

Early Superchargers

By PETER M. GROSZ

A BRIEF REVIEW OF THE BEGINNINGS OF GERMAN
AIRCRAFT SUPERCHARGER DEVELOPMENT, 1917-19

INTRODUCTION (From a letter by the author)

The article in a previous issue of the JOURNAL (Summer 1967, p. 99) entitled "Turbo Supercharger Development, Evolution to First Operational Use" by MSgt. Merle Olmsted was extremely informative, particularly in covering the salient U. S. pioneering work in this field.

The reason for writing this is twofold: first, for the sake of historical completeness it is felt that the early German experiments with superchargers should be mentioned, and secondly, our readers should be interested. Much of the German work during WW I was never published since it was purposely hidden from the Allied Aeronautical Control Commission teams in 1919. Even when it was released, the German work was more or less disregarded by the rather nationalistic press of the victor nations. The fact is that the Germans were certainly well ahead of the Allies in supercharger development and application at the end of the First World War.

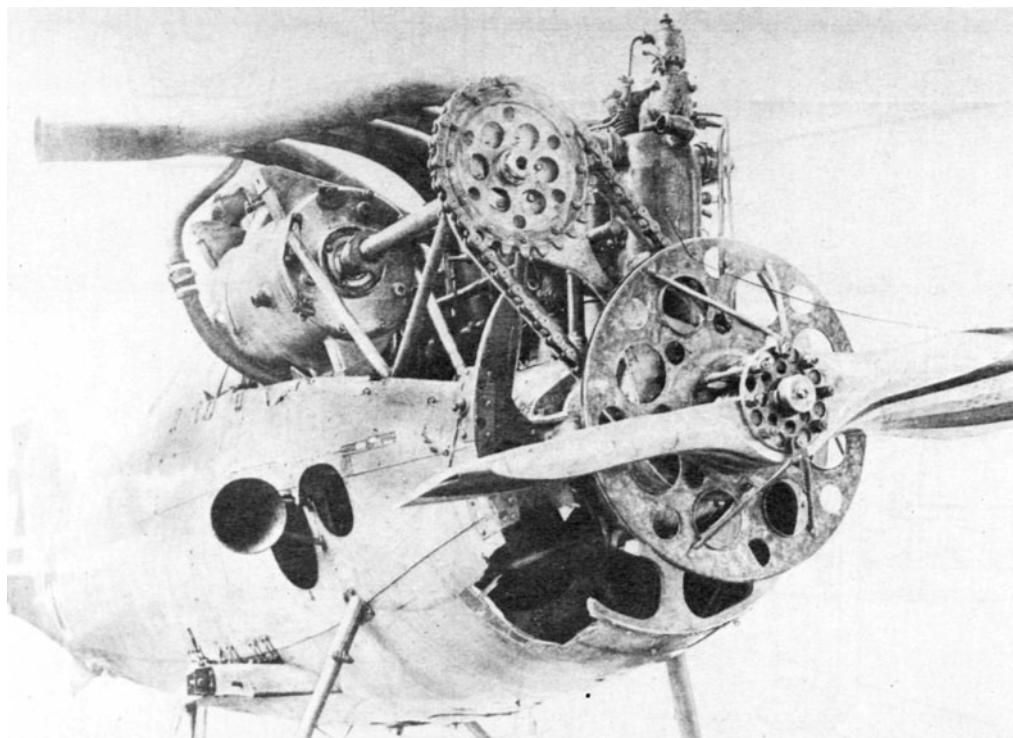
Enclosed is a brief outline which, I believe, will place this development in its proper historical perspective.

