J. ORTEN-BOVING.

GOVERNING CONTRIVANCE FOR JET IMPELLED WATER MOTORS.

APPLICATION FILED MAY 3, 1910.

993,616.

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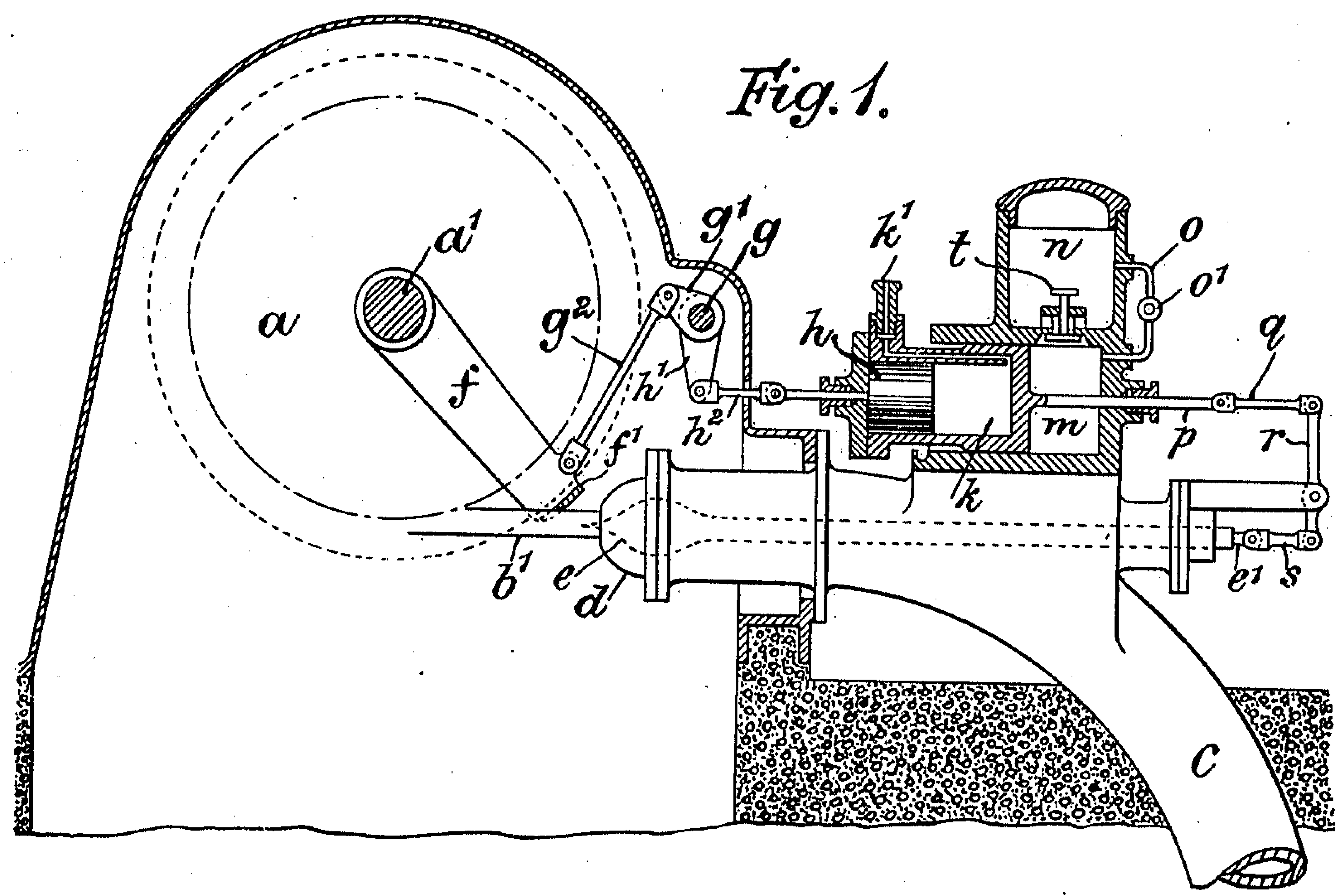
Fig. 1.



