

M. A. ROSS.

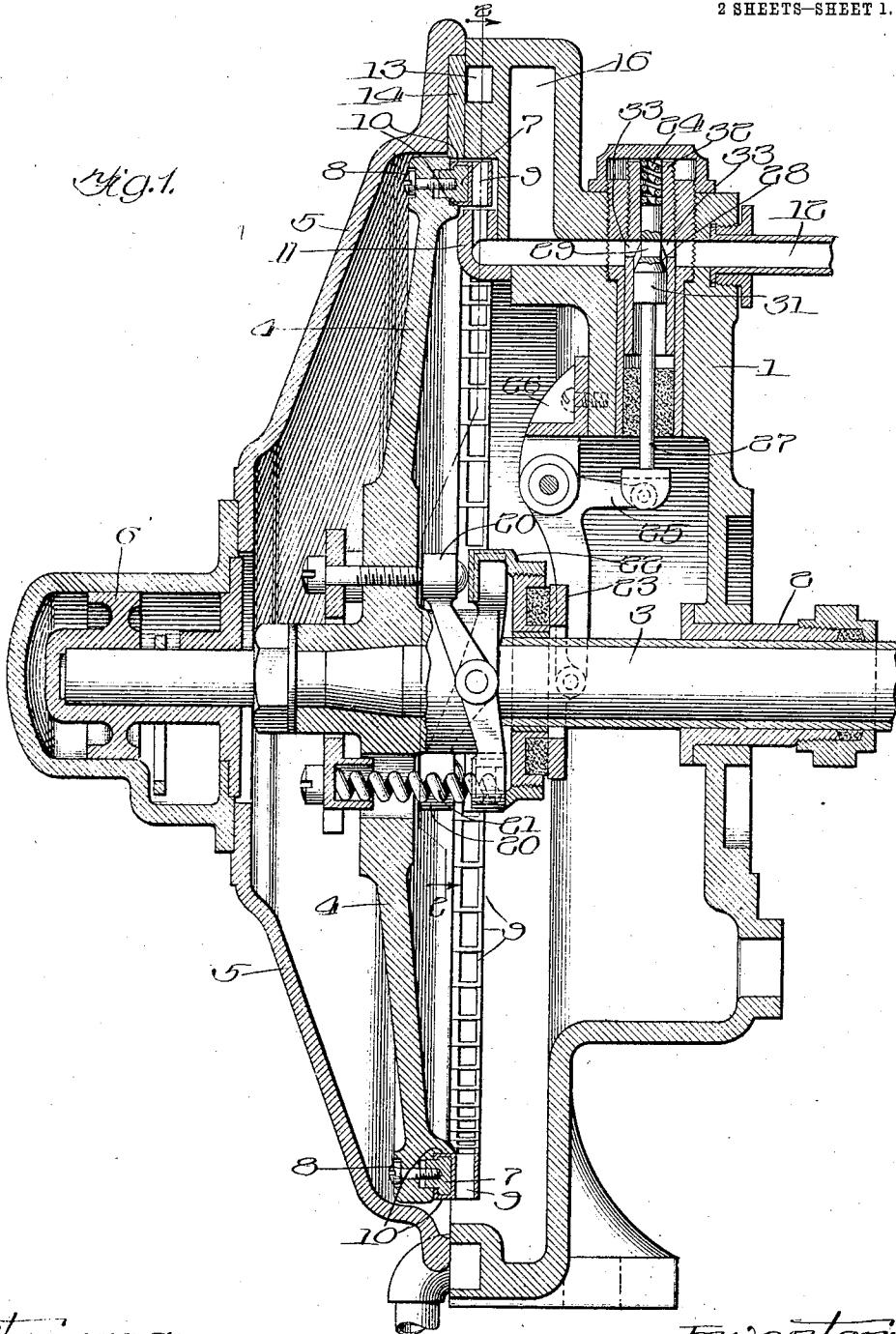
TURBINE.

APPLICATION FILED FEB. 26, 1913.

1,065,318.

Patented June 17, 1913.

2 SHEETS—SHEET 1.



Witnesses:
Jno. H. Nelson Jr.
Edward Nelson

Inventor:
Mark A. Ross.
By L. H. Gray, Atty.

