No. 753,155. PATENTED FEB. 23, 1904.

J. W. MACFARLANE.

WATER DRIVEN CENTRIFUGAL MACHINE.

APPLICATION FILED JUNE 10, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

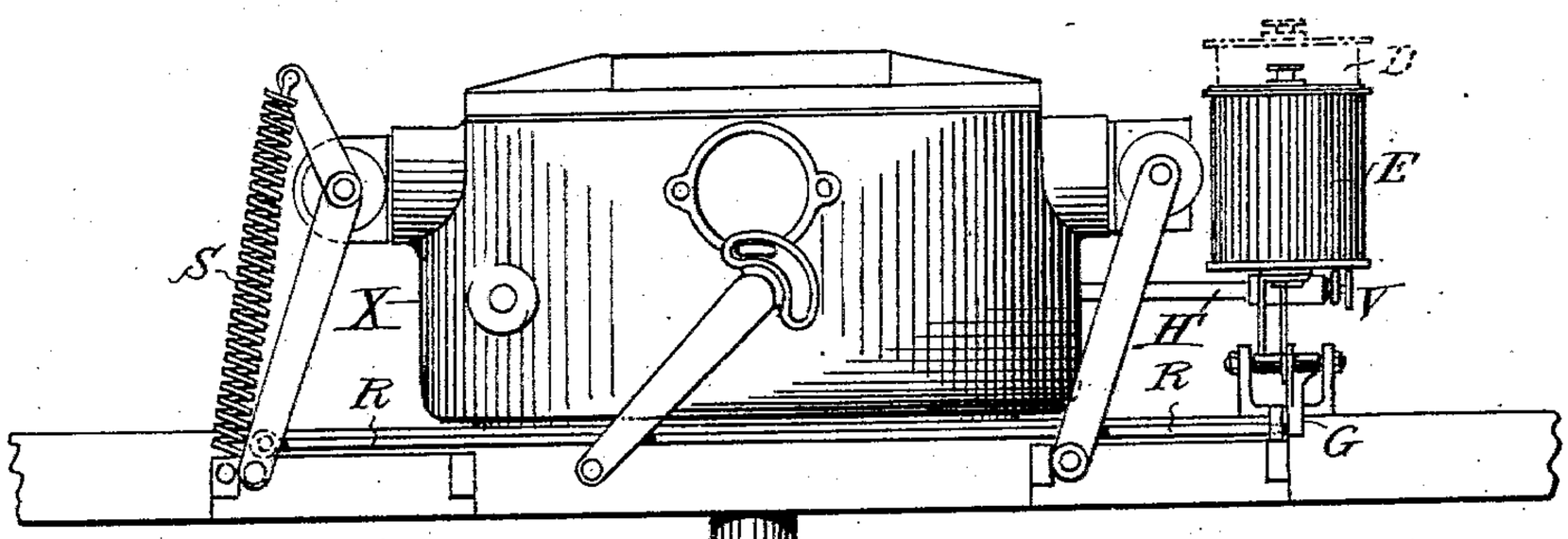

Fig. 1.

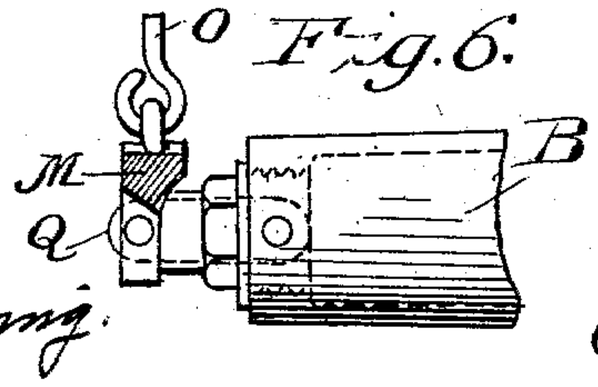

Fig. 6.