(signed) Peter M. Grosz

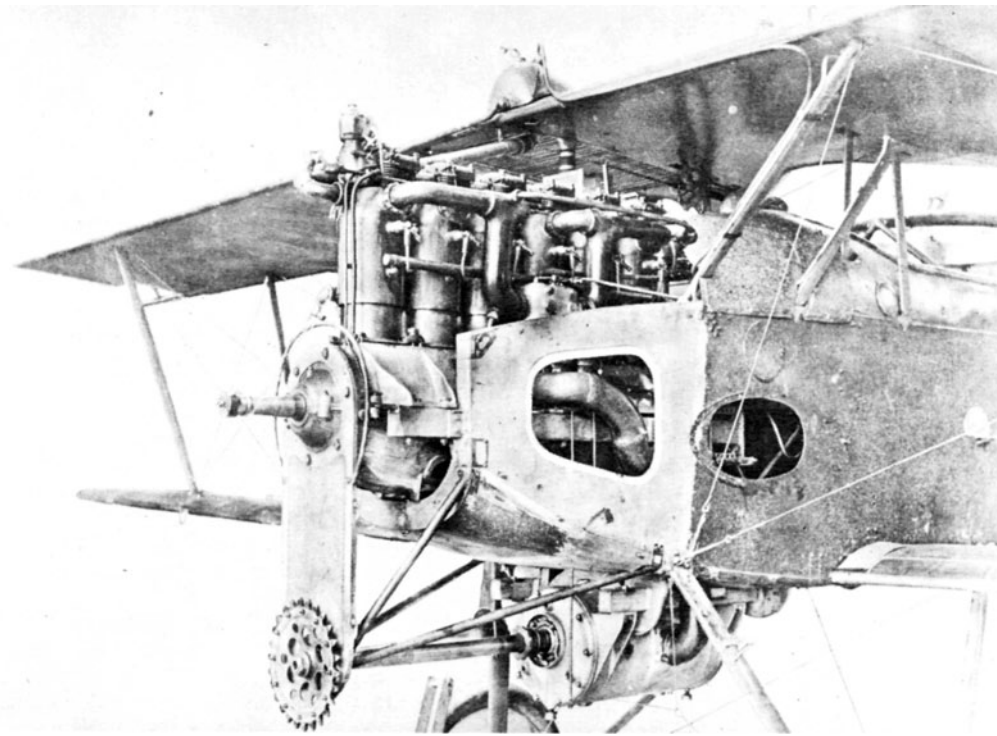
The Germans developed superchargers during the latter part of World War I to increase the altitude performance of their aircraft. They had already brought out the so-called "high-altitude", over-compressed aircraft engines, particularly the BMW IIIa and Maybach Mb IVa, which enabled their long-range reconnaissance machines to fly out of the reach of Allied fighters. In order to extend high-altitude performance even further, German companies were actively engaged in the design, construction and testing of turbo-superchargers and other supercharging techniques. The firms Siemens-Schuckert, Daimler, Brown-Boveri, AEG and Schwabe built superchargers which were tested on a variety of aircraft ranging from single-seaters to multi-engined giant bombers.

The Daimler Motorenengesellschaft, builders of the Mercedes engine, was the only company that constructed a Roots-type supercharger. These were tested on a Halberstadt C1.II and an Albatros D.Va. Tests showed a 50% increase in engine performance at an increase of 150-200 rev/min. The Albatros D.Va showed a marked increase in its rate of climb. These Roots-type superchargers were either gear or belt driven from the propeller end of the crankshaft. (Figures 1 and 2).

On the whole the centrifugal superchargers showed better and more promising results during tests than the Roots-type blowers. Centrifugal superchargers were generally driven through gears and mounted at the crankshaft end opposite the propeller. On giant aircraft, such as the Staaken R VI 30/16 and DFW R II 16/16 the supercharger was mounted in the fuselage and driven by a separate



Albatros D.Va, Mercedes 180 hp engine with Roots-type supercharger, was tested in 1918. (Photo - Peter M. Grosz Collection)



The Daimler-built Roots-type supercharger for the Mercedes D.IIIa engine was mounted under the fuselage of a Halberstadt CL.II for test. This was chain driven with the chain going round a sprocket on the rear of the propeller hub. (Photo - Gross)

Figure 1 - below - diagram of the side-mounted Daimler Roots Supercharger for Mercedes D.IIIa engine.