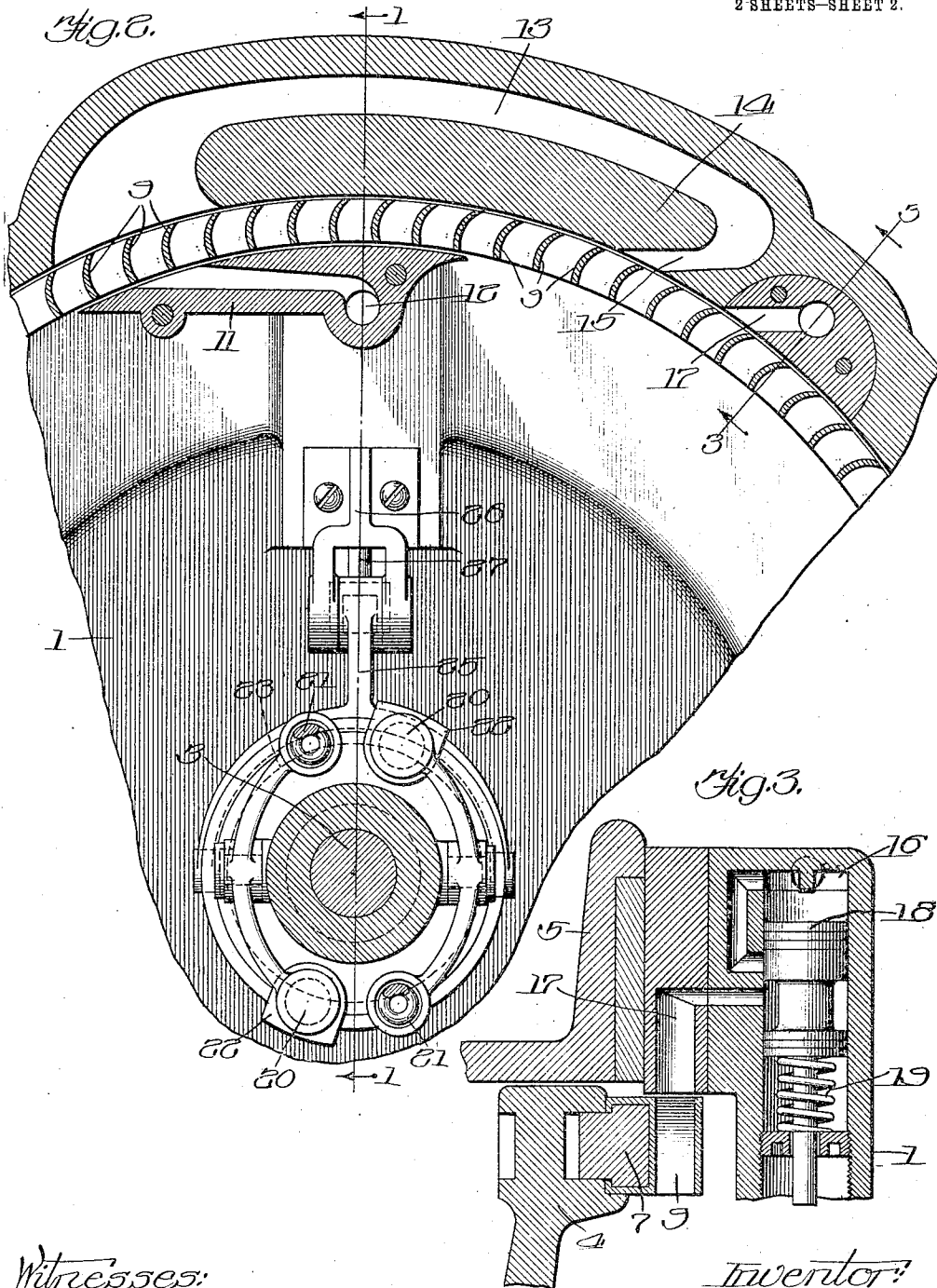
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Inventor:
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UNITED STATES PATENT OFFICE.

MARK A. ROSS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO HARRY P. BAYLEY,
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TURBINE.

1,065,318.

Specification of Letters Patent.

Patented June 17, 1913.

Original application filed January 20, 1913, Serial No. 743,006. Divided and this application filed February 26, 1913. Serial No. 750,851.

To all whom it may concern:

Be it known that I, MARK A. ROSS, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Fluid-Turbines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to turbines, the claims in the present application being divided from my original application Serial No. 743,006, filed January 20, 1913.

The invention has for one of its objects the provision of an auxiliary nozzle which is brought into play to direct propelling fluid upon the turbine wheel when the pressure of the propelling fluid passing through the main nozzle operating upon the same wheel buckets has been reduced below a predetermined value whereby the speed of the turbine wheel may be maintained substantially constant.

My invention has for its further object the improved construction of the governing valve that controls the admission of operating fluid to the turbine.

The invention will be fully explained by reference to the accompanying drawings, showing the preferred embodiment thereof, and in which—

Figure 1 is a sectional elevation on line 1 1 of Fig. 2; Fig. 2 is a sectional view on line 2 2 of Fig. 1; and Fig. 3 is a sectional view on line 3 3 of Fig. 2.