Witnesses:
Katherine E. Manning.
Jno. C. Adams

Inventor:
James Dright Macfarlane
By Wright Brug
Attorneys.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2

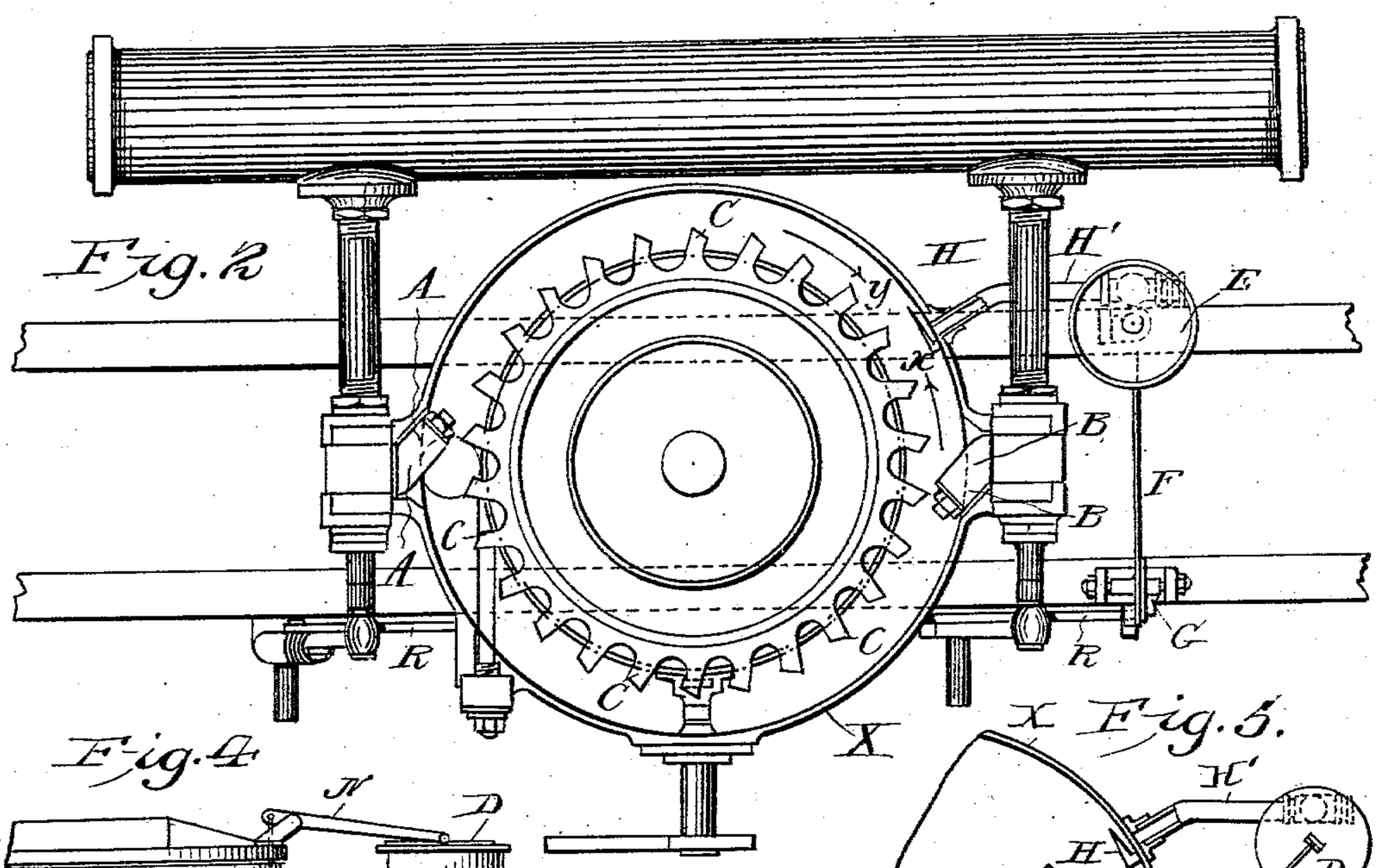


Fig. 4

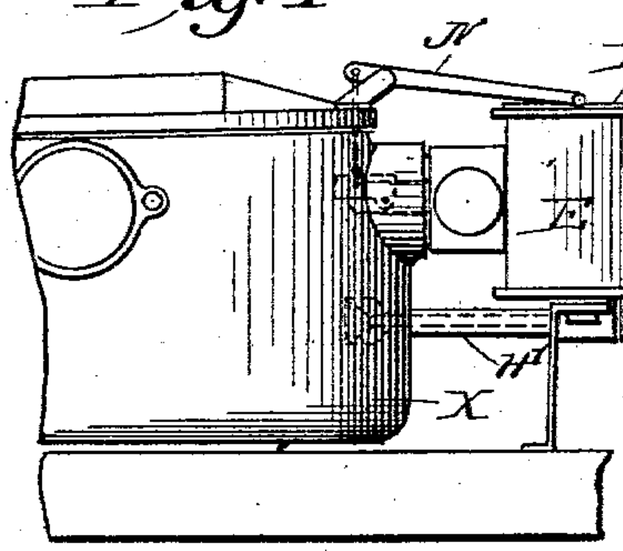
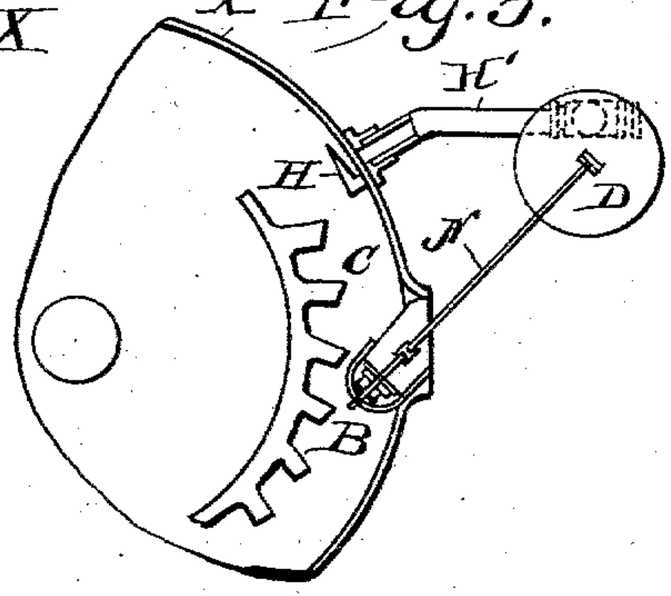


Fig. 5.



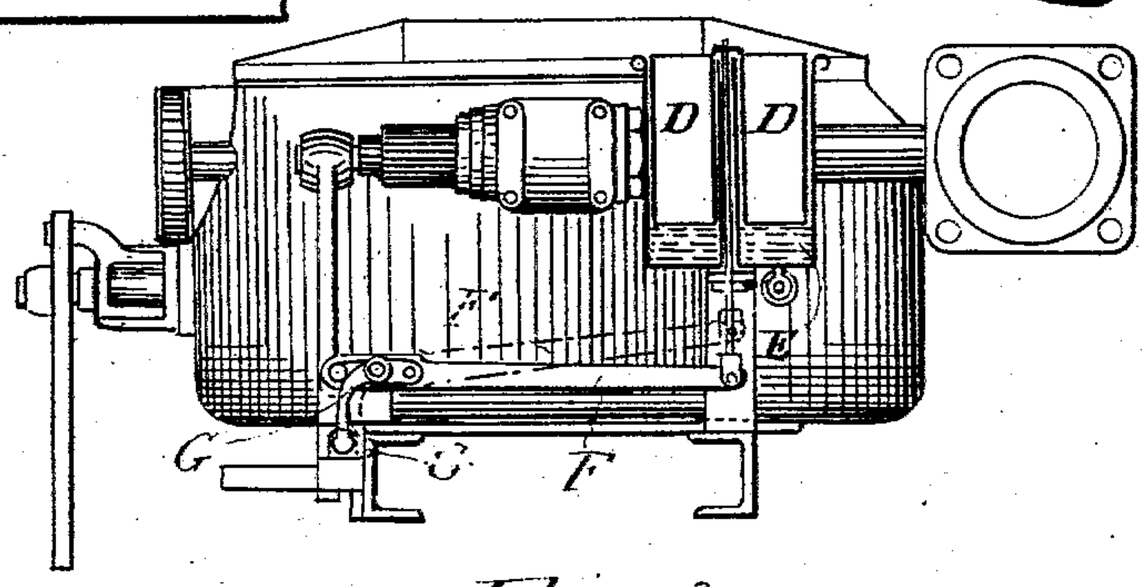


Fig. 3.

