No. 875,244 PATENTED DEC. 31, 1907

C. G. CURTIS.

ELASTIC FLUID TURBINE.

APPLICATION FILED DEC. 3, 1903.

Fig. 1

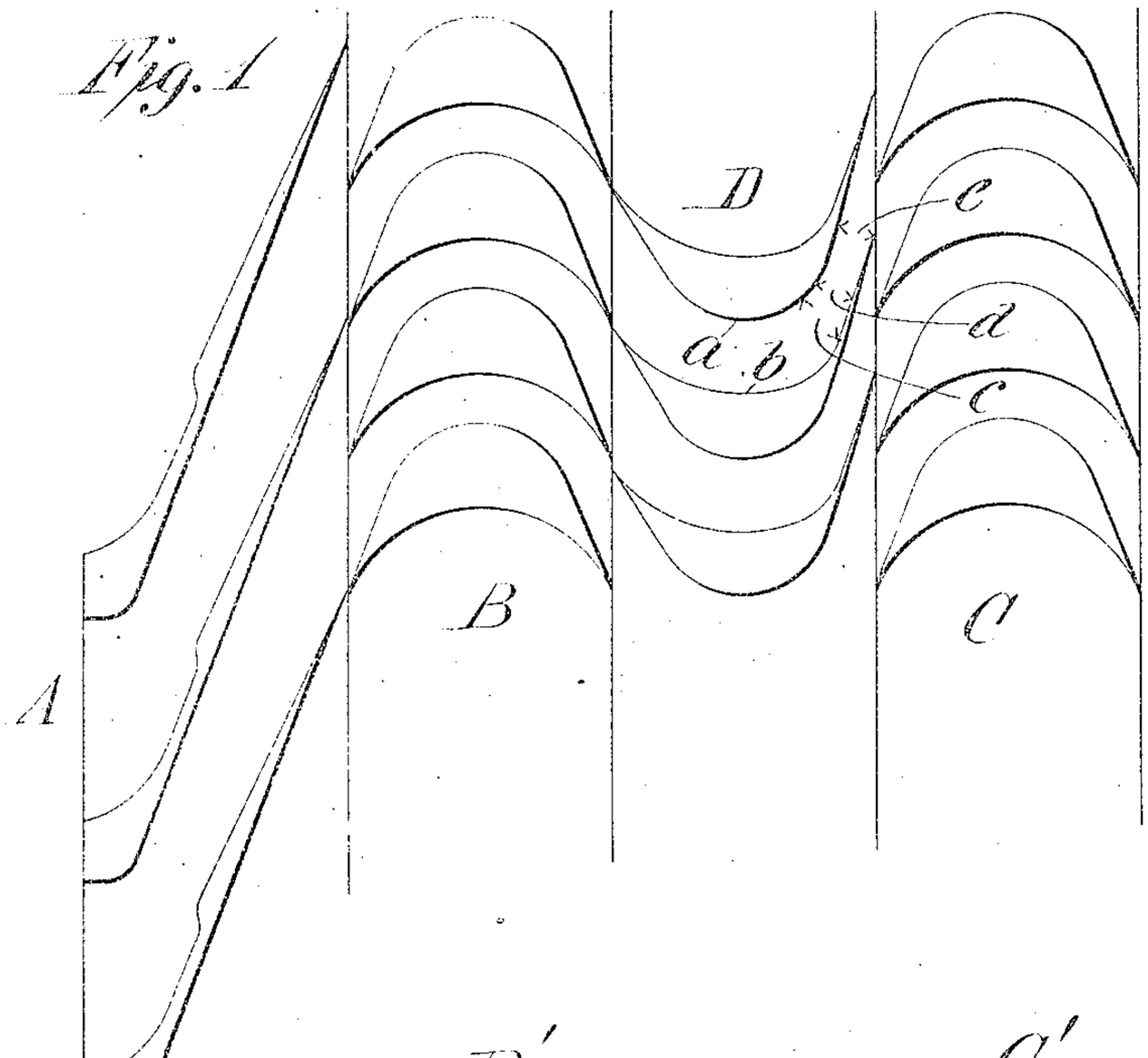

Fig. 2

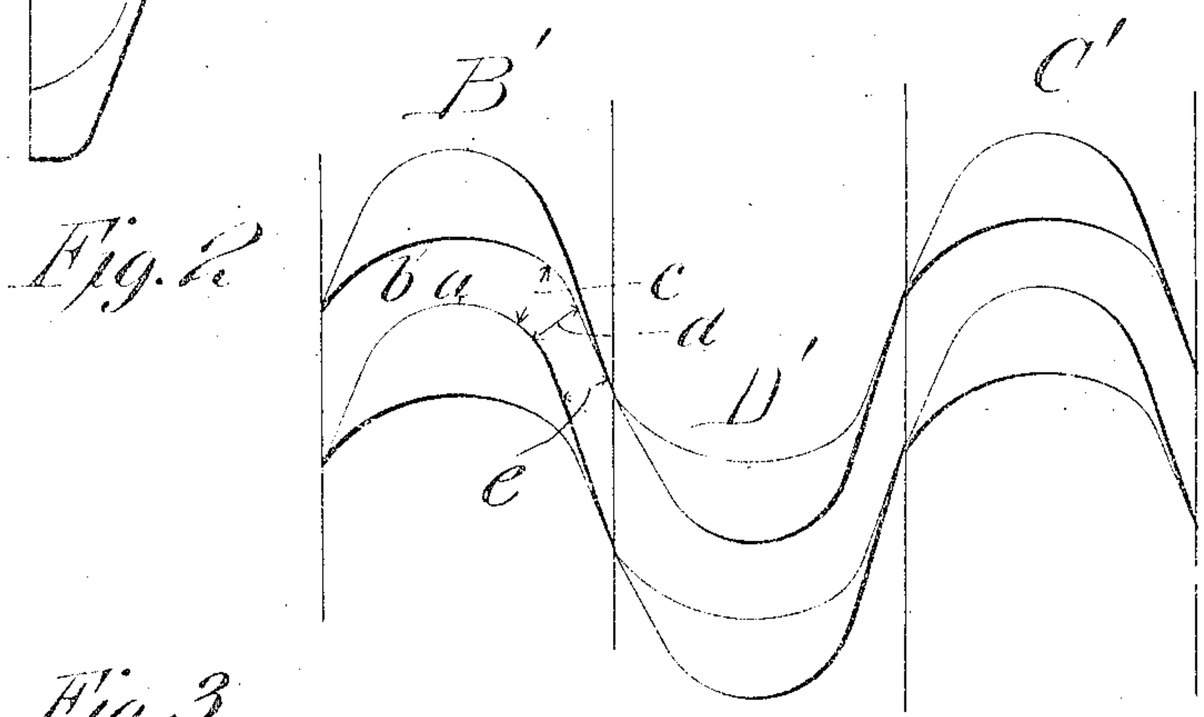

