Oct. 7, 1947. S. C. WATSON 2,428,728

TURBINE WHEEL

Filed May 18, 1944

Fig. 3

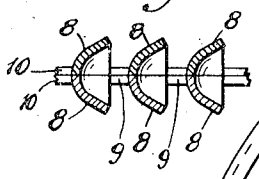


Fig. 1

Fig. 2

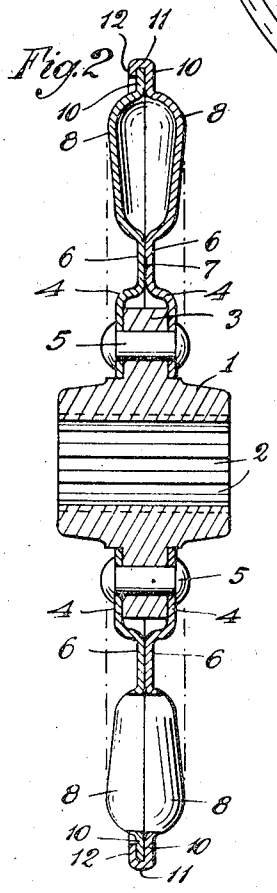


Fig. 5

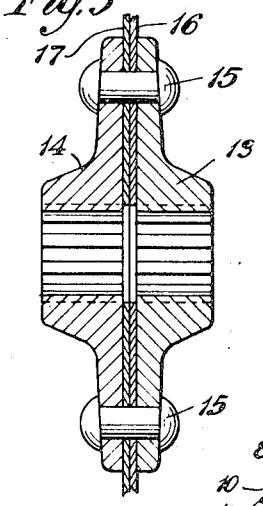


Fig. 6

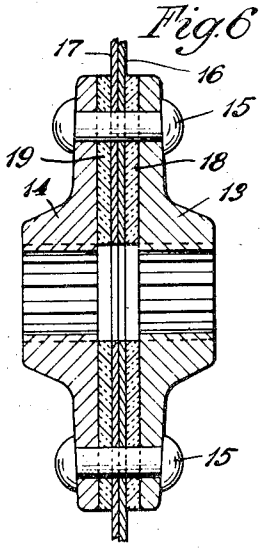
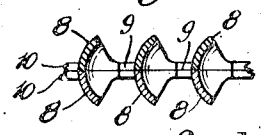


Fig. 4



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TURBINE WHEEL

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5 Claims. (Cl. 253—39)

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This invention relates to a turbine wheel of a type which may be used with gas or liquid or a mixture of gas and liquid as the driving or propelling means.

It has for one object to provide such a turbine wheel of inexpensive construction and particularly to provide a wheel formed by stampings. Heretofore turbine wheels have been made of many parts in which particularly the buckets or blades have been separately made and thereafter secured to the body of the wheel by welding, brazing, riveting or by other mechanical means and this has involved an expensive construction because of the relatively large amount of work necessary not merely in forming but in assembling the many parts of such a wheel and in thereafter truing the wheel or balancing it.

It is, therefore, one object of the present invention to make a turbine wheel of the minimum number of parts and to reduce the amount of work involved in making, finishing and balancing the wheel.

Another object is to make such a wheel of a minimum number of parts and form the parts by stamping so that they are both accurate and are ready for assembly upon the completion of the stamping or forming operation.

Other objects will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings wherein:

Figure 1 is a side elevation of a wheel made according to the present invention;

Figure 2 is a transverse section taken at the line 2—2 of Figure 1;

Figure 3 is a section in detail showing the form of blades or buckets best adapted for a liquid turbine;

Figure 4 is a similar detail showing the forms of blades or buckets best adapted for a gas turbine;

Figure 5 is a view showing a modified form of hub arrangement; and

Figure 6 is a view similar to Figure 5, showing a further modification of the hub.

Like parts are designated by like characters throughout the specification and drawings.