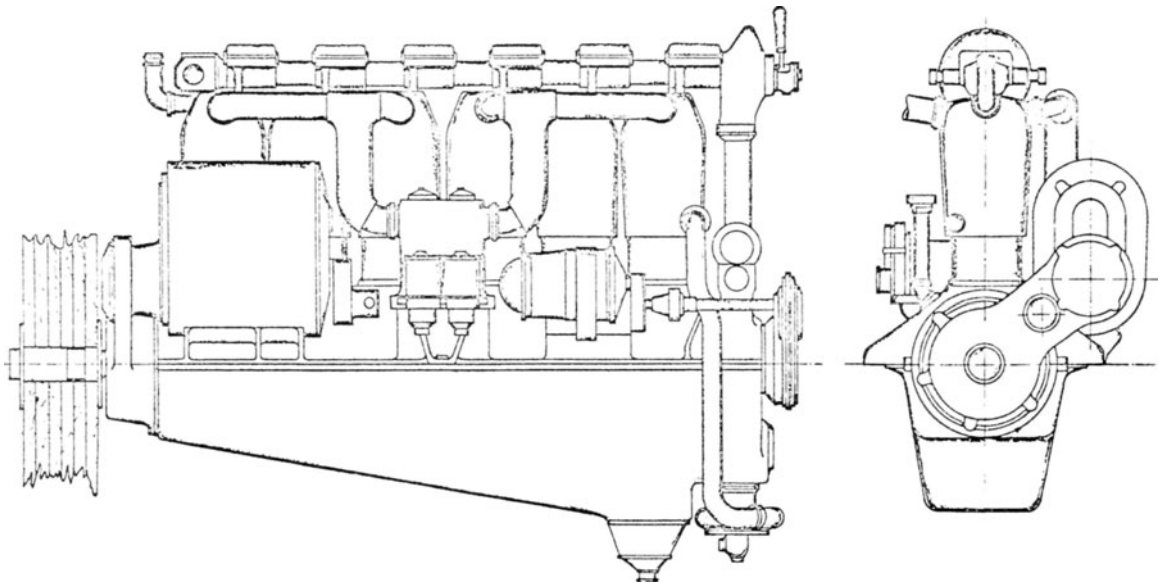
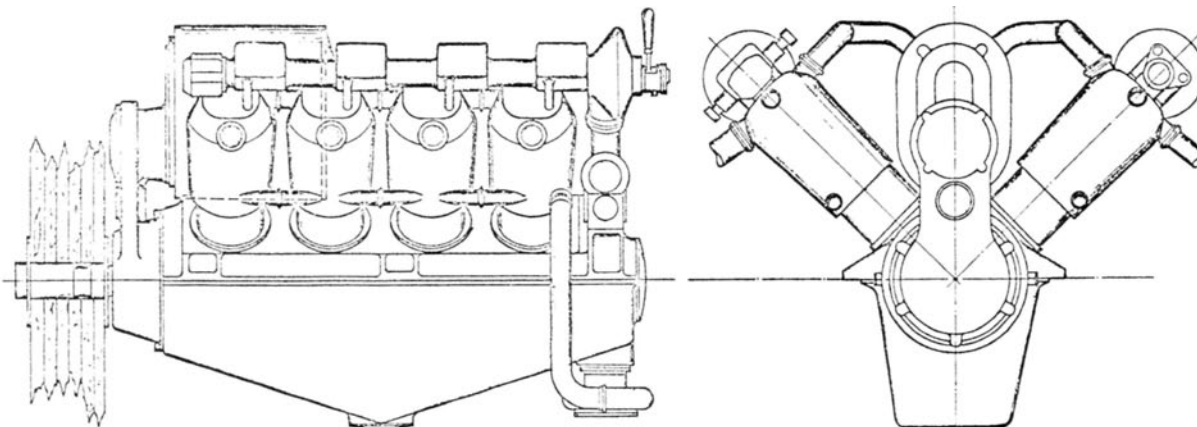
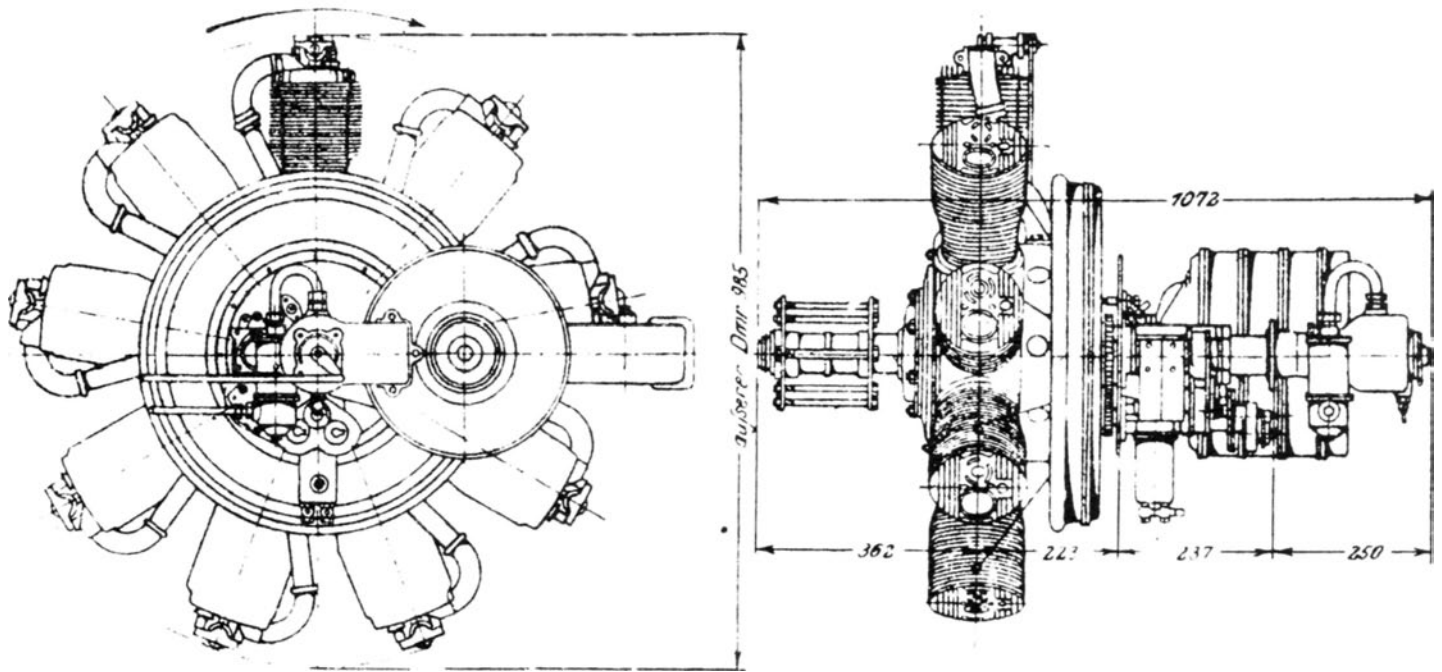


