No. 735,889. PATENTED AUG. 11, 1903.

T. G. E. LINDMARK.

STEAM TURBINE.

APPLICATION FILED JAN. 9, 1903.

NO MODEL.

Fig. 1.

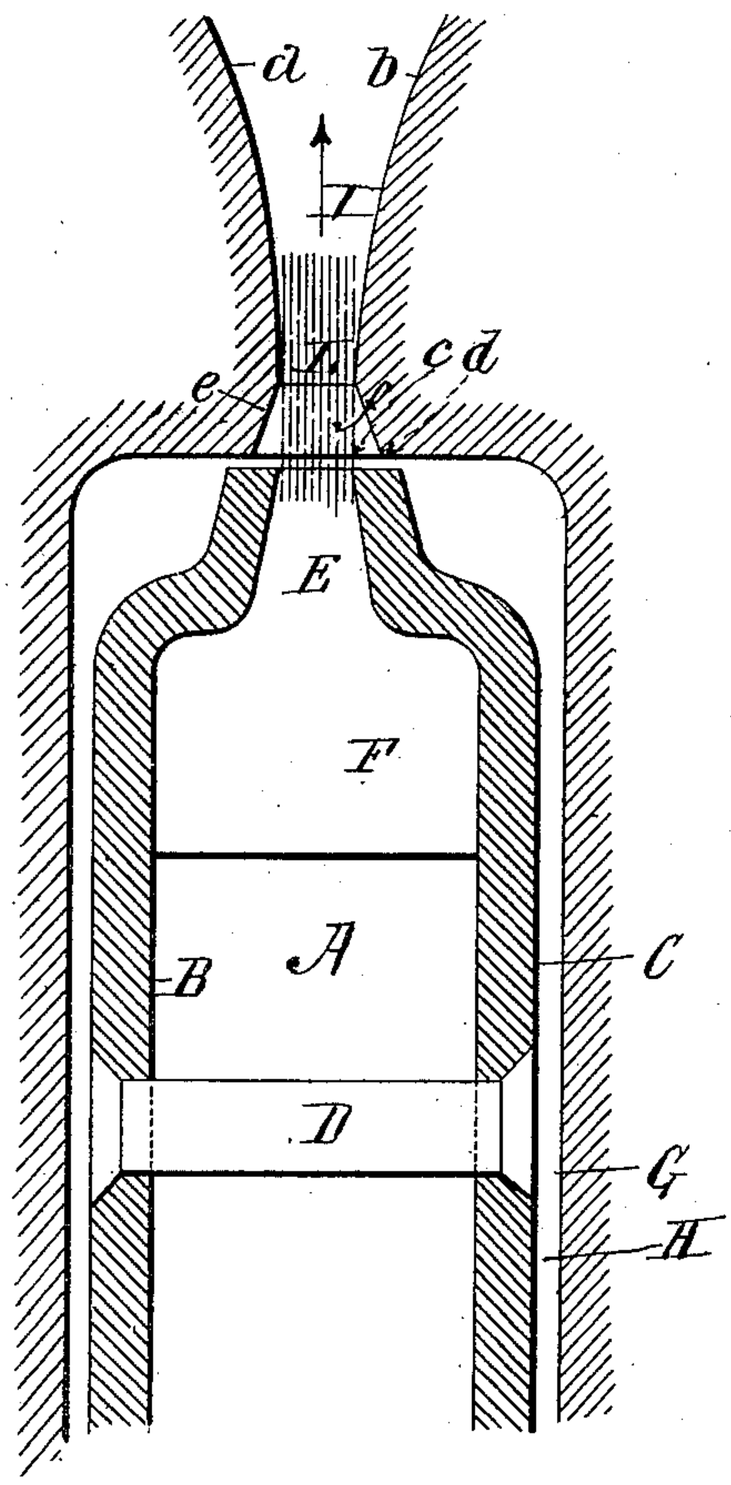
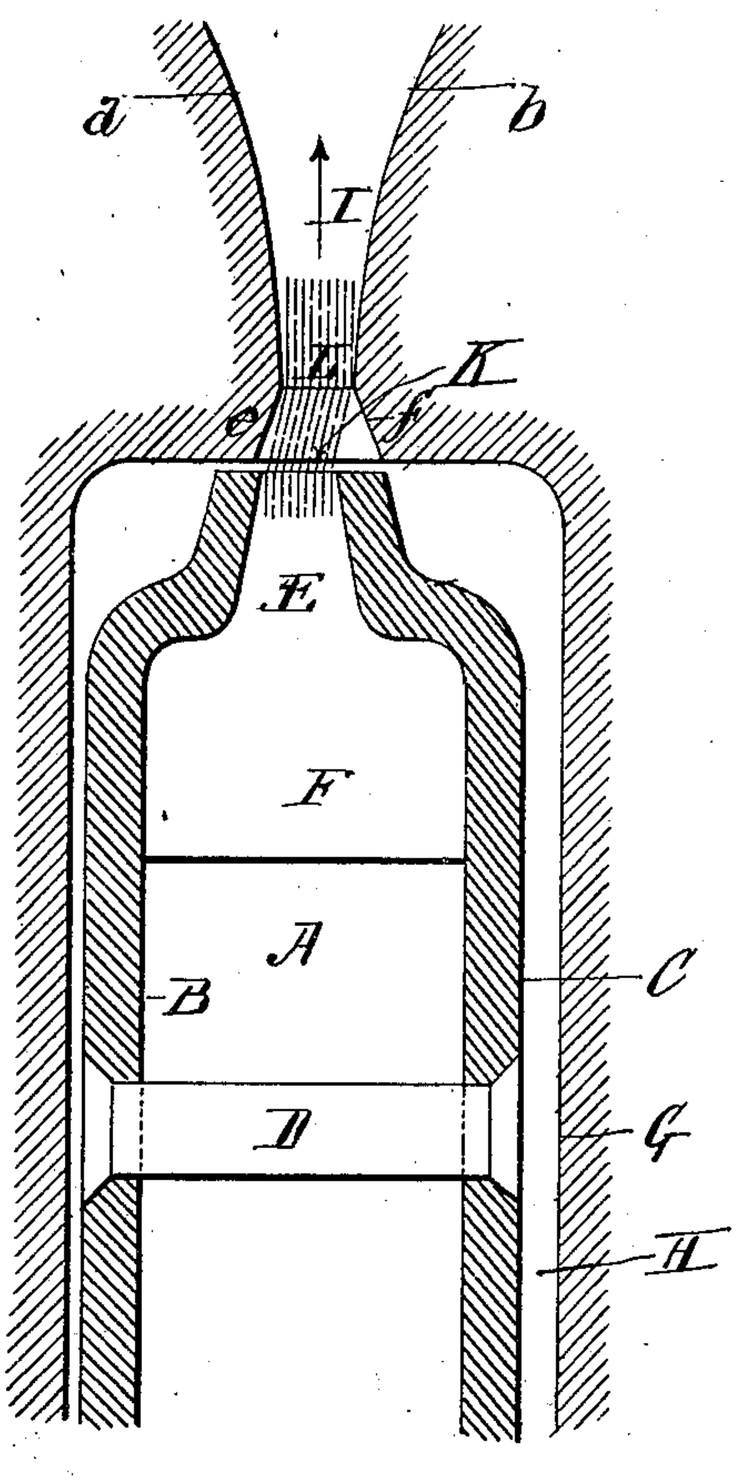


