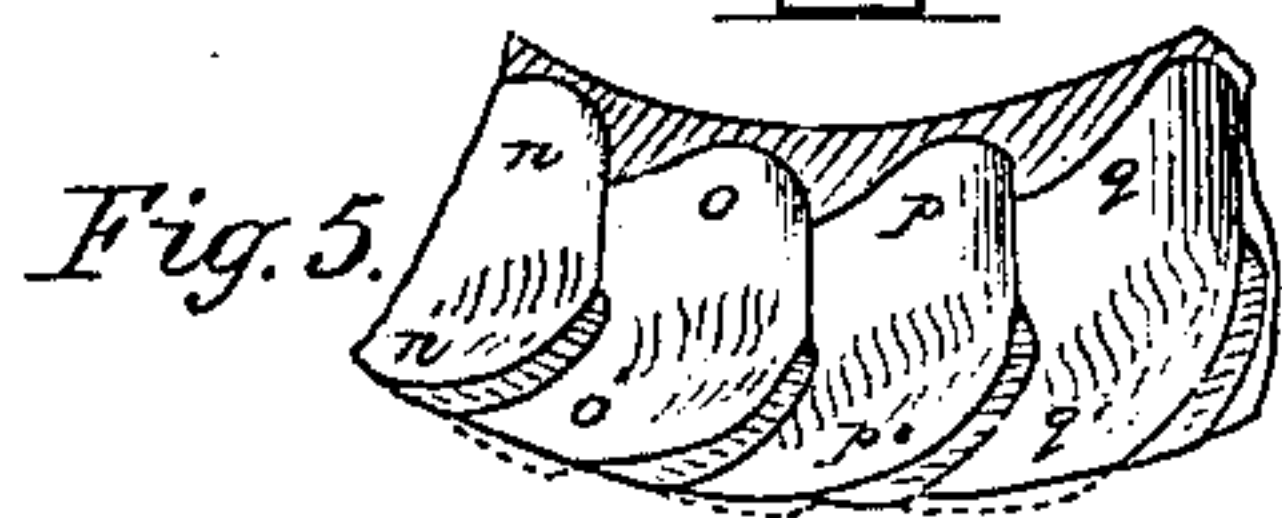
