T. A. MACDONALD.

WATER WHEEL.

APPLICATION FILED AUG. 11, 1909.

967,402. Patented Aug. 16, 1910.

Fig. 1.

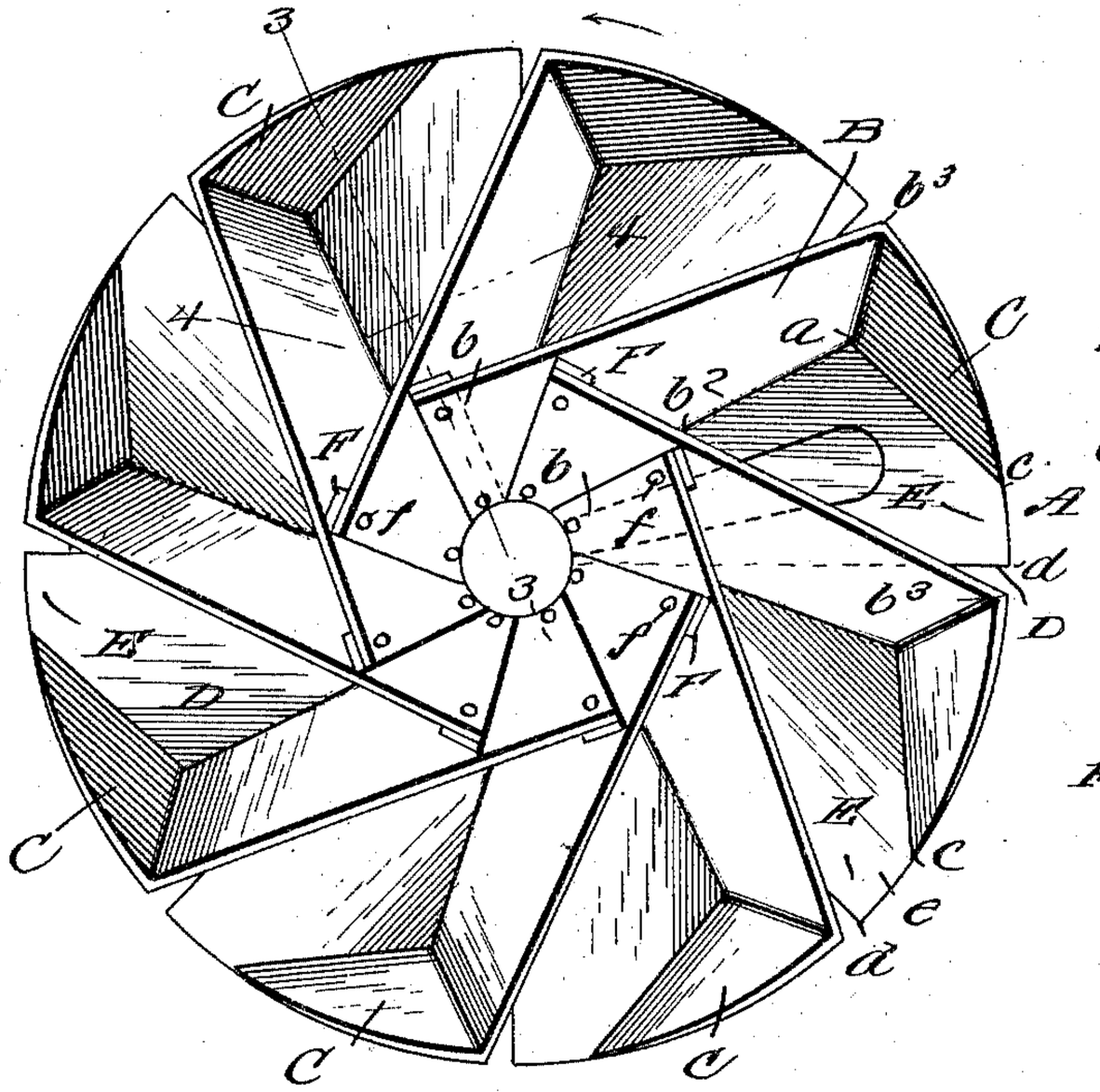


Fig. 2.

