeroplanes will take on supplies of petrol as required from boats."

which started in the great race round Britain last summer, was started from the seat, so that the pilots were inde-

pendent of outside help. Nobody but an acrobat would attempt to start his machine by turning the propeller himself and then climbing to his seat before the machine gathered great speed. This, indeed, would be impossible on a biplane; but I have seen a monoplane pilot actually succeed in doing it. Needless to say, machines will generally be more comfortable; monoplanes in which the pilot is seated over the wings will be provided with transparent sections in front and below him, so that he will be able to see what is beneath him instead of, as in many cases at present, having more than half the landscape blotted out from view.





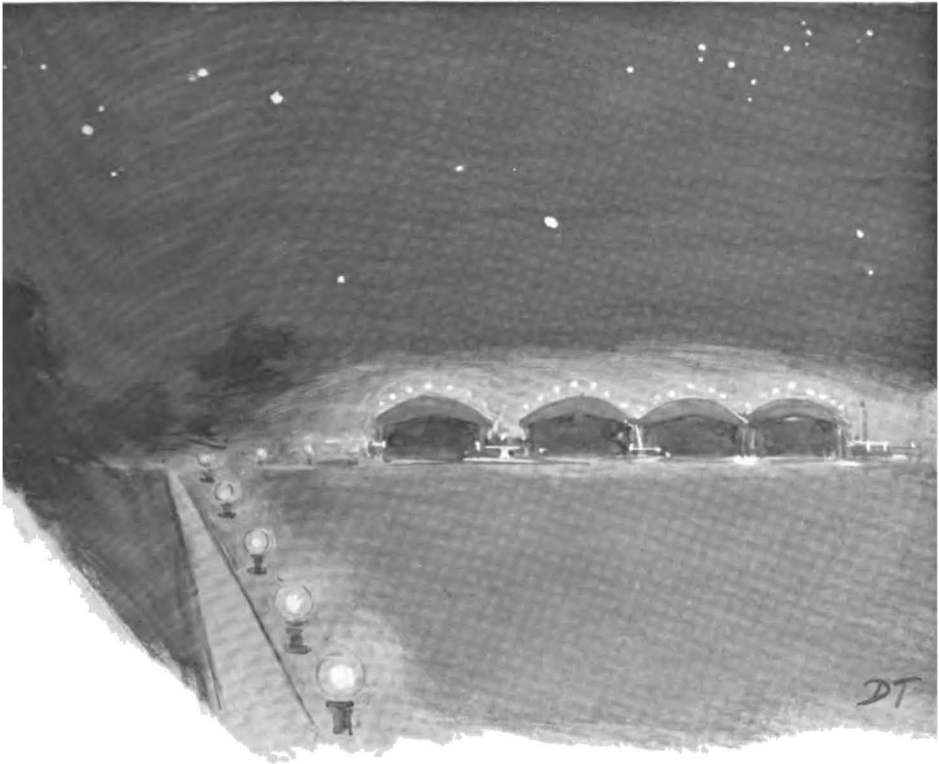
*Flying could be done at night*

night flying across country only awaits motor reliability and the provision of properly equipped and lighted landing grounds. At present a man who started on a night flight across country even by bright moonlight, would be taking inexcusable risks. His motor might stop, and even though the light of the moon revealed to him apparently unencumbered grass land on which he could attempt a good landing, it would probably not be sufficient to show him obstacles such as a single telegraph wire, or a ditch in time for him to avoid them, and the result might easily be a fatal accident. But with motors less prone to give out—and, indeed, some of our motors are all but absolutely trustworthy—and with landing-places known and illuminated, at not too distant intervals, aviators who are familiar with the part of the country over which they are flying could safely fly by night.