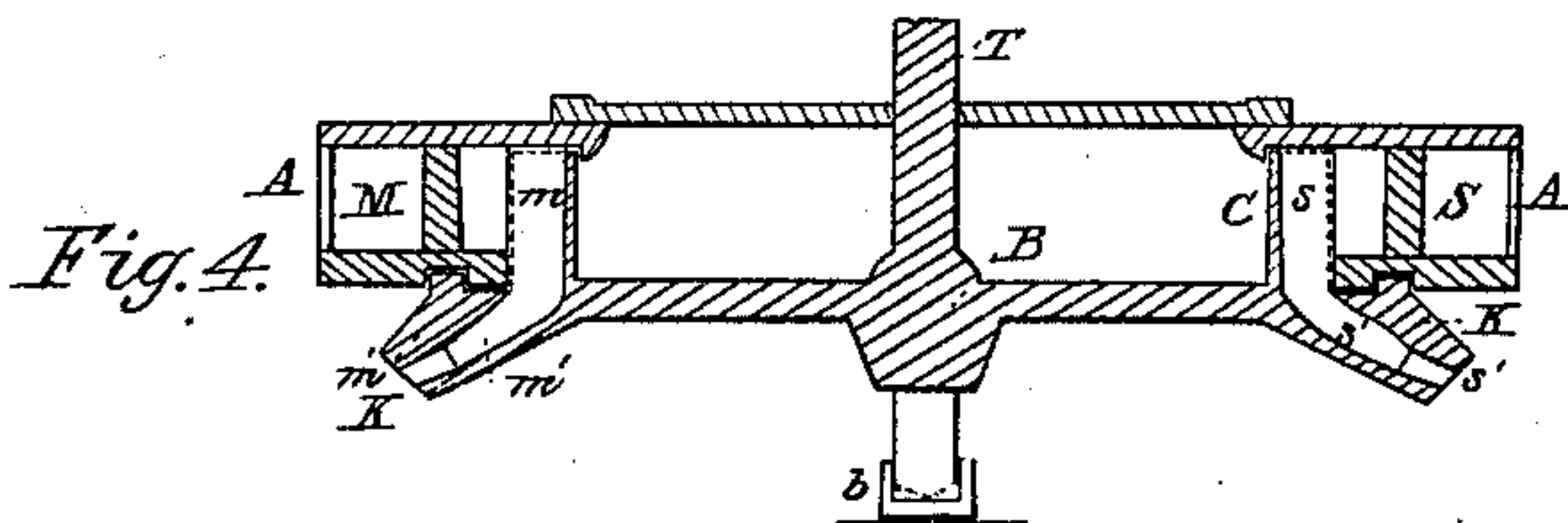
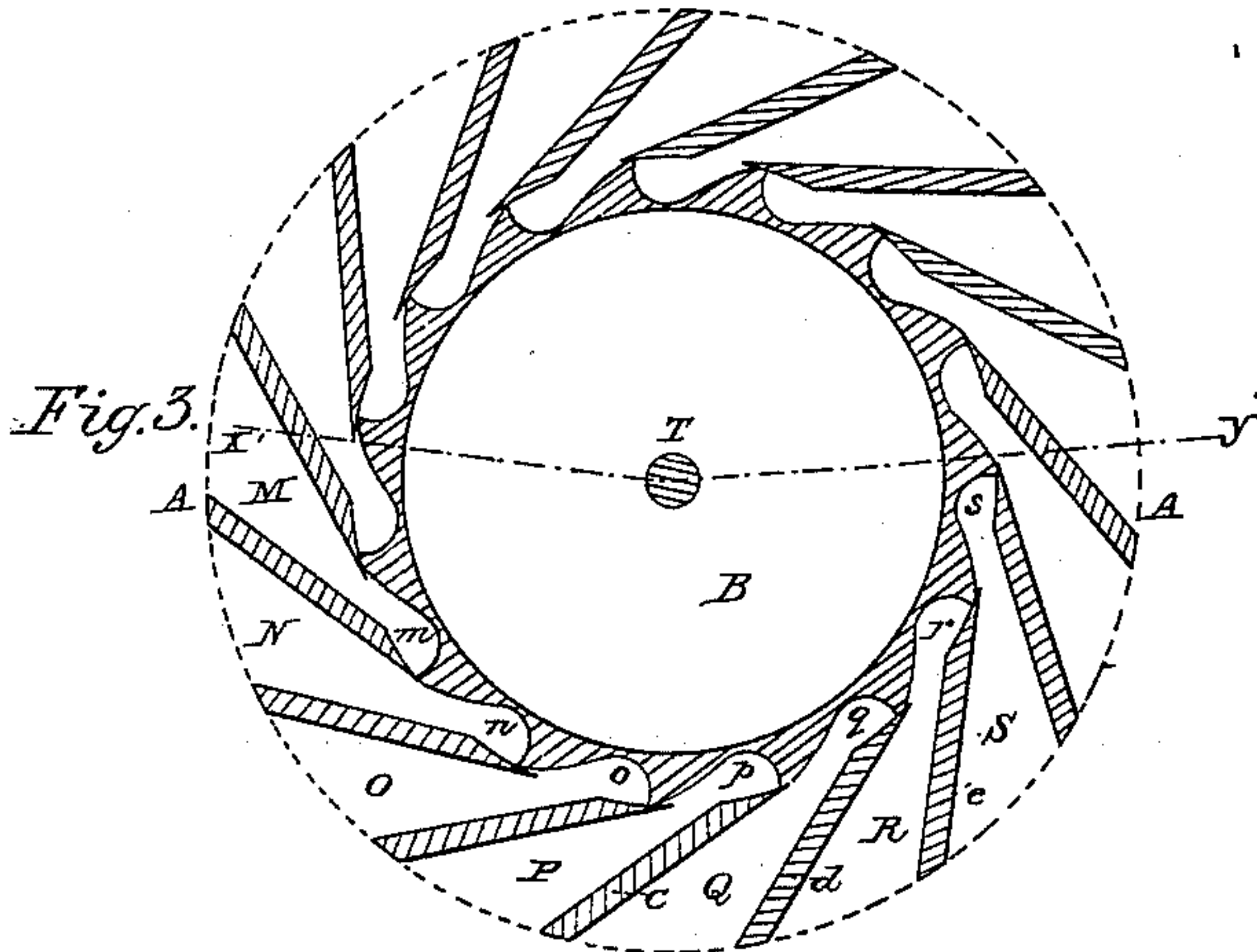
