

	<i>Patentee</i>	<i>Date</i>	<i>G B</i>	<i>U S A</i>	<i>Fr</i>	<i>Others</i>
87	S N C A Centre	1946	634332		931296	
88	The Fairey Aviation Co	1946	614676			
89	The Cierva Autogiro Co	1946	614621/2/3/4			
90	The Cierva Autogiro Co	1946	614695/6			
91	The Fairey Aviation Co	1947	627117			
92	E A Stalker	1948		2516489		
93	The Fairey Aviation Co	1948	632065			
94	B Nicholaeff	1948		2472917		
95	H F Pitcairn	1948		2440758		
96	The Autogiro Co of America	1948	654757			
97	H J McCollum	1949		2485502		
98	D T Dobbins	1950		2514749		

## Discussion

**The Chairman** I do really think Mr HAYWARD is to be congratulated on the scope of his most absorbing paper

**Mr E W Micklethwaite** (*Messrs Kelburn and Strodé*), who was invited to open the discussion, said I think it is only fair to say that I had not suggested speaking at all, but I was warned that there was a danger of my being called upon to do so, and perhaps the reason is that my knowledge and experience of helicopters, of their history and their design, is probably less than that of anybody else here So that I can speak unfettered by any expert knowledge or preconceived ideas

As "a man in the street," when I read the paper, admittedly without the aid of any of the pictures we have seen this evening, I found it a little indigestible I said to the author that I would not compare it with a card index, but that there seemed to be very little connection between one suggestion or development and the next, and I wondered whether it would be possible to arrange the information in the order of development of the various ideas He replied that he had tried doing that, but he had got into such a muddle that he had had to give up and revert to the purely chronological arrangement I thought that interesting, and it suggested to me that probably the inventors of the various designs did not in all cases familiarise themselves with everything that had been suggested before Probably some of the suggestions are a little fantastic, but undoubtedly there are a great many earlier ideas which might contribute to those of the later inventors

Coming back to the beginning of the paper, Mr Hayward referred to Leonardo da Vinci In connection with almost any subject of invention it is fairly safe to assume that Leonardo da Vinci "had a go," and in this case we are not disappointed In his notebooks (translated by MacCurdy) there is a picture of a sort of screw revolving around a vertical axis, with the note —"Let the outer extremity of the screw be of steel wire as thick as a cord, and from the circumference to the centre let it be 8 braccia" That is a diameter of about 32 ft Then he states "I find that if this instrument made with a screw be well made—that is to say, made of linen of which the pores are stopped up with starch—and be turned swiftly, the said screw will make its spiral in the air and it will rise high" That rather suggests that he probably flew it, which is likely, because he did a number of flights—and killed a number of his apprentices

But there does not appear to have been an engine in this machine One wonders what would have happened if Leonardo da Vinci had studied the work of Hero (or Heron) of Alexandria, who made one of the first steam engines (about the year 200 A D or possibly a good deal earlier) which had a jet-propelled rotor There was a hollow globe to which steam was admitted from one of two trunnions, and there were two L-shaped nozzles through which steam came out and spun it round Possibly

if Leonardo da Vinci had had that in mind we should have had a jet-propelled helicopter rotor about the year 1500

The experts here may find in the later parts of the paper a clear connection between one idea and another, a gradual line of development working through them, but to me, as "a man in the street," it seemed that that was rather lacking. If I may point a moral from the paper, it is that inventors might do well to pay rather more attention to what previous inventors have thought of and patented. If that is the moral of the paper, I think it is also to some extent its value. The author has provided both a signpost to show the right road, and a motor 'bus in which to travel along it. He has, in fact, presented us with a very convenient document describing a very large number of proposals, if we wish to examine them. In addition to giving us an interesting and pleasant evening, he has provided a reference work which will no doubt be consulted on many occasions in the future.

**Mr Mittler** (*English Electric Co., Ltd.*) When, in the first World War, Professor von Karman was in charge of research at the Austro-Hungarian Airforce Establishment in Fischamend, and when I was his humble junior assistant, he experimented with a captive helicopter, suggested by a senior assistant, having two contra rotating rotors geared together side by side to an electric motor, the cable of attachment supplying the current to this electric motor. The idea was that captive balloons had proved to be highly vulnerable in war, and this arrangement was intended as a substitute for them, and to carry a machine gun in the middle between the rotors. But the thing was incurably unstable, and when the war was over, was abandoned.

