Nov. 17, 1953

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2,659,196

Filed Aug. 9, 1949

2 Sheets-Sheet 1

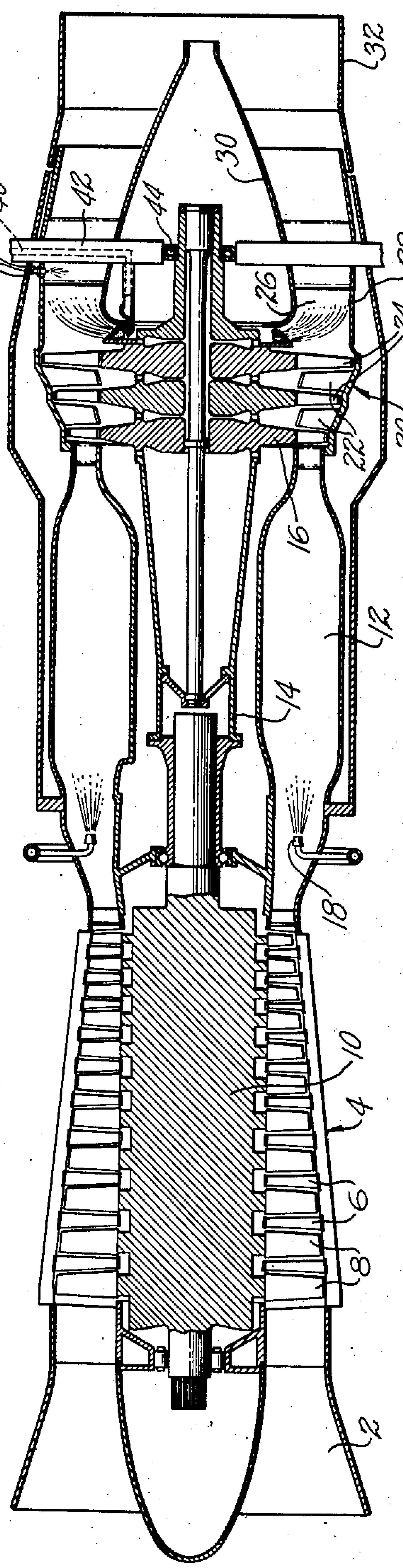

FIG. 1

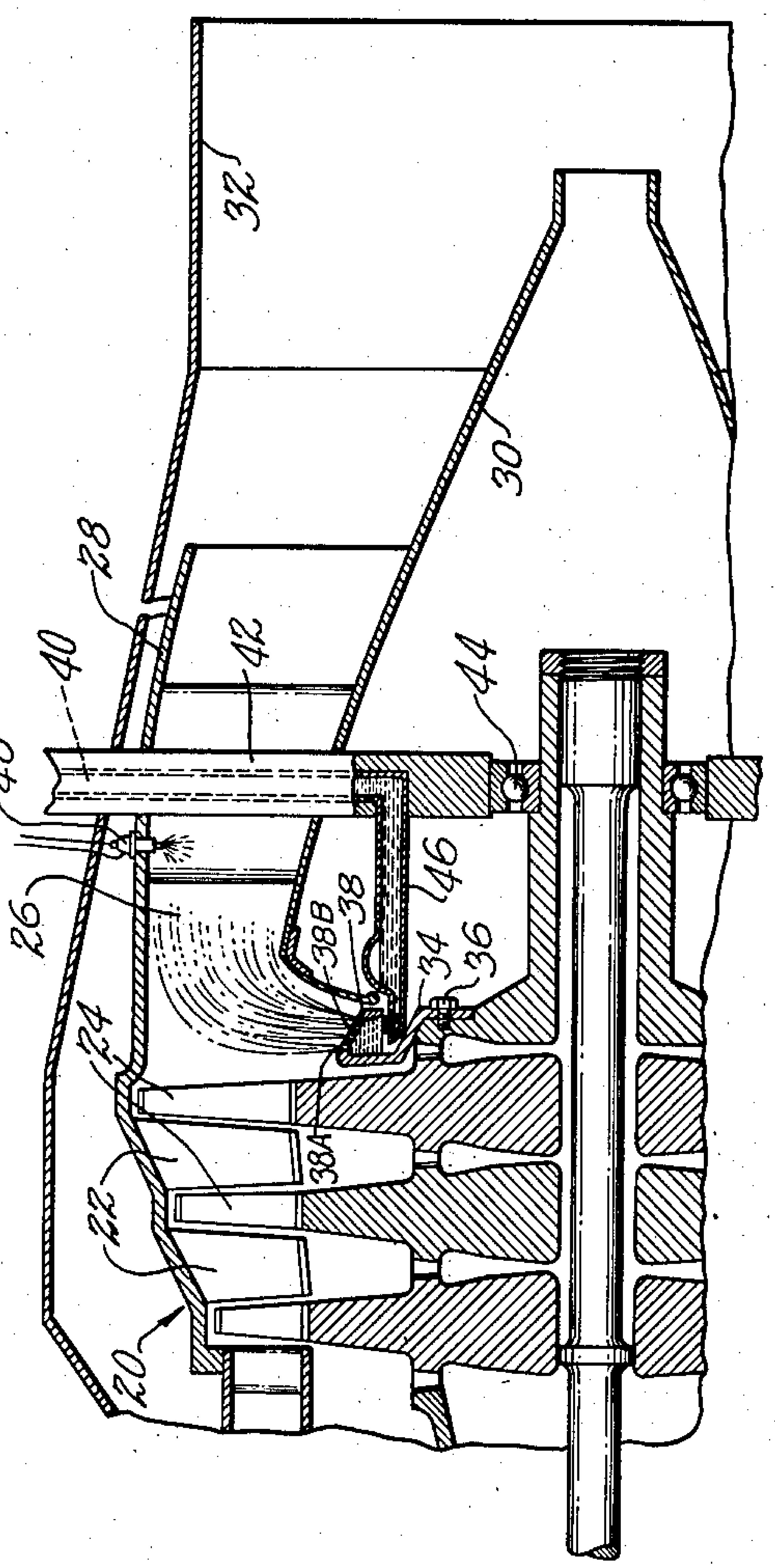

FIG. 2

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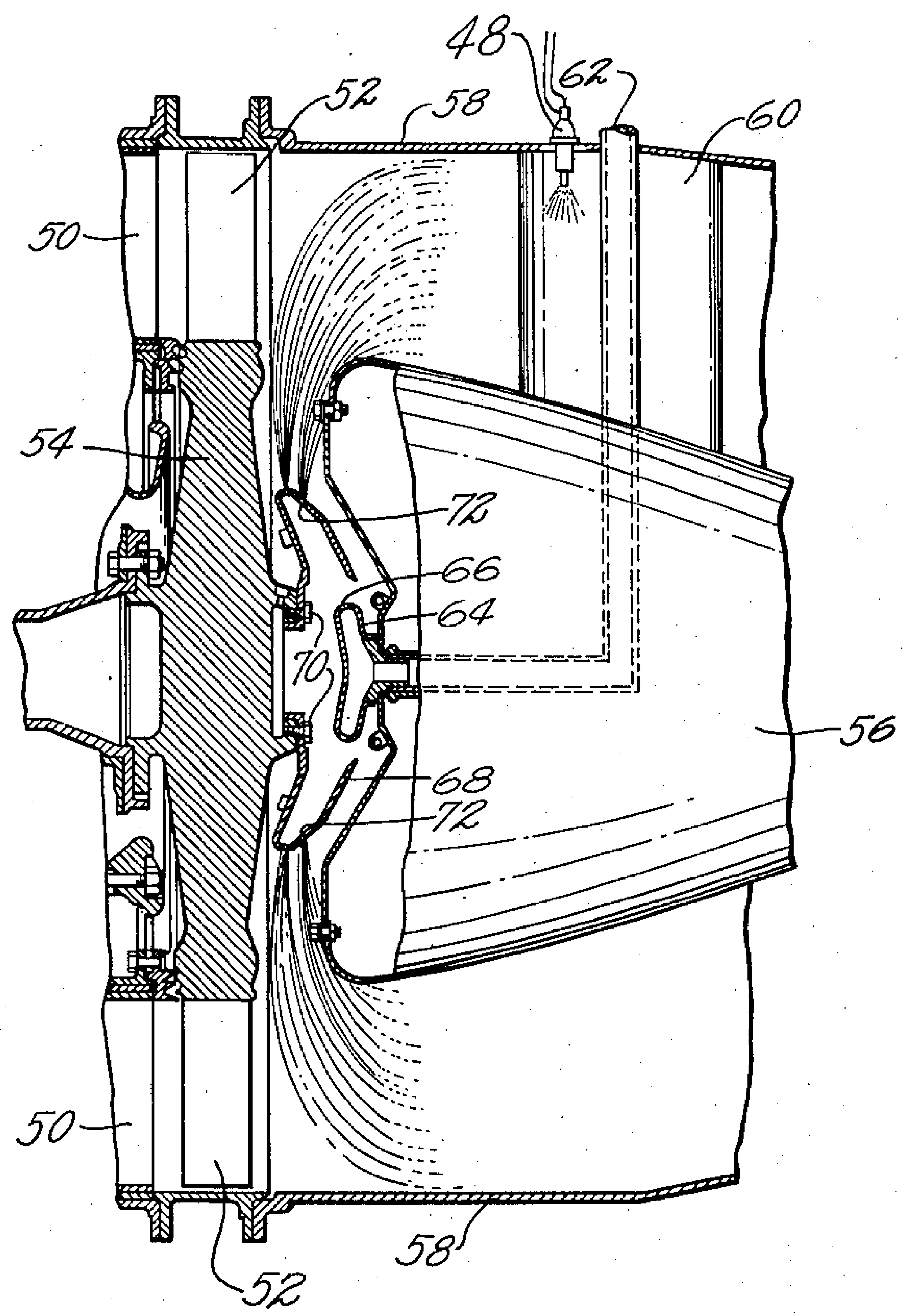
FIG. 3



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Patented Nov. 17, 1953 2,659,196

UNITED STATES PATENT OFFICE

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CENTRIFUGAL FUEL SUPPLY MEANS FOR JET ENGINE AFTERBURNERS

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Application August 9, 1949, Serial No. 109,283

1 Claim. (Cl. 60—35.6)

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This invention relates to an arrangement for the distribution of fuel to the afterburner in a compressor-turbine type of power plant.

The horsepower or thrust of a jet engine of either the turbo-jet or turbo-prop type may be increased by burning fuel in the gas exhausting from the turbine before it is discharged through the thrust nozzle, such burning of fuel being referred to as afterburning. A feature of the present invention is an arrangement for distributing fuel in the exhaust gas to insure complete burning of the fuel and substantially uniform heating of the exhaust gas by the fuel.

Another feature is an introduction of the fuel into the annular stream of exhaust gas from the turbine by means of a spinning ring mounted on the turbine. One feature is the arrangement of the ring such that the distribution of fuel across the annular stream of gas will be substantially uniform.

Other objects and advantages will be apparent from the specification and claim and from the accompanying drawings which illustrate an embodiment of the invention.

Fig. 1 is a sectional view through a gas turbine power plant showing the afterburner.

Fig. 2 is a sectional view on a larger scale showing the turbine with the fuel ring mounted thereon.

Fig. 3 is a view similar to Fig. 2 showing a modification.

