

Sept. 26, 1939.

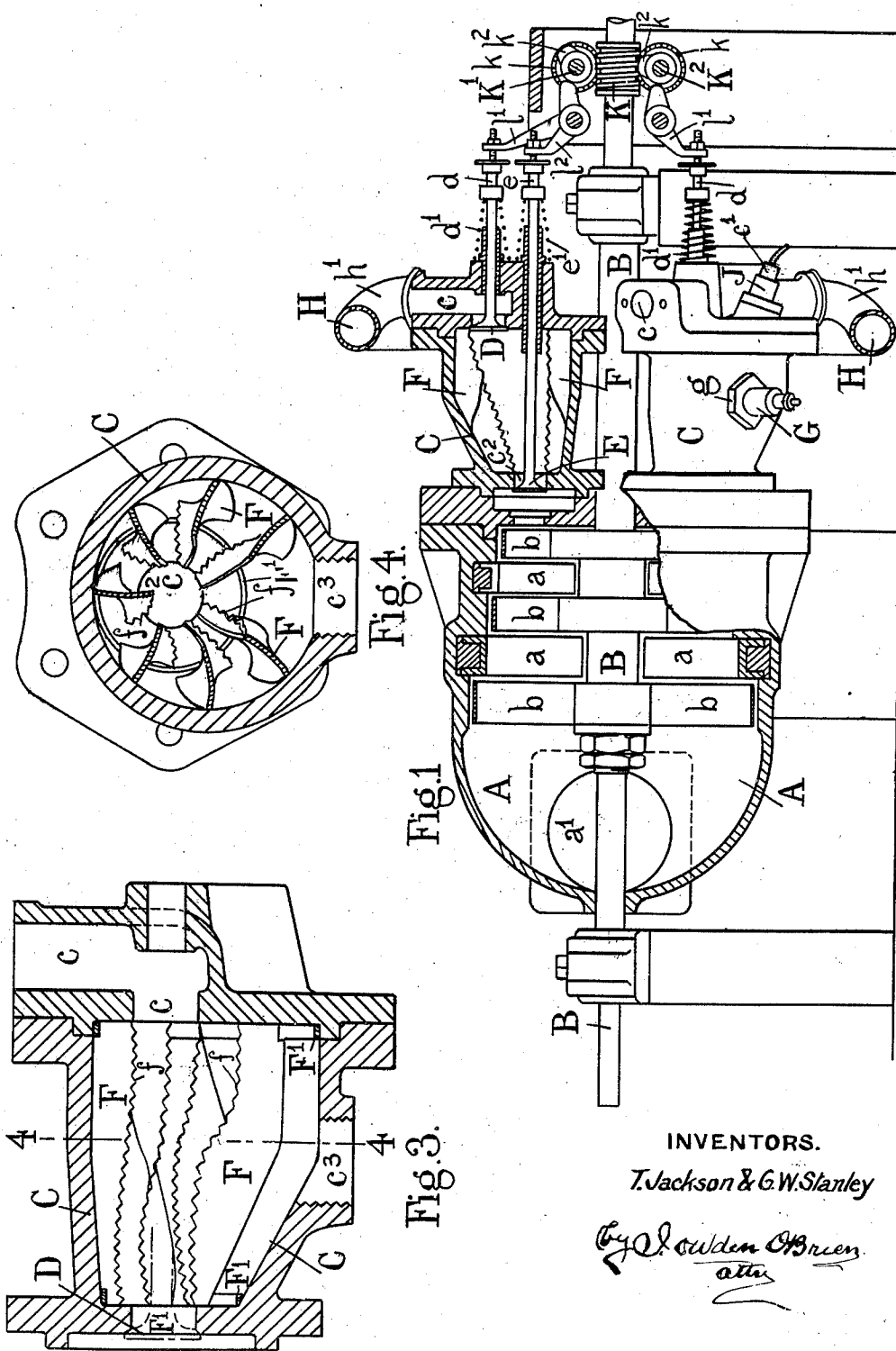
T. JACKSON ET AL

2,174,266

INTERNAL COMBUSTION TURBINE

Filed June 8, 1938

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

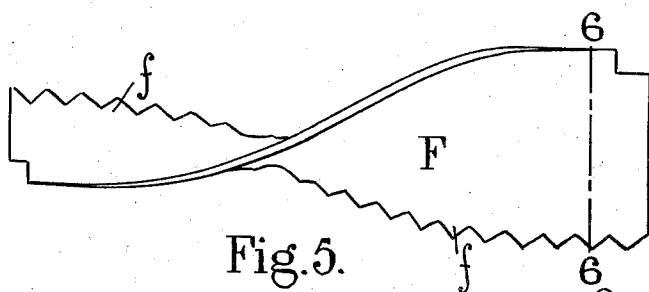


Fig. 5.

