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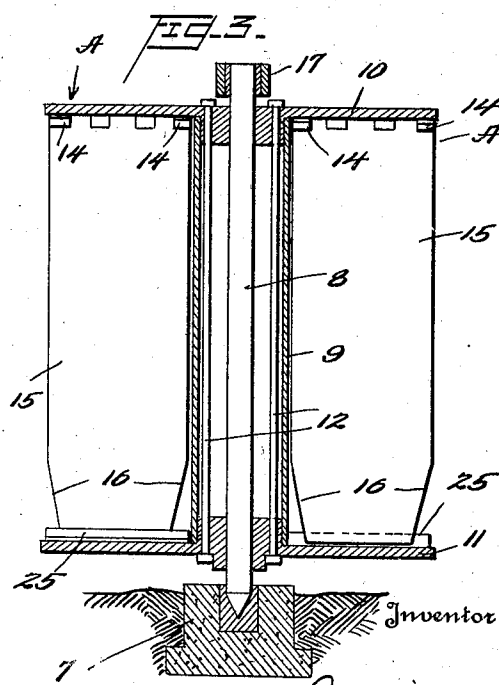
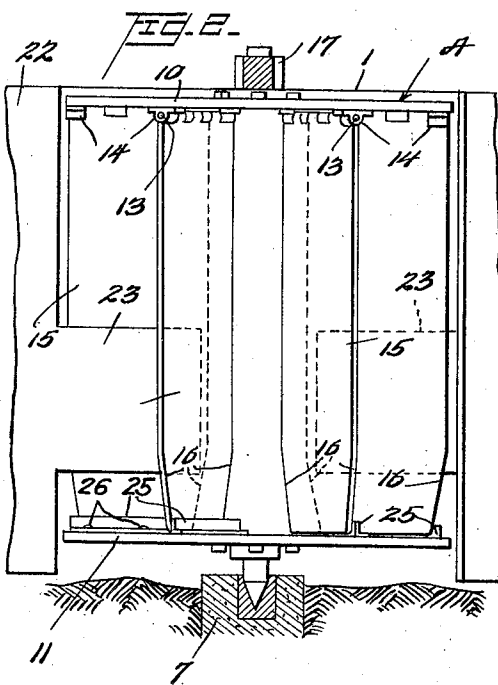
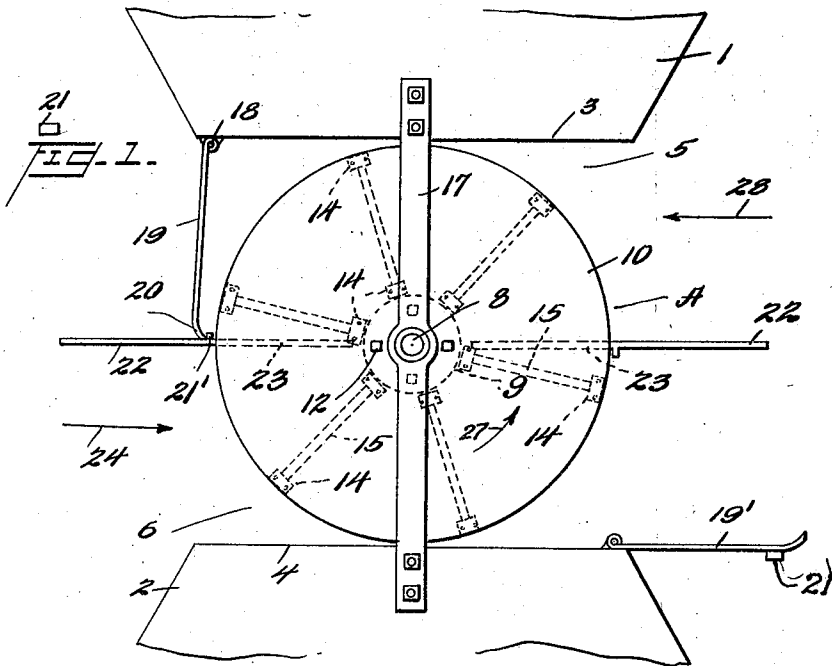
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TIDE POWER APPARATUS