With reference first to Fig. 1, the power plant has an inlet **2** to a compressor **4** which has a plurality of rows of stationary vanes **6** cooperating with rows of blades **8** on the rotor **10**. Gas from the compressor is discharged into one or more combustion chambers **12** arranged in a ring around the shaft **14** that connects the compressor rotor **10** to the turbine rotor **16**. Fuel is admitted to the combustion chamber or chambers by a number of fuel nozzles **18**.

The heated gas from the combustion chambers is directed through a turbine **20** having rows of nozzle vanes **22** cooperating with rows of blades **24** on the rotor **16**. Gas from the turbine is discharged through an annulus **26** between a duct **28** and a tail cone **30** and through a thrust nozzle **32**. It will be understood that the power plant shown is only one of several arrangements of the type of power plants for which the afterburner arrangement, hereinafter described, is adapted.

Referring now to Fig. 2, fuel is discharged into the annular gas path **26** by means of a ring **34** mounted as by bolts **36** to the downstream side of the turbine rotor. The ring which is con-

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centric with the rotor has a plurality of perforations **38** in its periphery through which fuel is sprayed radially outward from the ring and into the path of the gas discharging from the turbine. Fuel may be supplied to the ring through a duct **40** which may be located within one of the supporting legs **42** for the rear bearing **44** for the turbine shaft.

For the purpose of assuring a uniform distribution of fuel across the entire radial dimension of the annular gas path, the ring **34** may have the discharge openings **38** so arranged that some of the openings are spaced radially from the axis of rotation a greater distance than the remainder. Thus, as shown in Fig. 2, the upstream row **38A** of the perforations are located on a diameter greater than the succeeding rows **38B**, the outer surface of the ring being arranged oblique to the axis of rotation for this purpose. With the perforations **38A** at a larger radius from the axis of rotation, it will be apparent that the pressure head developed within the ring will be greater and the spray from this row of openings will thereby be carried a greater distance radially than the spray from the adjacent row. It will be noted that the ring **34** forms an annular trough, the inner surface of which is open so that fuel from the duct **40** and the cooperating longitudinally extending duct **46** may flow directly into the annular trough.

Provision may be made for igniting the mixture of fuel and gas downstream of the turbine, as, for example, by means of a spark plug **48** carried by the duct **28**, and the duct **28** and cooperating nozzle **32** are made long enough so that complete combustion will normally occur before the gas is discharged through the nozzle.

In the modification of Fig. 3, the gas flows over a series of nozzle vanes **50** onto the turbine blades **52** on the periphery of the rotor **54** and thence into the annular space between the tail cone **56** and the outer duct wall **58**. The tail cone is supported in position by radially extending supporting webs **60** through one of which the fuel duct **62** extends for delivering fuel to a stationary distributing head **64** having openings **66** in its periphery for discharging fuel into the spinning fuel ring **68** mounted as by bolts **70** on the downstream side of the turbine disc. The openings **72** in this ring are arranged in a manner similar to those above described in connection with Fig. 2 with the upstream rows of openings located at a greater radial distance from the axis of rotation than at succeeding rows. Here again, as in Fig. 2, the ring forms an annular trough open at its inner surface so that fuel in the inner opening 66 may be discharged directly into the trough.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claim.

I claim:

In a fuel supply device for a gas turbine power plant afterburner, the combination of a turbine including a rotor, a duct through which exhaust gases passing through the turbine are discharged, a fuel supply ring mounted on the downstream side of the rotor and rotating therewith, said ring being coaxial with the rotor and having a flange substantially frusto-conical in shape and tending to converge in a downstream direction, two or more circumferential rows of holes around the flange and through which fuel may be discharged into said exhaust duct, the circumferential row of holes nearest the rotor being at the greatest radial distance from the axis of rotation of the ring with the radial distance of the remaining rows being progressively less in a downstream direction so that fuel pressure head in each circumferential row due to centrifugal force is progressively less in a downstream direction and equal radial distribution as well as equal circumferential distribution of fuel in the exhaust duct can be obtained.

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