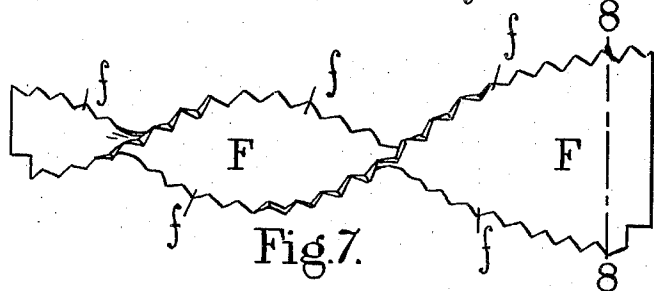


Fig. 7.

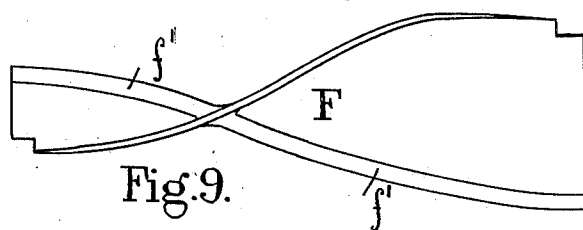


Fig. 9.

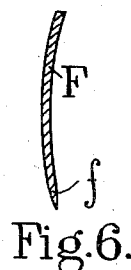


Fig. 6.

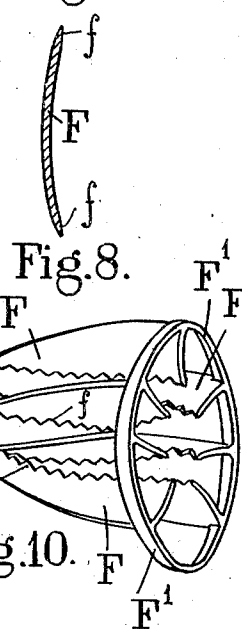


Fig. 8.

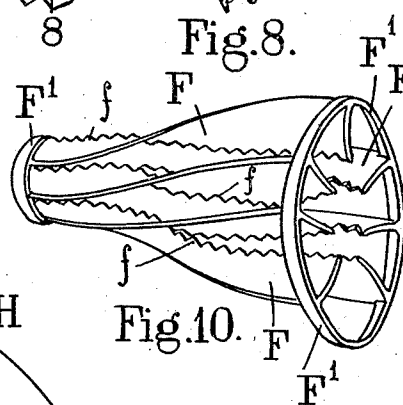


Fig. 10.

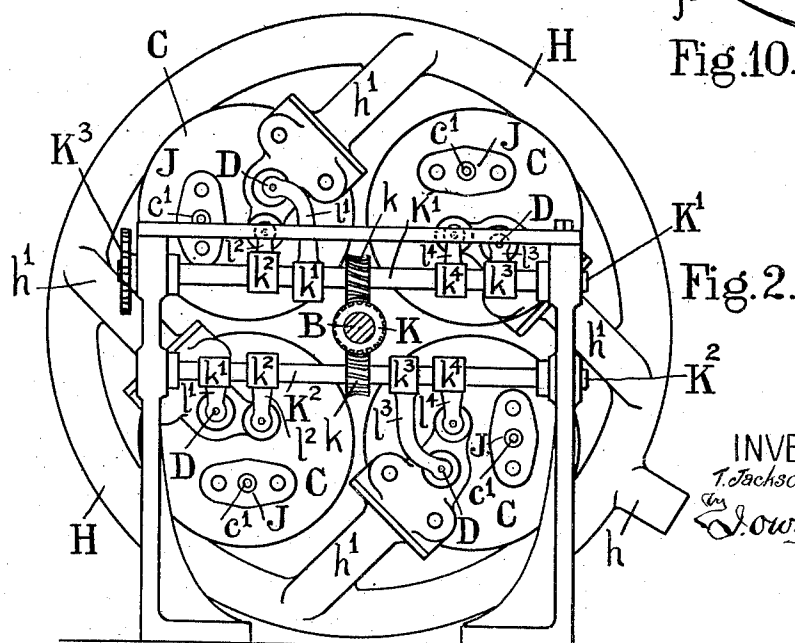


Fig. 2.