Fig. 2.



WITNESSES:

Gustave Dieterich.

Edwin H. Dieterich.

INVENTOR

Tore G. E. Lindmark

BY Paul Benjamin

His ATTORNEY

No. 735,889. Patented August 11, 1903.

UNITED STATES PATENT OFFICE.

TORE GUSTAF EMANUEL LINDMARK, OF STOCKHOLM, SWEDEN.

STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 735,889, dated August 11, 1903.

Application filed January 9, 1903. Serial No. 138,334. (No model.)

To all whom it may concern:

Be it known that I, TORE GUSTAF EMANUEL LINDMARK, a subject of the King of Sweden and Norway, residing at Stockholm, Sweden, have invented a new and useful Improvement in Steam-Turbines, of which the following is a specification.

Reaction steam-turbines having circumferential discharge of steam through openings between buckets may be combined with a channel disposed in the wheel-casing and surrounding the wheel discharge-outlet. Said channel then receives the exhaust from the wheel and operates to increase the efficiency of the steam, as fully described in my patent applications Serial Nos. 85,747 and 87,346. I have found that when the channel at its inlet is of a width (measured in the direction of the axis of rotation of the wheel) equal to that of the wheel discharge-outlet slight lateral movements of the wheel (similarly measured) are apt to impair the said efficiency. This is due to the fact that as soon as the wheel thus becomes displaced not only does the actual effective inlet become contracted in width, but a shoulder is formed in it by the now overlapping inner periphery of the casing against which a portion of the escaping steam-jet impinges and so uselessly expends its energy.

My invention has for its object the prevention of this difficulty; and it consists in constructing the channel-inlet aforesaid of greater width than the wheel-outlet, so that it extends beyond the latter on both sides, and then converging the sides of the channel form this inlet, so that at a point farther outward radially they reach a width about equal to that of the discharge-opening.

In the accompanying drawings, Figure 1 is a section of the outer portion of a reaction turbine-wheel with a channel in its casing, the cross-section of said channel increasing in the direction of the steam-jet, as fully described in aforesaid applications, the parts being in the positions which they assume when the wheel is symmetrical with reference to said casing. Fig. 2 represents the same parts, the wheel, however, no longer being symmetrically disposed in its casing, but shown as having moved laterally to the left of the figure. Similar letters of reference indicate like parts.

A represents a portion of the wheel, body formed by the heads B C, united by cross-bolts, one of which is shown at D. Circumferentially around the wheel is formed the exhaust-opening E, through which the steam escapes between buckets, one of which is represented at F. G shows a part of the wheel-casing in which is the chamber H, in which the wheel A rotates. Said chamber communicates with the annular passage or channel I, the cross-sections of which increase, as above mentioned. In the drawings said increasing is such that the walls *a b* diverge outwardly, so that the width of the passage (measured in the direction of the axis of rotation of the wheel) is greater at its outlet than at its inlet at L. At L said width is equal to or about equal to the width of the wheel exhaust-opening E. The channel I is provided with an inlet portion or nozzle, the side walls *e f* of which converge from its mouth K in the chamber H to the point L of the channel I, said mouth or inlet-opening (similarly measured) being wider than the exhaust-opening E, so that the opposite edges of said opening overlap the sides of the inlet by equal distances *e d*. The opening at L thus becomes the true channel-opening, so far as the function of the channel itself is concerned. The converging portion from L to K has no effect on the action of said channel, but simply permits of the lateral displacement of the wheel without causing the production of an abrupt shoulder or the narrowing of the entrance. When the wheel is symmetrical in the casing, as shown in Fig. 1, the escaping jet (indicated by the dotted lines) moves in the direction of the arrow straight from the wheel exhaust-opening to the channel-aperture at L. If, however, the wheel be laterally displaced, as illustrated in Fig. 2, it is obvious that the enlarged opening K permits the jet to enter unobstructed and pass to and through the opening L in a direct course.

A slight lateral play of the wheel therefore becomes unobjectionable, since the disadvantages incident to it are thus fully overcome.

I claim—

In combination with a radial-flow steam-turbine having a circumferential discharge-opening an annular channel surrounding said opening and receiving the exhaust therefrom; the inlet to said channel (measured in the direction of the axis of rotation of the wheel) being wider than said wheel discharge-opening and extending beyond the same on each side thereof and the walls of said channel converging from said inlet outwardly until the width of said channel is reduced to about the width of said wheel discharge-opening, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

TORE GUSTAF EMANUEL LINDMARK.

Witnesses:

WALDEMAR BOMAN,

T. EKEBOHM.