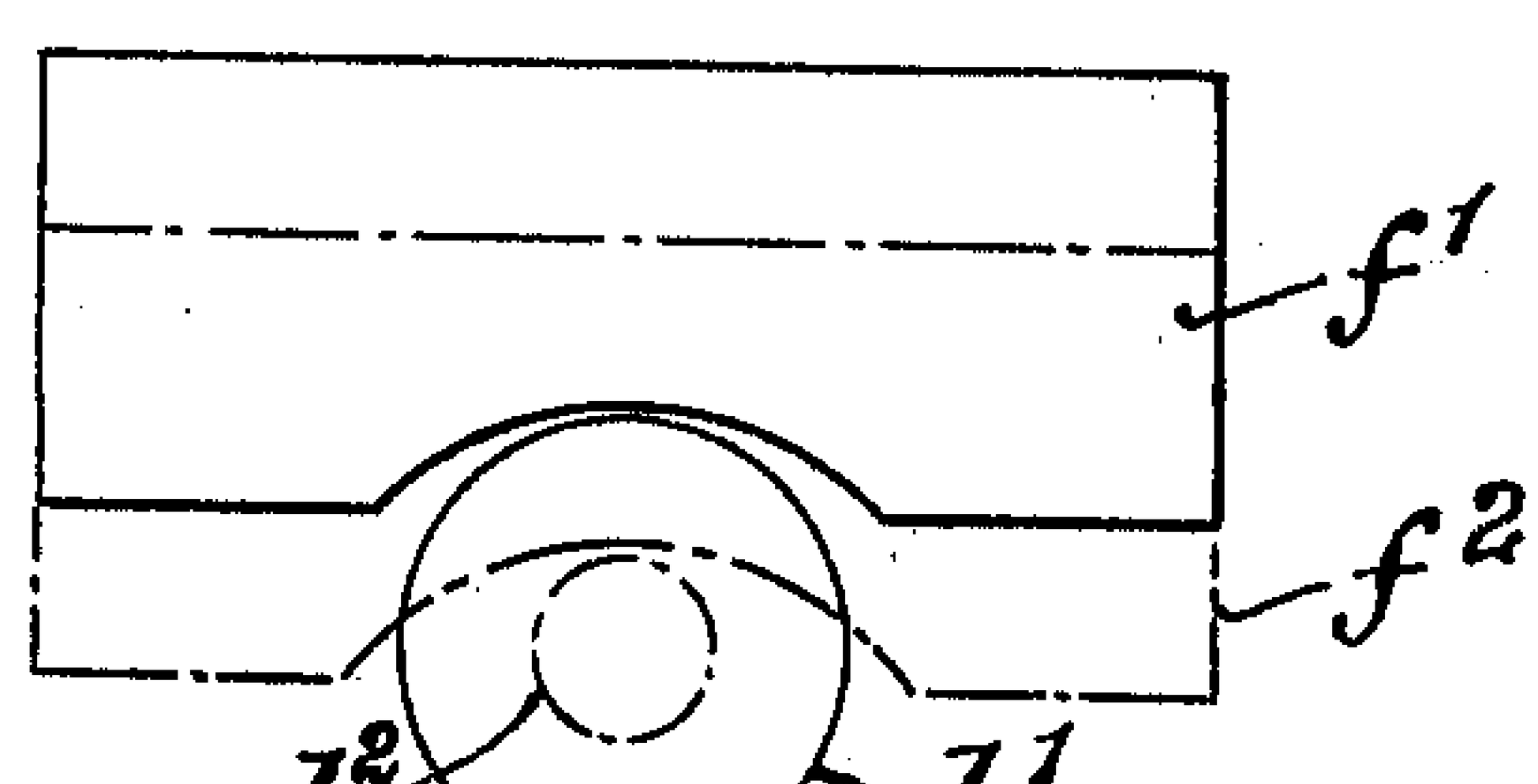


Fig. 2.

