C. D. DOUGLAS.

MOTIVE POWER ENGINE.

APPLICATION FILED AUG. 26, 1918.

1,303,781.

Patented May 13, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

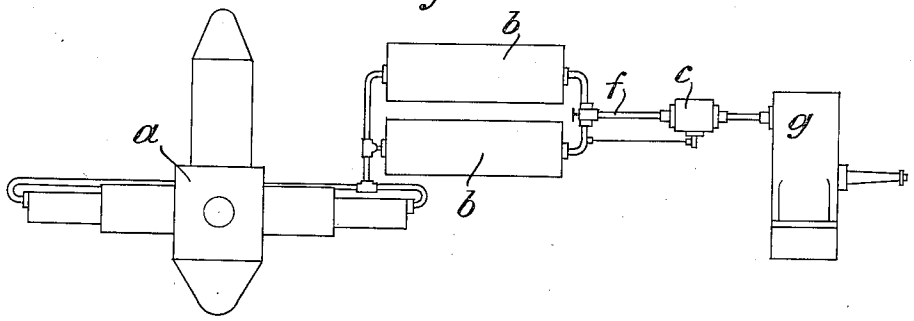
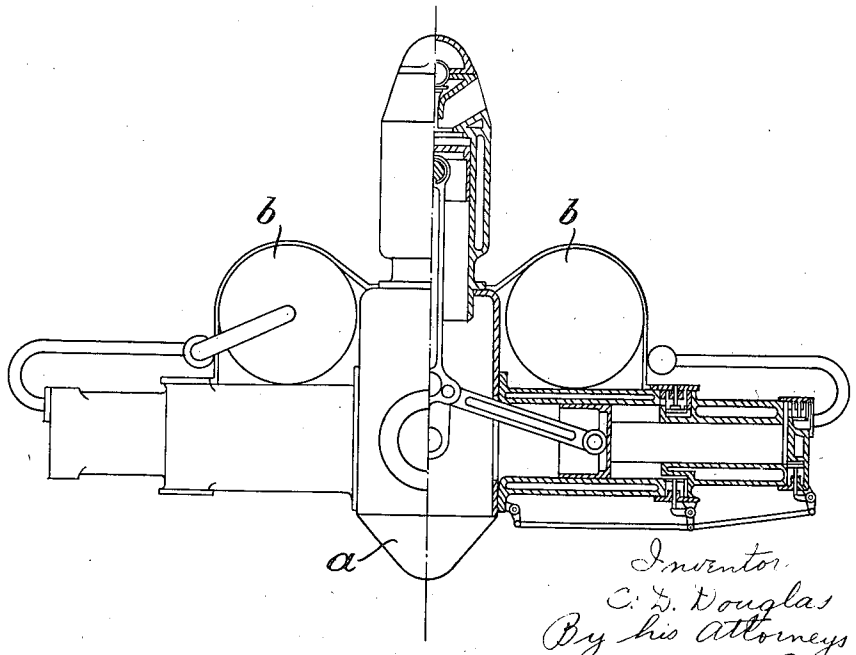


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

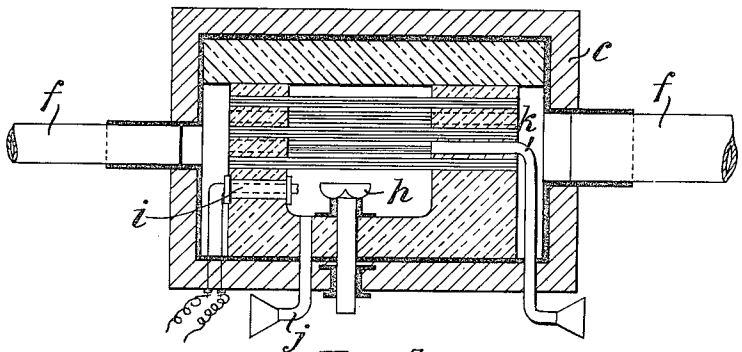
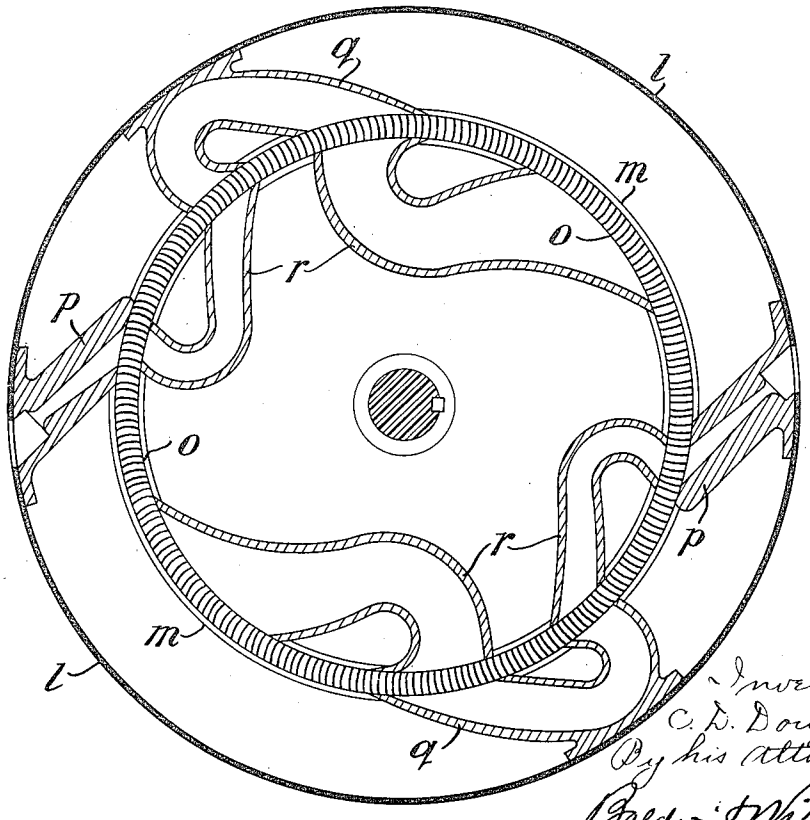


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES DOHRN DOUGLAS, OF WATFORD, ENGLAND.

