

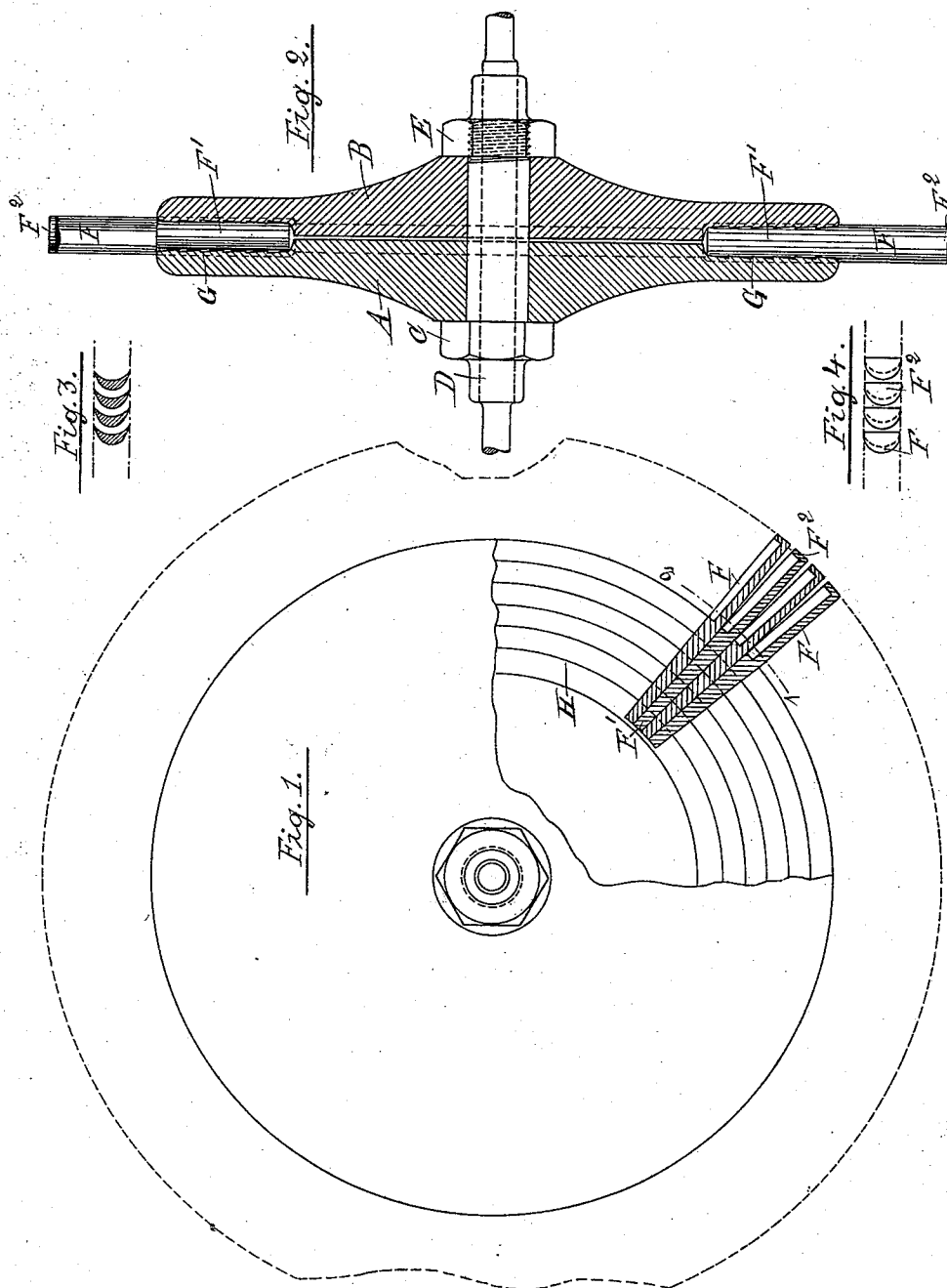
(No Model.)

2 Sheets—Sheet 1.

C. G. P. DE LAVAL.
STEAM OR GAS TURBINE WHEEL.

No. 532,232.

Patented Jan. 8, 1895.



WITNESSES;

William Duesen
Charles Schroeder

INVENTOR

Carl Gustaf Patrik de Laval
BY *Joseph Paquet*
ATTORNEYS.

C. G. P. DE LAVAL.
STEAM OR GAS TURBINE WHEEL.

No. 532,232.

Patented Jan. 8, 1895.

Fig. 5.

