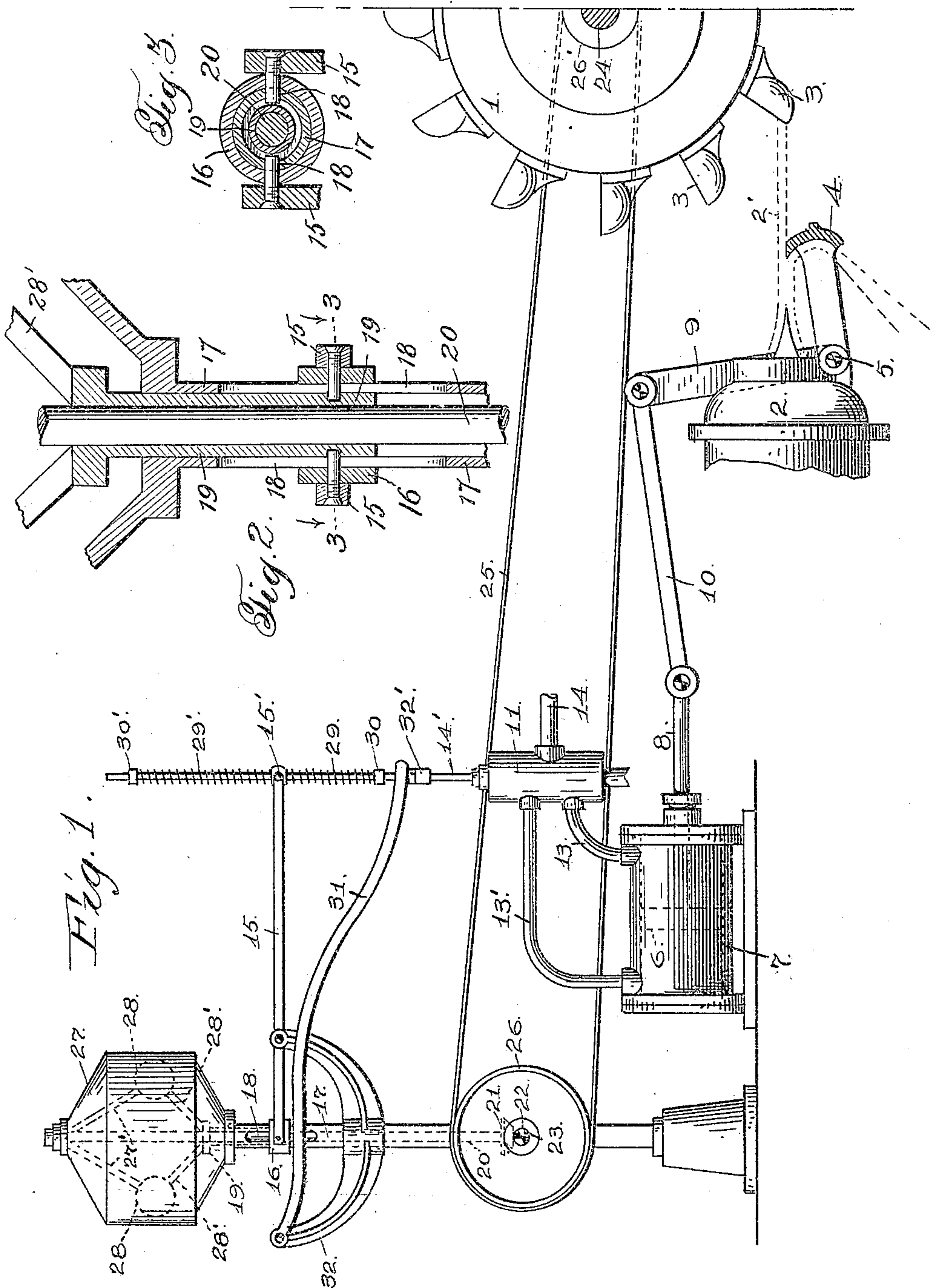


G. J. HENRY, JR.
SAFETY ATTACHMENT FOR HYDRAULIC MOTORS.
APPLICATION FILED MAR. 22, 1909.

958,120.

Patented May 17, 1910.



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UNITED STATES PATENT OFFICE.

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SAFETY ATTACHMENT FOR HYDRAULIC MOTORS.

958,120.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GEORGE J. HENRY, JR., a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Safety Attachments for Hydraulic Motors, of which the following is a specification.

The hereinafter described invention relates to that class of hydraulic motors known as water wheels, which are driven from an impact stream directed from a controlled nozzle onto the buckets of the water wheel; the object of the invention being to provide simple and effective means for automatically controlling the deflection of the impact stream to place the same off of the buckets of the water wheel on the destruction of the connection between the said wheel and the governing mechanism for varying the quantity of the impact stream and the direction of the same issuing from the nozzle, thereby preventing the wheel from running away and rupturing the hydraulic plant.

