No. 882,102. PATENTED MAR. 17, 1908.

W. O. DUNTLEY.

STEAM TURBINE.

APPLICATION FILED JULY 30, 1907.

2 SHEETS—SHEET 1.

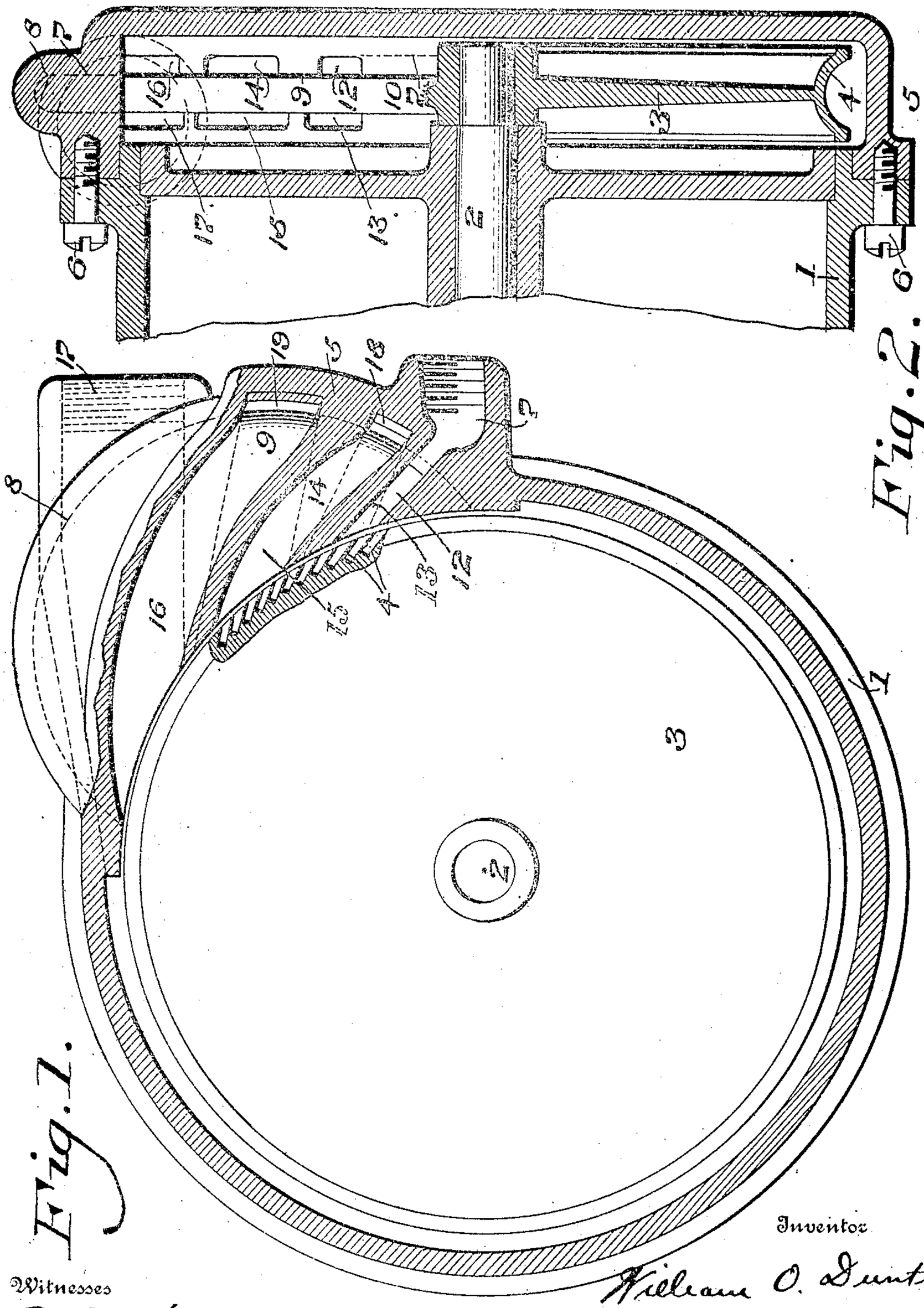

Fig. 1.

Fig. 2.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 6.

