R. H. PYLE.

TURBINE.

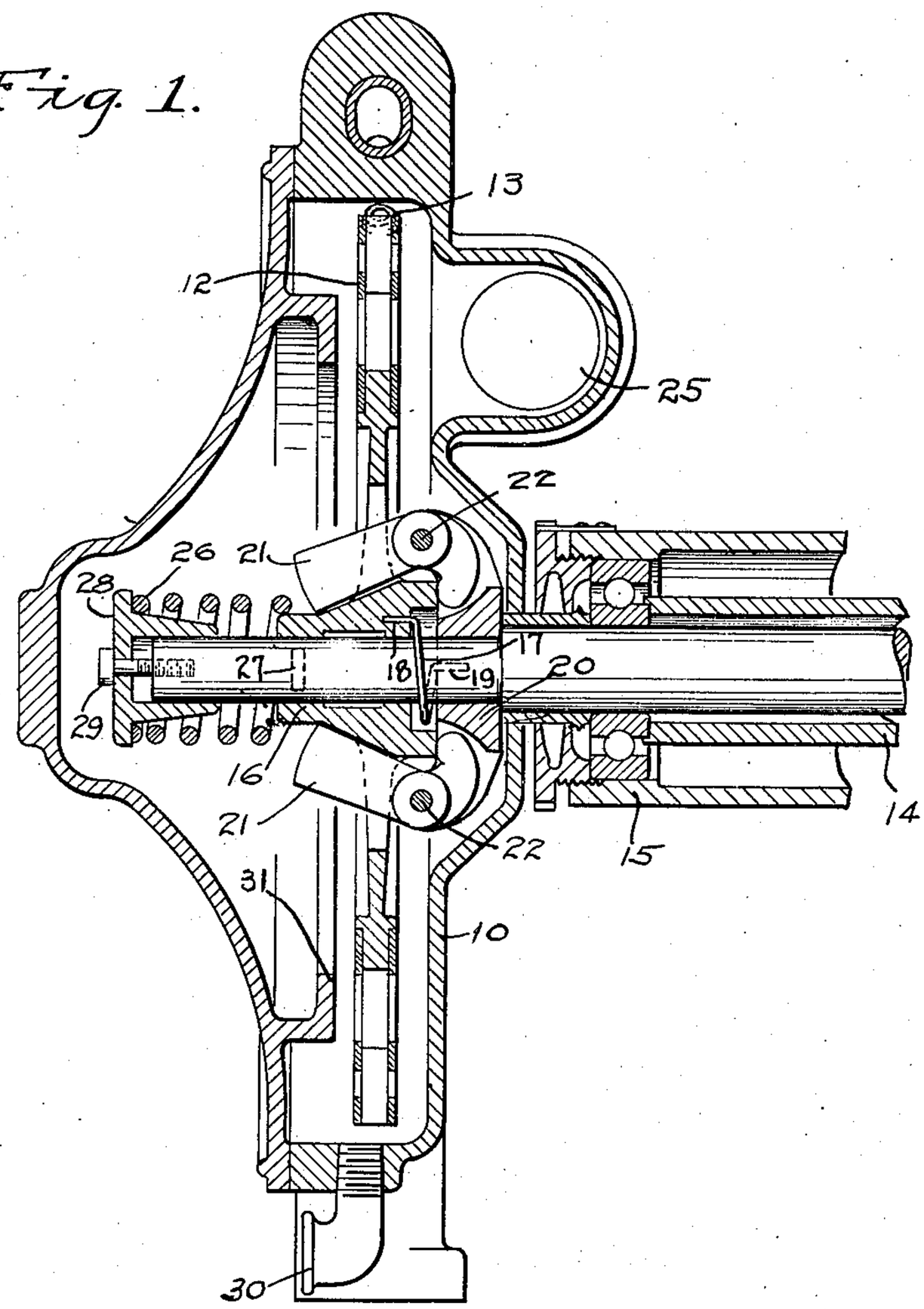
APPLICATION FILED AUG. 9, 1915.

