(No Model.)

C. G. CURTIS.

ELASTIC FLUID TURBINE.

No. 582,720. Patented May 18, 1897.

Fig. 1.

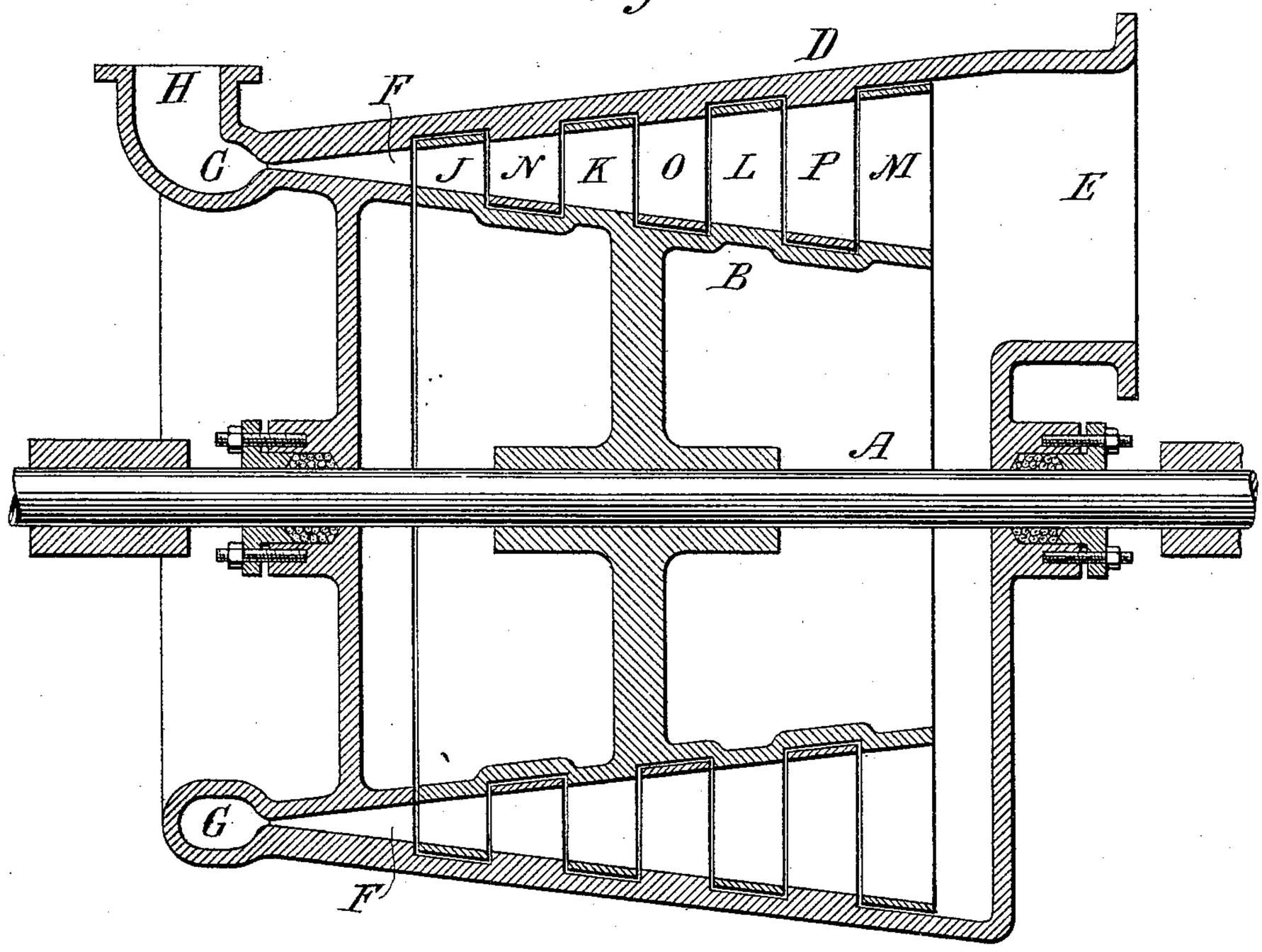
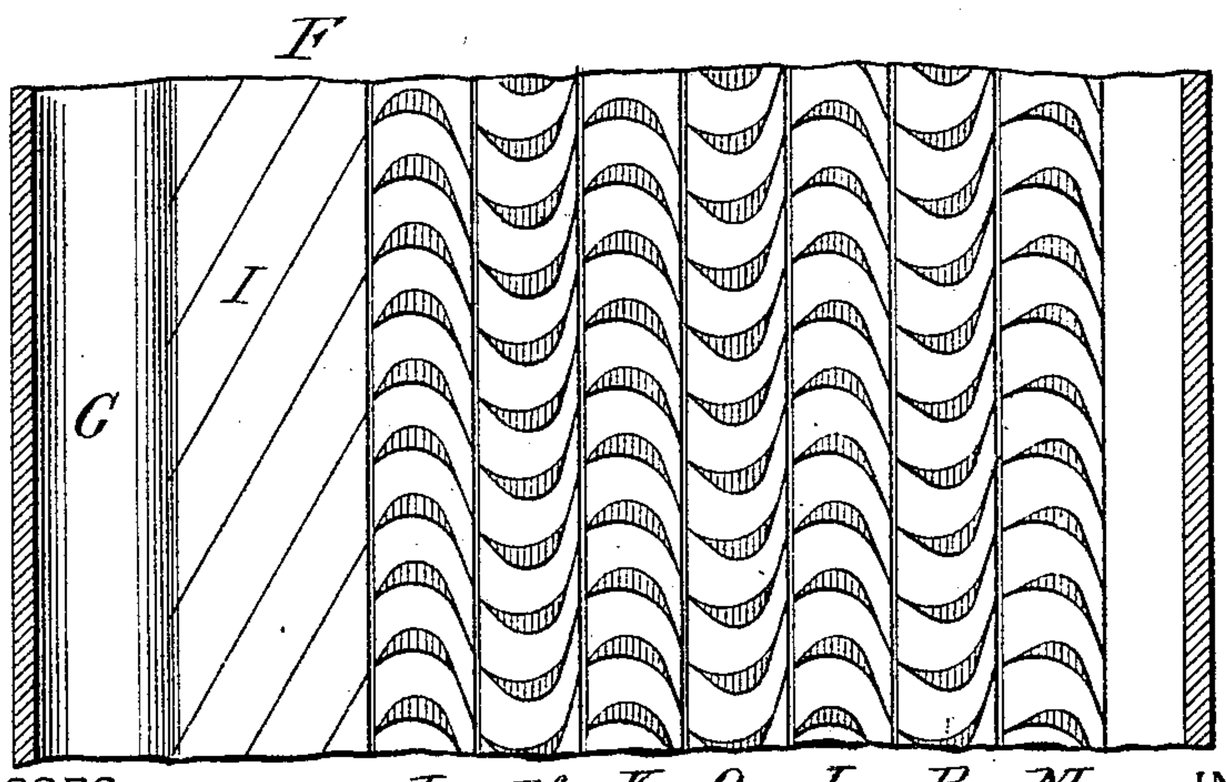