MOTIVE-POWER ENGINE.

1,303,781. Specification of Letters Patent. Patented May 13, 1919.

Application filed August 26, 1918. Serial No. 251,517.

To all whom it may concern:

Be known that I, CHARLES DOHRN DOUGLAS, a subject of the King of Great Britain, residing at "Shirley," Beechcroft Road, Watford, Herts, England, have invented new and useful Improvements Relating to Motive-Power Engines Particularly for Use in Aircraft, of which the following is a specification.

The present invention has reference to motive power engines particularly, although not exclusively applicable to flying machines which are now universally provided with internal combustion engines for driving their propellers.

Motive power engines to which this invention relates are those which embody in combination an internal combustion prime motor, an air compressor operated thereby, a turbine or equivalent device driven by the compressed air and means for heating and expanding the compressed air before it enters the turbine.

According to my invention I employ for superheating the compressed air a furnace or muffle in which is inclosed a regulatable petrol or gas burner through which pass pipes conveying the air to the turbine.

By the employment of a muffle completely inclosing a separate self-contained regulatable superheater for the compressed air it is easy to concentrate the heat and thus insure that the superheating expansion shall be effective and in accordance with actual requirements. These may vary from time to time and need some regulation of the heating appliance which can only be done if separate and independent heating means inclosed in a muffle are employed. Heating appliances previously proposed have depended for their heat upon exhaust products of combustion or hot water obtained from the cooling jackets or, if a separate heating burner has been employed it has been arranged beneath a coil situated in an open ended vessel constituting a kind of flue in which the burner is also situated.

The power of the compressed air, suitably heated, may be applied direct to the turbine or equivalent operating device, through suitable pipes or may be supplied, if preferred, to a reservoir, which would store the power and feed it as required through a heater to the operating device.

In the accompanying drawings Figure 1 shows in diagram the elements which I propose to associate in carrying out my invention.

Fig. 2 is an elevation partly in section of a form of combined internal combustion engine, compressor and reservoir which might be employed.

Fig. 3 shows in section detached a compressed air heater in accordance with my invention.

Fig. 4 is a front view of a turbine partly in section.

a is a structure combining an internal combustion engine and an air compressor which in Fig. 2 are shown with cylinders working at right angles to one another but which for the sake of lightness or convenience of manufacture might be arranged with the engine and compressor cylinders tandem-wise or with the engine and compressor cylinders in one structure with the same piston operating in both. *b* are reservoirs for receiving the compressed air from the compressors and storing the same. *c* (Fig. 3) is a furnace or muffle consisting of an asbestos lined box having an inlet and an outlet compartment, and a heating compartment separated therefrom by any suitable insulating medium such as fire clay, and is further provided with a series of open ended tubes connecting the inlet and outlet compartments and passing through the heating compartment, as is clearly shown in the drawings. The inlet and outlet compartments are connected with pipes *f*, leading from the reservoirs *b* (or from the compressor if no reservoir is employed) to the engine *g*. *h* is a petrol or petrol gas burner for maintaining a suitable temperature within the muffle and *i* is an electric igniter for the burner. *j* is an orifice for air to support combustion. The products of combustion from the burner escape by the aperture *k*.

The object of employing a heater is, as everyone will be aware, to insure a rapid and extensive expansion of the air which is necessary or desirable to obtain good results. The air engine I am proposing to employ may be of the rotary or turbine type such as is indicated in Fig. 4. *l* is a circular stationary structure with an annular recess *m* therein into which project the blades *n* of the turbine wheel *o* fixed to the driving shaft. *p* are inlet nozzles for heated compressed air which rushes through the turbine three times guided by the passages *q r* in the stationary structure *l* before exhausting to

the atmosphere in any convenient manner, not shown. I may here point out that it is of importance to place the air heater in the closest proximity possible to the air engine so that the full benefit derivable from the heating and expansion may be obtained.

The form of the air engine and likewise the form of the internal combustion prime motor will be selected or designed and their relation to one another positionally arranged in accordance with the requirements of each case but the air compressor will in all cases be the medium for receiving and imparting the energy developed by the prime motor.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

1. The combination with a motor, of an air compressor, a compressed air engine, pipes leading the air from the air compressor to the air engine, and a furnace surrounding the air pipes, said furnace comprising a box, a lining of insulating material, an inlet compartment, an outlet compartment, and a heating compartment, open ended air tubes connecting the inlet and outlet compartments, and a burner in the heating compartment.

2. The combination with a motor of an air compressor, a compressed air engine, pipes leading the air from the air compressor to the air engine, and a furnace surrounding the air pipes having an inlet compartment, an outlet compartment, a heating compartment, open-ended air tubes connecting the inlet and outlet compartments, and a burner in the heating compartment.

In testimony that I claim the foregoing as my invention, I have signed my name this 25th day of July, 1918.

CHARLES DOHRN DOUGLAS.