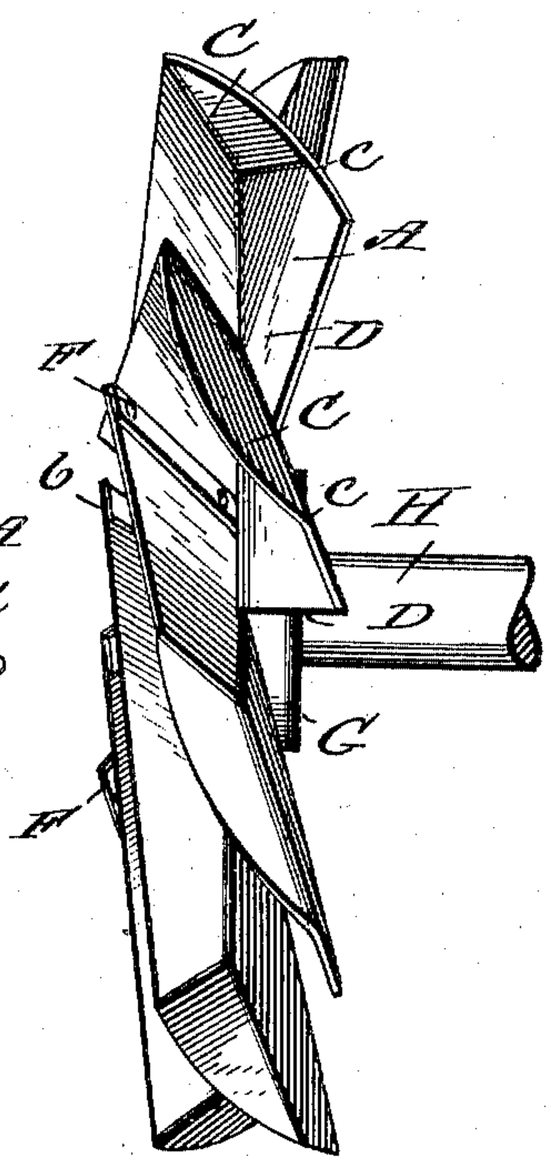


Fig. 3.

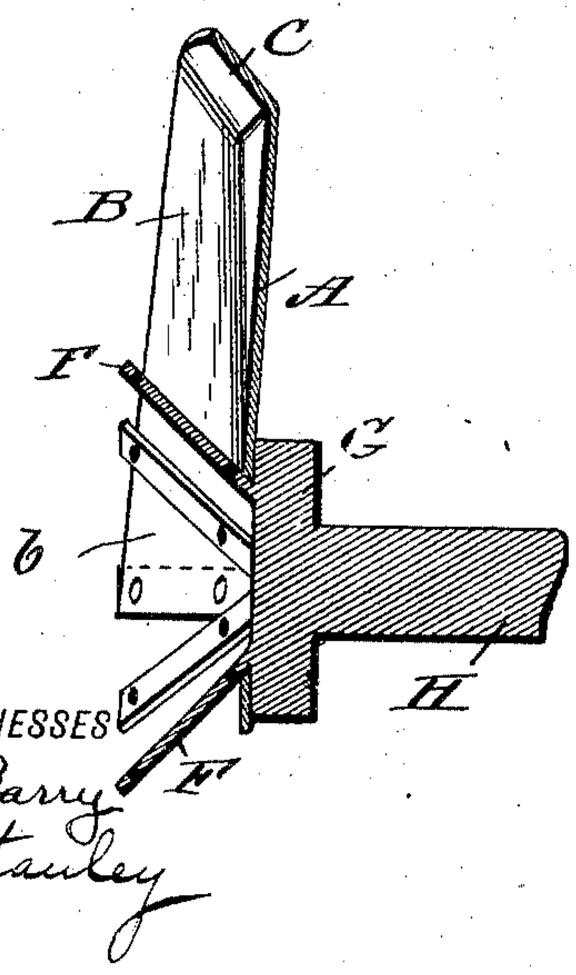
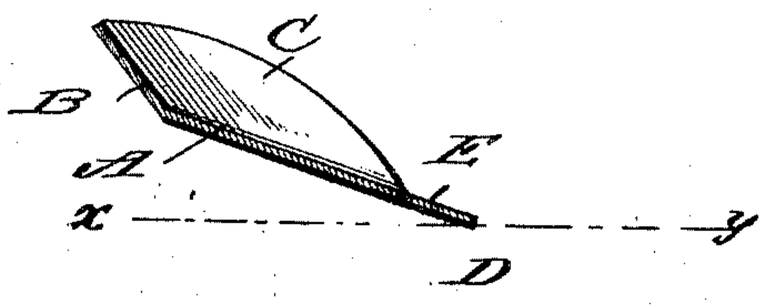


