Sept. 4, 1928.

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J. J. HOPPES

WATER WHEEL

Filed July 14, 1924

Fig. 1

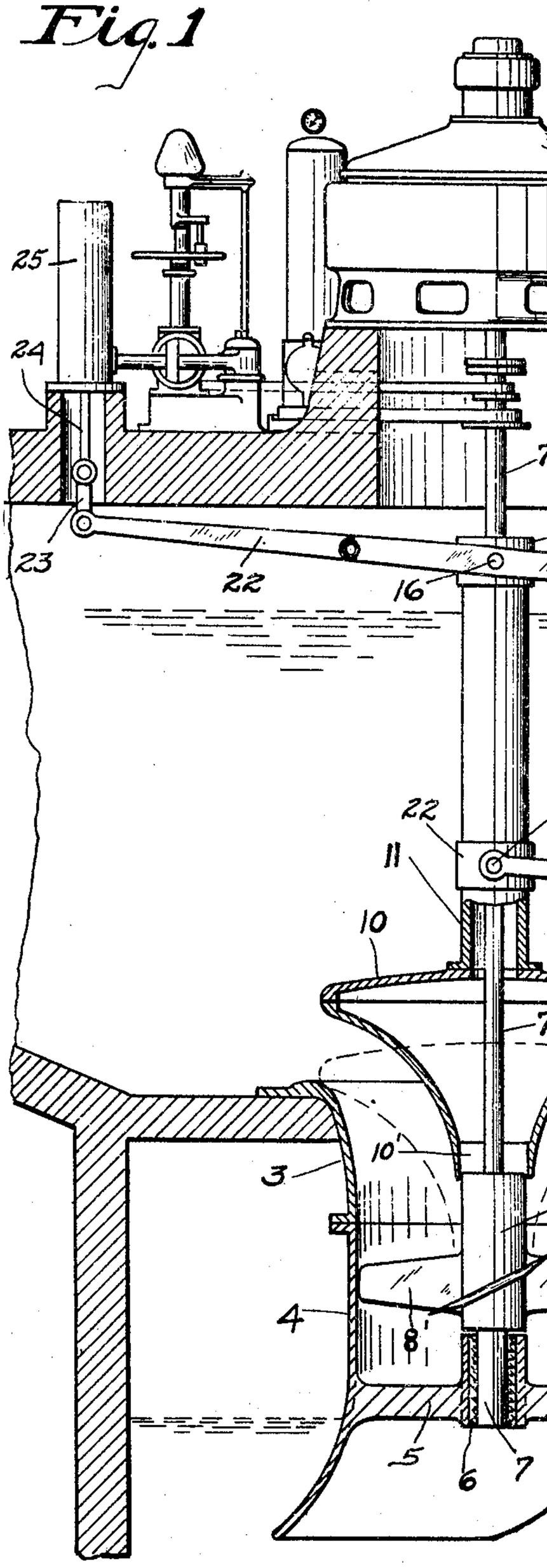
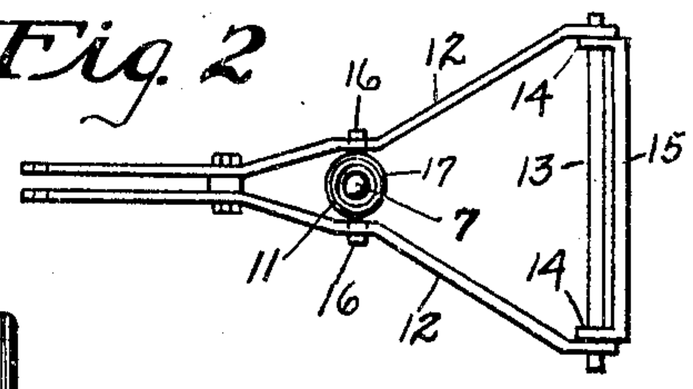


Fig. 2



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UNITED STATES PATENT OFFICE.

JOHN J. HOPPES, OF SPRINGFIELD, OHIO.

WATER WHEEL.

Application filed July 14, 1924. Serial No. 725,788.

My invention relates to improvements in water wheels, it more particularly relating to water wheels of the axial flow type.

An object of my invention is to provide a wheel of this character which will be simple in its construction, economical in manufacture and effective in its operation.

A further object of the invention is to provide a valve for controlling the water flowing to the runner so shaped as to change the course of the water and direct the same to the runner so as to furnish a true axial flow of water with the minimum amount of resistance.