Filed June 7, 1929

2 Sheets-Sheet 1



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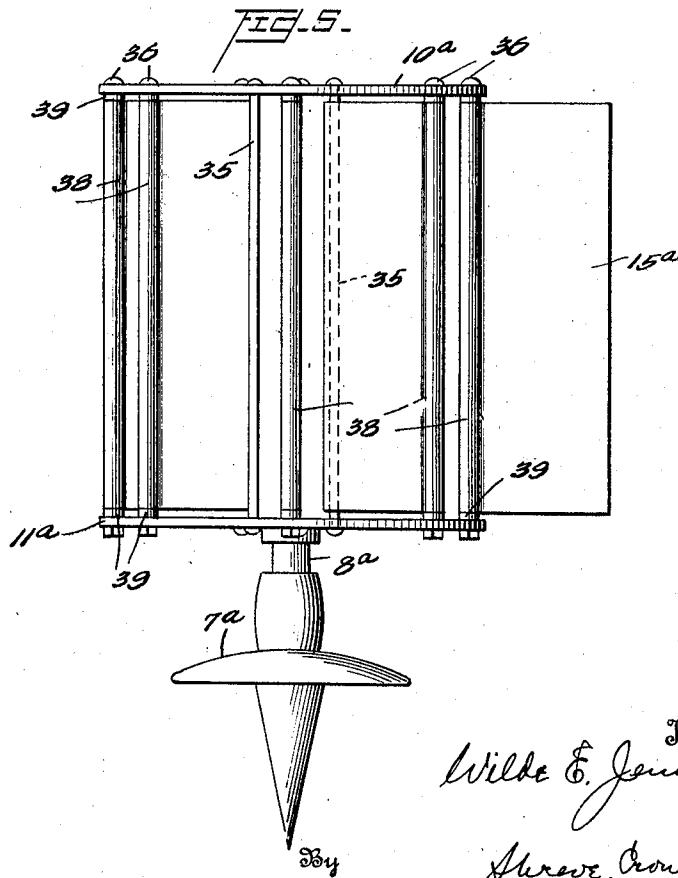
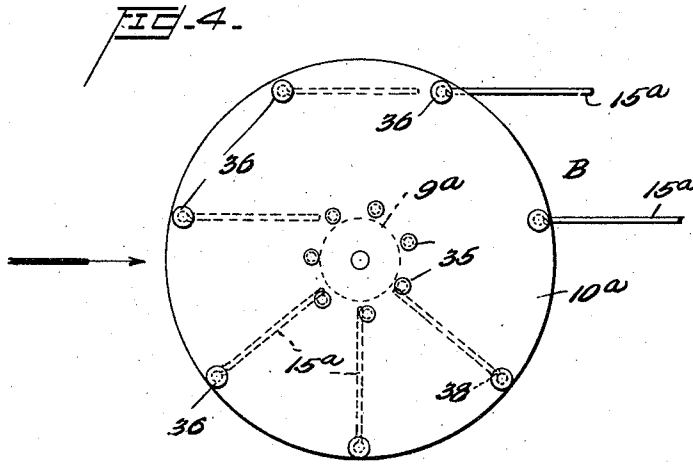
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TIDE POWER APPARATUS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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TIDE POWER APPARATUS

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Generically this invention relates to water power apparatus, but it is more especially directed to the type operable by the ebb and flow of the tides.

An important object of this invention is the provision of a novel form of water wheel rotatable about a vertical axis and in the same direction irrespective of the direction of flow of the tide or water current.

Another important object of this invention is the provision of a water wheel of the above character mounted on a vertical axis, having a wall structure contiguous opposite sides and extending at right angles to the normal current flow and diagonally opposite water gates adapted to be alternately opened and closed by the current flow to direct said current against one side of the said wheel only, to drive said wheel in a given direction, irrespective of the direction of the flow of the tide or current.

A further object of this invention is the provision of a water driven wheel mounted on a vertical axis submersible in a body of water, having a plurality of paddle blades and means for maintaining certain of the blades at right angles to the current flow, the blades on the opposite side of the wheel being inactive and upon change of direction of flow, the inactive blades becoming active and the first mentioned blades inactive to drive the wheel in a given direction irrespective of the flow of the tide or current.

A still further object of this invention is the provision of an apparatus as above described comprising a plurality of such water wheels mounted in superimposed relation on a vertical shaft.

