

# THE WRIGHT J-5 "WHIRLWIND"

## An American Engine Which Has Made History

In our issue of last week we were able to give a very complete set of curves relating to the Ryan monoplane on which Capt. Lindbergh flew from New York to Paris, but it was pointed out that these curves did not, except by inference, tell one very much about the engine. We have since received from the Wright Aeronautical Corporation of Paterson, New Jersey, U.S.A. particulars of the Wright "Whirlwind" engine used not only by Lindbergh, but also by Chamberlin in his flight in the Bellanca monoplane from New York nearly to Berlin.

Before giving a description of the technical features of the Wright "Whirlwind" a few notes on the history of the engine and some of its performances to date may not be without interest. We, therefore, quote from the Wright Bulletin No. 16, the following passages:

### "Whirlwind" History

"The current Wright 'Whirlwind' model J-5 is the result of seven years' intensive development on one type of engine without alteration in bore and stroke and without changing any basic feature of the original design. The development contract under which this series of models began was dated February 28, 1920. Since that time seven successive models have been developed and over a thousand engines sold, practically all going into immediate service where thousands of flying hours have been accumulated. This service testing in the hands of the United States Navy and many commercial interests has resulted in a wealth of practical experience and technical data, which has formed the ground work for further improvement in detailed design. These improvements have first been developed and tested in the laboratory through extensive dynamometer trials and later supplemented by flight tests where average service conditions were simulated. When conclusively proven, the changes have been definitely adopted as standard and made a feature of the next production run of engines.

"This policy of gradual improvement and perfection has resulted in a sound development where each successive model has contained improvements dictated by service experience with the preceding engine, and in which each model has been uniformly successful.

"In 1916 Mr. Charles L. Lawrance started a development of air-cooled engines of small power. His early experiments led him to the belief that larger powers could be successfully constructed, and it was largely through his efforts that an experimental contract for the development of a 9-cylinder, 140 h.p. air-cooled radial engine was awarded by the United States Army early in 1920. Immediately thereafter the United States Navy also gave Mr. Lawrance a contract for a similar type of engine to have a guarantee of 200 h.p. at 1,800 r.p.m. These two engines were developed simultaneously and both passed their fifty-hour acceptance tests early in 1921. This second engine, designed and constructed for the United States Navy, was the fore-

runner of the now famous Wright 'Whirlwind' engines, having a bore of 4½ ins. and a stroke of 5½ ins., and rated at 200 h.p. at 1,800 r.p.m. Since that time seven successive models have been produced without alteration in the basic design. These models have been the J-1, J-2, J-3, J-4, J-4A, J-4B and J-5. Each model has been produced in quantity for the United States Navy before being released for commercial sale. In this way commercial aviation in the United States has been given the benefit of time-tested engines of a design already approved and tried by the United States Navy. The current models, J-5c and J-5ca, combine all the experience with the preceding engines and constitute a refinement which goes far beyond their capabilities.

"It is the policy of the Wright Company to incorporate engine improvements and minor new developments in their engines as rapidly as possible. To designate each factory run of engines of exactly the same detailed design, capital letters are added to the basic model designation. In this way the model J-4A was a refinement of the model J-4, and in a similar way the models J-5c and J-5ca indicate minor modifications of the basic model J-5 design."

### Some Whirlwind Performances

All our readers will be acquainted with the fact that it was the Wright "Whirlwind" engine that was used by Lindbergh and Chamberlin in their transatlantic flights. Commander Byrd, who is reported also to be contemplating a transatlantic flight (in a three-engined Fokker monoplane) has also chosen this engine (or rather, three of it!) for his venture. This was but natural since three of these engines carried him and Mr. Floyd Bennett to the North Pole and back safely on May 9 last year. Other important flights made by machines fitted with the Wright "Whirlwind" engine have included the following:

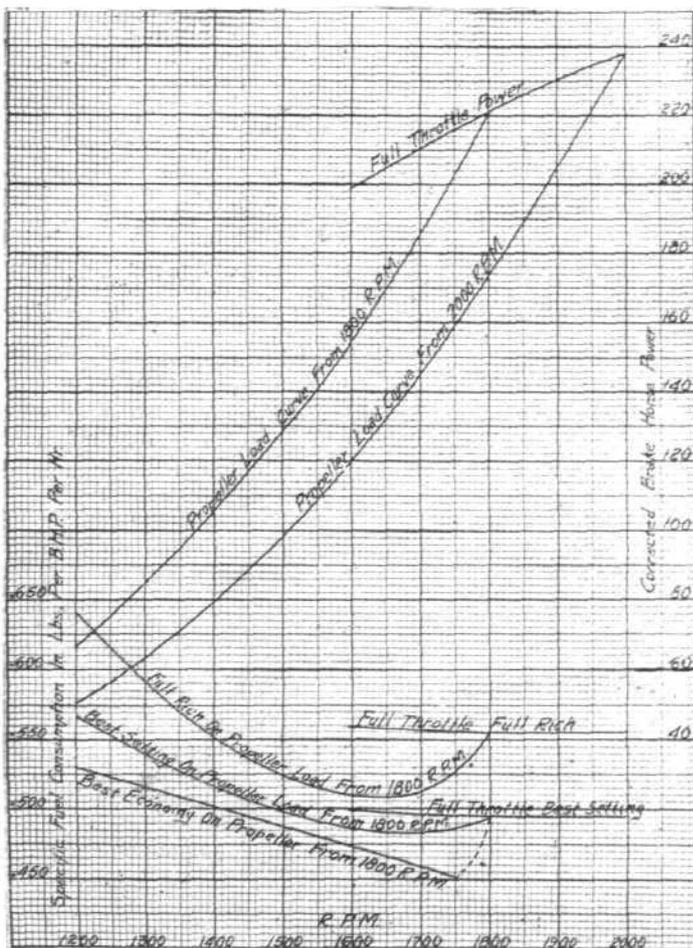
The world's duration record without alighting of 51 hrs. 11 mins. made on April 14 this year by Chamberlin and Acosta in the same Bellanca monoplane on which Chamberlin and Levine recently crossed the Atlantic. Won first, second and third places in the Second (American) Annual Aeroplane Reliability Tour of 1926, the route of which was over 2,500 miles long, and the machines being: First, the Travel Air, with 600 lbs. pay load, 124.5 m.p.h.; second, Buhl Airster, 800 lbs. pay load, 113.5 m.p.h.; third Stinson-Detroit, 640 lb. pay load, 106.7 m.p.h. Won Transport Race at the National Air Races at Philadelphia in 1926, in a Wright-Bellanca monoplane carrying 1,607 lbs. pay load (8 lbs. h.p.!) at 121.5 m.p.h. Won twelve out of eighteen prizes at Philadelphia National Air Races in 1926.

During 1926, "Whirlwind" engines flew 1,750,000 miles in safety on commercial air routes in the United States and Canada, and including engines bought by the United States Army and Navy, more than 1,000 "Whirlwind" engines have been sold to date.

### Technical Details

The Wright "Whirlwind" engine, in all its variations or models, is a radial air-cooled engine with 9 cylinders evenly spaced around a cylindrical crankcase. The latter is of aluminium alloy, with front cover removable, but with back cover cast integral with the crankcase barrel, and containing the ducts of the induction system. The earlier models of the "Whirlwind" had aluminium cylinders shrunk and threaded on to a steel sleeve, this construction being regarded as somewhat cheaper than the method of forming the cooling fins on the steel barrel. In the J-5 model, however, which was the one used by Lindbergh and Chamberlin, the cylinder construction has been altered, this change, in fact, being the most important one between the J-4B and the J-5 models. In the latter the cylinder is built in two parts, the steel cylinder barrel with integral steel cooling fins machined out of the barrel forging; and the cast aluminium alloy head screwed and shrunk on to the top of the barrel. In this way a more direct heat transference is attained. The combustion chamber in the cylinder head is hemispherical in form and the inlet and exhaust valves are set at an angle of 70°, with their heads flush in the combustion chamber. The exhaust valve is of the salt-cooled type, as referred to by Mr. Charles L. Lawrance in the paper which he read before the Royal Aeronautical Society on February 4, 1926. With this form of valve the stem is drilled through its length, the opening being filled with potassium nitrate and sodium nitrate.

The cylinder head of the J-5 model permits of larger valves, with consequent improvement in the full throttle volumetric efficiency, and the design gives an increased area of fins around the valve ports, thus improving the cooling. It is claimed that the new cylinder and cylinder head construction is largely responsible for the improved fuel economy of the J-5 model, which on a 50-hour full-throttle endurance test averaged 0.458 lb. hp./hr., with an output of 216 h.p. at 1,827 r.p.m.



THE WRIGHT "WHIRLWIND" ENGINE: Power curves of models J-5C and J-5CA.