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UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION TURBINE

Thomas Jackson and George William Stanley,
Denton, EnglandApplication June 8, 1938, Serial No. 212,522
In Great Britain June 15, 1937

3 Claims. (Cl. 60—41)

This invention relates to improvements in internal combustion turbines particularly for use with crude oil which comprise the combination with a series of alternately fixed and moving blades of a plurality of cylindrical combustion chambers spaced around the turbine casing each having mechanically operated air inlet and combustion product delivery valves and a fuel injector operated in correct sequence, the air being supplied under pressure by a fan or other means, the combustion chambers being provided with internal fins or ribs which during working, after ignition has been started electrically become incandescent and ignite successive charges.

According to the present invention the internal fins or ribs of each combustion chamber are curved transversely and arranged spirally or at an inclination to the surface of the chamber whereby turbulence or swirling of the gases is produced in each chamber.

The outer edges of the fins or ribs are preferably tapered to a fine edge or are of serrated form whereby the edge or the points will readily become incandescent during normal working due to the heat of combustion within the chambers and ignite the mixture of injected fuel and air therein.

The invention will be described with reference to the accompanying drawings in which—

Fig. 1 is a side elevation partly in section of the turbine.

Fig. 2 is an end view thereof.

Fig. 3 is a vertical longitudinal section through one of the combustion chambers.

Fig. 4 is a transverse section on line 4—4 Fig. 3.

Fig. 5 is an elevation of one form of fin or rib for insertion in a combustion chamber.

Fig. 6 is a section on line 6—6 Fig. 5.

Fig. 7 is an elevation of another form of fin or rib.

Fig. 8 is a section on line 8—8 Fig. 7.

Fig. 9 is an elevation of another form of fin or rib.

Fig. 10 is a perspective view showing the fins or ribs for one chamber assembled together before being secured in the chamber, the fins or ribs being of the construction shown in Figs. 5 and 6.

The turbine comprises a casing forming a chamber A containing a series of fixed blades *a* alternating with a series of moving blades *b* affixed to the shaft B which rotates within the casing. An exhaust outlet *a*¹ for the spent gases is provided in the chamber A through which the gases escape after acting on the blades *a* and *b* to rotate the shaft B.

A number of combustion chambers C, preferably four as shown in the drawings, are arranged symmetrically at one end of the turbine chamber A. Each chamber C is provided with an air inlet *c* controlled by a valve D, a fuel inlet *c*¹ to which fuel is supplied by a suitable pump and is preferably atomized before or as it enters the chamber C, and an outlet *c*² into the turbine chamber A said outlet being controlled by the valve E.

Each chamber C is provided on its inner surface with a series of fins or ribs F which are curved transversely as shown in Figs. 6 and 8 and are also of spiral or twisted construction longitudinally, as shown in Figs. 5, 7, 9 and 10 so that they can be arranged spirally or at an inclination around the inner surface of the chamber for the purpose of producing or increasing turbulence of the gases in the chamber and promote effective scavenging after combustion and prior to receiving the next charge of air.

The inner edge of each fin or blade F is preferably serrated to produce a plurality of fine points *f* which will readily become incandescent during normal working due to the heat of combustion within the chamber and ignite the mixture of injected fuel and air therein. The outer edge of each blade, i. e., the edge adjacent to the wall of the chamber, may be flat as shown in Fig. 5 or serrated to produce a plurality of fine points *f* as shown in Fig. 7.

Instead of the inner edge of each fin or blade F being serrated as above described it may be tapered to a fine edge *f*¹ as shown in Fig. 9.

The fins or ribs F are preferably formed separately from the chamber C to enable them to be removed therefrom and replaced should they become burnt or worn. The fins or ribs for each chamber may be formed into a unit which can be readily inserted into the chamber. Such a unit is shown in Fig. 10 which shows the fins or ribs F secured at each end to a ring or annulus F¹ of suitable diameter to fit within the chamber.