Fig. 3

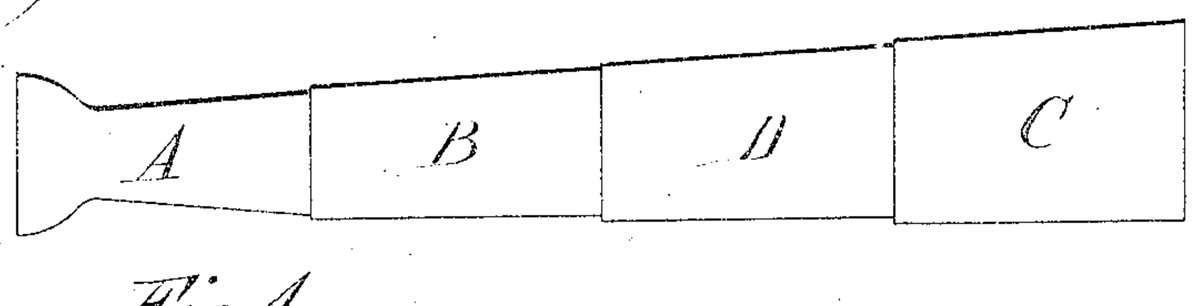

Fig. 4

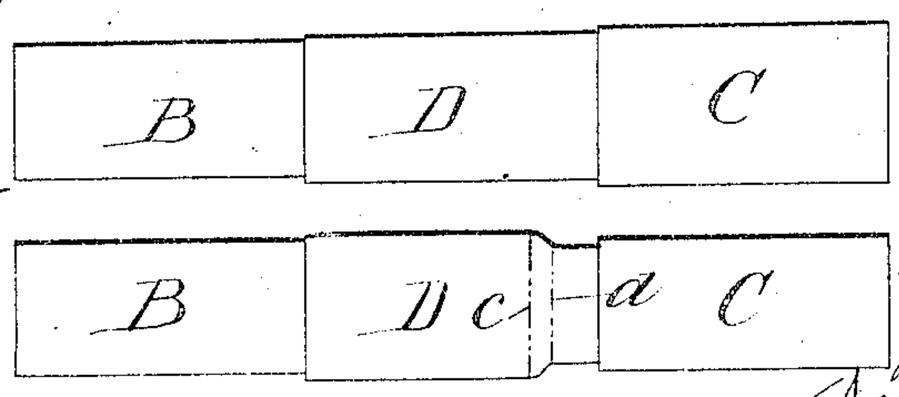

Fig. 5

Witnesses:

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UNITED STATES PATENT OFFICE.