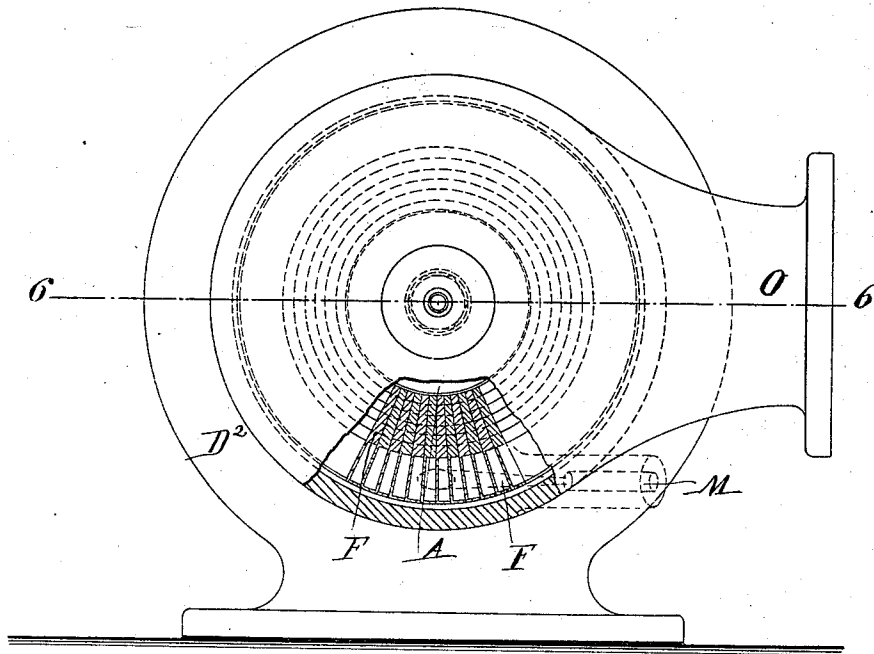
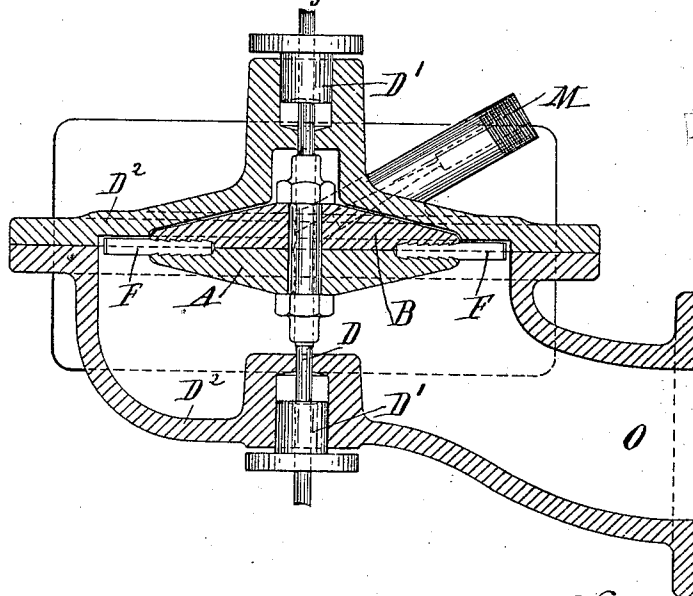


Fig. 6.



WITNESSES:

Carl Kable.

Geo. L. Wheelock

INVENTOR
C. G. P. de Laval
BY *J. J. Faugner*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

CARL GUSTAF PATRIK DE LAVAL, OF STOCKHOLM, SWEDEN.

STEAM OR GAS TURBINE WHEEL.

SPECIFICATION forming part of Letters Patent No. 532,232, dated January 8, 1895.

Application filed August 13, 1892. Serial No. 442,997. (No model.) Patented in Sweden February 2, 1892, No. 4,406; in England February 2, 1892, No. 13,770; in Germany June 22, 1892, No. 68,359; in France July 29, 1892, No. 223,322; in Belgium August 1, 1892, No. 100,761; in Switzerland August 1, 1892, No. 5,733; in Norway August 1, 1892, No. 3,137; in Spain September 20, 1892, No. 13,592; in Finland June 7, 1893, No. 464; in New South Wales November 7, 1893, No. 4,718; in South Australia November 7, 1893, No. 2,592; in Queensland November 8, 1893, No. 2,497, and in New Zealand November 11, 1893, No. 6,538.

To all whom it may concern:

Be it known that I, CARL GUSTAF PATRIK DE LAVAL, a subject of the King of Sweden and Norway, residing at Stockholm, Sweden, have
5 invented certain new and useful Improvements in Steam or Gas Turbine Wheels, (for which I have obtained a patent in Sweden, No. 4,406, dated February 2, 1892; in Germany, No. 68,359, dated June 22, 1892; in England, No.
10 13,770, dated February 2, 1892; in France, No. 223,322, dated July 29, 1892; in Belgium, No. 100,761, dated August 1, 1892; in Spain, No. 13,592, dated September 20, 1892; in Switzerland, No. 5,733, dated August 1, 1892;
15 in Norway, No. 3,137, dated August 1, 1892; in Finland, No. 464, dated June 7, 1893; in New South Wales, No. 4,718, dated November 7, 1893; in Queensland, No. 2,497, dated November 8, 1893; in South Australia, No.
20 2,592, dated November 7, 1893, and in New Zealand, No. 6,538, dated November 11, 1893,) of which the following is a specification.