The provision of illuminated landing-places raises the general question of ground signs for the guidance of aerial navigators. France has already been mapped out into squares, each having two numbers to describe it, the numbers indicating the locality even without reference to a map. It is proposed that the numbers should be marked out

boldly with chalk for the convenience of aerial navigators. But the question of the visibility of such marks, unless they are made of enormous size, has been raised. Ground marks were employed in some of the big cross-country competitions, and many of the aviators said that they were quite useless. But it is to be remembered that the marks then employed were occasional arrows, and unless the aviator happened to keep on the appointed route, he might easily miss them. The system proposed, however, would cover the whole of the country with identification marks; and in conjunction with it, no doubt the names of railway stations would be exhibited in large horizontal white letters. Also, there would be special signs to indicate good landing-places. Probably these measures will not be taken in this country during the next five years. In France, however, they will certainly be well on their way.

Many systems of ground-marks are conceivable, and it is probable that they would all be based upon a division of the country into equal squares—a suitable size being two-mile squares. The squares would be numbered from a point in the centre of the country, and the 26 letters of the alphabet and



—with illuminated landing stages.

the nine numerals would be employed in their 234 simple combinations. In addition, each square would be marked by E, or N, or S, or W, or by two of these letters, to show its relative position—east, or north, or south, or west of the centre. For a very big country it would be necessary to introduce further combinations, but the one indicated is large enough for Great Britain. Each division, by it, would have two symbols, except the two lines of squares that intersected the central point, for each of which one symbol would suffice. One of the squares, for example, would be marked

C	2	N
B	1	E

showing that it was at the third letter of the second alphabet North, and at the second letter of the first alphabet east of the centre. Supposing they were one-mile squares, this would mean

a point 20 miles north and two miles east. Familiarity with the code would show the reader the position at a glance; but he would be provided with a key showing, perhaps, opposite each set of symbols, the name of the nearest town. The symbols would, I am confident, be large enough and conspicuous enough if made in white, and about twenty feet in length. A symbol could, of course, be repeated if necessary twice or three times in the same square.

Special maps for aviators, suitable compasses, and other instruments are rapidly coming into use, and in the course of five years all these details will be well established.

REGULAR AEROPLANE SERVICES.

Egypt, Australia, Canada, and South Africa will have regular aeroplane ser-

vices between outlying stations and towns not yet served by railways. The British Colonies, indeed, are somewhat behind the times as regards aviation. The Belgian Government is already establishing aeroplane communications in the Congo State, the French are doing the same thing in Morocco and Senegal. But among the pupils who have learned to fly lately in England have been a large number of officers of the Indian Army and many Australians, so that it is certain that interest is being awakened. And it is impossible to exaggerate the importance of aeroplane communications in countries where the white population is widely scattered, and has no means of communication save by occasional long and weary journeys over bad roads, or scarcely perceptible tracks.

#### ELECTIONEERING UP-TO-DATE.

A member of the French Senate, M. Reymond, is a certificated aviator, and has, indeed, taken out the superior military brevet. He travelled to his constituency by aeroplane a few weeks ago and in an up-to-date progressive country like France, it can safely be assumed that he increased his popularity and the number of the votes that will be given to him at the next election. Politics in England will have undergone a tremendous intellectual and moral revolution if, in the course of the next five years, many candidates for Parliament do not see that in the aeroplane they have an unequalled means of advertising themselves and exciting the admiration of young voters, more particularly of young lady voters, should they by that time be enfranchised. Compared with flying round the constituency, administering the kick-off at the local football match is tame.

I am sorry to say that I have already come across the self-styled "professor" of aeronautics. One finds his name in some capacity on company prospectuses for the exploitation of some proposition in aviation or dirigible ballooning. But it goes without saying that a prospectus appealing for capital requires a very rigorous in-