WITNESSES

W. P. Burk

John A. Percival

INVENTOR

Jens Orten-Boving

BY

[signature]

ATTY

UNITED STATES PATENT OFFICE.

JENS ORTEN-BOVING, OF LONDON, ENGLAND.

GOVERNING CONTRIVANCE FOR JET-IMPELLED WATER-MOTORS.

993,616. Specification of Letters Patent. **Patented May 30, 1911.**

Application filed May 3, 1910. Serial No. 559,117.

To all whom it may concern:

Be it known that I, JENS ORTEN-BOVING, subject of the King of Sweden, residing at 9½ Union Court, Old Broad street, in the city of London, England, have invented new and useful Improvements in Governing Contrivances for Jet-Impelled Water-Motors, of which the following is a specification.

This invention relates to improvements in governors employed to regulate the supply of water to jet-impelled motors, which governors are of the type in which, when a reduction of speed or power is required, the first operation performed is to divert a portion of the issuing jet of water, this action being followed by a diminution of the section of the jet at a rate sufficiently gradual to avoid an undue increment of pressure in the water-supply pipe which is caused by the change of momentum of the flowing mass of water contained within the pipe, the second effect being caused by the operation of what will be described as an intercepter.

In the accompanying drawing is shown, as a representative example, a form of construction embodying the invention the nature of which is above described.

In this drawing:—Figure 1 is a part sectional elevation, and:—Fig. 2 is a transverse view of a detail.

In Fig. 1 *a* represents a Pelton or other kind of water-wheel which is driven by a jet of water b^1 conveyed by a pipe *c* and delivered through a nozzle *d*, the area of discharge through which is regulated by a pointed valve *e* whose axis coincides with those of the nozzle and jet.

The contour of the nozzle and valve are such as to direct a stream of annular section to converge into a cylindrical jet the diameter of which diminishes as the valve is moved from right to left and so constricts the area of discharge and diminishes the power developed.

The diminution of power by a reduction in the quantity of water delivered through the nozzle must be effected very slowly or a dangerous pressure will occur in the supply pipe by the abrupt arrest of the momentum of the moving mass of water in what may be a very long supply pipe, and yet, when the load or work to be performed lessens, and often quite suddenly, it is requisite that the power exerted should be correspondingly diminished in a very prompt manner to prevent the wheel and the machinery driven thereby from acquiring an injurious speed. This is effected by interposing in a portion of the section of the jet a deflector f^1 which is pivotally mounted on the spindle a^1 of the water-wheel or other appropriately situated pivot, thereby diverting a portion of the stream and preventing it from impinging on the blades of the wheel.

The interposition of the deflector is effected by some form of "governor", not shown, which operates on the spindle *g* and angularly displaces it anti-clockwise as the speed of revolution increases, the movement of the spindle being transmitted to the deflector f^1 by a lever g^1 keyed to the spindle and connecting rod g^2. The displacement of the governor-spindle *g* also causes, by means of a second lever h^1 and connecting-rod h^2, a piston *h* to be thrust away from the left end of a cylinder *k* against the pressure of fluid which is admitted to the cylinder through a flexible pipe connected to the orifice k^1. Normally, the piston *h* will be retained at the left end of the cylinder by the fluid pressure within the cylinder *k*, but when an increase of speed occurs the piston will move away from the left end of the cylinder and eject some of the fluid. The cylinder *k* constitutes a hollow plunger of a fixed cylinder *m* and the fluid pressure within *k* will persistently tend to replace the piston *h* to the left end, by causing the cylinder *k* to move to the right. Now the space within the fixed cylinder *m* not occupied by the plunger-cylinder *k*, is filled with a viscous liquid such as oil, and this space is placed in communication with a reservoir *n* by a passage *o* which can be throttled to any desired degree by an adjustable valve o^1. On account of the passage *o*, the liquid in *m* will leak into the reservoir *n* when a pressure is applied to force the plunger-cylinder *k* to the right but, by regulating the constriction o^1, the rate of displacement of the plunger-cylinder can be made as slow as may be desired. When by the movement of the cylinder *k* to the right the piston *h* again occupies the left end of the cylinder, further progress of the plunger-cylinder will be arrested because then the fluid-pressure on the cylinder-end will be balanced by the equal and opposite pressure on the piston *h*.

