June 2, 1953 W. E. ABEL 2,640,314

DISK VALVE PULSE JET ENGINE

Filed Dec. 16, 1949 2 Sheets-Sheet 1

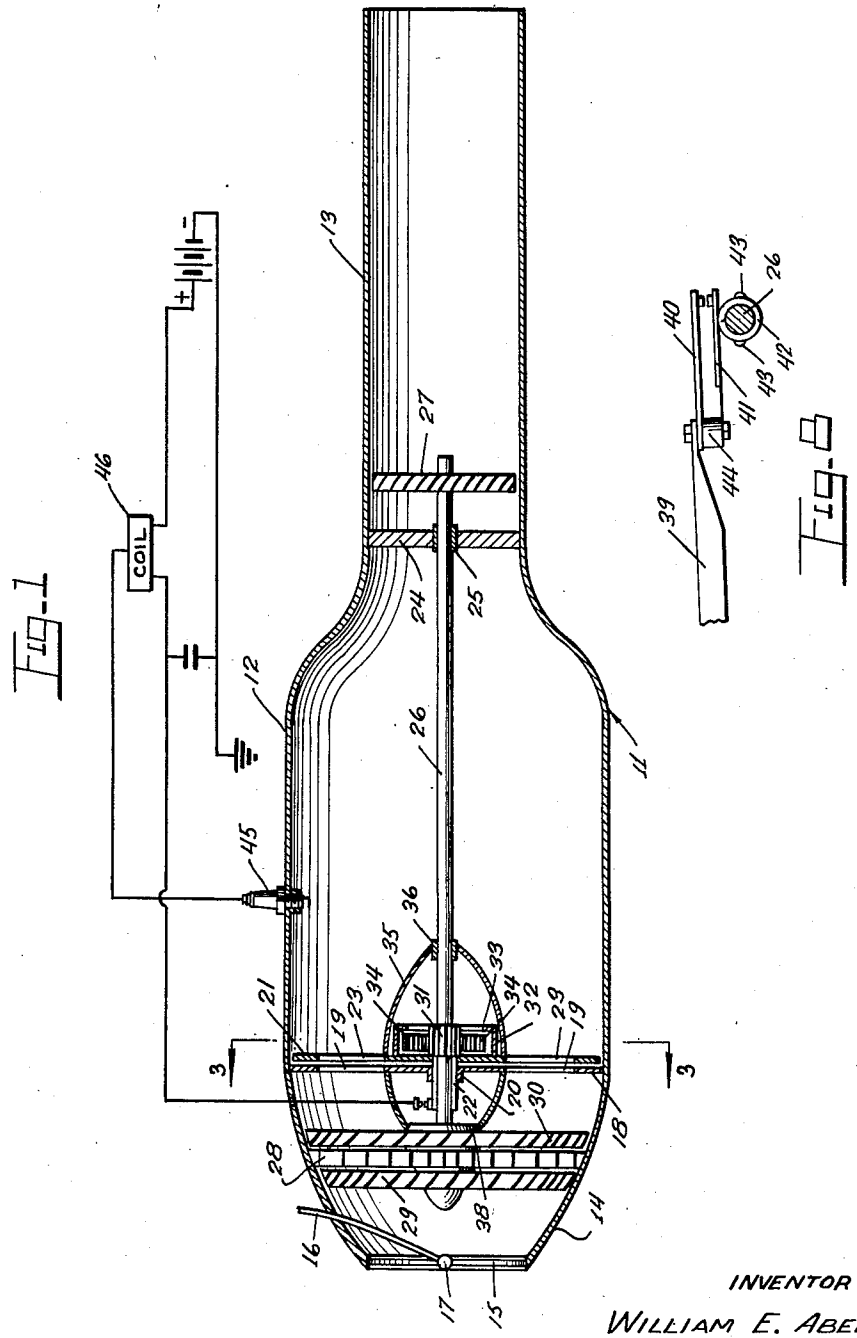

Fig. 1

Fig. 8

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Fig. 2

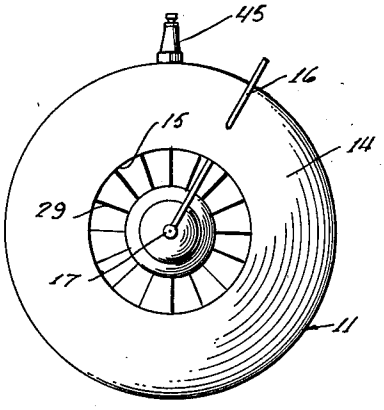


Fig. 3

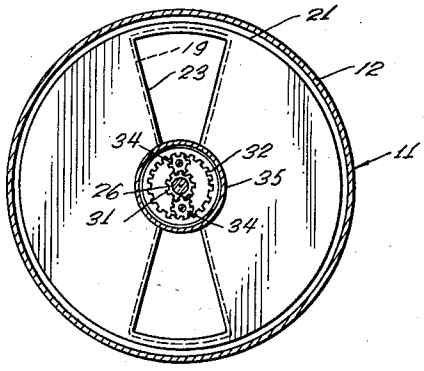


Fig. 4

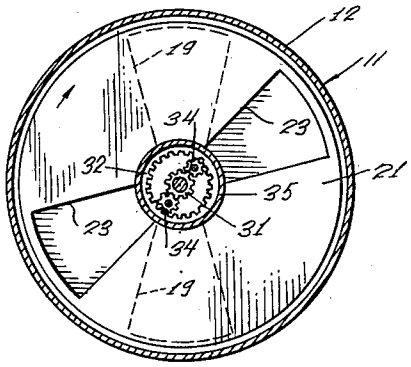


Fig. 5

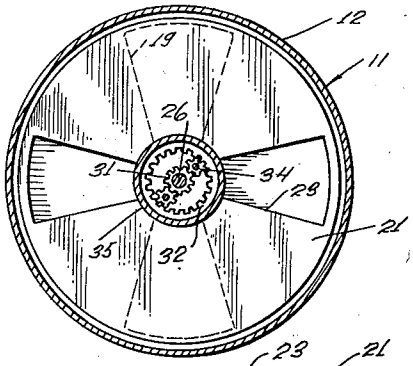


Fig. 6

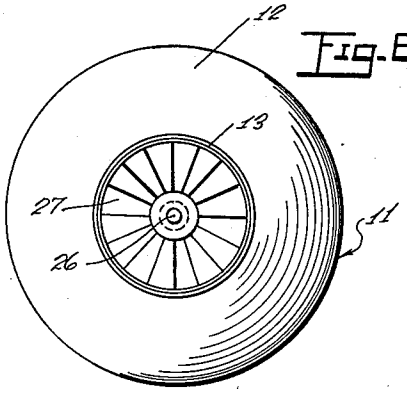
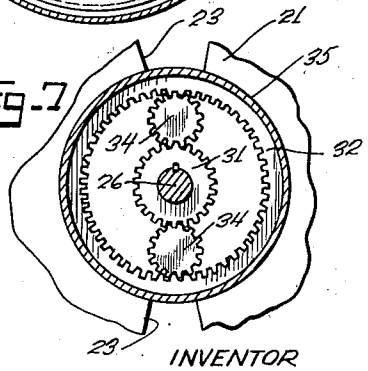


Fig. 7



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DISK VALVE PULSE JET ENGINE

William E. Abel, Great Falls, Mont.

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3 Claims. (Cl. 60—35.6)

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This invention relates to jet engines, and more particularly to propulsive jet engines of the type suitable for use as power units for aircraft and other vehicles.

A main object of the invention is to provide a novel and improved jet engine which is simple in construction, light in weight, and very economical in utilization of fuel.

A further object of the invention is to provide an improved jet engine of the pulse type wherein fuel and air are mixed in explosive proportions, drawn into a combustion chamber, ignited, and then expelled from the engine, producing the desired thrusts, the engine involving only a few parts, which are inexpensive to manufacture, the engine being sturdy in construction, and being very efficient in performance.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

Figure 1 is a longitudinal vertical cross-sectional view taken through an improved jet engine constructed in accordance with the present invention, the electrical ignition circuit of the engine being shown in schematic form;

Figure 2 is a front end view of the engine of Figure 1;

Figure 3 is a transverse vertical cross-sectional view taken on line 3—3 of Figure 1;

Figure 4 is a view similar to Figure 3, but showing the valve disc of the engine in ignition position;

Figure 5 is a view similar to Figure 4, but showing the valve disc of the engine in a position subsequent to ignition and approaching exhaust;

Figure 6 is a rear end view of the jet engine of Figure 1;

Figure 7 is an enlargement of the intermediate portion of Figure 3, showing in detail view the planetary gear arrangement for driving the valve disc of the engine;

Figure 8 is an enlarged detail elevational view showing the breaker points and operating cam of the ignition system for the engine, as employed in Figure 1.