1,167,018.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

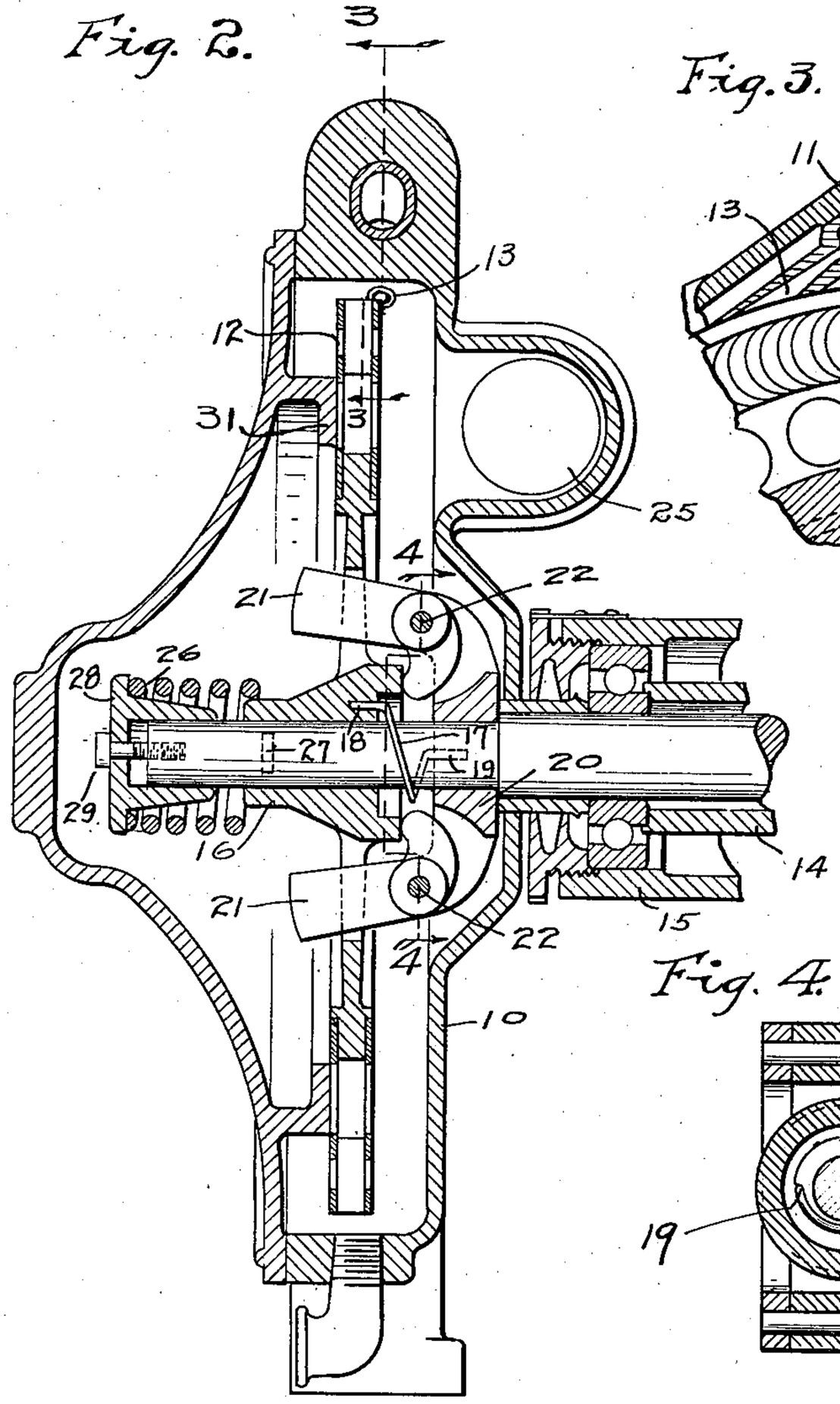


Fig. 3.