Fig. 2,



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UNITED STATES PATENT OFFICE.

CHARLES G. CURTIS, OF NEW YORK, N. Y., ASSIGNOR TO THE CURTIS COMPANY, OF SAME PLACE.

ELASTIC-FLUID TURBINE.

SPECIFICATION forming part of Letters Patent No. 582,720, dated May 18, 1897.

Application filed August 4, 1896. Serial No. 601,602. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. CURTIS, a citizen of the United States, residing at New York city, in the county and State of New York, have invented a certain new and useful Improvement in Elastic-Fluid Turbines, of which the following is a specification.

The object I have in view is to produce an elastic-fluid turbine in which the steam is delivered simultaneously to an entire annular range of rotating vanes, which turbine will be much simpler in its construction, operate at a lower speed of rotation, and have a higher efficiency than similar turbines heretofore constructed or proposed. This I accomplish by the employment of an annular delivery-nozzle expanding or diverging in the direction of flow of the fluid and converting the pressure of the fluid largely into velocity before it strikes the first set of movable vanes. The movable vanes consist, preferably, of two or more sets mounted upon the periphery of the drum and separated by intermediate annular sets of stationary vanes which are mounted upon the shell. The annular working passage—*i. e.*, the passage through the movable and stationary vanes between the discharge end of the nozzle and the exhaust—is enlarged or expanded in the direction of flow of the fluid, so as to accommodate without choking the increased volume of the fluid due to its reduced velocity as it progresses and also to compensate for and overcome the effects of frictional retardation and the tendency to reconvert velocity into pressure by eddy-currents, &c. The expansion annular nozzle is designed to convert the pressure into velocity, while maintaining at the discharge end of the nozzle such a pressure above that of the exhaust as may be required to produce the flow of the elastic fluid through the turbine under the most efficient conditions and to secure the highest velocity practicable at each point of action upon the movable blades. The annular expansion delivery-nozzle is divided by thin partitions placed obliquely, so as to deliver the fluid at the proper angle to the movable vanes of the first set. The several sets of movable and stationary vanes are made, preferably, in an unsymmetrical curved form, having greater or flatter angles at their receiving ends than at their discharging ends and having their discharging ends extended in a substantially straight oblique direction, so as to discharge the fluid at approximately the same angle as it is discharged by the delivery-nozzle. The receiving ends of the several sets of movable and stationary vanes are placed progressively at a greater or flatter angle, so as to conform at their receiving ends to the angle of the discharge of the fluid from the preceding set of vanes. In all respects in which the principles are applicable the elastic-fluid turbine of this invention is constructed upon the principle of the jet-turbine, upon which I have already received a patent, No. 566,968, dated September 1, 1896.

In the accompanying drawings, forming a part hereof, Figure 1 is a vertical section through the turbine, and Fig. 2 is a horizontal section through a portion of the vane-passages.

A is the shaft, upon which is mounted a drum B of conical or tapering form, as shown, and surrounding this rotating drum is a shell D, having its walls flaring outwardly between the nozzle and the exhaust. This shell terminates in an exhaust-opening E.

F is an annular expansion-nozzle having diverging sides and connecting with an annular conduit G, which is connected by a pipe H with the steam-boiler or other source of elastic fluid under pressure. The nozzle F is divided by obliquely-arranged partitions I, Fig. 2. Upon the drum B are mounted a number (two or more) of complete annular ranges J K L M of movable vanes, and between these, suspended from the shell D, are one or more complete annular ranges N O P of stationary vanes. The working passage is expanded in the direction of the flow of the fluid, as illustrated, for the purposes already stated, and the expansion-nozzle F is designed to convert the pressure largely into velocity, maintaining at its discharging end a pressure above that of the exhaust for the purpose already stated.

What I claim is—

1. In an elastic-fluid turbine, the combination with a complete annular range of movable vanes, of an annular expansion-nozzle,

delivering the elastic fluid simultaneously to all the vanes and converting pressure into velocity, substantially as set forth.

2. In an elastic-fluid turbine, the combination with two or more sets of annular ranges of movable vanes and one or more sets of annular ranges of stationary vanes, of an annular expansion-nozzle, delivering the elastic fluid simultaneously to all the vanes of the first set of movable vanes and converting pressure into velocity, substantially as set forth.

3. In an elastic-fluid turbine, the combination with two or more sets of movable vanes and one or more sets of stationary vanes, each forming a complete annular range and the annular working passage through which is expanded in the direction of the flow of the fluid, of an annular expansion-nozzle converting pressure into velocity and maintaining at its discharging end a pressure above that of the exhaust, substantially as and for the purpose set forth.

This specification signed and witnessed this 30th day of July, 1896.

CHARLES G. CURTIS.

Witnesses:
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