Referring to the drawings, the engine comprises an elongated shell or body 11 having a main portion 12 and a reduced tail portion 13. Main portion 12 tapers at its forward end, as shown at 14, and is provided at said forward end with the air intake opening 15. Designated at 16 is the fuel-supply conduit, which is secured in the tapered forward wall portion 14 of the body 11 and extends through said portion 14 terminating in a fuel-discharge nozzle 17 located centrally of the opening 15. Fuel is supplied under pressure from a suitable source, not shown, to the fuel line 16.

Secured in the forward portion of body 11 rearwardly of the tapered portion 14 is a disc member 18 which is formed with diametrically-opposed, radially-flaring openings 19, 19. Secured in the central portion of disc member 18 is a bearing sleeve 20. Designated at 21 is a disc member formed with an axial sleeve 22 which is rotatably received in the bearing sleeve 20. Disc member 21 is formed with diametrically-opposed, radially-flaring openings 23, 23 which are registrable with the respective openings 19, 19 of the fixed disc member 18.

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Secured in the tail portion 13 is a diametrically-disposed bar member 24 provided at its central portion with a bearing sleeve 25. Designated at 26 is an axial shaft which is rotatably mounted at its forward portion in the sleeve 22 and at its rear portion in the sleeve 25. Secured to the rear end of shaft 26 is a turbine wheel 27 which is located in the tail portion 14 of body 11, as shown in Figure 1. Shaft 26 extends rotatably through a fixed turbo-blower section 28 secured in the tapered forward portion 14 of the body 11. Secured to the shaft 26 forwardly adjacent fixed turbo-blower section 28 is a turbo-blower wheel 29, and secured to said shaft rearwardly adjacent fixed turbo-blower section 28 is another turbo-blower wheel 30. The blades of wheels 29, 30 and 27 are shaped and angled in the conventional manner to define flaring nozzle passages therebetween, whereas the radial blades of section 28 are shaped to define straight passages therebetween.

Secured on shaft 26 rearwardly adjacent valve disc 21 is a gear 31. Secured to disc 21 concentrically with gear 31 is a ring gear 32 having inwardly directed teeth. Ring gear 32 has a peripheral, inwardly directed retaining flange 33, and rotatably positioned in the ring gear inwardly adjacent said flange are respective planetary gears 34, 34 which are in mesh with gear 31 and the teeth of ring gear 32. The gears 31, 34 and 32 are arranged so that rotation of shaft 26 drives disc 21 in the same direction as shaft 26, but preferably at from one-eighth to one-half the speed thereof.

Secured to disc 21 is a rearwardly tapering housing 35 which covers the gears and which carries at its rear end a sleeve 36 through which shaft 26 rotatably extends. Secured to fixed disc 18 is a forwardly tapering annular shell 37. Wheel 30 has centrally mounted thereon a circular plate 38 rotatably received within the forward end of shell 37. Mounted within the compartment defined by shell 37 is a fixed bracket 39, shown in Figure 8, carrying the spaced contact members 40 and 41. Member 40 is rigid, whereas member 41 is resilient. Member 41 engages a cam 42 secured on shaft 26. Cam 42 has diametrically-opposed projections 43, 43 engageable with contact member 41 to periodically move member 41 into engagement with the rigid contact member

40 responsive to rotation of shaft 26. The contact members 40 and 41 are insulated from each other at their secured ends by an insulation block 44.

Designated at 45 is a spark plug secured in the wall of body portion 12 rearwardly of the valve disc 21, as shown in Figure 1. The contact members 40 and 41 are connected in the primary circuit of a conventional ignition system shown schematically in Figure 1, the high voltage terminal of the ignition coil 46 of the system being connected to the center electrode of the spark plug. A spark is provided across the electrodes of the spark plug twice for each rotation of shaft 26 by the opening and closing of the breaker point members 40 and 41.