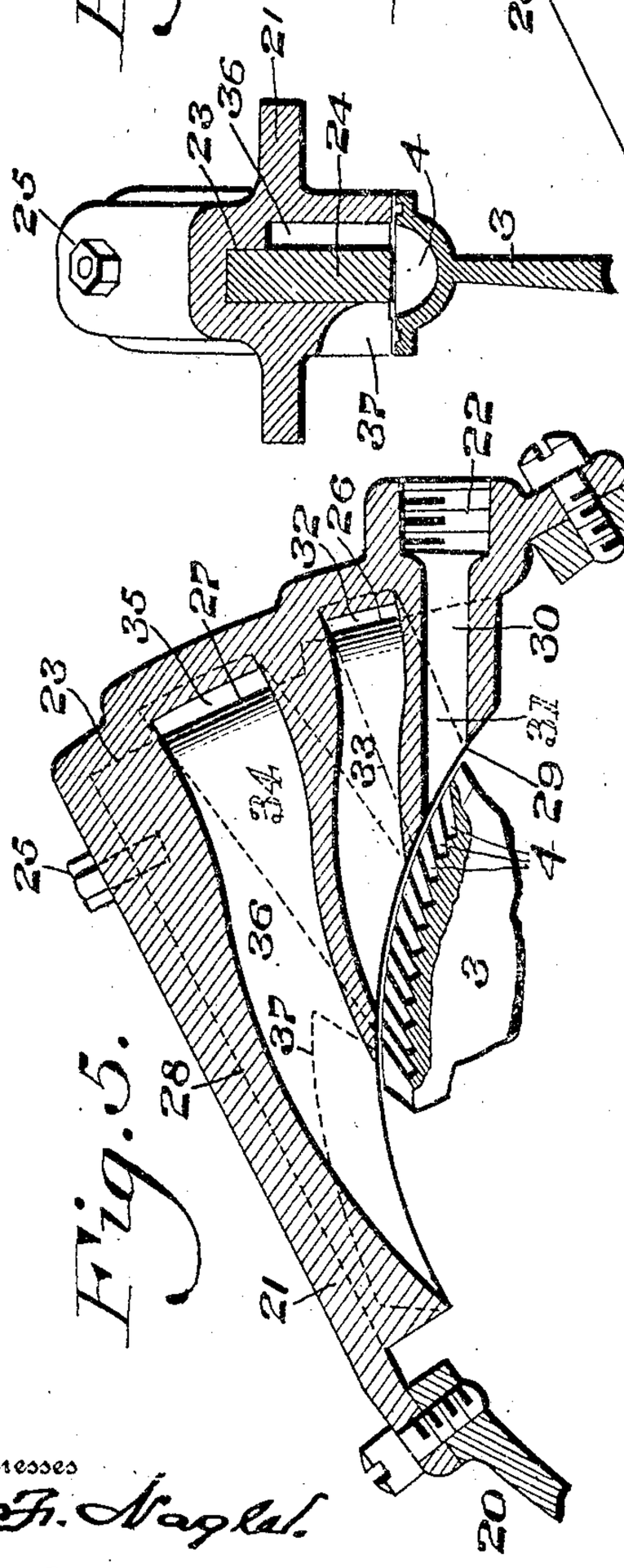

Fig. 7.

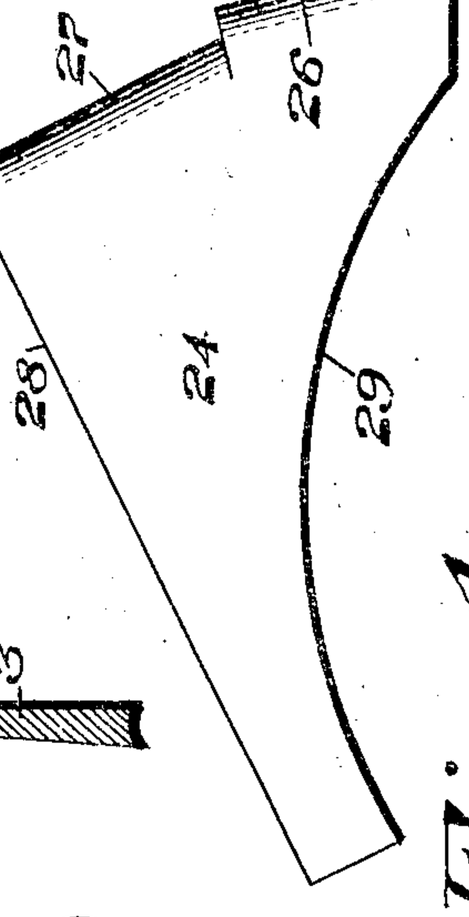

Fig. 8.

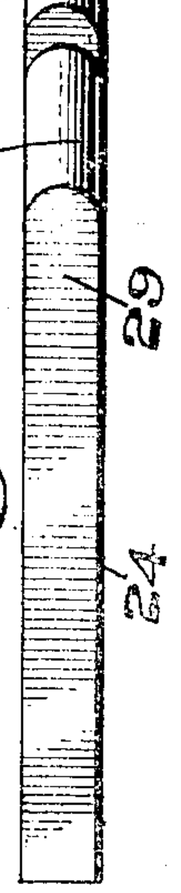

Fig. 4.

