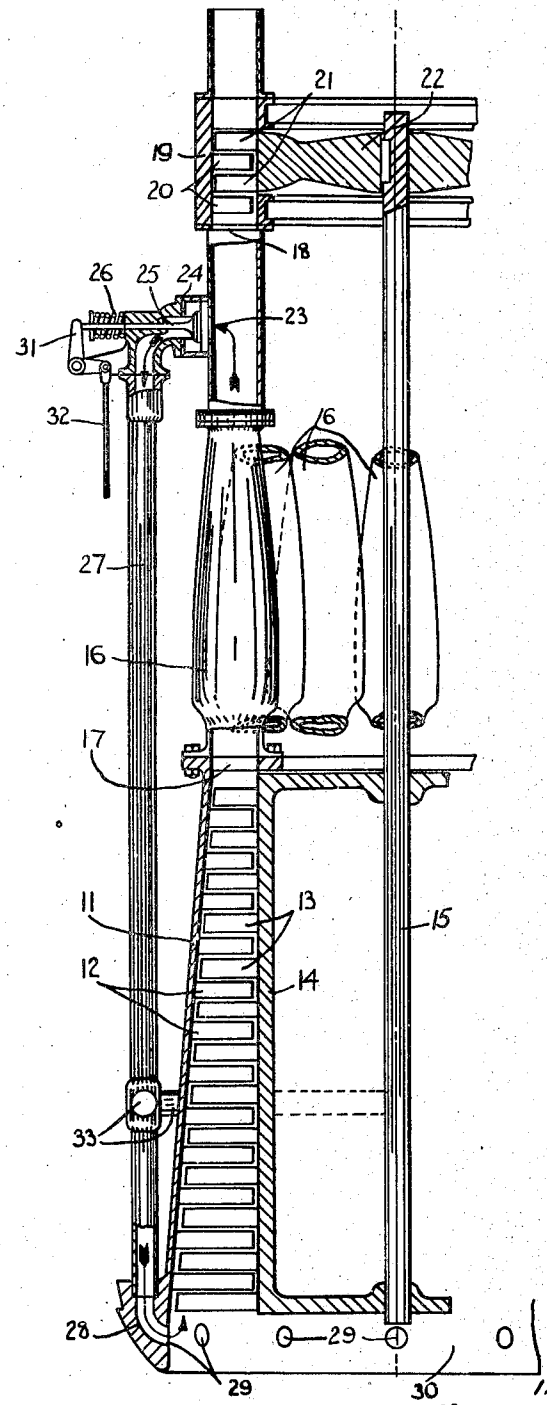
July 16, 1946. T. CLARK ET AL 2,404,275

INTERNAL-COMBUSTION TURBINE PLANT

Filed June 28, 1943



INVENTORS
Thomas Clark
William Henry Lindsey
BY Loyd Hall Sutton
ATTORNEY

Patented July 16, 1946 2,404,275

UNITED STATES PATENT OFFICE

2,404,275

INTERNAL-COMBUSTION TURBINE PLANT

Thomas Clark and William Henry Lindsey, Coventry, England, assignors to Armstrong Siddeley Motors Limited, Park Side, Coventry, England

Application June 28, 1943, Serial No. 492,614
In Great Britain October 2, 1942

3 Claims. (Cl. 60—41)

1

This invention relates to an internal-combustion turbine plant.

Our main object is to prevent the formation of ice in the compressor in a very simple way. Ice, it will be understood, is particularly liable to form in the compressor when such a plant is being used to provide jet propulsion for an aircraft and the latter reaches a predetermined height above sea level.

A further object is to provide means for abstracting a small quantity—say, 2%—of the burning mixture, preferably before it passes to the turbine, and for injecting this small quantity into the air at the compressor inlet.

For a better understanding of these and other objects and advantages of the invention attention should be directed to the following description in which reference is made to the accompanying diagrammatic drawing. The single figure of this is a fragmentary sectional elevation of an internal-combustion turbine plant according to the invention.

The drawing shows a turbine plant having an axial-flow-type of rotary compressor comprising a stationary casing 11 with sets of fixed blades 12, 12 between and coacting with which are sets of blades 13, 13 on a rotary drum 14 keyed or otherwise secured upon a shaft 15. The plant has a plurality of combustion chambers 16, 16 which are arranged in parallel with one another and symmetrically spaced angularly round the axis of the shaft 15, and the delivery of air from the compressor outlet 17 is divided between these combustion chambers 16. The outlets 18 of the latter lead to an axial-flow-type of turbine including a stationary casing 19 carrying sets of fixed blades 20, 20 which coact with blades 21, 21 on a rotor 22 keyed or otherwise secured upon and driving the shaft 15.

Only the outline of a combustion chamber 16 is shown, as such combustion may take many known forms. The burner and fuel-injection arrangements form no part of the present invention and are not therefore illustrated.

In the present instance each combustion chamber 16, near its outlet end, has an opening 23 leading to a valve chamber 24 which is shown as containing a poppet valve 25 pressed by a spring 26 to the closed position. Each poppet valve thus controls the delivery of some of the burning gases from the associated combustion chamber 16 to a pipe 27 leading from the valve chamber forwardly outside the compressor and curled round at its front end 28, such that some of the burning gases can be injected through the open ends 29 of these pipes into the air at the compressor inlet 30. We show, for controlling a valve 25, a bell-crank 31 operable by a rod 32.

2

In practice it will be desirable for all the valves 25 to be operable in unison and by equal amounts, so that equal quantities of the burning gases will be abstracted from the different chambers 16. At the same time the open ends 29 of the pipes 27 are, it will be observed, symmetrically spaced angularly round the compressor inlet, so as to distribute evenly the injected gases. If desired the interiors of the pipes 27 may, anywhere along their lengths, be interconnected to ensure uniform pressures therein. At 33 we show part of an annular pressure-equalizing pipe which interconnects the interiors of all the pipes 27.

As stated, we contemplate abstracting, say, only 2% of the total burning gases, which, in ordinary conditions, will provide ample heat for deicing purposes.

What we claim as our invention and desire to secure by Letters Patent of the United States is:

1. An internal-combustion turbine plant including an axial-flow-type of rotary compressor and a combustion chamber connected to the outlet end of the compressor, in combination with a passage leading from the combustion chamber to the inlet end of the compressor, and controllable valve means which when opened allows about 2% of the burning mixture to be passed from the combustion chamber to the compressor inlet.

2. An internal-combustion turbine plant including a compressor and a plurality of angularly-spaced combustion chambers arranged in parallel, and connected to the compressor outlet, in combination with means for abstracting a small quantity of the burning mixture from each combustion chamber and injecting it at angularly-spaced points into the air at the compressor inlet to raise the temperature thereof, and means for equalizing the delivery to said angularly-spaced points.

3. In combination with an internal-combustion turbine plant including an air compressor, a plurality of combustion chambers arranged in parallel and connected to the compressor outlet and a turbine connected to the outlets of said combustion chambers, means providing passages for abstracting a small quantity of the hot gases produced in the combustion chambers and injecting said hot gases into the air at the compressor inlet to warm said air, and means for equalizing the pressure in said passages.

THOMAS CLARK.
WILLIAM HENRY LINDSEY.