In operation, the engine is started by rotating shaft 26 by any suitable means, for example, by directing a blast of air into opening 15 which passes through the members 29, 28, 30 and aligned openings 19 and 23 and acts on the turbine wheel 27 to drive the shaft. Air and fuel are mixed in the chamber adjacent the intake opening 15 and forms an explosive mixture which passes through the aligned openings 19 and 23 into the main body portion 12. Since shaft 26 is rotating, openings 23, 23 move out of registry with openings 19, 19, as shown in Figure 4, and ignition then occurs, exploding the mixture. The gases of combustion are expelled through the tail pipe 13, producing the propulsive thrust. These gases flow through the turbine wheel 27, causing said wheel to rotate shaft 26.

The gases are exhausted as disc 21 continues rotation, approximately to the position shown in Figure 5. When the disc 21 has been rotated 180° from its starting position, the openings 23, 23 again come into registry with the openings 19, 19, allowing a new charge of explosive mixture to be forced into the combustion chamber by the action of the wheels 29 and 30, which coact to define a blower unit rotated by the rotating of the turbine wheel 27. The charge is ignited by spark plug 45 shortly after openings 23, 23 move out of registry with openings 19, 19, as shown in Figure 4, causing another propulsive jet pulse to be produced. The above action repeats itself continuously, two pulses being produced for every revolution of disc valve 21.

While a specific embodiment of a jet engine of the pulse type has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

I claim:

1. A jet engine comprising a tubular body having a tapering forward end, an air intake opening at the forward end of said body, an elongated reduced rear end on said body, a first apertured disc rigidly secured in the forward portion of said tubular body, an axial shaft rotatably mounted in said body and extending through said apertured disc, a blower wheel carried on said shaft forwardly of said disc, a turbine wheel carried on said shaft in said reduced rear end for rotating said shaft, means for injecting fuel into said body between the air intake at the forward ends of the body and the blower, a second apertured disc rotatably mounted adjacent said first disc for cooperation with the first disc to intermittently admit the fuel charge into said body rearwardly of said disc, a first gear secured to said shaft, a ring gear secured to said second disc around said first gear, a planetary gear in said ring gear meshing with the ring gear and the first gear and coupling said second disc to said shaft, and ignition means in said body rearwardly of said discs.

2. A jet engine comprising a tubular body having a tapering forward end, an air intake opening at the forward end of said body, an elongated reduced rear end on said body, a first apertured disc rigidly secured in the forward portion of said tubular body, an axial shaft rotatably mounted in said body and extending through said apertured disc, a blower wheel carried on said shaft forwardly of said disc, a turbine wheel carried on said shaft in said reduced rear end for rotating said shaft, means for injecting fuel into said body between the air intake opening at the forward end of the body and the blower, a second apertured disc rotatably mounted adjacent said first disc for cooperation with the first disc to intermittently admit the fuel charge into said body rearwardly of said discs, a first gear secured to said shaft, reduction gearing coupling said first gear to said second disc for rotating said second disc at a speed less than the speed of rotation of said shaft, and ignition means in said body rearwardly of said discs.

3. A jet engine comprising a tubular body having a tapering forward end, an air intake opening at the forward end of said body, an elongated reduced rear end on said body, a first apertured disc rigidly secured in the forward portion of said tubular body, an axial shaft rotatably mounted in said body and extending through said apertured disc, a blower wheel carried on said shaft forwardly of said disc, a turbine wheel carried on said shaft in said reduced rear end for rotating said shaft, means for injecting fuel into said body between the air intake opening at the forward end of the body and the blower, a second apertured disc rotatably mounted adjacent said first disc for cooperation with the first disc to intermittently admit the fuel charge into said body rearwardly of said discs, a first gear secured to said shaft, reduction gearing coupling said first gear to said second disc for rotating said second disc at a speed less than the speed of rotation of said shaft, ignition means in said body rearwardly of said discs, and means on said second disc for actuating said ignition means in timed relation to the rotation of said second disc.

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