The present invention refers to certain improvements in steam or gas turbine-wheels,
25 and has for its object to provide the turbine-wheel with a large number of buckets of any desired size and shape.

The invention consists of a steam or gas turbine-wheel, the body of which is made of two
30 disks or plates and provided with detachable buckets, which buckets are secured into the circumferentially-recessed body of the turbine-wheel in any convenient manner.

The invention consists further of certain
35 details of construction and combination of parts, which will be fully described and finally pointed out in the claims.

In the accompanying drawings,—Figure 1 is a side-view of my improved turbine-wheel, showing some of the buckets in section. Fig.
40 2 is a vertical transverse section of the wheel. Fig. 3 is a section on the line 1—2 of Fig. 1. Fig. 4 is an end view of a few buckets, and Figs. 5 and 6 show respectively the turbine
45 with its wheel in side-elevation a part being broken away, and a horizontal section on line b—b, Fig. 5.

Similar letters of reference indicate corresponding parts.

AB, is the body of the turbine-wheel, which
50 is mounted on the shaft D, and supported in suitable journal-bearings D' D' on the casing D² D².

M is the inlet-port or nozzle for the steam or other expansive fluid, setting the wheel
55 in motion during its passage transversely through the space between the buckets F.

O is the outlet for the fluid, which is made large enough for providing for the free exit
60 of the steam.

The body of the turbine-wheel is made
60 in two disks, A and B, each of them being thicker at the center and held together by means of a fixed nut C, at one end of a shaft D, which passes through the center of the
65 wheel, and a detachable nut E, which is screwed on to the other end of said shaft. The inside of each disk A and B is provided with a recess near the circumference, which
70 recesses, when the disks are screwed together, form a deep groove, in which the buckets F may be inserted and secured. For this purpose each bucket is provided with a shank or
75 stem F', the size of which corresponds with the dimensions of the aforesaid groove. The buckets themselves are of concave-convex shape, in cross-section only as is usually employed for this class of wheels.

For the purpose of obtaining a closed channel for the fluid, running transversely through
80 the turbine-wheel, the buckets may, if desired, be provided with a projection or abutment F² at the outer ends.

In order to prevent the buckets from radial
85 dislocation outward, which they would be liable to by the centrifugal force and insufficient fastening of the disks A and B, the shanks or stems F' may be made broader at the base than higher up near the curved portion forming the buckets, and the inside in
90 the recess of each disk A or B turned out so as to fit, as shown in dotted lines, Fig. 2 or, as shown in full lines in the drawings, the shanks or stems F' may be provided with a

certain number of notches G fitting into a corresponding number of concentric grooves H turned in the sides of the recessed circumference of the disks A and B.

5 The body of the turbine-wheel may likewise be made in several pieces, for instance, in three parts, namely: of two disks like A and B, and of a plate inserted between them as shown also in dotted lines, Fig. 2. In this
10 way, the disks A and B do not require to be turned out in order to produce a deep groove between them for the purpose of securing the buckets, but need only be provided with concentric grooves near the circumference in order
15 to hold the shanks of the buckets. The recess at the circumference is obtained by interposing the aforesaid plate between the disks A and B. It is evident, without special illustration that the parts may also be held
20 together at the circumference instead of at the center of the wheel, as shown.

It is obvious that various other means for securing the buckets in the wheel may be resorted to, without departing from the spirit
25 and scope of my invention, and I do not therefore limit myself to the exact construction shown.

Having now particularly described my invention, I claim as new and desire to secure
30 by Letters Patent—

1. The combination, with the body of a steam or gas turbine-wheel having a circumferential recess and concentric ribs in the faces of said recess, of a series of separate buckets
35 arranged closely together and provided with notched shanks, engaged by the concentric ribs on said recess, and provided at their outer

ends with projections or abutments which are placed in contact with each other, substantially as set forth. 40

2. The combination, with the body of a steam or gas turbine-wheel, formed of two disks or plates having a circumferential recess and concentric ribs in the faces of said recess, of a series of separate buckets arranged closely together and provided with
45 notched shanks or stems engaged by the concentric ribs in said recess, and provided at their outer ends with projections or abutments which are placed in contact with each
50 other, and means for securing said disks together, substantially as set forth.

3. The combination, with the body of a steam or gas turbine-wheel, formed of two disks or plates, being thicker at the center and
55 having a circumferential recess and concentric ribs in the faces of said recess, of a series of separate buckets arranged closely together and provided with notched shanks engaged by the concentric ribs in said recess, and provided
60 at their outer ends with projections or abutments which are placed in contact with each other, a fixed nut at one end of a shaft passing through the center of the wheel, and a detachable nut screwed onto the other end
65 of said shaft, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

CARL GUSTAF PATRIK DE LAVAL.

Witnesses:

TYCKE ROBSAHON,
CARL WANLOO.