A further object of my invention is to provide an arrangement for controlling the flow of water to a wheel of the axial flow type whereby the water can be controlled by a single valve in distinction from a plurality of valves.

In the accompanying drawings:

Fig. 1 is a vertical sectional view showing the improvements.

Fig. 2 is a plan view of the upper radius member on a reduced scale.

Referring to the drawings, 1 represents the penstock which forms a support for the operating parts and constitutes a chamber 2 for the water which supplies the runner. The bottom of this penstock is apertured to receive and support the cylinder 3 and draft tube 4, the draft tube being provided with a bridge or spider 5 to support a bearing 6 for the lower end of the runner shaft 7. The runner consisting of a hub 8 and radial blades 8′ is secured to the shaft 7 within the draft tube. The upper end of the shaft 7 extends to and is connected with the rotor of a generator 9 mounted upon the deck or upper wall of the penstock 1.

The cylinder 3 flares outwardly in the direction of its inlet end and has a peripheral flange 3′ at its upper end which rests upon and is secured to the bottom of the penstock 1 to support the cylinder and its draft tube. Surrounding the shaft 7 in substantially concentric relation therewith is a conical or pear-shaped valve 10 the lower end 10′ of which has a loose fit about the hub 8. The valve has an upwardly extending hollow stem 11 which is supported by radius members 12 and 13. Each radius member is of a bifurcated nature as shown in Fig. 2 in which 12 represents a pair of arms having their outer ends pivoted on a rod 13 supported in the ears 14 of a bracket member 15, secured to the penstock, with their inner ends pivotally connected with a pair of trunnions 16 projecting from a collar 17 on the upper end of the valve stem 11. The arms of the radius members 13 are similarly pivoted at their outer ends on a rod 18 supported in the ears 19 of a similar bracket 20 and have their inner ends pivotally connected to trunnions 21 projecting from a collar 22 secured to the valve stem near its lower end.

The arms 12 are extended as indicated at 22 and the free ends of the extensions are pivotally connected by a link 23 to the piston rod 24, the piston of which operates in a cylinder 25 which forms a part of hydraulic pressure devices of a well known type, these devices being controlled by a centrifugal governor in a well known way.

The sides of the valve 10 are formed on curves which extend through substantially ninety degrees of a circle, the sides of the lower part of the valve being substantially parallel to the axis of rotation of the runner and gradually curved outwardly so as to constitute, in connection with the inner walls of the cylinder, a curved passageway which will direct or change the course of the water from a substantially radial flow to an axial flow. The course of the water is thus changed in its flow through the passageway and directed so as to give a true axial flow with a minimum amount of resistance. Further, when the valve is adjusted to admit more or less water this has no effect upon the width of the stream of water as it leaves the passageway between the valve and cylinder, this width of water being substantially equal to the length of the blades so that the blades will have an effective impact surface throughout their entire length in whatever position of adjustment of the valve.

Means are provided for adjusting the valve through the pressure cylinder 25, the piston of which is connected to the extensions 22. When the fluid pressure system is employed this adjustment is automatic depending upon the speed of the runner. Instead of the automatic adjustment, however, hand operated means may be employed for adjusting the valve.

By the construction described it will be seen that the water will be directed to the blades of the runner to give the best results, the arrangement being such that the flow of the water is directed from a lateral or

radial direction to an axial flow before reaching the runner blades. It will be further seen that there are no sharp angles or other obstructions in the water passageway between the valve and cylinder which would interfere with the free flow of the water to the runner.

Having thus described my invention, I claim:

1. In a water wheel, a runner having blades, a casing enclosing said runner, a valve controlling the inlet end of said casing and cooperating therewith to form a water passageway, a single centrally arranged stem connected with said valve, and radius rods pivotally connecting said stem with a stationary point.

2. In a water wheel, a runner having radial blades and an extended hub, an open-ended casing in which said runner is mounted, a valve in the inlet end of said casing cooperating with the same to direct the water in an axial direction with relation to said runner, said valve being slidably mounted upon the extended hub of said runner.

3. In a water wheel, a runner having radial blades and an extended hub, an open-ended casing in which said runner is mounted, a valve cooperating with said casing to direct the water in an axial direction with respect to said runner, a stem connected with said valve and projecting away from said casing, and pivoted supports connected with said stem to support and position the valve, the space between said casing and valve being unobstructed.

In testimony whereof, I have hereunto set my hand this 10th day of July, 1924.

JOHN J. HOPPES.