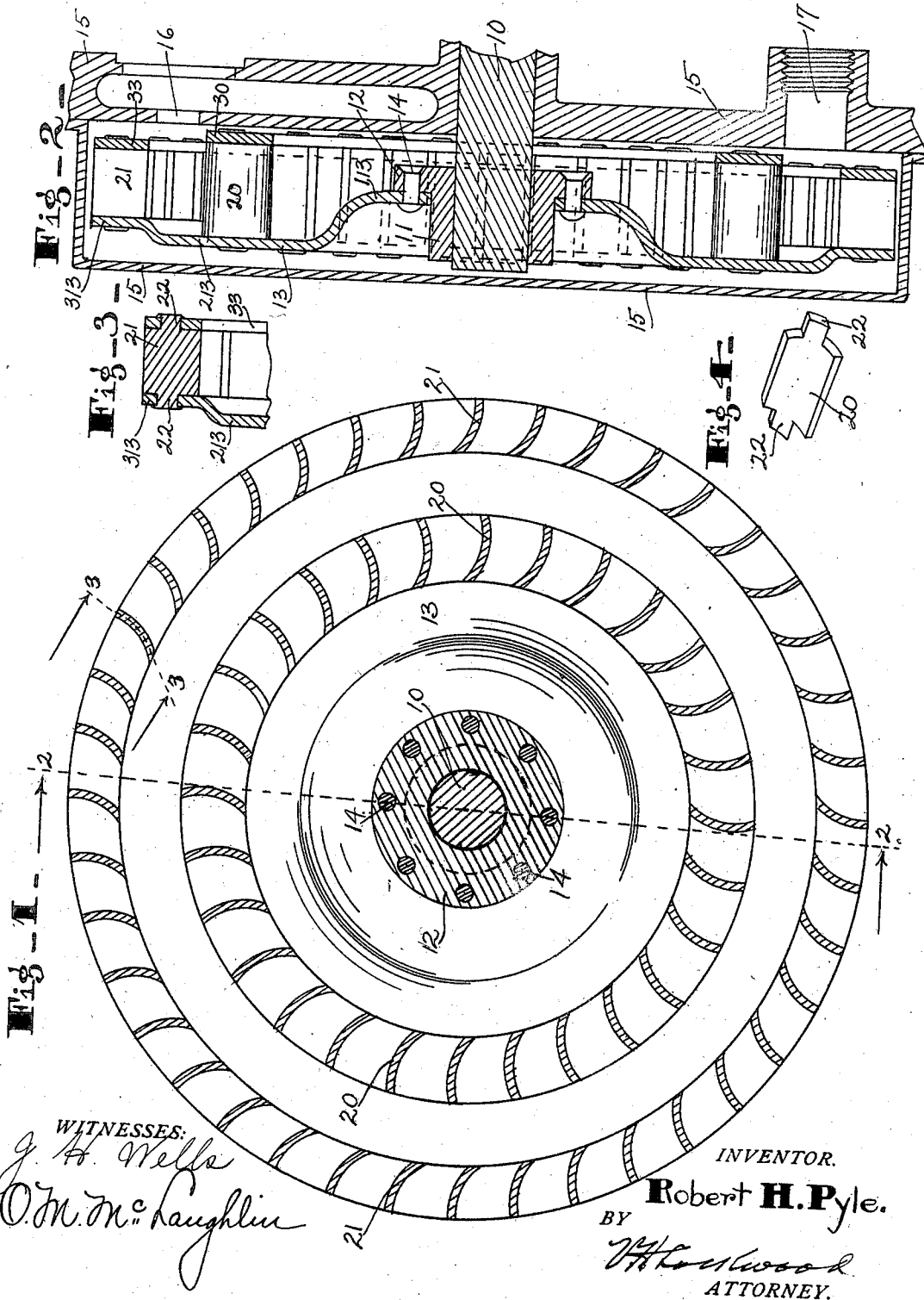


1,036,708.

Patented Aug. 27, 1912.



WITNESSES:

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STEAM-TURBINE.

1,036,708.

Specification of Letters Patent. Patented Aug. 27, 1912.

Application filed July 25, 1910. Serial No. 573,644.

To all whom it may concern:

Be it known that I, ROBERT H. PYLE, of Indianapolis, county of Marion, and State of Indiana, have invented a certain useful Steam-Turbine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

The object of this invention is to provide improvements in steam turbine or rotary engines which will strengthen and tend to maintain durably the shape of the revolving wheel carrying the buckets in spite of the influences of centrifugal forces while at high speed. To that end the body of the revolving wheel is made of a plate in disk form with the central portion pressed or bent so as to occupy an intermediate position in the casing, although the outer portion of the plate lies to one side of the chamber in the casing so as to carry the buckets. In other words, the wheel is mounted on the shaft with its central portion in a plane that will maintain the centrifugal balance of the wheel during the operation thereof.