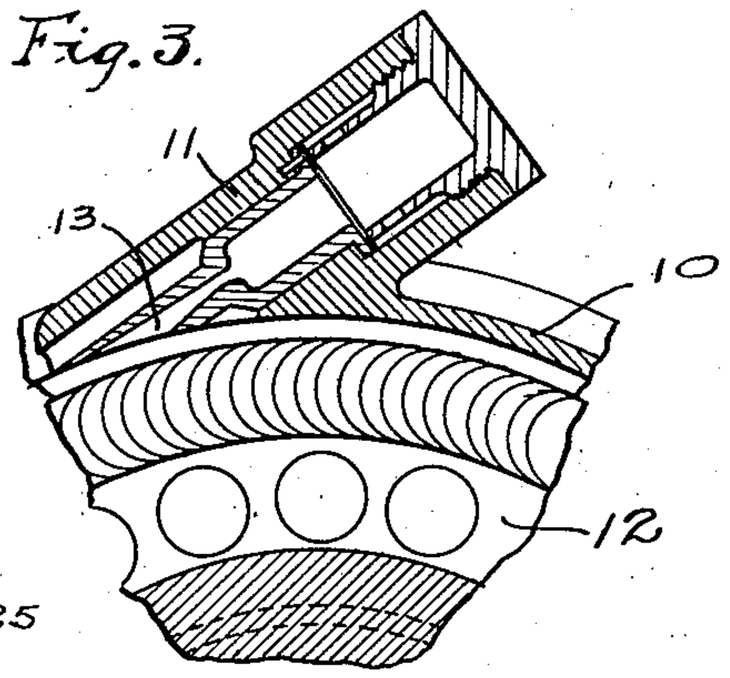
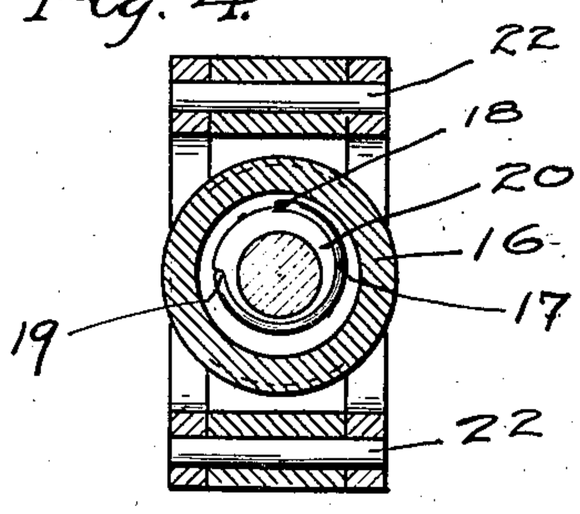


Fig. 4.



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TURBINE.

1,167,018. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed August 9, 1915. Serial No. 44,636.

To all whom it may concern:

Be it known that I, ROBERT H. PYLE, a citizen of the United States, and a resident of Indianapolis, county of Marion, and State of Indiana, have invented a certain new and useful Turbine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like letters refer to like parts.

The object of this invention is the automatic regulation or control of the speed of a steam turbine, whereby when the speed becomes excessive, its actuation will be reduced.

Said invention relates to that sort of turbine device wherein the turbine wheel is slidable in the casing longitudinally of the shaft so as to be moved into or out of registry with a nozzle through which the incoming steam or other fluid under pressure reaches and acts upon the periphery of the turbine wheel.

One feature of the invention consists in mounting a centrifugal weighted governor lever on the shaft or non-slidable means mounted on the shaft for engaging and acting on the turbine wheel to effect its sliding movement when the speed becomes excessive and thus move the wheel so as to reduce the extent of its registry with the nozzle and diminish the effect on the same of the incoming fluid under pressure.

The invention also includes the combination with the foregoing, of a spring to resist the sliding movement of the wheel and also a spring for coupling the wheel with the shaft, whereby the wheel will be permitted to have such sliding movement and yet effectively transmit power to the shaft.