One or more electric heater plugs G are arranged in each combustion chamber C for the purpose of igniting the mixture of air and fuel in the chamber when starting up from cold. The heater G is connected through a plug *g* screwed into an aperture *c*³ in the wall of the chamber with a source of electrical supply which can be switched off when the fins or ribs F have been raised to a sufficient high temperature to cause the combustion of the mixture when in the chamber. The use of the heater plugs G is only necessary for a short time on starting up as afterwards the combustion of the mixture will main-

tain the fins or ribs F at a sufficiently high temperature to continue the combustion of each successive charge.

The air for combustion is supplied under pressure to each combustion chamber C from an annular air pipe H connected at h to a fan or pump and by the pipes h¹ with the air inlet c of each chamber which inlet is, as has been previously stated, controlled by the valve D.

The fuel is supplied to each combustion chamber by a pump which is connected to suitable atomizing devices J arranged in the fuel inlets c¹.

After combustion the gases pass from each chamber C to the turbine chamber A through the outlet c² controlled by the valve E.

The valves D and E are driven from cam shafts driven through worm gearing from the turbine shaft B. In a turbine having four combustion chambers as illustrated in the drawings two cam shafts K¹ and K² are employed arranged at right angles to the longitudinal axis of the shaft B and driven therefrom through the worm K and worm wheels k. Each shaft K¹ or K² carries four cams k¹, k², k³ and k⁴ arranged in pairs, the cams k¹ and k³ of one shaft K¹ controlling the air inlet valves D of two adjacent combustion chambers and the cams k² and k⁴ of the same shaft controlling the outlet valves E of the same chambers to the turbine chamber A. The cams k¹ and k³ of the other shaft K² similarly control the air inlet valves D of the other two chambers C and the cams k² and k⁴ the outlet valves E thereof.

The cams k¹, k², k³ and k⁴ operate the valves D and E through pivoted levers l¹, l², l³ and l⁴ which act on the ends of the valve rods d and e and move them against the action of the springs d¹ and e¹ which act to keep the valves closed.

The cams k¹, k², k³, k⁴ are so positioned on the shafts K¹ and K² so that each chamber C will receive the combustion air and deliver it to the turbine chamber A in succession and not simultaneously thereby giving a more even flow to the turbine blade a, b.

The pumps delivering the fuel to the atomiser J are driven from a gear wheel K³ on one of the cam shafts K¹ or K² and the pumps are synchronized with the cams that the fuel is injected into the chambers C at the correct time in relation to the opening of the air inlet valves D. Instead of a pump for each chamber, a single fuel

supply pump may be employed and the supply of fuel to each chamber be controlled by a suitable distributing valve.

An internal combustion turbine according to the invention is particularly applicable for use with heavy oil as fuel and can be used generally for propulsion purposes such as for aircraft and road vehicles and also for marine and power plant purposes.

What we claim as our invention and desire to protect by Letters Patent is:

1. In an internal combustion turbine of the type referred to in combination combustion chambers, a plurality of internal fins extending the whole length of the combustion chamber and curved transversely and arranged obliquely and spirally to the surface thereof and rings attached at each end of the fins to secure them together into a tapered unit which can be readily inserted into and removed from the chamber.

2. In an internal combustion turbine of the type referred to in combination combustion chambers, a plurality of internal fins extending the whole length of the combustion chamber and curved transversely and arranged obliquely and spirally to the surface thereof, a plurality of points on the inner edge of each fin which will readily become incandescent during normal working due to the heat of combustion within the chamber and ignite the charge of injected air and fuel and rings attached at each end of the fins to secure them together into a unit which can be readily inserted into and removed from the chamber.

3. In an internal combustion turbine of the type referred to in combination combustion chambers, a plurality of internal fins extending the whole length of the combustion chamber and curved transversely and arranged obliquely and spirally to the surface thereof, a tapered knife edge on the inner edge of each fin which will readily become incandescent during normal working due to the heat of combustion within the chamber and ignite the charge of injected air and fuel and rings attached at each end of the fins to secure them together into a unit which can be readily inserted into and removed from the chamber.

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