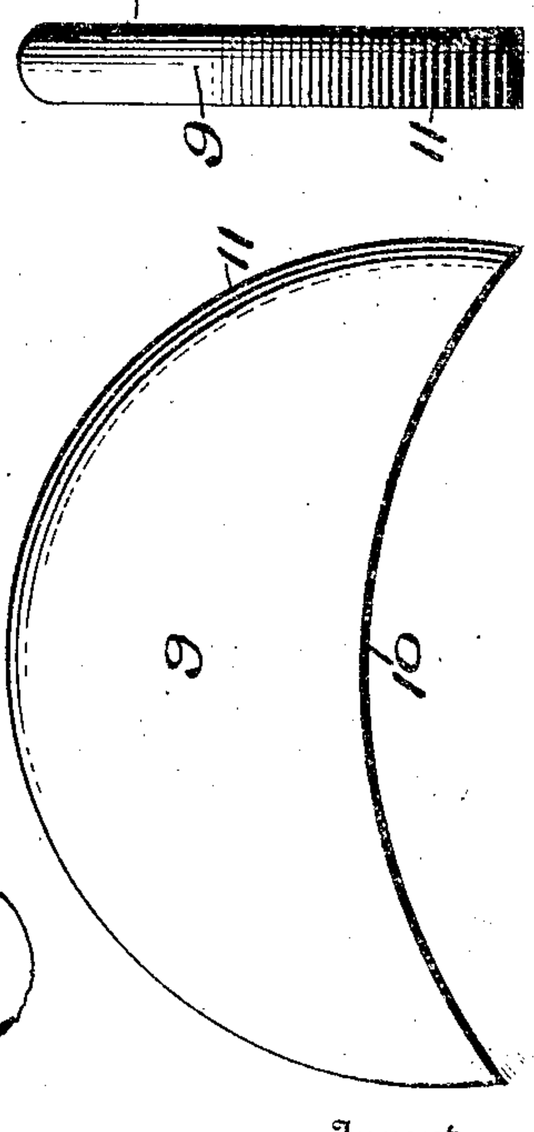

Fig. 3.

Witnesses

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UNITED STATES PATENT OFFICE.

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STEAM-TURBINE.

No. 882,102. Specification of Letters Patent. Patented March 17, 1908.

Application filed July 30, 1907. Serial No. 386,239.

To all whom it may concern:

Be it known that I, WILLIAM O. DUNTLEY, a citizen of the United States, residing in the city of Chicago, county of Cook, and State of Illinois, have invented a new and useful Steam-Turbine, of which the following is a specification.

One of the main objects of my present invention is to devise a turbine which is adapted to be actuated by fluid pressure and in which the construction of the channels for guiding the motive fluid are greatly simplified, whereby I am enabled to construct a turbine with great economy in manufacture and attain, at the same time, a greater efficiency than has heretofore been deemed possible. It is essential in a device of this character that the walls of the channels or grooves have a smooth and even surface and it has been found in practice to be commercially impracticable to cast grooves or channels sufficiently smooth and even to produce an effective turbine, and this is especially true of turbines of small size in which the channels are comparatively small. In order to overcome this defect of prior devices, I preferably cast the outer sides of the channels integral with the stator or stationary channel casing and form the inlet and outlet channels by the insertion of a preferably ungrooved member which may be readily removed when it is desired to polish or smooth the walls of the channels.

To the above ends, my invention consists broadly in a novel construction of a turbine in which the outer walls of the channels are cast integral with the stator and the inner walls are formed by the insertion of a dividing member which forms the inlet and outlet channels when in assembled position, whereby said member may be readily removed when it is desired to inspect or polish the channels.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings, two forms of a device, since these embodiments best illustrate the principle thereof and give satisfactory and reliable results in practice, although it is obvious that the various instrumentalities of which my invention consists, can be variously arranged and organized, and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown.

Figure 1 represents a sectional plan view of a turbine, embodying my invention. Fig. 2 represents a sectional elevation of a portion of Fig. 1, with parts of the rotor broken away. Fig. 3 represents a plan view of the dividing member seen in Fig. 1. Fig. 4 represents an end view of Fig. 3. Fig. 5 represents a sectional plan view of another embodiment of my invention. Fig. 6 represents a sectional view of Fig. 5. Fig. 7 represents a plan view of the division member seen in Figs. 5 and 6. Fig. 8 represents a side elevation of Fig. 7.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings:—1 designates a casing in which is mounted a driving shaft 2 which carries the rotor 3, which latter is provided at its periphery with a series of buckets 4.