British Patent 500192, based on a U.S.A. patent, dated August, 1936, which was well before World War II, relates to one of Hitler's "secret weapons," a captive autogiro towed behind a warship. Everybody could buy this "secret paper" at the British Patent Office for 1s.

The third point I want to make has nothing to do with war, which is perhaps remarkable. I want to refer to an arrangement which was the subject of British Patent 474005, dated September 1st, 1936, and accepted in 1937. It relates to a Trojan "horse," the belly of which contains two internal combustion engines. One of the engines drives propellers sticking out at the front of the horse and at the back, whilst another engine drives two helicopter rotors sticking out below and at the top respectively. There is also a parachute affixed to it and shock absorbers in the hooves. If this patent had been dated 1836 I would not have been surprised, but it is dated 1936, *i.e.*, long after Cierva's autogiro and Sikorski's helicopter.

(Mr Mittler exhibited at the meeting the specifications to which he had referred.)

**Mr O. L. L. Fitzwilliams** (*Founder Member—Westland Aircraft, Ltd.*) I should like to thank Mr HAYWARD very much for having done for us a job which obviously we ought to have done for ourselves. For instance, I am in the rather odd position of having applied for a patent about nine months ago which I see now was already published.<sup>1</sup> This was the type of jet drive in which the torque from the rotor is used to give the pressure in the jet. It seemed to me to be very interesting.

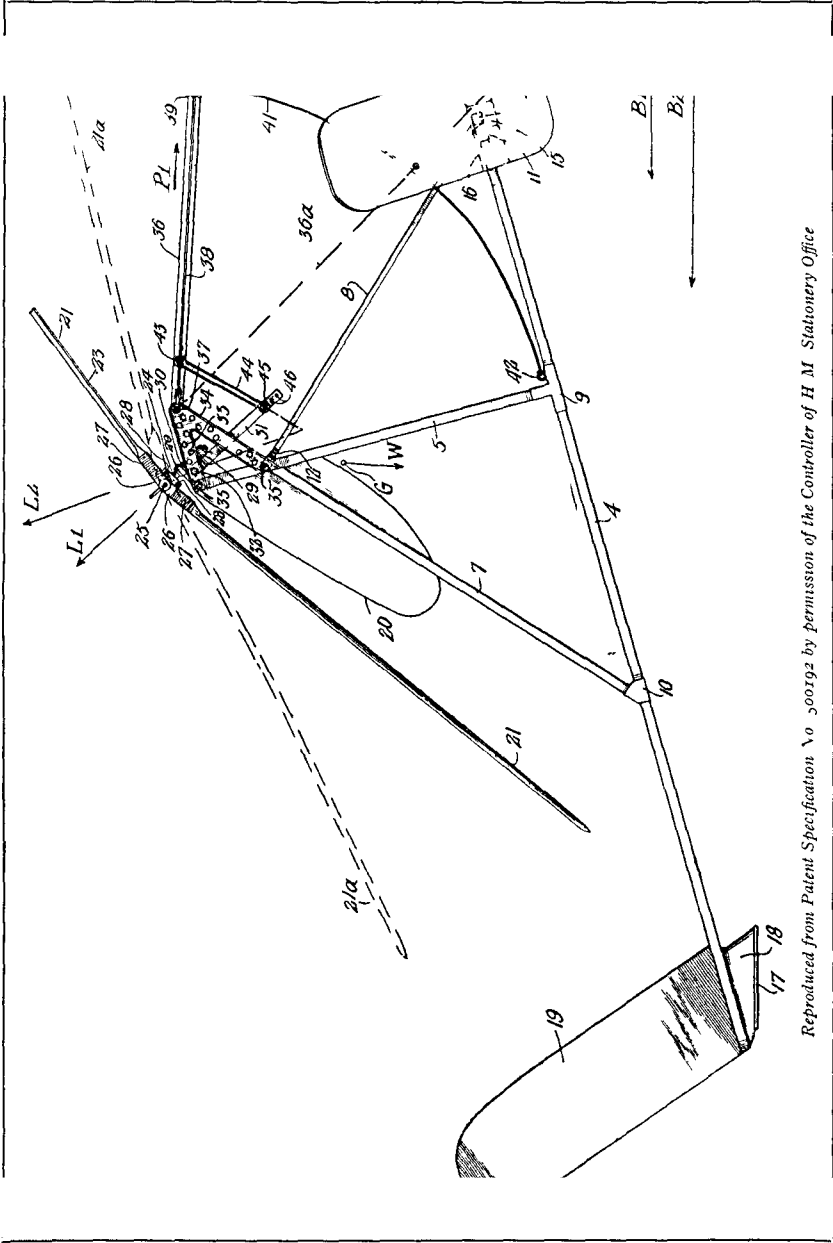
I noticed that Mr Hayward, in dealing with the various patents, gave them all equal weight. I would like to ask him to give us some idea of what they are worth because most of the patents of the American Stalker, for instance, seem practically worthless. It seems that 85 per cent or even more of the patents about which we have heard this evening probably have no commercial value. Can Mr Hayward say which, in his opinion, have a real value?<sup>2</sup>