The invention has been made with particular reference to its use in connection with electric head lights for locomotives and the like, although the invention is not limited to such use. Heretofore in devices of the kind, the governor valve has been employed to control the amount of steam or fluid under pressure to go through the turbine. The trouble with such mechanism was that the valve was very liable to stick and fail to operate because of the lime or foreign matter in the water and steam. With this present device such difficulty cannot possibly arise as the steam is absolutely unobstructed at all times and there is no condition which would prevent the lateral movement of the turbine wheel so that this invention prevents any stoppage or ineffective operation of the turbine and it operates with uniformity and is correspondingly more durable.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings, Figure 1 is a central longitudinal section through the device with the parts in their idle or normal positions. Fig. 2 is the same with the parts in position after the speed becomes too high. Fig. 3 is a section on the line 3—3 of Fig. 2. Fig. 4 is a section on the line 4—4 of Fig. 2.

There is shown herein a turbine casing 10 of usual type having a nozzle 11 connected with the upper part thereof for the admission of steam or other fluid under pressure tangentially of the casing and of the turbine wheel 12 in the casing. The nozzle opening 13 as it enters the casing is located substantially midway of the periphery thereof, as indicated in Fig. 1.

One end of the shaft 14 to be driven by the turbine wheel is mounted in the casing and in suitable bearings 15 outside of the casing. The end of the shaft within the casing is reduced somewhat and the hub 16 of the turbine wheel is slidably mounted on it and is operably connected with the shaft by a spring 17 extending partially around the shaft and with one end 18 secured to the hub of the turbine wheel and the other end 19 secured within a fixed frame 20 which is secured on the shaft so as to revolve therewith and which carries the centrifugal governor weights 21. These weights are pivoted between their ends to said frame 20 at 22 and so that the inner or short arms of the governor weights will engage the hub of the turbine wheel. When the governor weights are actuated centrifugally under excessive speed, the short arms thereof will slide the turbine wheel to the left from the position shown in Fig. 1 to the position shown in Fig. 2.

Normally the periphery of the turbine wheel registers with the opening 13 from the nozzle so as to obtain the full force and effect of the incoming steam. After the speed becomes excessive and as the turbine wheel

is moved laterally by the governor weights, the degree of registry between the nozzle and the turbine wheel will be gradually reduced so as to correspondingly reduce the action or effect on the wheel of the incoming steam. And the reduction of such action and effect becomes greater and greater as the wheel becomes still further out of registry with the nozzle until it may move so far as not to be influenced by the incoming steam.

When the turbine wheel is wholly or partially out of registry with the steam nozzle, steam passes out through the exhaust port 25 in the upper part of the casing. The turbine wheel is held in its normal position and the centrifugal action of the governor weights is resisted or counteracted by a spiral spring 26 which surrounds the shaft with one end lying against a pair of lugs 27 on the hub of the turbine wheel and the other end against a cap 28 adjustably secured to the end of the shaft 14 by a set screw 29. By adjusting the screw 29 the tension of the spring 26 may be adjusted.

The operative connection between the turbine wheel and the shaft, whereby the wheel will drive the shaft, through the instrumentality of the spring 17 is important. With such spring connection the turbine wheel is freely slidable on its shaft whereas if the hub of the turbine wheel were splined on the shaft, the friction between the wheel and the shaft would be so great as to oppose or interfere with the movement of the turbine wheel under the influence of the centrifugally operated governor weights. At the lower end of the casing there is a drainage opening 30.

Thus with this mechanism there is no restriction of the steam nozzle and, therefore, it enters with full and uniform force at all times. There is nothing to interfere with the movement of the turbine wheel by the governor weights and even the steam pressure against the governor for propelling the same does not resist the sliding movement under the influence of the governor weights. As the turbine wheel moves laterally in one direction or the other, the spring 17 adjusts itself, as shown in Figs. 1 and 2. Thus in Fig. 2, it has yielded to the movement of the turbine wheel and although the turbine wheel has been moved away from the frame 20, it can transmit power as effectually through said frame 20 to the shaft 14 as when the parts are in their normal position shown in Fig. 1. In other words, with such arrangement the ready and complete transmission of power from the turbine wheel to the shaft, regardless of the position of the turbine wheel on the shaft, is accomplished.