To comprehend the invention, reference should be had to the accompanying sheet of drawings, wherein—

Figure 1 illustrates in side elevation a water wheel, a nozzle for directing a stream onto the buckets thereof, the governing mechanism for controlling the stream issuing from the nozzle in accordance with load changes on the wheel, and the means for automatically controlling the deflection of the issuing stream on a breakage of the connection between the water wheel and the governing mechanism. Fig. 2 is a broken vertical sectional view of the fixed sleeve and the slide sleeve through which works the drive shaft or spindle for the governing means, disclosing the connection between the fulcrumed lever and the slidable sleeve. Fig. 3 is a cross section plan view taken on line 3—3, Fig. 2 of the drawings.

In the drawings, the numeral 1 is used to indicate an ordinary water wheel of the tangential type, 2 a controlled nozzle for directing an impact stream 2' onto the buckets 3 of the water wheel, and 5 a deflecting hood arranged in advance of the outlet orifice of the nozzle for regulating the deflection of the issuing stream. The movement of the swinging deflecting hood 4, which is mounted on the rock shaft 5 carried at the outer end of the nozzle, is controlled by the fluid

actuated piston 6, located within the cylinder 7, the piston stem 8 of said valve being connected to the crank arm 9 of the rock shaft 5, by means of the link 10.

Fluid under pressure is admitted from the cylinder 11 into the cylinder 7 by the pipe connections 13—13', fluid under pressure being delivered into the cylinder 11 by means of the supply pipe 14, leading from a suitable source of supply. The admission of fluid into the pipes 13—13' respectively, is controlled by the usual pilot valve working within the cylinder 11, the stem 14' of which extends beyond the said cylinder and is raised and lowered during the working movement of the governing means by the action of the fulcrumed lever 15. The inner end of this lever is connected to a collar 16, slidable on the fixed sleeve 17, which collar in turn is connected, by means of a pin working within the slotted portion 18 of the sleeve 17, to a vertically movable sleeve 19, the inner end of the pin connecting the lever 15 to the slide collar 16, and which extends through the slotted portion 18 of the sleeve 17, rests within a circular groove cut in the face of the sleeve 19. The said sleeve 19 is located and works within the sleeve 17 and over the rotatable drive spindle 20, which spindle is driven by the pinion 21 on the lower end thereof, meshing with a gear 22 of the shaft 23. Rotation is imparted to the shaft 23 from the drive shaft 24 on which is mounted the water wheel 1, connection between the said shafts being made by the drive belt 25, working over the belt wheels 26—26' mounted respectively on the shafts 23—24.

To the upper end of the drive spindle 20, and within the governor casing 27, is movably connected the upper arms 27' of the fly balls 28, the lower arms 28' of which are connected to the vertically movable sleeve 19.

The outer end of the fulcrumed lever 15 is attached to a slide block 15', loosely mounted on the valve stem 14', and which is held normally in a neutral position by the pressure of the springs 29—29', which bear respectively against the slide block 15' and the fixed collars 30—30', which springs normally acting with equal pressure against the slide block 15' hold the same in balance. These springs are of light construction and offer but slight resistance to the movement of the stem 14' in either direction.

The foregoing parts are of well known construction and the working thereof for regulating the stream issuing from a hydraulic nozzle understood by those skilled in the art, which in brief is as follows: As the fly balls 28 of the governing means are thrown outwardly by the increased rotation of the spindle 20, due to a reduction in the load placed onto the water wheel 1, the sleeve 19 is raised, carrying therewith the collar 16 and lifting the inner end of the fulcrumed lever 15, attached thereto. Such movement lowers the outer end of the said lever, causing the slide block 15', through the medium of the spring 29 to act against the collar 30 and force downwardly the valve stem 14', to move the pilot valve within the cylinder 11 to uncover the lower port thereof, so as to allow of fluid under pressure to pass from said cylinder through the connection 13 into the cylinder 7, the pressure of which forces inwardly the piston 6, the movement of which is transmitted through the described connection to raise the deflecting hood 4 and place the same into the impact stream 2', to deflect a portion of the same from off the buckets 3 of the water wheel, and thereby secure water regulation in accordance with the working load placed onto the water wheel. On an increase in the working load placed onto the water wheel, the speed of the rotating spindle 20 is decreased, which results in the fly balls 28 moving inwardly and a downward movement of the vertically movable sleeve 19, lowering therewith the slide collar 16 and the inner end of the fulcrumed lever 15. With this movement of the said lever its outer end is raised, causing the slide block 15', acting against the collar 30' through the medium of the spring 29', to lift the valve stem 14' and shift the pilot valve within the cylinder 11 to open the upper port thereof and permit of fluid under pressure to pass from the cylinder 11 into the cylinder 7 through the connection 13', back of the piston 6, which is forced outwardly within its cylinder so as to lower through its connections the deflecting hood 4, to move the same out of the stream and permit of a greater water quantity of the impact stream striking against the buckets of the water wheel. In this manner, provision is made for regulating by the governing mechanism the water quantity of the impact stream onto the bucket of a water wheel, in accordance with variations in the working loads placed thereon, and under normal conditions and within certain limitations such working parts meet ordinary requirements, irrespective as to whether the deflection of the impact stream is accomplished in whole or part by means of a deflecting hood, or whether the nozzle body itself be deflected for such purpose. However, in case the drive belt connection 25 for