Figure 2 - below - Daimler Roots supercharger mounted between cylinder banks on the 195 hp Mercedes D.IIIb





The Schwade centrifugal supercharger was mounted at the rear of the 110 hp Oberursel Vr. II.

126 hp Mercedes engine. The supercharged air was led to the engines through a network of large pipes.

The Schwade supercharger was test flown in a Fokker Dr I triplane powered by a 110 hp Oberursel Ur II engine (Figure 3). These tests and the government acceptance tests were very successful and in late 1918 it had been planned to place a substantial quantity of Schwade superchargers into mass production for operational use.

The Siemens-Schuckertwerke built superchargers for the 260 hp Mercedes D IVa and their own Siemens-Halske Sh II and Sh III rotary engines. (Figures 4 and 5). These were under test at the war's end.

AEG achieved good results with a three-stage supercharger operating at 10,000 rpm mounted on a 260 hp Mercedes D IVa engine (Figure 6). An AEG GV

bomber with a standard ceiling of 4,000 meters (13,124 ft.) was able to reach 6,000 meters (19,686 ft) with eight persons aboard (rather than the standard crew of 3-4) using this supercharger (Figure 7 shows the barogram of the flight). AEG also had a supercharger for R-planes (giant bombers) under test, driven by a 160 hp Mercedes engine.

Brown-Boveri was particularly active in supercharger development. Its first design, driven by a 120 hp Mercedes engine, was a four-stage supercharger mounted in the Staaken R 30. The comparative climb curves (Figure 8) show a remarkable increase in rate of climb and ceiling. Larger installations were under construction for future giant bombers.