5 designates a bonnet or casing which is secured to the casing 1 by means of any suitable fastening devices, such as the screws 6, as indicated in Fig. 2.

7 designates the inlet for the motive fluid, which is threaded or otherwise adapted to be connected with the motive fluid supply. The casing 5 is recessed, as indicated at 8, thereby adapting the same to receive the member 9 which in the present instance has a crescent shaped contour in order that the inner curved wall 10 thereof will terminate in proximity to the buckets 4 when the parts are in assembled position, said member being retained in position by its engagement with the recess 8 or by any other suitable means. The outer periphery of the member 9 is rounded off as indicated at 11. This member 9 when inserted in position, divides the enlarged portion of the casing 5 into inlet and outlet ports. The motive fluid entering the inlet port passes through the channel or nozzle 12 and impinges against the buckets 4. It then reënters the stator or stationary member 5 through the groove or channel 13 and further expands in the groove or channel 14 and impinges against the buckets 4 of the rotor 3. The motive fluid again reënters the stator or stationary member 5 through the groove or channel 15, passes around the member 9 and is further expanded in the groove 16, impinges against

the buckets 4 and then passes out through the exhaust passage 17 in the stationary member 5.

It is to be noted that the stationary casing 5 is recessed as indicated at 18 and 19 in order that the motive fluid may pass around the member 9 when the same is in assembled position.

From the embodiments seen in Figs. 5 to 7 inclusive, I have shown a slightly modified form of channel forming member which in Fig. 7 is shown in detached position, and in this embodiment the casing 20 surrounding the rotor has secured thereto by means of any suitable fastening devices the stator 21 in which is located the motive fluid inlet 22, which is adapted to be connected with the motive fluid supply. The stator 21 is recessed as indicated at 23 thereby adapting the same to receive the channel or nozzle forming member 24 when the same has been inserted therein, said member being retained in assembled position by means of a set screw or equivalent device 25 which engages therewith. The member 24 is provided on its periphery with the inclined faces 26 and 27 and a face 28 which in the present instance is angularly inclined to the face 27. The member 24 is also provided with a crescent shaped face 29 which when said member is in assembled position with respect to the stator 21 is in close proximity to the periphery of the buckets 4 of the rotor 3. The stator 21 is provided with channels or grooves which, when the member 24 is inserted in position, form inlet and outlet channels or nozzles.

The motive fluid entering the inlet 22 expands in the channel 30, impinges against the buckets 4 and reënters the stator by the channel 31, passing around the face 26 of the member 24, and through chamber 32 of the stator. The motive fluid is again expanded in the channel or nozzle 33, impinges against the buckets 4 and then reënters the stator on the other side of the member 24, passing by means of grooves 34 and chamber 35 around the periphery 27 of the member 24 and expanding in the groove 36, impinges against the buckets 4, and then passes from the stator to the exhaust passage 37 on the opposite side of the member 24.

It will now be readily understood that in my novel construction, the sides of the channels are cast integral with the stator so that they may be readily polished and since the member 9 or 24 which is inserted therein to form the inlet and outlet channels may be readily polished so as to present a smooth and unbroken surface, it will be apparent that the motive fluid will not be liable to be retarded in any manner in its passage through the different channels as it passes through the stator.

In the present instance I have shown the members 9 and 24 as presenting an unbroken surface, but it will be apparent that if desired channels or grooves may be formed therein, which when the parts are in assembled position, will coincide with the channels or grooves cast integral with or carried by the stator.

It will be apparent that the motive fluid passing from the inlet, successively passes through one series of buckets into and through a grooved channel into the next series of buckets, through the same and into and through the next curved channel and finally to the exhaust, so that the motive fluid passes in a spiral path through the stator. The cross-section area of the channels increases relatively to the predetermined ratio of expansion of the steam.

In the present instance I have shown the turbine as having a plurality of pressure stages, it being apparent that the number of these channels employed will depend upon the condition and requirement of the case, as velocity stages may be substituted for pressure stages.

It will now be apparent that the channels in my novel construction are at all times readily accessible, so that they may be inspected and polished if required, so that at all times the motive fluid will have a minimum of friction thereagainst in passing through the stator.

I have found in practice that a construction such as is indicated in Figs. 5 to 7 inclusive, gives more advantageous results than that shown in Figs. 1 to 4 inclusive, although it will be apparent that my invention in its broad scope comprises a stator in which the outer sides of the channels are carried by the stator, while the inner surface of the channel is formed by a member inserted therein which may be readily removed when desired.