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ELASTIC-FLUID TURBINE.

No. 875,244. Specification of Letters Patent. Patented Dec. 31, 1907.

Application filed December 3, 1903. Serial No. 183,597.

To all whom it may concern:

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

The object of my invention is to supply an effective means for converting the pressure component of the residual energy remaining in the elastic fluid after acting upon the movable vanes into velocity and adding it to the velocity component so as to secure an increased velocity at the point of delivery of the elastic fluid to the next set of moving vanes. This I accomplish by making the intermediate vane spaces without contraction in their cross-sectional area until the direction of flow has been reversed, and contracting the vane spaces at this point to form throats; the space beyond extending in straight lines to their discharging ends and forming, with the throats and larger anterior chambers, nozzles in which the pressure component is changed into velocity and is added to the velocity component. The same feature of construction may also be applied to moving vanes.

In the accompanying drawing, Figure 1 is a view showing part of a sectional nozzle and movable and intermediate vanes developed in a plane, the intermediate vanes having the peculiar construction referred to; Fig. 2 is a similar view of movable and intermediate vanes, showing the principle of construction applied to both kinds of vanes; and Figs. 3, 4 and 5 are diagrams showing in outline the shape of the spaces on radial sections taken centrally through the spaces.

With reference to Fig. 1, A represents sections of an expansion sectional nozzle, B and C are sets of movable vanes, and D is a set of intermediate stationary vanes. The nozzle and the movable vanes are of the construction well understood in connection with my elastic fluid turbines. The stationary intermediate vanes D have the same distance between their forward and rear walls *a b* until the direction of the fluid column is changed, when these walls approach each other rapidly, beginning at the point *c*, and reach a minimum distance at the point *d*, beyond which to the end of the space the walls have parallel sides *e* and form, with relation to the throat *c*, *d* and the anterior bowl produced by the larger vane space, a nozzle for converting pressure into velocity. The residual energy in the elastic fluid when discharged from the moving vanes B is made up of velocity and pressure components. The pressure component is converted into velocity by the nozzle action of the intermediate vanes, this velocity being added to the velocity component of the residual energy and increasing the velocity of the fluid jet and making its action more effective upon the second set of movable vanes C.

The same principle of construction may be applied to the movable vanes, as well as the intermediate vanes, as illustrated in Fig. 2, in which B′ C′ are the movable vanes and D′ the intermediate stationary vanes. The top and bottom walls of the vane spaces may diverge slightly as shown in Fig. 3, or be parallel as shown in Fig. 4. The throat *c*, *d* may be produced by drawing inwardly the top and bottom walls as illustrated in Fig. 5, or the contraction may be made partly by the convergence of the side walls and partly by the convergence of the top and bottom walls.

What I claim is:

1. An elastic-fluid turbine having a wheel provided with buckets, such buckets having their inlets of greater area in cross-section than their outlets, and an expansion-nozzle arranged to deliver the elastic fluid to such buckets.

2. In an elastic fluid turbine, an element having a vane space acting to convert residual pressure into velocity, having its discharging end provided with a throat, and straight walls beyond the throat, and having anterior to the throat a curved portion of undiminished cross-sectional area from the receiving end of the vane space to the throat, substantially as set forth.

3. In an elastic fluid turbine, an intermediate stationary element having a vane space acting to convert residual pressure into velocity, having its discharging end provided with a throat, and straight walls beyond the throat, and having anterior to the throat a curved portion of undiminished cross-sectional area from the receiving end of the vane space to the throat, substantially as set forth.

4. In an elastic fluid turbine, an element having a vane space having parallel curved

front and rear walls provided with a contracted throat beyond the center of the vane space and extending in straight parallel lines to the discharging end of the vane space, substantially as set forth.

5. In an elastic fluid turbine, an intermediate stationary element having a vane space having parallel curved front and rear walls provided with a contracted throat beyond the center of the vane space and extending in straight parallel lines to the discharging end of the vane space, substantially as set forth.

6. In an elastic fluid turbine, the combination with an expansion nozzle, of movable vanes receiving the fluid from the nozzle, stationary intermediate vanes receiving the fluid from the movable vanes with a residual energy having velocity and pressure components, such intermediate vanes having vane spaces each provided with a throat at its discharge end to convert the pressure component into velocity and add it to the velocity component, and another set of movable vanes receiving the elastic fluid from the intermediate vanes, substantially as set forth.

This specification signed and witnessed this 1st day of December 1903.

CHARLES G. CURTIS.

Witnesses:
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