In the particular form here shown the wheel comprises a hub 1 having a central perforation and provided with grooves 2 by means of which it may be readily secured to a shaft or other part. The hub is preferably provided with a laterally extending flange 3. The turbine wheel proper comprises in effect two separately formed or

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stamped wheel portions with which the turbines or blades are integral. Each of the wheel portions is provided with a relatively flat portion 4. When assembled these portions are preferably parallel to each other and are separated from each other by a distance equal to the thickness of the hub flange 3. They are positioned one on each side of the flange and are secured thereto by rivets 5 or otherwise. Beyond the riveted portion the wheel members are shaped with relatively flat areas 6, 6 which are in contact with each other as shown particularly in Figure 2 and may be secured together by spot-welding 7 or by other means or by continuous welding.

Each of the wheel members is shaped to provide one half of a bucket or blade so that when the two mating wheel members are assembled face to face, a series of complete buckets or blades is adequately formed. Each wheel member includes a series of radially arranged half buckets or blades. As shown in the figures these comprise the members 8, 8. Intermediate the members 8, each wheel is cut away as at 9. Outwardly beyond the buckets and cut away portions 9, each wheel is provided with a ring like flange or peripheral section 10. The sections 10 are, as shown, in contact with each other and in substantially co-planar relationship with the area 6. The peripheral sections 10 may be secured together by welding, riveting or otherwise but in the form here shown one of the members 10 is provided with an extension 11 which is bent about the other member 10 as at 12 and thus serves to tie the edges of the two wheel portions together. The member 12 may be welded in place, brazed, riveted or otherwise secured or the mere forming of this shape in the form here shown may be sufficient to hold it in the position required and to hold the parts tightly together.

In general the device as above described comprises a hub which may be formed of cast, forged or otherwise produced material of the desired shape and two wheel members which are substantially alike and which when put together are in effect mating members or rights and lefts to produce cooperatively the complete wheel with its series of complete blades or buckets. In general the two wheel members are formed by stamping or a similar operation.

Prior to the stamping operation the wheels may comprise merely flat discs. They are then shaped into the profile shown and the buckets are formed by punching operations. The exact means for forming the wheel members and the exact sequence of the forming operations form

no essential part of the present invention and the forming and punching operations may be carried out successively in a varying number of steps or in a single step. Correspondingly the assembly may be carried out in more than one way, but in general after the wheel members are formed they are assembled on the hub and against each other and are secured in place on the hub and to each other.

After the wheel is completed it may be partially or wholly plated or otherwise coated with metal or other material designed to resist abrasion, corrosion, shock, wear or damage of any sort. One suitable coating medium is chromium which may be applied by electro-plating or in any other well known chromium plating, coating or alloying.

The turbine wheel of the present invention may be used either with a liquid or a gas as the propelling means and may be associated with any desired nozzle construction. It may be used in any desired type of housing. One use for which this wheel is particularly adapted is that in connection with a supercharger for an internal combustion engine in which the turbine is driven by the exhaust gases. Such gases are generally available at a very high temperature and the wheel is shaped and coated, plated or otherwise treated to resist such temperatures or the entire device may be made of stainless or other steels which are in themselves without further treatment highly resistant to high temperatures and to wear and damage of the sort incident to the use of an exhaust turbine. Since the wheel itself is not limited in its use, however, to an exhaust turbine, it is shown merely by itself without any particular association with any other mechanism.

In Figure 5 a modified form of hub construction has been shown. As there shown a two part hub formed of parts 13 and 14 is illustrated. These hub parts or sections are secured together by rivets 15 or otherwise. The turbine wheel members are positioned between the hub sections and are held or gripped between them. As shown in Figure 5 only the inner portion of the turbine wheel members are shown and for purposes of illustration, these are numbered 16 and 17. They are perforated to receive the rivets 15 which secure the hub sections together. The hub may be of any desired diameter relative to the other parts of the assembly. If the hub parts are of sufficient diameter they may embrace a substantial part of the area of the wheel members and in that case such securing means as the spot-welding 7 of Figures 1 and 2 or other similar securing means may be omitted and the hub sections will form the entire means for securing the wheel members together except the means which are used to secure the wheel members at or adjacent their peripheries.