Particularly I would ask about the patent in which turbine engines are shown at the blade tips. I cannot imagine, considering the earlier work of Isacco, how such a mounting of an engine can be patentable.

**Mr Hayward** (in reply) My thanks are due to the speakers for their remarks on my paper.

Mr MICKLETHWAITE may be interested to know that I am aware of a model made according to da Vinci's design, a tiny petrol engine was installed and the model flew quite well.

Referring to his remarks on the development of ideas, I gave this aspect of the paper considerable thought and set out to follow each individual theme from inception to the present time. I found considerable overlap in many of the patents discussed and in some cases an idea appears to be abandoned but reappears ten years later. I discovered that the only method of treating each patent fairly and to save considerable



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confusion by more than one reference to each patent was to retain a purely chronological arrangement

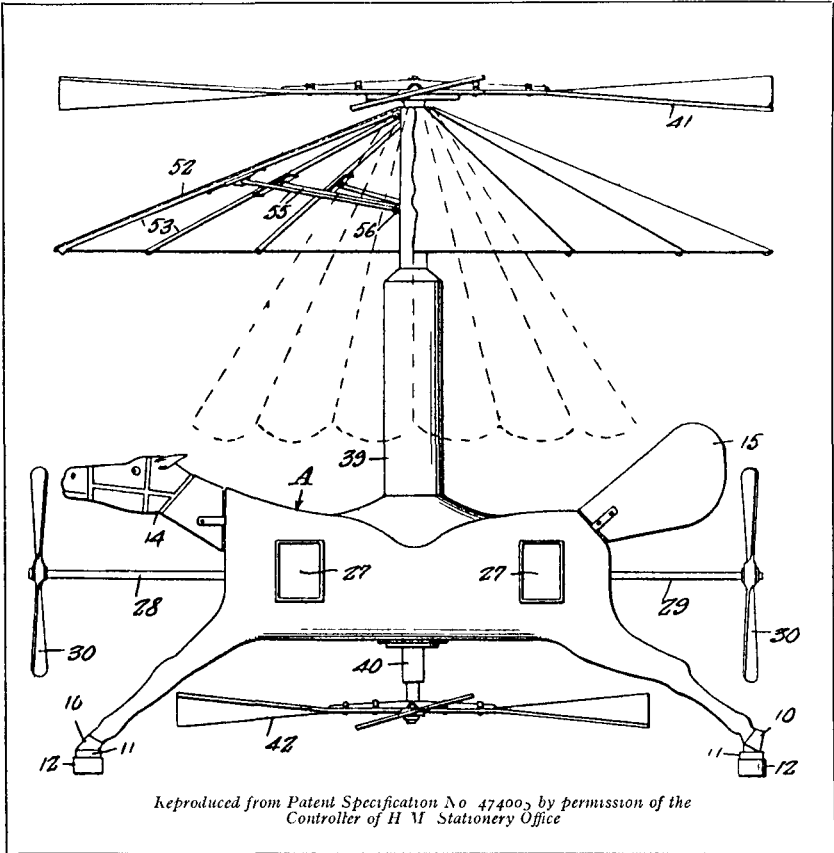
I consider that my paper shows two rather definite lines of thought One favours a fuselage located compressor supplying air or gas to a pressure jet unit on the rotor blade tips and the other favours the provision of tip mounted ram jets or pulse jets Pressure jets mounted on the rotor blade tips appear to be more recent and to present considerable design and structural problems