The German wartime superchargers, all built in 1918, utilized aluminum case castings and compressors

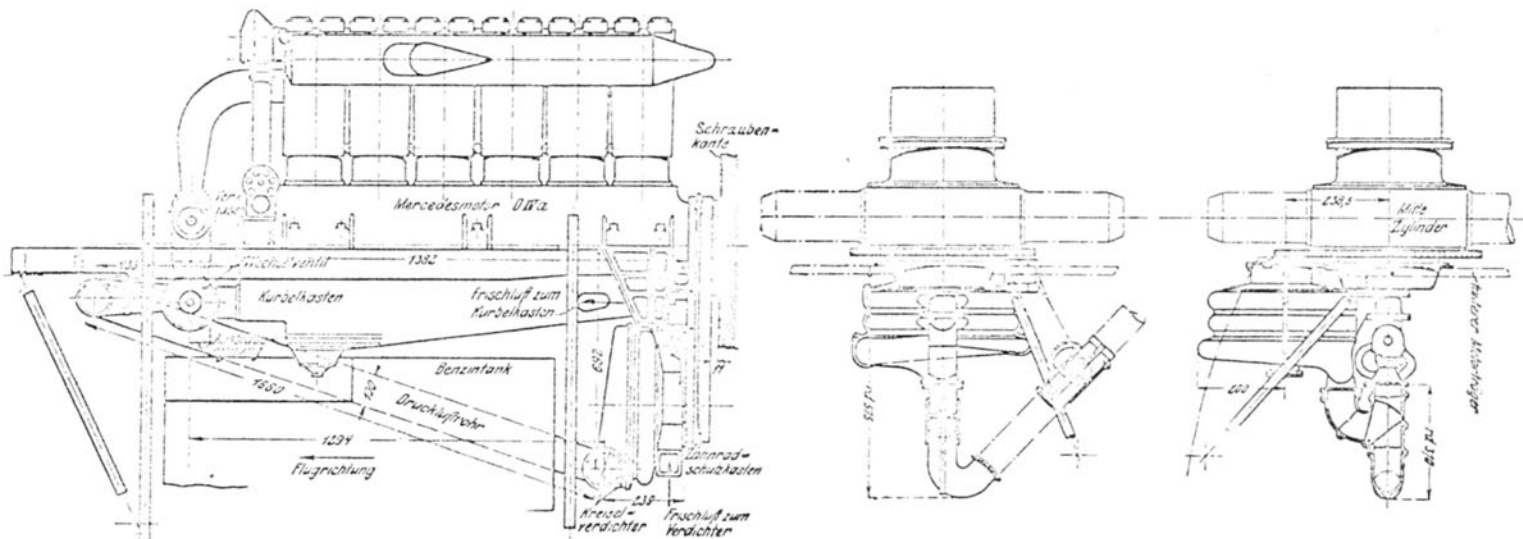


Figure 4 - left - Siemens-Schuckert supercharger on Mercedes D.IV a and at right Figure 5 on Siemens-Halske

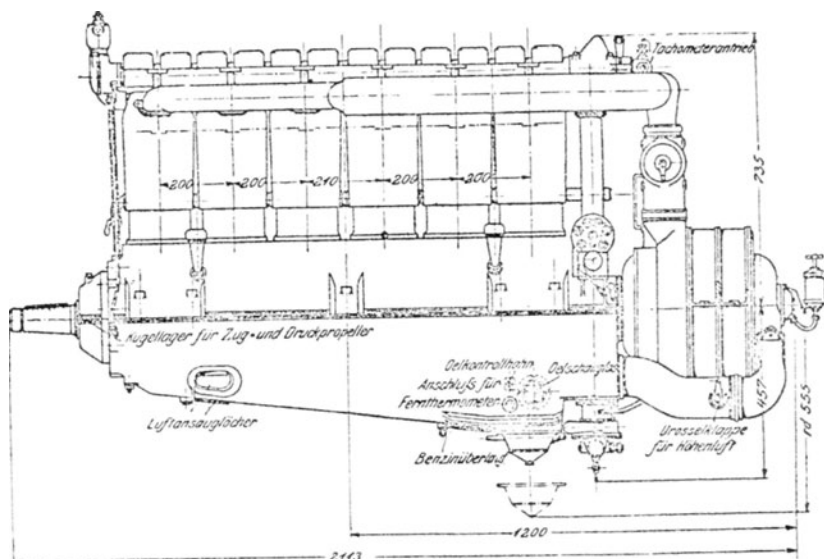


Figure 6 - left - the Schwade centrifugal supercharger mounted directly on the rear of the Mercedes D.IVa crankshaft.