Like parts are indicated by similar characters of reference throughout the different figures.

The turbine structure includes a suitably supported main frame 1 having a stuffing box 2 through which the shaft 3 of the turbine wheel or rotor 4 projects. The frame 1 constitutes a portion of a housing for the wheel 4, a cap piece 5, which is secured to the frame 1, constituting a complemental housing portion. The cap piece 5 supports a bearing 6 for the shaft 3. The rotor 4 carries a ring 7 that is separably secured thereto by means of a plurality of screws 8, this ring constituting a mounting ring for the turbine buckets 9. The turbine buckets are provided with rearwardly extending inturned ears 10 that are assembled upon the

ring, to which end the ring may be split at one portion to permit of the access of the mounting portions of the buckets to the ring, the buckets being slipped along the ring as they are placed thereupon.

The operating fluid, such as steam, is admitted to the turbine buckets through the primary nozzle 11, steam finding access to this primary nozzle through the steam pipe 12. The steam impinges upon the buckets to rotate the wheel 4 in a counter-clockwise direction, as seen in Fig. 2, the steam upon leaving the buckets being guided in its somewhat natural direction by means of the passage 13 in a secondary nozzle 14, the discharge end 15 of the secondary nozzle 14 being located to the rear of the primary nozzle in order that the steam may be permitted to have its somewhat natural direction of flow, the receiving end of the secondary nozzle passage 13 being located in position immediately to receive the steam supplied by the primary nozzle after it has passed from the buckets. The nozzle passage 13 is desirably formed directly in the casting of the main frame 1, in which casting there is desirably also provided a steam receiving space 16 closely approximating the position of the secondary nozzle and in communication with the pipe 12 whereby the secondary nozzle may be heated by the steam. In the case of operating fluid other than steam the temperature of the secondary nozzle is modified by the temperature of the operating fluid finding access to the space 16. The space 16 also constitutes a steam conducting space through which steam may be passed when the auxiliary nozzle 17 is to be brought into play. A valve 18 is operated upon by the pressure of the steam within the space 16 to close the communication between the space 16 and the passage of the auxiliary nozzle 17, when the steam pressure is sufficiently strong to oppose the valve opening action of the spring 19. When the pressure of the steam is reduced below a predetermined value the spring 19 becomes effective to permit of the passage of steam from the space 16 to the auxiliary nozzle 17, then to supplement the propelling action of the steam directed upon the wheel through the nozzles 11 and 14 to the end that the speed of the wheel 4 may be maintained substantially

uniform. When the steam exceeds a predetermined pressure the opening action of the spring 19 is overcome by the steam so that the auxiliary nozzle 17 is thereupon thrown out of service.

Any suitable form of governing mechanism may be employed. That which is shown includes a weighted lever 20 that is operated centrifugally in one direction and by a spring 21 in the reverse direction, this lever turning with the wheel as does the ring 22 which is operated upon by the lever to be moved back and forth along the shaft 3. The ring 22 is provided with suitable structural characteristics whereby it may operate upon a non-rotating ring 23 to move this latter ring longitudinally of the shaft 3 in one direction, a spring 24 operating through the intermediation of valve and lever mechanism to move the ring 23 in the reverse direction. A bell crank lever 25 is pivoted at its elbow upon a bracket 26 that is secured directly to the frame 1. The lower end of the bell crank lever is articulated to the non-rotating ring 23 and the upper end of the bell crank lever is articulated to the lower end of the valve stem 27. The valve stem 27 carries a valve 28 at its upper end, this valve being provided with a valve passage 29 upon opposite sides of which portions 30 and 31 of the valve are disposed to guide the valve in its travel. The valve passage 29 is disposed longitudinally of the pipe 12 and the valve itself is movable transversely of the pipe 12. The portions 30 and 31 of the valve are received within the guiding cylinder or tube 32, whereby the valve is guided in its movements. The valve 28 is tapered and there is a tapered seat provided in the tube 32 that is engaged by the tapered portion of the valve when the valve is closed, the tube 32 having steam passages 33 where the tapered seat in the tube is located. By means of the tapered portion 28 of the valve and the tapered seat in the tube 32 the valve may be perfectly closed without the necessity of close sliding fit of the portions 30 and 31 with the tubular guiding element 32 whereby the valve will not stick although means are present for preventing the leakage of steam by the valve. The element 32 is adjustable transversely of the passage 12 so that the effective size of the openings 33 may be initially determined.