With these and other objects in view, which will become apparent as the description proceeds, the invention resides in the construction, combination and arrangement of parts, hereinafter more fully described and claimed, and illustrated in the accompanying drawings, in which like characters of reference indicate like parts throughout the several figures, of which:

Fig. 1 is a plan view of my improved water power apparatus showing the wall and gate structure;

Fig. 2 is a side elevation of my improved water wheel;

Fig. 3 is a central sectional view;

Fig. 4 is a plan view of a modified form of wheel; and

Fig. 5 is an elevation of Fig. 4.

Although I am aware that attempts have been made to generate power from the flow of the tides, that such devices with which I am familiar have proven unsatisfactory by reason of the necessity of costly wall and foundation structure and intricate cooperating wheel mechanism, the erection of which being only possible at certain shore locations; and it was to overcome the deficiencies of such apparatus and to provide one capable of being located where desired with a minimum of base construction and so designed as to derive a maximum of power by directing the current flow against one side of the water wheel only, irrespective of the direction of the flow to continuously rotate the same in a given direction and a novel water wheel having paddles active on one side and simultaneously inactive, on the opposite side, the paddles on the inactive side becoming active and those on the opposite side inactive upon change of direction of the water current or tide, certain of said wheels being adaptable for operation in midocean without wall or elaborate foundation structure, that I designed the water power device forming the subject matter of this invention.

In the illustrated embodiment characterizing this invention there is shown wall or abutment sections 1 and 2, respectively, with their inner ends 3 and 4, spaced apart to form water ways 5 and 6, respectively, and positioned at a point midway between ends 3 and 4 is a foundation 7 constituting suitable foundation structure constructed of concrete, masonry or the like, for a purpose hereinafter more fully appearing.

A water wheel A comprising a vertical shaft 8, having a drum portion 9 suitably mounted thereon, having a circular plate member 10 mounted on said shaft adapted to seat on the upper surface of said drum and a similar plate 11 similarly mounted

on said shaft and adapted to seat against the bottom surface of said drum, said plates being firmly secured thereto by bolt rods 12 extending through each of said plates and through the drum. The under surface of plate 10 is provided with a multiplicity of rods 13 radiating outwardly from the drum to the circumferential periphery of the plate, suitably secured by strap hangers 14 and hingedly mounted on the rod by having one edge bent therearound or otherwise suitably connected thereto is a paddle or vane 15 having each of its sides curved inwardly or slanting as at 16 for a purpose hereinafter more fully explained.

The wheel A is adapted to be mounted in the opening between the walls 3 and 4, the lower end of shaft 8 is pivotally mounted in base 7, the upper end of said shaft adapted to extend through frame 17, said frame having one end suitably supported on wall section 1 and the other end similarly supported on abutment section 2, as will be clear without further description.

Suitably mounted and hingedly connected to one corner of the wall 1 as at 18 is a water gate 19, having its free edge curved inwardly as at 20, so that when the current is flowing in gate closing direction the gate will be brought to closed position at right angles to the flow of the current, thereby permitting the current to operate on one-half of the wheel only, and when the flow is in the opposite direction the gate will be opened and brought into alignment with the end 3 of wall 1, its movement in the opening direction being limited by post 21 or other suitable anchoring means adapted to contact the outer edge of the gate.

In order to limit the movement of the gate in closing direction a ledge or other suitable stop means is formed coincident with the median line of the wall as at 21' and integrally or otherwise connected to the ledge or stop means 21' in alignment with said median line is a wing or dividing wall 22 extending outwardly from said ledge, which to some extent protects gate 19 and prevents the force of the current directly against said gate, and when in open position cooperates with said gate to produce a spillway and this gate and wing structure is duplicated on the opposite side of the wall, a similar gate 19' being hingedly connected to the other wall section diagonally opposite to the gate 19.

A plate 23 forming a continuation of wing 22 and integrally or otherwise suitably joined thereto extends within the wheel between the upper and lower plates 10 and 11, respectively, to a point substantially flush at its inner end with the drum 9, with its upper edge sufficiently spaced from the upper plate to permit passage thereover of blades 15

during rotation of the wheel, and slightly spaced from the lower plate, as will be hereinafter more fully explained.