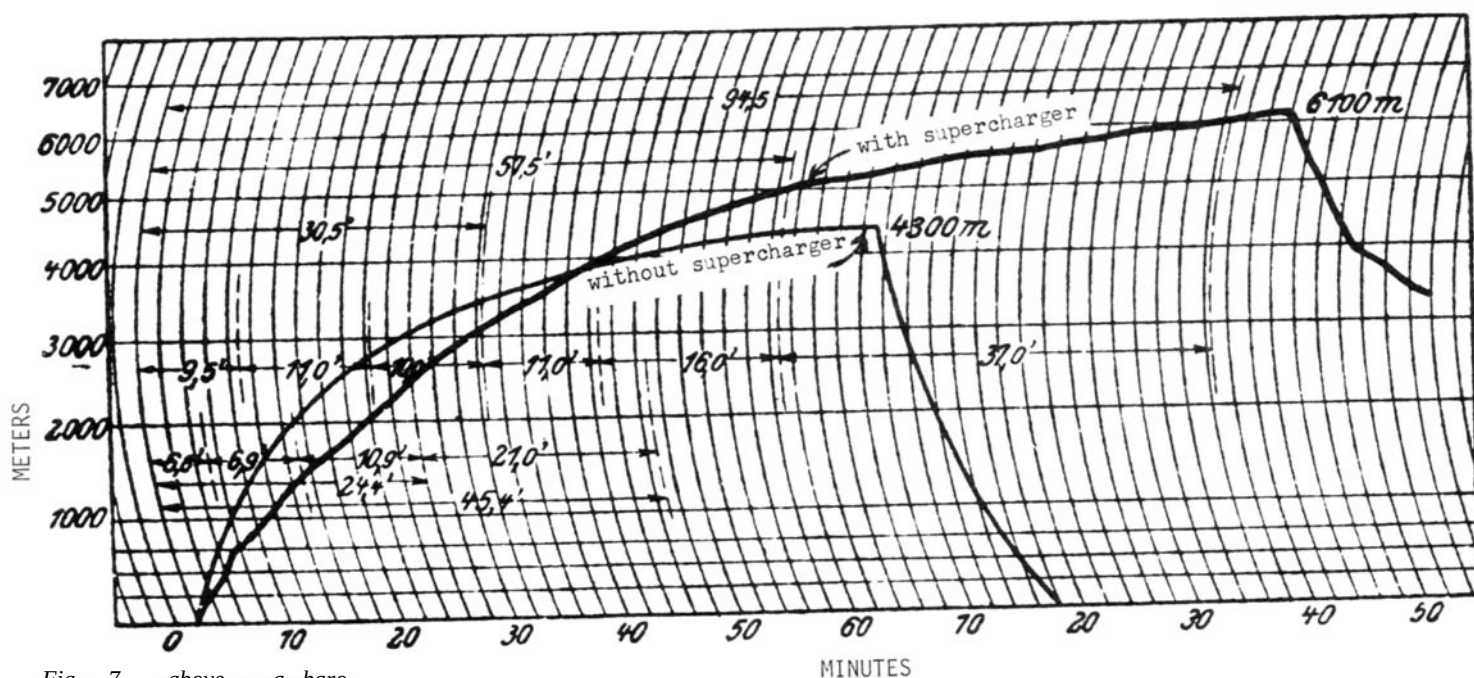
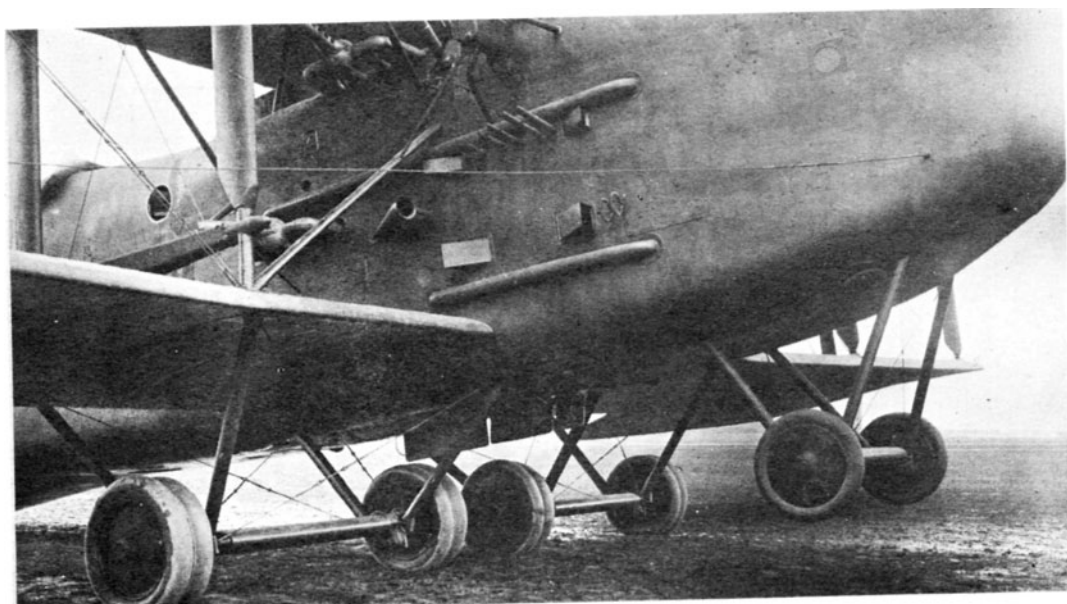