By means of a piston-rod *p*, link *q*, lever *r* and link *s*, the slow movement of the plunger-cylinder *k* is communicated to the before-mentioned intercepting valve *e*

through the protruding tail-rod e^1, the valve e thus constricting the jet to reduce the power value thereof and to cause all portions of same to avoid impinging against the deflector f^1.

It will be seen that, by means of the contrivance above described, when a reduction of power is required the deflector f^1 is, by means of the governor, brought promptly into action. At the same time between the deflector f^1 and the intercepter e lost motion temporarily occurs, but such lost motion is subsequently completely recovered causing, when a permanent régime has been attained, the position of the deflector f^1 and the position of the intercepter e to be definitely related to each other and both dependent on the position assumed by a single governor.

The ratios of the interposed levers are so proportioned that in all positions, when the lost motion has been recovered, the deflector will stand clear of the jet with a minimum interval so as to be in position to effect a further reduction of power with the least displacement of the governor and delay. In Fig. 2, which shows the deflector and the section of the jet of water on an enlarged scale, the large circle b^1 drawn with a full line, is intended to represent the diameter of the jet when the valve e is fully open, the simultaneous position of the deflector being represented in full lines by f^1. When the valve is partially closed, the smaller dash-dot circle b^2 shows the section of the jet and the corresponding position of the deflector is shown in dash-dot lines by f^2.

Connecting the cylinder m and the reservoir n is an additional passage commanded by a valve t which closes when the plunger-cylinder k moves to the right but opens to permit the free back-flow of liquid from the reservoir, when k moves to the left. Accordingly, when increase of power is required, there will be no constraint against the prompt opening of the intercepting valve, the deflector being simultaneously proportionately moved so as to avoid interference with the stream which attains an enlarged section.

I claim:

1. In a jet-impelled water-motor, a nozzle, a shaft adapted to be angularly displaced by a governor, a jet-deflector connected therewith, a piston also connected therewith, a cylinder containing said piston and a fluid under pressure, a dash-pot of which said cylinder constitutes the plunger, a jet-intercepting valve in said nozzle and means connecting said cylinder-plunger with said valve.

2. In a jet-impelled water-motor, a nozzle, a shaft adapted to be angularly displaced by a governor, a jet-deflector connected therewith, a piston also connected therewith, a cylinder containing said piston and a fluid under pressure, a dash-pot of which said cylinder constitutes the plunger, means for regulating the ejection of fluid from said dash-pot, a jet-intercepting valve in said nozzle and means connecting said cylinder-plunger with said valve.

3. In a jet-impelled water-motor, a nozzle, a shaft adapted to be angularly displaced by a governor, a jet-deflector connected therewith, a piston also connected therewith, a cylinder containing said piston and a fluid under pressure, a dash-pot of which said cylinder constitutes the plunger, a non-return valve opening into said dash-pot, a jet-intercepting valve in said nozzle and means connecting said cylinder-plunger with said intercepting valve.

4. In a jet-impelled water-motor, a nozzle, a shaft adapted to be angularly displaced by a governor, a jet-deflector connected therewith, a piston also connected therewith, a cylinder containing said piston and a fluid under pressure, a dash-pot of which said cylinder constitutes the plunger, means for regulating the ejection of fluid from said dash-pot, a non-return valve opening into said dash-pot, a jet-intercepting valve in said nozzle and means connecting said cylinder-plunger with said intercepting valve.

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

JENS ORTEN-BOVING.

Witnesses:
RIPLEY WILSON,
HERBERT D. JAMESON.