In the modified form of Figure 6 the structure is the same as that shown in Figure 5, except that two spacing means 18 and 19 have been added between the two hub members 13 and 14 and the wheel members 16 and 17. The members 18 and 19 are preferably formed of heat-insulating material, or at least of material which is a poor conductor of heat and they thus serve, when in the position of Figure 6, to make the transmission of heat from the buckets through the wheel structure to the axle and the bearings less effective and hence to simplify the problem of the bearing construction and heat control.

Although I have shown an operative form of my invention, it will be recognized that many changes in the form, shape and arrangement of

parts can be made without departing from the spirit of the invention, and my showing is therefore to be taken as, in a sense, diagrammatic. In particular, the construction does not require a separate hub. The wheel members might be fastened directly to a shaft or other support, or might themselves be shaped to produce a hub. The invention is not, however, limited to a construction in which a specific hub piece is provided.

I claim:

1. In combination in a turbine wheel, a hub, a pair of sheet-like wheel members, each of said members shaped to provide portions embracing said hub, means securing said members to said hub, said members each being provided with a radially directed continuous peripheral flange, the flange of one of said members being reversely bent and embracing the flange of the other of said members whereby to secure the peripheries of said members together, each of said members being shaped to provide one-half of a plurality of turbine blades, the said members positioned together so that the half blades of one member are positioned with respect to the half blades of the other member to form together a plurality of complete turbine blades.

2. In combination in a turbine wheel, a hub, a pair of sheet-like wheel members, each of said members shaped to provide portions embracing said hub, means securing said members to said hub and to each other at said hub, each of said members being provided with a continuous, radially directed, peripheral flange, the flange of one of said members being reversely bent and embracing the flange of the other of said members whereby to secure the members together continuously about the entire periphery thereof, each of said members being shaped to provide one-half of a plurality of turbine blades, the said members positioned together so that the half blades of one member are positioned with respect to the half blades of the other member to form together a plurality of complete turbine blades.

3. In combination in a turbine wheel, a hub, a pair of sheet-like wheel members, each of said members shaped to provide portions embracing said hub, means securing said members to the hub and to each other at said hub, each of said members being provided with a radially directed peripheral flange, the flange of one of said members being reversely bent and embracing the flange of the other of said members whereby to secure the peripheries of said members together, each of said members being shaped to provide one-half of a plurality of turbine blades, the said members positioned together so that the half blades of one member are positioned with respect to the half blades of the other member to form together a plurality of complete turbine blades, said members being cut away to provide radial spaces intermediate said blades, and each member being provided adjacent the hub with a concentrically disposed portion in substantially coplanar relation to the respective radially directed flanges of said members, said flanges and said co-planar, concentrically disposed portions of the members lying in face to face contact.

4. In combination in a turbine wheel, a hub, a pair of sheet-metal, unitary wheel members, each of said members shaped to provide portions embracing said hub, means securing said members to said hub and to each other at said hub, one of said members having its periphery engaged about that of the other of said members, each of said members being shaped to provide one-half

of a plurality of radially spaced turbine blades, the said members positioned together so that the half blades of one member are positioned with respect to the half blades of the other member to form together a plurality of complete turbine blades, said members being cut away to provide radial spaces intermediate said blades, each said member being provided with concentrically disposed portions respectively adjacent to the periphery thereof and adjacent to the hub, at opposite ends of said blades which portions are disposed in substantially co-planar face to face contact, and means securing contacting portions of the members together at a point intermediate the periphery thereof and the hub.

5. In combination in a turbine wheel, a pair of wheel members secured together about their peripheries, each of said members provided with a plurality of radially arranged cut away portions and provided intermediate said cut away portions with a plurality of radially arranged incomplete blade sections, said members when secured together being so positioned that each blade section of one member is positioned opposite a corresponding blade section of the other member, the two blade sections of each pair cooperating to form a complete symmetrical turbine blade, said members being shaped to provide substantially co-planar annular contacting portions disposed at opposite ends of said blade sections, and means securing annular contacting portions of said members together.

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