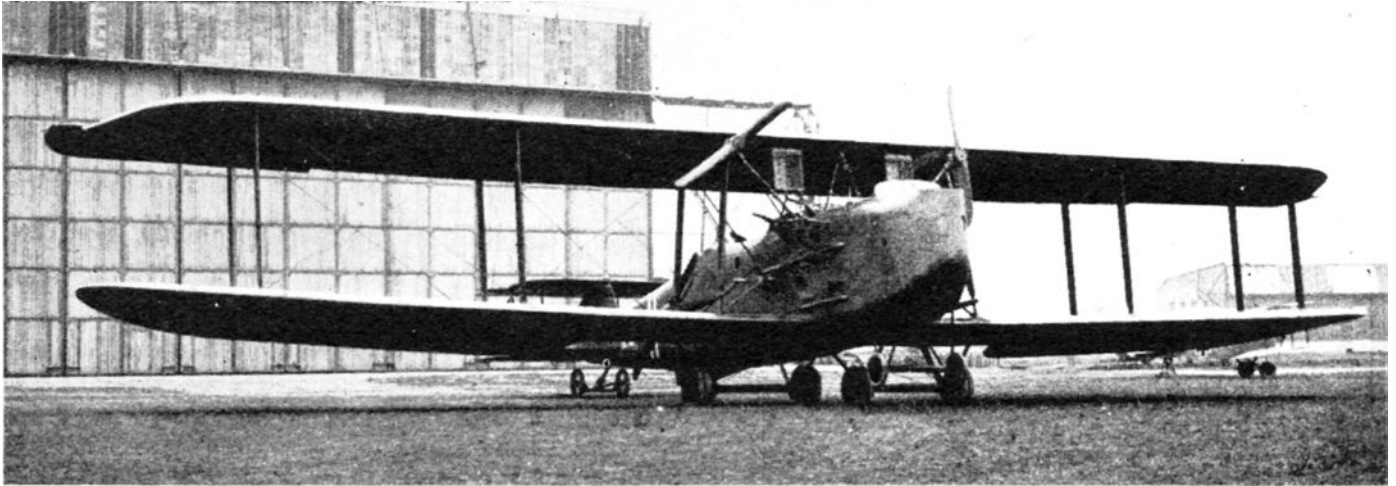