Certain claims upon the turbine structure here shown are claimed in my co-pending application Serial No. 750,850, filed February 26, 1913, and my co-pending application Serial No. 743,006, filed January 20, 1913, of which latter application the claims of the present application constitute a division.

While I have herein shown and particularly described the preferred embodiment of my invention I do not wish to be limited to the precise details of construction shown as

changes may readily be made without departing from the spirit of the invention.

Having thus described my invention I claim as new and desire to secure by Letters Patent the following:

1. A turbine including a turbine wheel; a primary nozzle for directing driving fluid upon the turbine wheel buckets; an auxiliary nozzle for also directing driving fluid upon the aforesaid turbine wheel buckets; and valve mechanism operating to permit the passage of driving fluid through the auxiliary nozzle when the pressure of such fluid is below a predetermined value, and operated upon by the driving fluid, when the pressure of such driving fluid is in excess of a predetermined value, to cut off the flow of driving fluid to the auxiliary nozzle to occasion the passage of driving fluid solely through the primary nozzle upon said buckets.

2. A turbine including a turbine wheel; a primary nozzle for directing driving fluid upon the turbine wheel buckets; an auxiliary nozzle for also directing driving fluid upon the aforesaid turbine wheel buckets; and valve mechanism operating to permit the passage of driving fluid through the auxiliary nozzle when the pressure of such fluid is below a predetermined value and operated upon by the driving fluid, when the pressure of such driving fluid is in excess of a predetermined value, to cut off the flow of driving fluid to the auxiliary nozzle to occasion the passage of driving fluid solely through the primary nozzle upon said buckets, said valving mechanism including a spring that operates to open the valve of the valving mechanism when the pressure of the driving fluid is below a predetermined value thereby to permit of the passage of driving fluid to the auxiliary nozzle.

3. A turbine including a fluid passage for directing operating fluid to the turbine wheel; a governing plunger valve operating transversely of such passage, said valve having a valve opening adapted to be positioned to permit or cut off the flow of driving fluid and having portions upon each side of said opening for guiding the valve in its travel; and a guiding structure engaging the portions of the valve between which the valve opening is disposed, said guiding structure having a tapering seat for the valve and engaged by the valve when the valve is in a closed position, the portion of the valve engageable with said seat being also tapered.

4. A turbine including a fluid passage for directing operating fluid to the turbine wheel; a governing plunger valve operating transversely of such passage, said valve having a valve opening adapted to be positioned to permit or cut off the flow of driving fluid and having portions upon each side

of said opening for guiding the valve in its travel; and a guiding structure engaging the portions of the valve between which the valve opening is disposed, said guiding structure having a tapering seat for the valve and engaged by the valve when the valve is in a closed position, the portion of the valve engageable with said seat being also tapered, the guiding structure for the valve being apertured where said seat is located for the passage of driving fluid to the turbine wheel.

5. A turbine including a fluid passage for directing operating fluid to the turbine wheel; a governing plunger valve operating transversely of such passage, said valve having a valve opening adapted to be positioned to permit or cut off the flow of driving fluid and having portions upon each side of said opening for guiding the valve in its travel; and a guiding structure engaging the portions of the valve between which the valve opening is disposed, there being a tapering seat for the valve and engaged by the valve when the valve is in a closed position, the portion of the valve engageable with said seat being also tapered.

6. A turbine including a fluid passage for directing operating fluid to the turbine wheel; a governing plunger valve operating transversely of such passage, said valve having a valve opening adapted to be positioned to permit or cut off the flow of driving fluid and having portions upon each side of said opening for guiding the valve in its travel; and a guiding structure engaging the por-

tions of the valve between which the valve opening is disposed, there being a tapering seat for the valve and engaged by the valve when the valve is in a closed position, the portion of the valve engageable with said seat being also tapered, there also being apertures where said seat is located for the passage of driving fluid to the turbine wheel.

7. A turbine including a fluid passage for directing operating fluid to the turbine wheel; a governing plunger valve operating transversely of such passage; and a tubular element in which said valve operates, this tubular element having apertures whose effective size is governed by the valve, the tubular element being adjustable longitudinally of itself whereby the effective size of said apertures may be adjusted.

8. A turbine including a fluid passage for directing operating fluid to the turbine wheel; a governing plunger valve movable transversely of said passage; and an apertured element cooperating with the valve and longitudinally of which the plunger valve moves to regulate the flow of operating fluid and adjustable transversely of the passage thereby to adjust the effective fluid passage therethrough.

In witness whereof, I hereunto subscribe my name this twenty-fourth day of February A. D., 1913.

MARK A. ROSS.

Witnesses:

E. L. WHITE,
G. L. CRAGG.