imparting motion of the shaft 24 to the shaft 23 for actuating the governing mechanism, or such other transmitting means as may be employed for such purpose, becomes broken or destroyed, the governing mechanism is thrown out of commission, and the water wheel being uncontrolled runs wild or "races," which results in heavy damage to the hydraulic plant. It is to provide against such contingency and the resultant damage to the power plant, that has resulted in the present invention, which consists in means for automatically removing the impact stream from the buckets of the water wheel on the driving means for the governing mechanism being destroyed.

In the present case, the automatic controlling means comprises a lever 31, pivoted at its inner end to a fixed bracket 32. The upper edge of the said lever is situated within the path of the slide block 16, but at a point just beyond the limit of its downward movement under the normal working condition of the governor mechanism. The outer end of the said lever rests on an adjustable block 32', secured to the valve stem 14' of the pilot valve within the cylinder 11, a short distance below the block 30. The manner of placing the outer end of the operating lever 31 into engagement with the valve stem 14' of the pilot valve is immaterial, likewise the construction of the said lever and the operation thereof by the slide collar 16.

In use, presuming the connection between the drive shaft of the water wheel and the shaft for the governing means to have broken, the operation in the present case is as follows: Rotation of the spindle 20 ceases, the fly balls 28 move inwardly and the sleeve 19 moves downwardly below the limit of its normal stroke, causing the slide collar 16 to engage with and throw the weight of the fly-balls and the slide sleeve connected therewith onto the pivoted lever 31, to forcibly depress the same and cause the outer end thereof resting on the collar 32' secured on the valve stem 14' to exert a downward pressure thereon, sufficient to overcome the slight resistance offered by the light spring 29' and the upward pressure of the lever 15 thereon. The pressure thus placed by the lever 31 onto the fixed collar 32' forces inwardly the pilot valve within the cylinder 11, opening the lower port thereof, and permitting fluid under pressure to flow from the said cylinder into the cylinder 12 through the connection 13, to force inwardly the piston 6, so as to raise through its connections therewith the deflecting hood 4, and deflect the issuing impact stream from off the buckets of the water wheel. The fluid actuated means of the governing mechanism is thus automatically thrown into action for the placing of the water off of the buckets of the water wheel, on a rupture or

breakage of the drive connection between the water wheel and the governing means.

Having thus described the invention, what is claimed as new and desired to be protected by Letters Patent is:

1. In a controlled hydraulic nozzle for regulating an impact stream relative to a water wheel, the combination with the fluid actuated means for varying the impact stream, of governing mechanism for controlling the fluid actuated means, drive connection for operating the governing mechanism from the drive shaft of the water wheel, and means interposed between the governing mechanism and the fluid actuated means for automatically operating the same to place the impact stream off of the buckets of the water wheel on a breakage in the drive connection for the governing mechanism.

2. In a controlled hydraulic nozzle for regulating an impact stream relative to a water wheel, the combination with regulating devices for varying the impact stream, governing mechanism, connection between said mechanism and the regulating means, drive connection for imparting rotation of the water wheel to the governing mechanism, and means interposed between the said governing mechanism and the regulating devices for automatically operating the same on a breakage of the drive connection for the governing mechanism.

3. In combination with a water wheel, of a nozzle for directing an impact stream onto the buckets of the water wheel, governing mechanism, drive connection for imparting rotation of the water wheel to the governing

mechanism, regulating devices operated from said mechanism for controlling the impact stream in accordance with load changes, and means interposed between the governing mechanisms and the regulating devices for automatically operating the same to place the impact stream off of the water wheel on a breakage in the drive connection.

4. In a water wheel, the combination with the regulating mechanism for controlling an impact stream relative to the water wheel, of governing mechanism driven from the water wheel, and safety means interposed between the governing mechanism and the regulating mechanism, said means automatically placing into operation the regulating mechanism to place the impact stream off the water wheel on a breakage in the drive connection for the governing mechanism.

5. In an apparatus of the described class, the combination with the governing mechanism, drive connection for actuating the same, a valve stem, a fulcrumed lever connection between said stem and the governing mechanism for operating the same under normal working conditions, and a pivoted lever engaging the valve stem and operated by the governing mechanism to depress the said stem on a breakage in the drive connection for the said governing mechanism.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE J. HENRY, JR.

Witnesses:

N. A. ACKER,

D. B. RICHARDS.