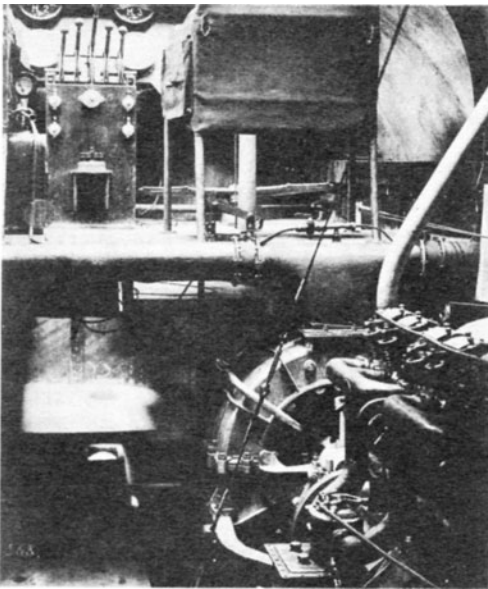
Fig. 7 - above - a barogram of an AEG G.V flight with 8 persons aboard which reached 6,100 meters altitude, using the AEG-developed supercharger. Date - 30 July 1919.

DFW R.II 16/17 had its supercharger inside the fuselage with the main power plants. The compressed air was ducted outside the fuselage to the engines behind the auxiliary power unit, which, in this case, was a 120 hp Mercedes engine.





DFW R.II 16/17, a modification attempt to catch up with other German R-types in performance. Built in Feb. 1918, it was first flown on 22 Jan. 1918. (Photo - Peter M. Bowers, reproduced here through the courtesy of the authors of *The German Giants* (Putnam), Peter M. Grosz and George W. Haddow).



The auxiliary power unit installation in the DFW R.II 16/17. (Photo - Grosz)

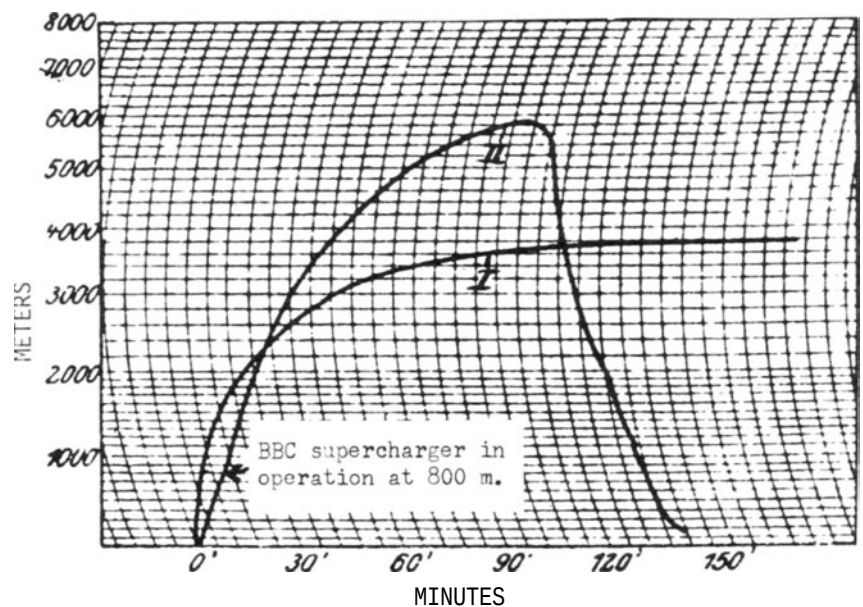


Figure 8 - Barogramm, Staaken R.30 climb curves without (I) and with (II) Brown-Boveri supercharger.

made of special alloy steel and the gears of chrome nickel steel.

Although details are scanty, it should be mentioned that during the war, the Germans produced preliminary designs for an exhaust driven supercharger. It was never constructed due to its excessive weight and the lack of data concerning the effect of the back pressure on engine valves and other parts.

Finally, some attempts were made to achieve better altitude performance by using liquid oxygen to enrich the carburetor intake air. These tests were unsuccessful since the additional oxygen at altitude had a deleterious effect on an engine that was already operating near its temperature limits.

Right - Centrifugal compressor, air ducts and 120 hp Mercedes engine in Staaken R.VI 30/16. (Grosz)