Witnesses:
Katherine E. Manning
Jno. C. Adams

Inventor:
James Wright Macfarlane
By Knight Bros
Attorneys.

No. 753,155. Patented February 23, 1904.

UNITED STATES PATENT OFFICE.

JAMES WRIGHT MACFARLANE, OF GLASGOW, SCOTLAND.

WATER-DRIVEN CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 753,155, dated February 23, 1904.

Application filed June 10, 1901. Serial No. 63,986. (No model.)

To all whom it may concern:

Be it known that I, JAMES WRIGHT MACFARLANE, partner of the firm of Watson, Laidlaw & Co., engineers, 98 Dundas street, in the city of Glasgow, Scotland, have invented certain new and useful Improvements in Water-Driven Centrifugal Machines, of which the following is a specification.

My invention relates to improvements in centrifugal machines or hydro-extractors which are driven by water or other fluid motors. In such machines if full speed is to be attained rapidly or within a given time a greater amount of power may be required during acceleration of the speed than is necessary to maintain a uniform speed after acceleration has ceased, and the shorter the time in which full speed has to be attained the greater the amount of power to be expended. The fluid driving the motor issues from a nozzle or nozzles, so as to strike the buckets in a direction tangential to the motor-wheel and toward the center of the buckets. The result of this is that on starting the motor the fluid strikes the buckets and is immediately thrown backward. As the speed of the turbine increases the backward motion of the spent fluid becomes less, and when the required speed is reached the fluid falls free of the wheel without backward motion. If the speed of the turbine further increases, the spent fluid has a forward motion in the direction of the motion of the wheel. I propose to make use of this change of the direction of motion of the spent fluid to operate mechanism for controlling the fluid-delivery means which consists in automatically cutting off or reducing the supply of fluid flowing from one or more nozzles as soon as the desired speed has been reached.

In carrying out my invention I may employ one or more nozzles through which the fluid is applied to the motor. When the machine is started, the nozzle or nozzles may be opened, so that the largest power is applied and the speed is quickly obtained. As stated, I propose to utilize the change of direction of motion of the spent fluid to actuate suitable mechanism to reduce or cut off one or more of the nozzles. This may be done by placing in a suitable position in the path of the spent fluid scoops, valves, vanes, baffles, floats, or other suitable device, a portion of the spent fluid being entrapped thereby when the current formed by the spent fluid is flowing in one direction and conveyed by a conduit to mechanism for cutting off the fluid, said valves, vanes, &c., being inoperative when the current is flowing in a reverse direction.

In the drawings forming part of this specification, Figure 1 is a front elevation of a machine, partly in section. Fig. 2 is a plan. Fig. 3 is an end elevation partly in section. Figs. 4 and 5 are side elevation and plan, respectively, of a modification of the machine. Fig. 6 is a detail drawn to an enlarged scale of the slide arrangement used in this modification.

Like letters designate like parts in all the figures of the drawings and in the specification.

The invention comprises a casing X, in which is mounted a Pelton wheel C, driven by fluid admitted through two nozzles A B. While I prefer to employ two or more nozzles, as already described, I may instead make use of only one nozzle of a sufficiently large area to provide the full amount of power required during the period of acceleration. When the maximum speed has been attained, the excess of power may be cut off by reducing the effective area of the nozzle. At the lower part of the casing a scoop H is placed before an opening therein, and said opening communicates through a conduit H′ with the mechanism to be operated. The scoop H preferably consists of an angled plate secured at one end to the inner wall of the casing and extending in front of the opening therein a short distance from the wall of the casing. When the fluid is flowing in one direction, the scoop H acts as a shield or baffle for the opening; but when the flow of the fluid is reversed the scoop gathers up some of the fluid, and it is conveyed as hereinbefore mentioned.