Another object is to facilitate the construction of such devices.

The nature of the invention will be understood from the accompanying drawings and the following description and claim.

In the drawings Figure 1 is a side elevation of the steam turbine wheel and a transverse section through the shaft and a hub. Fig. 2 is a section on the line 2—2 of Fig. 1, but showing also a portion of the casing. Fig. 3 is a section on the line 3—3 of Fig. 1. Fig. 4 is a perspective view of one of the buckets before it is assembled with the rest of the wheel.

There is shown herein a shaft 10 to which a hub 11 is secured in any suitable way. In the form herein it is shrunk on the shaft and has an extended radial flange 12 to which the turbine wheel plate 13 is secured by bolts or rivets 14. The wheel operates within a fixed casing 15 which has a steam inlet port 16 and an exhaust port 17. The plate 13 is a circular disk which is pressed or formed so that portions thereof lie in three planes. The inner portion 113 surrounds and is secured to the hub substantially midway between the two side walls of the casing, and, therefore, lies in a plane substantially midway between the two sides of the steam turbine wheel as a whole. Beyond the inner

and central portion 113 the plate is bent laterally to form the major portion 213 thereof which lies close to one side wall of the casing 15 and to which one set of buckets 20 are secured. The outer portion 313 of the plate 13 is again bent inwardly somewhat to a plane which lies between the planes of the portions 113 and 213, and this outer portion carries the outer series of buckets 21. The buckets 20 and 21 are secured at one of their ends to the portions 213 and 313, respectively, of the wheel 13, and at their other ends said buckets are secured respectively to the rings 30 and 31.

The turbine wheel as a whole, therefore, may be said to consist of the hub 11, the plate 13 with its three portions 113, 213 and 313, the two rings 30 and 31, and the intermediate buckets 20 and 21, as these are all rigidly secured together into one structure which is fixed on the shaft 10 and revolves under the impact of the steam entering the casing 15. The plate forming the portions 113, 213, and 313 of the wheel is relatively thin so that the wheel may be made light, and yet by securing the inner portion 113 to the shaft at a point about midway of the planes through the portions 213 of said plate and the ring 30, which are the two lateral planes of the wheel as a whole, the centrifugal force while the wheel is at high speed will not tend to unbalance the wheel or throw it to one side or the other out of the intended position and into engagement with the walls of the casing. Thus, if the plate 13 were straight and secured to the shaft near one side of the casing 15, under a high speed, the centrifugal force would throw the outer portion of the turbine wheel to the left from the position shown in Fig. 2 into engagement with the casing, and that would seriously injure the success of the device in operation and use. As it is shown in Fig. 2, the wheel as a whole will maintain its parts in the same plane under the highest speed that it does while stationary. In other words, it is so constructed and arranged that it is not caused by centrifugal force to move laterally in either direction to any extent but will maintain its centrifugal balance.

The buckets, both 20 and 21, are formed as shown in Fig. 4, consisting of a body portion with a lug 22 at each end. The entire bucket may be stamped or cut out of

a single plate, as the lugs 22 are in the same plane longitudinally as the body of the bucket. The plate 13 and the rings 30 and 31 are provided with suitable holes through them to receive the lugs 22 of the buckets, as shown in Fig. 3, and after the parts are assembled the ends of the lugs are offset so that the buckets are riveted into permanent connection with the plate and rings.

10 I claim as my invention:

In a steam turbine, the combination with a casing provided at one side with inlet and exhaust ports, and a shaft associated therewith, of a hub mounted upon said shaft and provided with an attaching flange, an imperforate disk carried by said flange and arranged at the side of said casing remote from the inlet and exhaust ports, the central portion of said plate being pressed inwardly, whereby to occupy a plane at substantially the middle of the casing, the pe-

ripheral edges of said plate occupying a plane beyond the plane occupied by said central portion, and the portion of said plate intermediate the central portion and the peripheral edges being pressed outwardly to occupy a plane beyond the plane occupied by the peripheral edges, buckets carried by the peripheral edge portions and the portion intermediate the peripheral edge portions and the central portion, and rings carried by the end portions of the buckets adjacent to the inlet and exhaust ports.

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

ROBERT H. PYLE.

Witnesses:

G. H. BOLN,
J. H. WELLS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."