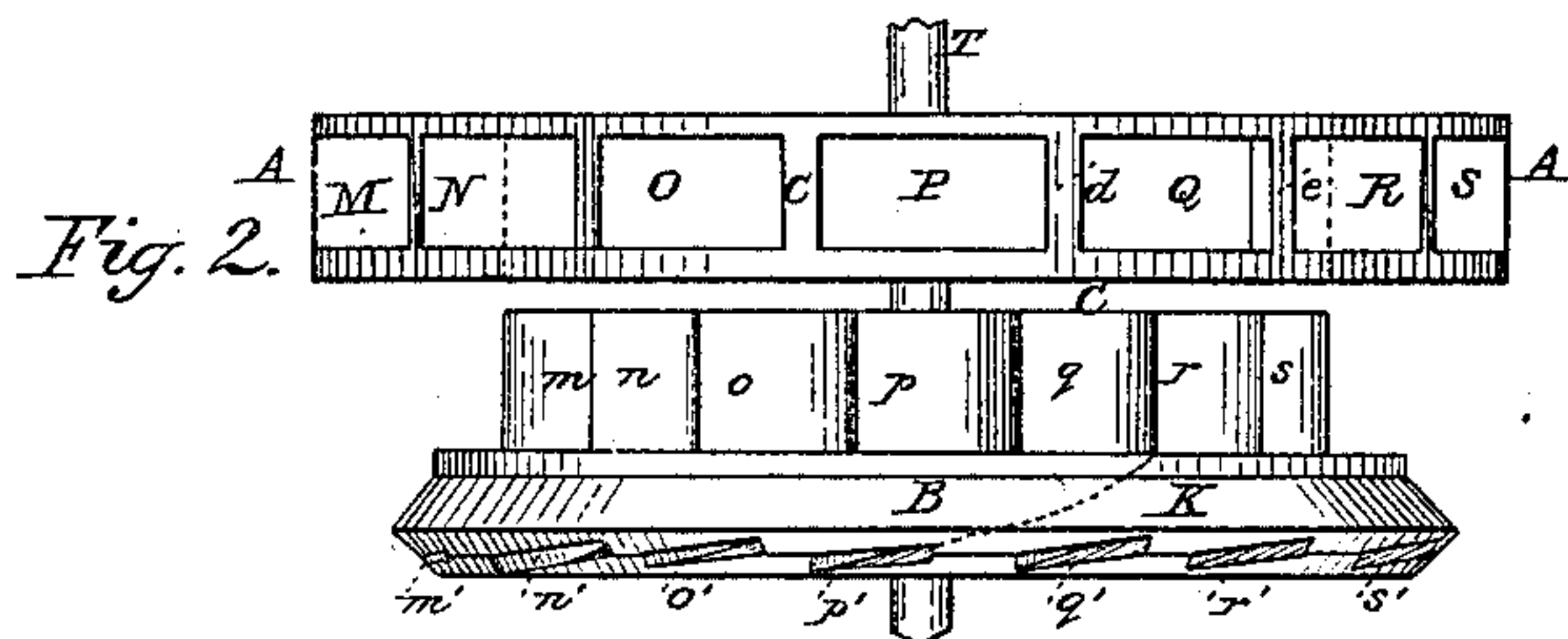