In this connection it will be noted that the wing 22 and respective inwardly extending portions 23 constitute a dividing wall midway between the end walls 3 and 4 and centrally through the wheel to substantially prevent the current flow to the inactive half of the wheel during its operation, which will be clear from the above description. While the operation of my water power unit is clear from the above description, it might be well to further state that when the current flow is in the direction of arrow 24, gate 19 will be closed and gate 19' open and each of the paddles 15 as they come into the path of the current will contact the rod 25 or other suitable stop element at their lower edge, said rod in the present instance, has its inner end threadedly or otherwise engaging the lower edge of drum 9 and its outer end secured to bottom plate 11 by bolts or other fastening elements 26 secured to said plate in any well known manner. The force of the current will revolve the wheel A in the direction of the arrow 27 and when the paddle reaches the extension 23 it will travel over said extension and be inactive until it passes over the opposite element 23 to again become active as it enters the water current.

It will be obvious that when the direction of the current flow changes and flows in the opposite direction as indicated by arrow 28, gate 19' will be closed and gate 19 opened and the same operation will continue with the exception that the paddles as they enter the waterway 5 designated by arrow 28 will become active and those traversing the opposite side will be inactive until the direction of flow again changes, whereupon the initial operation will be repeated.

Figs. 4 and 5 illustrate a modified form of water wheel B similar in operation to the one above described, especially adaptable where it is not desirable to employ the wheel and gate structure as described in connection with the former wheel.

The modified form of wheel B is similar to wheel A except in this form the blades or rods 35 firmly interconnect the wheel plates or rims 10a and 11a corresponding in number to paddles 15a, and are arranged in equi-spaced relation surrounding and adjacent the circumferential surface of the hub or drum 9a and constitute stops for the paddles 15a on the side of the wheel active with respect to the current flow. The peripheral edges of said plates or rims 10a and 11a are connected by a series of spaced bolts or shafts 36 suitably secured by threaded nuts or in any suitable manner and rotatably mounted on each of the shafts 36 is one of the blades 15a in any well known manner, but

in the present instance, by having one end of the blade bent upon said shaft as at 38 and in order that the blades may have freedom of movement with respect to the plates a spacer washer 39 is mounted on said shaft 27 between the upper and lower edges of the blade and said plates. It will be noted the blades on one side are free to move outwardly and point in the direction of the current flow while those on the opposite side of the wheel are maintained at right angles to the current flow, said blades on each side of the wheel becoming alternately active and inactive corresponding to the change of direction of the current flow. Shaft 8a is adapted to rotatably seat in a semi-floating suitably anchored base 7a, the upper end of the shaft being mounted and connected with a suitable superstructure such as a light house or other structure, not shown. Since the operating principle of this wheel is identical with wheel A it is thought its operation will be clear from the above description without further explanation. In some instances, depending upon tide variance, it may be expedient to mount a multiplicity of these wheels in superimposed relation on shaft 8a.

From the above it will be apparent that I have designed water driven wheels of novel construction, manufacturable at a reasonable cost, and where desirable, in a comparatively inexpensive cooperating wall and gate structure, adapted to generate a maximum of power and entirely operable by the current flow in alternate opposite directions; adapted to a variety of uses, simple in construction and efficient for the purposes intended.

Although in practice I have found that the form of my invention illustrated in the accompanying drawings and referred to in the above description as the preferred embodiment is the most practical and efficient; yet realizing the conditions concurrent with the adoption of my device will necessarily vary, I desire to emphasize that various minor changes in details of construction, proportion and arrangement of parts, may be resorted to within the scope of the appended claim without departing from or sacrificing any of the principles of this invention.

Having thus described my invention, what I desire protected by Letters Patent is as set forth in the following claim:

A water power apparatus including a water driven wheel, a wall structure terminating at opposite sides of the wheel, and wing means extending outwardly from opposite edges of the wheel at right angles to said wall and extending within the said wheel to provide a separate waterway on each side thereof, and means operable by the current for simultaneously cutting off the flow through one waterway and permitting its flow through the other one when the current flow is in one direction and alternately operable with respect to said waterways when the current flow is in the opposite direction, whereby said wheel is driven in the same direction irrespective of the direction of the current flow.

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