Fig. 4.



WITNESSES

H. C. Barry

L. A. Stanley

INVENTOR

THOMAS A. MACDONALD

BY Munn & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS A. MACDONALD, OF CLIFTON, NEW JERSEY, ASSIGNOR OF SIXTEEN AND ONE-THIRD ONE-HUNDREDTHS TO ISAIAH E. ZIMMERMAN, OF PATERSON, NEW JERSEY, SIXTEEN AND ONE-THIRD ONE-HUNDREDTHS TO WILLIAM H. CASTLES, OF KINGSLAND, NEW JERSEY, AND SIXTEEN AND ONE-THIRD ONE-HUNDREDTHS TO GEORGE LENTZ, OF NORTH ARLINGTON, NEW JERSEY.

WATER-WHEEL.

967,402. Specification of Letters Patent. **Patented Aug. 16, 1910.**

Application filed August 11, 1909. Serial No. 512,361.

To all whom it may concern:

Be it known that I, THOMAS A. MACDONALD, a subject of the King of Great Britain, and a resident of Clifton, in the county of Passaic and State of New Jersey, United States of America, have made certain new and useful Improvements in Water-Wheels, of which the following is a specification.

My invention relates to improvements in water wheels and it consists in the combinations, constructions and arrangements herein described and claimed.

The invention is an improvement on that disclosed in my prior Patent No. 442,694, of December 16, 1890. In the said patent I show a wheel adapted to be anchored in a stream whereby the force of the current of the stream might be utilized to drive machinery of any description.

The present invention likewise has for its purpose the provision of a wheel for similar use which, however, is formed so as to have an increased efficiency without adding to the cost of construction. This I accomplish by changes which although apparently slight in themselves yet greatly add to the working efficiency of the device. These changes will be disclosed in the following specification and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings in which similar reference characters denote like parts in the several views in which—

Figure 1 is a face view, in perspective, of the wheel; Fig. 2 is an edge view; Fig. 3 is a section along the line 3—3 of Fig. 1, and Fig. 4 is a section along the line 4—4 of Fig. 1.

In carrying out my invention I provide a series of wings or blades constructed as shown in the figures being preferably stamped from sheet metal, or each blade may be cast separately and the blades may then be secured together. A description of one of these blades will suffice, since the rest are precisely similar in construction. The body portion of the blade consists of a substantially triangular portion A having the flange B on one side and the flange C on the outer end of the blade, the edge of the blade D opposite the side B being left free. The blade A is inclined at an angle to the plane of the face of the wheel, which is shown by the dotted line *x y* in Fig. 4. The flange B makes an obtuse angle with the part A. The flange C at the end of the blade is formed in an arc as shown in the drawings, but terminates short of the edge D leaving a space E by which the water may escape in its impact against the sides of the inclosing pipe or cylinder (if one is used) or against the main body of the stream, in case one should not be used.

The flange B is of approximately the same relative width from the outer to the inner ends. The inner ends *b* of the flanges are prolonged and abut against the faces of the flange of the blade next to it, in the manner shown in the figure.

The blades are secured to studs F disposed on a head G at the end of a shaft H by means of the rivets *f* or by bolts or screws or any other manner, as shown in Figs. 1 and 3.

