

No. 763,397.

PATENTED JUNE 28, 1904.

F. HODGKINSON & O. FRIK.

IMPULSE WHEEL FOR FLUID PRESSURE TURBINES.

APPLICATION FILED JUNE 8, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.

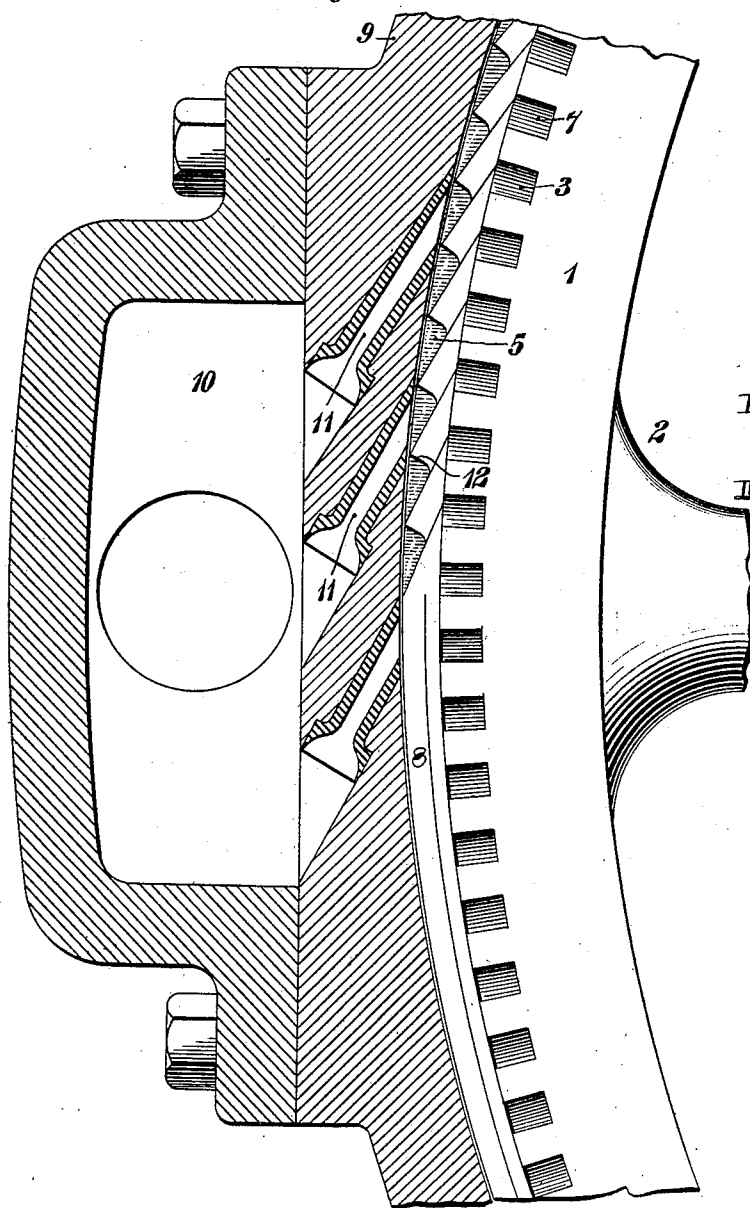
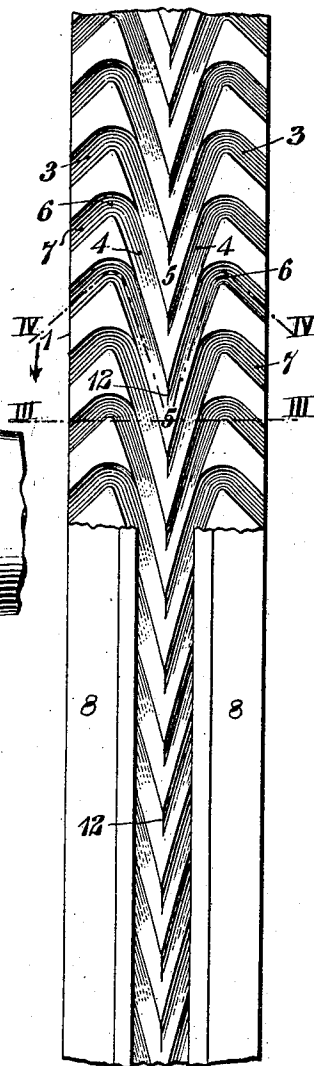


Fig. 2.



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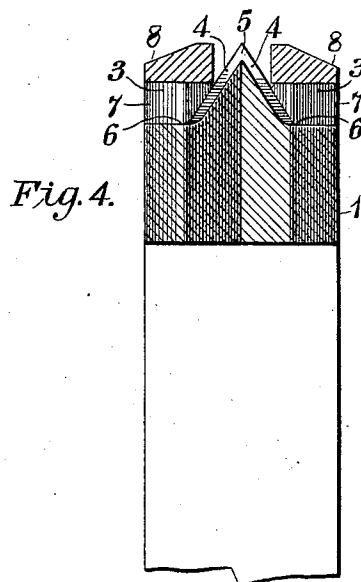
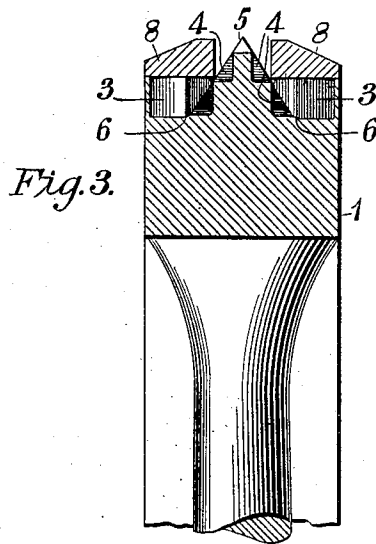
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UNITED STATES PATENT OFFICE.