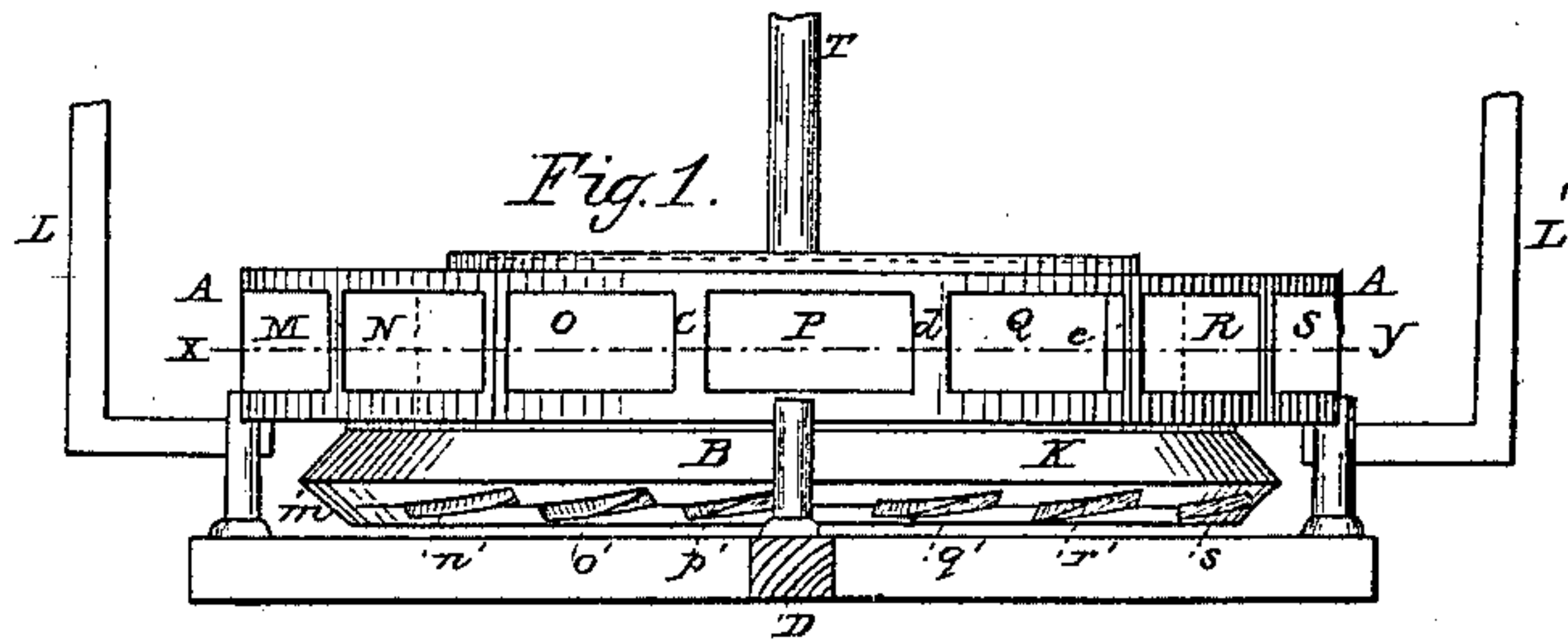