The wheel as thus constructed has several points of difference over the wheel disclosed in my prior patent which renders the present invention particularly efficient. In the first place the outer flange C instead of being curved as in the former patent is a plane, therefore the line *a c* from the corner of the blade to the outer edge is straight and makes an obtuse angle with the line b^2 *a* along the bottom of the flange B. The straightening of this flange C overcomes a defect of the older form, in that it permits all of the water to flow in the same direction, whereas with the curved blade the water is forced around against itself and therefore causes a back-pressure on the wheel. In other words, an eddy current is formed in the corner of the wheel represented by the angle b^2, *a*, *c*, which, of course, results in a loss of power.

Instead of curving the flange C the flange B is extended so that the corners b^3 and *d* lie all on a circle the center of which is the axis of the wheel. Thus a wheel of a given diameter may be placed in a pipe of a given radius and all of the available space for producing a forward movement of the wheel will be used. The outer flange terminates so as to leave a space E through

which the water coming from the wheel may impact against the side of the surrounding cylinder. This will give an added push to the wheel and results in a greater turning moment.

By extending the flange at its inner edge a greater surface is given for the action of the water than in the prior patent in which the height of the water at the center is practically negligible as far as turning effect of the water is concerned. The prolongation of each edge so as to meet the edge of the adjacent flange whereby the flanges may be secured together provides a construction which is considerably stronger than that shown in the prior patent, and which at the same time is simple. It will be observed that the individual blades may be removed by cutting out the rivets or loosening the bolts *f* which attach the blades to the studs F. Thus when one blade is damaged or worn it can be replaced by another one with very little effort.

The wheel as before stated is designed to be placed in a running stream. This stream may be a freely flowing stream or one flowing in a pipe, in either case the shaft H is rotated in a direction parallel with the stream thereby bringing the face of the wheel at right angles to the stream. The water impinging on the angular flange B and the inclined blades A forces the wheel around in the direction indicated by the arrow while the water is delivered rapidly from the opposite edge D. The entire force of the water is used in propelling the wheel forward owing to the construction and relative disposition of the parts described.

By the novel construction of the blades the side and end flanges of the wheel divide the flowing water into two parts, the water which the blades engage and take on their face or surface passes out into the stream below, while the water that seems to pass under the flange B and under flange C being turned out of its regular down or forward movement, a vacuum is created behind either blade thus freeing each blade from any back action whatever.

For the reason that before the water goes back to an even or straight course of the stream the blades have passed and continue to pass in this vacuum so long as the wheel turns.

Because of this peculiar construction of blades other wheels can be placed one after another in a running stream or pipe, and each one will give an added portion of power according to the head or pressure of the stream.

I claim:

1. A water wheel comprising a shaft provided with a head having a series of studs, a series of inclined triangular blades, each blade being provided with a straight flange on one edge thereof making an obtuse angle with the blade, and a straight flange at its outer end, the planes of the side and end flanges making an obtuse angle, the outer ends of the blades all lying in the circumference of a given circle, the inner ends of the side flanges being extended, and means for securing the extended ends of the side flanges to the studs on the shaft head.

2. In a water wheel, a central shaft, a series of blades each comprising an inclined body portion of approximately triangular shape, a side and an end flange secured to said blade, the planes of said flanges making obtuse angles with the plane of the blade, the end flange being curved and extending only over a portion of the end of the blade thereby leaving an exit for the water at the end of the blade, and means for securing the side flanges of the blades to the shaft.

3. In a water wheel, a central shaft, a series of blades, each blade comprising a body portion of substantially triangular shape having a straight side flange and a straight end flange making obtuse angles with the blade body and with each other, the outer edge of the end flange being arc shaped and terminating short of one corner of the body portion and means for joining the blades to the shaft.

4. A water wheel comprising a shaft provided with a head having a series of studs projecting therefrom on one side thereof, a series of triangular blades, each blade being provided with a straight flange on one edge thereof making an obtuse angle with the blade and a straight flange at its outer end, said straight end flange extending only over a portion of the end of the blade, thereby leaving an exit for the water at the end of the blade, the planes of the side and end flanges making an obtuse angle, the outer ends of the blades all lying in the circumference of a given circle, the inner ends of the side flanges being extended, and means for securing the extended ends of the side flanges to the studs on the shaft head.

THOMAS A. MACDONALD.

Witnesses:

L. A. STANLEY,

SOLON C. KEMON.