It will now be apparent that I have devised a novel and useful construction of a turbine, which embodies the features of advantage enumerated as desirable in the statement of invention and the above description and while I have in the present instance shown and described the preferred embodiment thereof which gives in practice satisfactory and reliable results, it is to be understood that my invention is susceptible of modification in various particulars without departng from the spirit and scope of the invention or sacrificing any of its advantages.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a fluid turbine, a recessed stator member comprising inlet and outlet channels having their outer walls projecting from said stator member, and a detachable member adapted to be held in the recess of said stator member constituting the inner wall of said channels, said detachable mem-

ber having a smooth and unbroken surface and periphery.

2. In a fluid turbine, a casing, a rotor in said casing, a recessed stator member supported by said casing, inlet and outlet channels having their outer walls projecting from said stator member and a member adapted to be detachably held in the recess of said stator member and constituting the inner wall of said channels.

3. In a fluid turbine, a stator body comprising a plurality of intercommunicating inlet and outlet channels, the outer walls of said channels being integral with said stator body, and a detachable member forming a common inner wall of said channels.

4. In a fluid turbine, a stator body provided with a longitudinal recess, a plurality of corresponding inlet and outlet channels in serial communication, the outer walls of said channels being integral with said stator body, and a detachable member adapted to be held in said recess and forming a common inner wall of said channels.

5. In the stator body of a fluid turbine, a fluid inlet, a plurality of inlet and outlet channels communicating serially and forming an approximate spiral path for the fluid, said channels having their outer walls connected to the stator body, and a detachable member adapted to form the inner wall of said channels.

6. In a fluid turbine, a stator body provided with a longitudinal recess, a series of inlet and outlet channels having their outer walls projecting from said stator body, and a detachable member adapted to be held in the above longitudinal recess constituting the common inner wall of said channels, said detachable member having a convex periphery.

7. In a fluid turbine, a casing, a rotor with buckets therein, a recessed stator body detachable from said casing, said stator body comprising a plurality of inlet and outlet ports positioned to form an approximate spiral path for the actuating fluid, the outer walls of said channels projecting from said stator body, and a member detachable from said stator body and adapted to be held in the recess of said stator body constituting the common inner wall of said channels.

8. In a recessed stator body of a fluid turbine, a fluid inlet, a plurality of inlet and outlet ports in operative relation with said fluid inlet, the inlet ports being positioned on one side of the recess of said stator body, the corresponding outlet ports being positioned in the opposite side, said ports having a plurality of their walls integral with the stator body, and a member detachably held in said recess completing the walls of said channels, said detachable member having an inner concave curvature and an outer convex curvature of a plurality of peripheries, the surfaces of which are at angles to each other.

9. In a fluid turbine, a casing, a rotor provided with buckets therein, a stator body detachable from said casing, said stator body being provided with a longitudinal recess and comprising a fluid inlet, an inlet channel communicating at one end with said fluid inlet and at the other end with a bucket of said rotor, an outlet channel communicating with said inlet channel through a bucket of said rotor, said channels and buckets thereby forming an approximate spiral path, said channels being positioned on opposite sides of the longitudinal recess in said stator body, and a detachable member adapted to be held in said recess constituting a common inner wall of said channels.

10. In a fluid turbine, a casing, a rotor therein and provided with buckets, a stator body supported upon said casing, said stator body being provided with a longitudinal recess, a fluid inlet, an inlet channel on one side of the longitudinal recess and communicating with said fluid inlet at one end, and adapted to communicate with the buckets of said rotor at the other end, an outlet channel positioned on opposite side of said longitudinal recess and forming through the medium of a bucket of said rotor an approximate spiral path with said inlet channel, the outer walls of said channels being integral with said stator body, and a detachable guiding member adapted to be held in the above recess and completing the walls of said channels, said detachable member being provided with a plurality of convex peripheries positioned at an angle with each other.

11. In a fluid turbine, a recessed stator member comprising inlet and outlet channels having their outer walls projecting from said stator member, the cross-sectional area of said channels increasing in the direction of fluid flow, and a member detachable from said stator member and adapted to be held in the recess of said stator member constituting the inner wall of said channels.

12. In a fluid turbine, a recessed stator member comprising inlet and outlet channels having their outer walls projecting from said stator member, the cross-sectional area of said channels increasing by a predetermined ratio relative to the distance of fluid flow through said channels, and a member detachable from said stator member and adapted to be held in the recess of said stator member constituting the inner wall of said channels.

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Witnesses:
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