The mechanism for automatically cutting off the fluid comprises a float-cup E, connected with the conduit H′ and having a float D mounted therein, which is connected by means of a lever F with a detent G. The valve of one of the fluid-delivering nozzles A is held

normally in a closed position by a spring S, attached to a short lever on the valve, and a sliding rod R is secured to the valve-lever proper. When the valve is opened, the sliding rod moves past the detent G and is held in this position by the said detent G until the detent is released.

When the machine is first started, the water issuing from the nozzles is deflected backward by the Pelton-wheel cups in the direction shown by the arrow *x*. As the speed of the wheel increases the backward speed of this water decreases until a speed is reached which may be considered the maximum of efficiency at which the water falls clear of the wheel without backward motion. If the speed should be further increased, the water leaving the wheel will travel in the direction of rotation of the wheel, as shown by arrow *y*, and will enter the scoop H and pass through the conduit H′ into the float-cups E, raising the float D by reason of the pressure of the fluid entering the scoop H, and through the lever F will release the detent G and allow the spring to shut the valve, thus leaving the nozzle B to keep up the speed.

The motion of this apparatus can be modified by the adjusting-valve V, which can delay the entrance of the water into the float-cup, so that the accelerating nozzle can be kept open for a longer or a shorter time, as found necessary.

In the modifications shown in Figs. 4, 5, and 6 when full speed is attained the spent fluid is, as before, caught in the scoop H and raises the float D, which acts through a lever N and link O on a block M, pivoted by links Q to the sides of the nozzle B, which cuts off all or a part of the effective area of the nozzle by being dropped in front of the nozzle, and so cuts out the unnecessary power automatically.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination with a casing, a rotary motor, and fluid-delivery means, of a device entrapping a portion of the spent fluid as described, a device constructed and arranged to be operated by such entrapped fluid, means for reducing the delivery of fluid, and connections between said device and said means.

2. The combination with a rotary motor, and fluid-delivering means, of a device entrapping a portion of the spent fluid when the current formed by the spent fluid is flowing in one direction and inoperative when said current is flowing in the reverse direction, mechanism to reduce the fluid-delivery and constructed to be operated by the entrapped fluid.

3. The combination with a casing, a rotary motor, and fluid-delivering means, of a device entrapping a portion of the spent fluid when the current formed by the spent fluid is flowing in one direction and inoperative when said current is flowing in the reverse direction, and means operated by the entrapped spent fluid automatically reducing the supply of fluid delivered to the motor.

4. The combination with a casing, a rotary motor, and a series of fluid-delivering nozzles, and mechanism for holding some of the nozzles normally closed, of mechanism holding the said normally closed nozzles open, a device entrapping a portion of the spent fluid when the current formed by the spent fluid is flowing in one direction and inoperative when the said current is flowing in a reverse direction, and mechanism operated by the entrapped fluid for releasing the mechanism which holds the nozzles closed.

5. The combination with a casing, a rotary motor, and fluid-delivering means, of a device entrapping a portion of the spent fluid when the current formed by the spent fluid is flowing in one direction and inoperative when said current is flowing in the reverse direction, a float-tank receiving the spent fluid, a float, and means operated by the float to reduce the supply of the fluid-delivering means.

6. The combination with a casing, a rotary motor, and two fluid-delivering nozzles, a spring holding the valve of one of said nozzles normally closed, a sliding bar connected with the valve of the normally closed nozzle, a detent holding the sliding bar against movement when the valve is open; a device entrapping a portion of the spent fluid when the current formed by the spent fluid is flowing in one direction and inoperative when said current is flowing in the opposite direction, a conduit conveying the entrapped fluid to a float-tank, a float and a lever connected to the float and operating the detent to release the slide-bar.

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

JAMES WRIGHT MACFARLANE.

Witnesses:

THOS. M. JOHNSTONE,

WALTER LINDSAY.