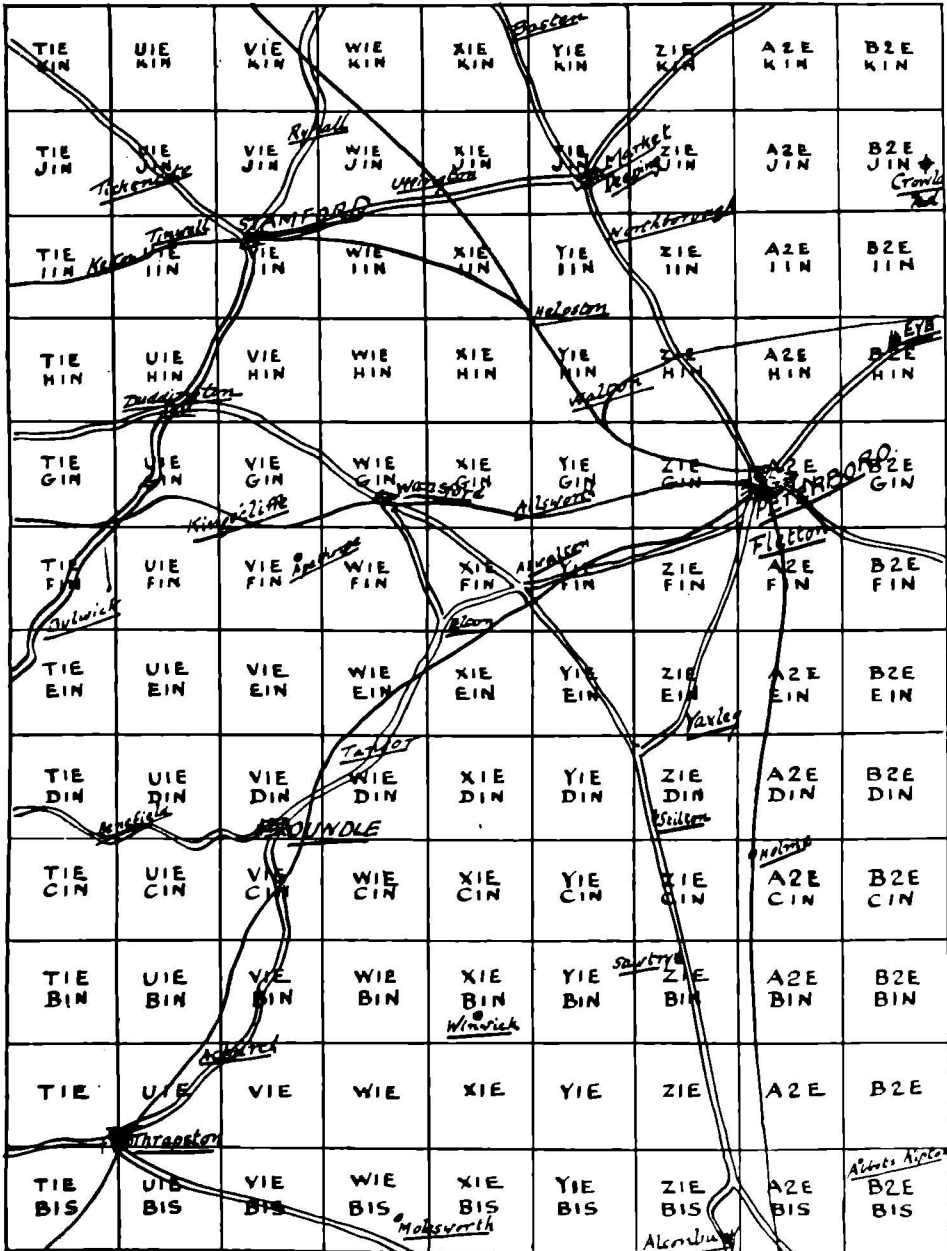
vestigation before it is accepted, and on its face scarcely recommends itself as a healthy concern. In this country there is no such thing as a professor of aeronautics; but so important a branch of learning, really presenting, as it does, quite a new aspect of nature which, notwithstanding all our extraordinary success in mechanical flight, still awaits careful and systematic study, cannot long be without its chair at one of the Universities. I am convinced that this is an immediately forthcoming development. Already the Imperial College of Science at South Kensington has awarded two research scholarships in aeronautics. In Germany there is a professor of aeronautics; and when Great Britain shall have one it might be possible, as it is not now, to regard the gentlemen who call themselves "professors" as possibly belonging to an order whose opinions will at all events be reasoned and worthy of respect.