To Mr MITTLER I point out that the historical part of my paper ceased at 1900

After this date I found that many more inventors were considering the possibility of the helicopter and therefore patents became more numerous, so much so, that if I had included a further period of ten years in my history this part of the paper would have taken up the whole evening

I agree with Mr Mittler that the two British patents he mentioned are interesting or, shall I say, amusing, but I do not believe that by any stretch of imagination, that they could be regarded as forming part of the progress of jet propulsion

I apologise to Mr FITZWILLIAMS for upsetting his pending patent applications but I do think that if he had had a good search made of prior patents before filing his application, he would have been saved time, trouble and expense



To state the value of any particular patent is very difficult, I have found that patents considered valueless can sometimes cause considerable embarrassment. It is my belief that the value of a patent depends to a large extent on what you, as a Company or an individual, are doing and to what lengths you are prepared to go to stop your competitors from copying your designs, etc. To challenge the validity of a patent is an expensive business.

By filing a patent specification you obtain considerable information. When the application is examined you will be informed of prior designs in your particular field, and you will also obtain claims for any of your ideas which are considered novel.

Knowing designers, I appreciate how quickly their ideas develop. It is nothing for the Patent Engineer of a Company to complete a specification on one day and have to completely rewrite it the next because the inventor has had second thoughts.

The Isacco patent was applied for in the United States of America in 1946 and accepted in 1949 and in Great Britain it was applied for in 1945 and accepted in 1948. The claim is for a jet propulsion unit which includes an air compressor and a turbine and in which there is a reversing mechanism between the two. The compressor and turbine rotate in opposite directions to balance out gyroscopic couples in the jet unit, which may be set above or below the blade axis.

The claims of the Fairey patent cover the mounting of a pressure jet unit on the tip of a rotor blade by attaching the unit to an extension of the main spar of the blade. It also covers the provision of an annular duct between the shaft bearings, the compressor and turbine to allow cooling air to flow through the unit.

**Mr Fitzwilliams** I had not in mind a comparison between Isacco's tip-mounted turbine and the other type, but I was concerned with the fact that in the 1920's he had mounted engines on the tips of the blades, and so had others. What is novel about it, therefore?

**Mr Hayward** There is no novel feature in just mounting a jet engine at the tip of a rotor blade but the method of mounting such an engine or the design of the engine itself may be novel.

**Mr R Grey** (*Fairey Aviation Co, Ltd*) It appears that the scope of a patent may be quite wide. Just how wide could this scope be? It seems to me that if some enterprising person had patented the principle of flight he would have been able to accumulate a large fortune.

**Mr Hayward** The scope of a patent is governed by the novelty of a design and by prior proposals in any particular field. I suggest that if you wanted to claim a patent for a particular design you should have the specification prepared in such a way that it claims the world. After the patent office examiners have concluded their investigation into prior art, novelty, etc., you would probably be left with a claim to the Isle-of-Wight<sup>1</sup>. Should you have any doubts as to the thoroughness of the British Examiners searches I suggest that you file your application in Holland. The Dutch Patent Office can be relied upon to make a very complete search through prior patents and they can also question the "obviousness" of an alleged invention.

## VOTE OF THANKS

**THE CHAIRMAN** On your behalf I congratulate Mr HAYWARD on the result of his immense research in compiling the vast amount of interesting information he has given to us. He tells us it is the first occasion on which he has addressed any meeting and I must say he spoke extremely well.

It remains for me now to ask you to join in thanking him and applauding him and I hope we shall have the pleasure of hearing another paper from him at some time in the future. (The vote of thanks was heartily accorded.)