The sliding movement of the turbine wheel under the influence of the centrifugal movement of the governor weights is stopped or limited by a brake ring 31 which extends inward from the left hand side of the casing into proximity of the wheel, as shown. The chief function, however, of said brake ring is to check the rotation of the wheel when it comes in frictional contact with the brake ring until the speed of the wheel is reduced and the governor weights are returned or permit the wheel to return or, at least, move out of engagement with the brake ring.

The invention claimed is:

1. A turbine including a wheel adapted to be driven by steam or other fluid under pressure directed to the periphery thereof and said wheel being mounted so as to be laterally slidable, a nozzle for directing steam or other fluid under pressure tangentially to the periphery of the wheel when in normal position for driving the same, rotatable non-slidable means mounted near the wheel and so as to be rotated coaxially therewith, weighted levers mounted on said means in position to engage the side of the wheel and to be actuated by centrifugal force and when so actuated to give the wheel sliding movement and thus reduce the extent of registry of the peripherv of the wheel with the nozzle, and yielding means for returning the wheel to normal position.

2. A turbine including a shaft, a wheel mounted concentric with said shaft and adapted to be driven by steam or other fluid under pressure directed to the periphery thereof and said wheel being mounted so as to be laterally slidable along said shaft, a nozzle for directing steam or other fluid under pressure tangentially to the periphery of the wheel when in normal position for driving the same, means for transmitting power from the wheel to the shaft which permits the sliding movement of the wheel with reference to the shaft, a frame secured on the shaft beside the wheel, governor weighted levers fulcrumed between their ends to said frame and arranged so as to be actuated by centrifugal force and when so actuated to engage and move the wheel slidably along the shaft, and yielding means for returning the wheel to its normal position in opposition to the action of the governor weighted levers.

3. A turbine including a shaft to be driven, a turbine wheel adapted to be driven by steam or other fluid under pressure being directed to its periphery and mounted on said shaft so as to be laterally slidable, a nozzle for directing the steam or other fluid under pressure to the periphery of said wheel when in normal position, governor weights adapted to be centrifugally operated for moving said wheel under high speed laterally out of registry with said nozzle, yielding means for resisting such movement of the wheel, and spring means for the trans-

mission of power from the wheel to the shaft which permits such lateral movement of the wheel.

4. A turbine including a shaft to be driven, a turbine wheel adapted to be driven by steam or other fluid under pressure directed to its periphery and mounted on said shaft so as to be laterally slidable, a frame secured to said shaft near said wheel, a nozzle for directing the steam or other fluid under pressure to the periphery of said wheel when in normal position, governor weights carried by said frame so that when actuated they will engage the wheel and slide it laterally out of registry with said nozzle, a spring secured at one end to said frame and extending circumferentially of said shaft and secured at the other end of said wheel for transmitting power from the wheel to the shaft, and a spring for resisting the sliding movement of the wheel.

5. A turbine including a casing, a nozzle in the periphery of the casing for the admission of steam or other fluid under pressure, a turbine wheel within the casing adapted to be driven by steam or other fluid directed to the periphery so as normally to be in registry with said nozzle, speed influenced means for laterally moving said turbine wheel out of registry with said nozzle, a spring tending to resist such sliding movement of the wheel, and a brake connected with the casing in position to be engaged by the wheel when it has been moved laterally out of registry with the nozzle for checking its rotation.

6. A turbine including a casing, a nozzle in the periphery of the casing for the admission of steam or other fluid under pressure, a turbine wheel within the casing adapted to be driven by steam or other fluid directed to the periphery so as normally to be in registry with said nozzle, speed influenced means for laterally moving said turbine wheel out of registry with said nozzle, a spring tending to resist such sliding movement of the wheel, and a brake ring connected with the casing and in position to be engaged by the side surface of the wheel when it has been moved laterally out of registry with the nozzle in order to check its speed, substantially as set forth.

In witness whereof, I have hereunto affixed my signature in the presence of the witnesses herein named.

ROBERT H. PYLE.

Witnesses:
J. H. WELLS,
R. G. LOCKWOOD.