#### REDUCED COST OF FLYING.

The most important thing of all I have left to the last, and that is the reduction of the cost of flying. At present it is quite erroneous to suppose that the more powerful, the more expensive, and the more extravagant engine that you fly with the better is the flight. As a matter of cold, hard fact, just the reverse is the case. This error has arisen from mere force of circumstances dictated by the great speed competitions. The real efficiency of the flying machine has been very largely ignored by leading makers, who have found themselves driven by competition to increase the number of miles per hour at which their machines can fly. Your very high-speed aeroplane is, in the majority of cases, a very indifferent flying machine; it is simply hurled through the air by the tremendous power of its engine; it will only remain in flight when travelling at a tremendous velocity; each fifty miles that it travels costs an inordinate amount in petrol, oil, and in wear and tear of machinery. It is, of course, capable of making headway against a

wind that would hold a slower machine almost stationary, as regards the ground

series of prizes for slow flying, for flying with low-power motors, and for



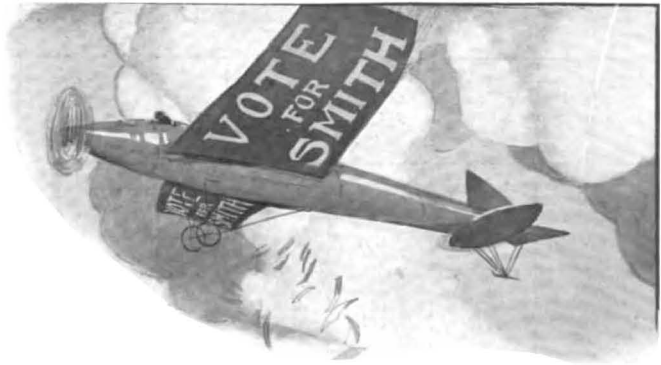
Map, illustrating system of identification marks for showing aviators where they are. This is a plan approved by many French authorities.

beneath. The race for speed has been a mad one, and it has cost many lives. What we need above all things is a

the best all-round performance according to the formula that the best machine is that one which will transport the

greatest load over the greatest distance in the least time and for the least expenditure of power. The great Lilienthal proved that with the expenditure of one-third of a horse-power a man could maintain himself in horizontal flight. A man can exert a third of a horse-power for a short time with his own muscles! Scarcely anyone flies nowadays with engines of less than fifty horse-power. And yet there has been a quite recent example of the fact that considerable speed can be attained with very much less power; M. Chevalier flew a 28 horse-power well-designed Nieuport monoplane in the Gordon Bennett, and attained a speed of 59 miles per hour. With a motor of 100 horse-power M. Leblanc's speed was less than 76 miles per hour, and Mr. Weymann's 100 horse-power Nieuport flew at no more than 78 miles per hour. But within the next five years we shall have aeroplanes flying quite fast enough for all ordinary purposes, very easy machines to fly with and to land with, and even more stable in gusty weather than the high-speed monoplane of to-day; and they will do it with motors of 8 or 10 horse-power. Then aeroplanes, instead of costing as they do now from £700 to £1,500 each, and being very expensive to run, will be £150, and even less; and they will, indeed, be within the means of middle-class people.

Apart from the inducement to be offered in the way of big prizes certain wise investigators are aiming at this result. The Wright Brothers have been going in for gliding experiments, one of their objects being to produce a machine that will offer reduced resistance to the air. Our high-speed



*An unequalled means of electioneering advertisement.*

merchants are doing little or nothing towards improving the aeroplane from the point of view of aero-dynamic efficiency. We should, however, be ungrateful if we did not acknowledge that their work has its value as regards details of mechanical construction.

I have chosen a period of five years, because it will witness great changes and a tremendous amount of progress. Some of our greatest engineers now recognise the great future there is for mechanical flight. All over the world large numbers of clever young engineers are employed in grappling with the various problems presented. The motor engineers are also hard at work, as are chemists, and inventors of all kinds. Many of those who have given time and money for these purposes in the past will never reap the reward. But that is an inevitable circumstance with a new industry. Others come in and carry on their work on a larger scale and in a better light.

PROBABLE MILITARY AEROPLANE STRENGTH OF THE GREAT POWERS IN 1917.

Country.	No. of Machines.	No. of Men in Air Division.
Great Britain	500	1,200
France ...	1,200	3,000
Germany ...	1,000	2,500
Russia ...	500	1,200
Italy ...	100	300
Austria ...	300	800