FRANCIS HODGKINSON, OF EDGEWOOD PARK, AND OTTO FRIK, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO THE WESTINGHOUSE MACHINE COMPANY, A CORPORATION OF PENNSYLVANIA.

IMPULSE-WHEEL FOR FLUID-PRESSURE TURBINES.

SPECIFICATION forming part of Letters Patent No. 763,397, dated June 28, 1904.

Application filed June 8, 1903. Serial No. 160,609. (No model.)

To all whom it may concern:

Be it known that we, FRANCIS HODGKINSON, a subject of the King of Great Britain and Ireland, and a resident of Edgewood Park, and
5 OTTO FRIK, a subject of the Emperor of Germany, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Impulse-Wheels for Fluid-Pressure
10 Turbines, of which the following is a specification.

Our invention relates to impulse-wheels employed for utilizing the velocity of expanded fluid to produce rotary motion; and it has for
15 its object to provide a machine of this character which may be easily and cheaply constructed and which shall have unusual mechanical strength and durability in service.

In the accompanying drawings, illustrating
20 the invention, Figure 1 is a view, partially in section and partially in side elevation, of a portion of an impulse-wheel, its casing, and the steam-chest and distributing-nozzles forming a part of the casing. Fig. 2 is a plan view of
25 a portion of the wheel shown in Fig. 1, parts of the shrouding-rims being broken away. Fig. 3 is a sectional view on line III III, and Fig. 4 is a sectional view on line IV IV of
30 Fig. 2 looking in the direction indicated by the arrow adjacent to said figure.

The body or rim 1 of the impulse-wheel 2 is provided with a circumferential series of duplicate steam-receiving passages or buckets 3, the receiving portions 4 of which have common
35 inlet-openings 5 at the periphery of the wheel and diverge forwardly and at gradually-increasing depth to points 6, which, as here indicated, are approximately half-way between the central plane and the outer sides or faces
40 of the wheel, though the exact points at which the portions 4 of the passages terminate are not material.

From the points 6 the portions 7 of the passages extend outwardly and rearwardly to the
45 side faces of the wheel, either at a uniform or at varying depths, as may be desired. As here indicated, they are substantially of uniform

depth and those at one side are at approximately right angles to those at the other.

As here shown, the portions 4 and 7 of these
50 passages are of uniform width, since they are severally formed by means of a suitable milling-cutter, which moves and is suitably guided during the cutting operation from one end to
55 the other of the passage, so as to form it at a single operation. These passages may be of different form from that shown, however, it being feasible to make each of them of increasing width, either throughout its length or from
60 any desired point, such as the point 6, to the outer end. We have also shown the portions 7 of the passages and all but the inlet ends of the portions 4 as covered by shrouds 8, which
65 are placed in position after the passages are completed; but a stationary casing might be formed to so fit the wheel that the shrouds could be omitted.

The wheel is mounted in and rotates in a casing 9, which is provided with a steam-box
70 10 and with suitable nozzles 11, leading therefrom to the adjacent portion of the wheel periphery, the steam being expanded into and discharged from the nozzles at high velocity. As the steam is discharged it is divided by the
75 sharp edges 12, formed by the passages 4, and as it reaches the points 6 of the passages it imparts its velocity to the wheel and exhausts in a lateral and rearward direction through the
80 portions 7. The number of nozzles 11 may obviously be varied from what is shown and the form and relation of the several parts be otherwise modified within reasonable limits. For example, the steam-receiving passages
85 may extend to one side only of the wheel, instead of being duplicated, as shown. Such modification of structure would involve merely the omission of the passages at one side
90 of the central plane of the wheel and a corresponding adjustment of the discharge-nozzles. A single-flow wheel of course might also be made thinner than the double-flow wheel, and this would be generally desirable. It is to be also understood that the wheel here shown and described may be utilized either alone or in

conjunction with other steam-using means into which the steam is exhausted from the passages 7.

We claim as our invention—

- 5 1. An impulse-wheel having a circumferential series of fluid-receiving passages each of which extends from an inlet at the wheel periphery outwardly and forwardly at a gradually-increasing depth for a portion of its length and thence rearwardly to its outlet which is exclusively in the side surface of the wheel. 10
2. An impulse-wheel having a circumferential series of fluid-receiving passages each of which extends outwardly and forwardly at a gradually-increasing depth for a portion of its length and thence outwardly and rearwardly at an approximately uniform depth. 15
3. An impulse-wheel having a circumferential series of fluid-receiving passages each of which extends outwardly and forwardly at a gradually-increasing depth for a portion of its length and thence outwardly and rearwardly to its outlet which is exclusively in the side surface of the wheel. 20
- 25 4. An impulse-wheel having duplicate sets of fluid-receiving passages which diverge in pairs from common inlet-openings at the wheel

periphery and each of which extends forwardly at a gradually-increasing depth for a portion of its length and then rearwardly at a substantially uniform depth. 30

5. An impulse-wheel having duplicate sets of fluid-receiving passages which diverge in pairs from common inlet-openings at the wheel periphery and each of which extends forwardly for a portion of its length and thence rearwardly to the outlet which is exclusively in the side of the wheel. 35

6. An impulse-wheel having duplicate sets of fluid-receiving passages of uniform width which diverge in pairs from common inlet-openings at the wheel periphery and each of which extends forwardly at a gradually-increasing depth for a portion of its length and thence rearwardly at an approximately uniform depth to the outlet-opening at the side of the wheel. 40 45

In testimony whereof we have hereunto subscribed our names this 5th day of June, 1903.

FRANCIS HODGKINSON.

OTTO FRIK.

Witnesses:

BIRNEY HINES,

W. S. THOMPSON.