Frary & Sherwin

Turbine Wheel.

N^o 90,251.

Patented May 18, 1869.



Witnesses.

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NORMAN T. FRARY AND EZRA T. SHERWIN, OF ADRIAN, MICHIGAN.

Letters Patent No. 90,251, dated May 18, 1869.

IMPROVEMENT IN TURBINE WATER-WHEELS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern :

Be it known that we, NORMAN T. FRARY and EZRA T. SHERWIN, both of Adrian, in the county of Lenawee, and State of Michigan, have invented a new and useful Improvement in Turbine Water-Wheels; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, which will enable others skilled in the art to make and use our invention, reference being had to the annexed drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of our invention consists in an improved construction and arrangement of the parts of a turbine water-wheel, whereby both the direct action and reaction of the water upon the wheel are combined and applied in the most economical and practical mode.

To enable others skilled in the art to make and use our improved water-wheel, we will now proceed to describe its construction and operation.

In the drawings—

Figure 1 represents a side elevation of one of our improved water-wheels in working-position, and also a sectional view of the sides and floor of the flume, to which the stationary portion or chamber A A is fastened.

Figure 2 represents a side elevation of the chamber A A, raised above the wheel B, to reveal more clearly the mechanical construction of the buckets of the wheel.

Figure 3 is a horizontal section in the plane indicated by the line X Y, fig. 1.

Figure 4 is a vertical section in the broken plane indicated by the line X' Y', fig. 3.

Figure 5 is a sectional perspective view of a detached portion of the wheel, showing the shape of the buckets.

A A represent the chamber, which is open on the under side, to receive the buckets of the wheel, and is placed upon the floor of the flume L L', over a round opening sufficiently large to admit the wheel.

This chamber is supplied with an annular series of horizontal chutes, M N O P Q R S, for the passage of the water from the flume to the opening in the interior of the chamber, and against the buckets of the wheel.

B represents the water-wheel, and it consists of the bucket-rim C, a circumferential series of buckets, *m n o p q r s*, a circumferential series of issues, *m' n' o' p' q' r' s'*, and a conical cap, K, which forms a cover for the issues, and into which the recesses forming the issues extend.

T is the vertical shaft, and is permanently fixed in the wheel B, which revolves partly within and partly below the recess of the chamber A A.

The outer extremities of the buckets *m n o* are intended to just clear the inner extremities of the sides

c d e of the chutes Q R, so as to prevent friction, and at the same time wastage of water.

The wheel B is kept up in the recess of the chamber A A by means of a step, *b*, fig. 4, placed under the lower end of the vertical shaft.

The conical ring K, covering the issues of the wheel, has on its under or base side, slight excavations made in it, which help to form the covering or roof to the issues, while a portion of the wheel extending outward under the conical ring K, forms the main opening and floor of the issues.

The wheel is to be located at the bottom of the flume, the stationary part A A to be bolted firmly to the floor of the flume, as shown at fig. 1, the recess in the chamber falling directly over the opening in the flume, so that when the wheel is raised up into its proper place in the chamber, it will not interfere with the floor.

Although the issues *m' n' o' p'*, are described as being formed partly in the conical ring K, and partly in that portion of the wheel which projects under it, yet it is intended, if desirable, to form these issues wholly in the one, or wholly in the other, as may be deemed most advantageous.

This improved wheel of ours is designed to run as well when partly submerged as when wholly above the water, the reason being that there is no back-water hindrance to the buckets or to the issues.

It is designed to have a separate gate at the mouth of each one of the chutes M N O, so as to let the water on to the wheel through a single chute, or through any number of them at once.

The buckets *m n o p* are to be made perpendicular to the shaft T, while the issues *m' n' o'* are to take the water from the bottom of the buckets, and convey it downward and outward from the centre of the wheel, on an angle of about forty-five degrees, upon a curved and inclined plane, and discharge it at the outlet of the issues, the novelty and utility of the wheel consisting, chiefly, in the direction which the water is thus forced to take by, first, its direct action against the buckets *m n o p*, and second, its reaction in passing through the issues *m' n' o'*, throwing off neither horizontally, nor falling perpendicularly, but half way between the two, that is, on an angle of about forty-five degrees, as before stated.

The water has a direct and forcible bearing against the floor and forward wall of each issue at the same time, which, in connection with its direct action against the buckets, and its reaction in leaving the issues, constitutes the chief merit of this wheel.

The operation of the wheel, then, is as follows:

The chamber A A having been secured by bolts or otherwise, to the floor of the flume, and the wheel B placed in position, as shown in fig. 1, the water is then let into the flume, and one or more of the gates opened, when the water rushes into the chutes and against the

buckets *m n o p*, and forcing the wheel into rotation, discharging out through the issues *m' n' o'*.

Having thus described our invention,

What we claim as new, and desire to secure by Letters Patent, is—

The within-described direct and reaction turbine water-wheel, consisting of the chamber *A A*, provided with the chutes *M N O*, (including the annular series,) and the wheel *B*, revolving on a vertical axis, and provided with the perpendicular buckets *m n o*,

(including the annular series,) and oblique issues *m' n' o'*, (including the annular series,) the whole constructed and arranged to operate substantially as set forth and described.

NORMAN T. FRARY.
EZRA T. SHERWIN.

Witnesses:

N. B. FASSETT,
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