No. 677,064. Patented June 25, 1901.

H. COOKE.

GOVERNOR DAMPER.

(No Model.) (Application filed Sept. 27, 1900.)

2 Sheets—Sheet 1.

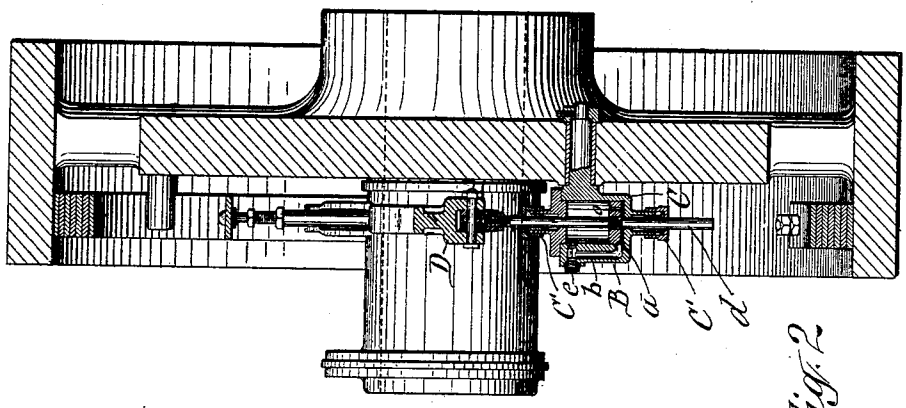


Fig. 2.

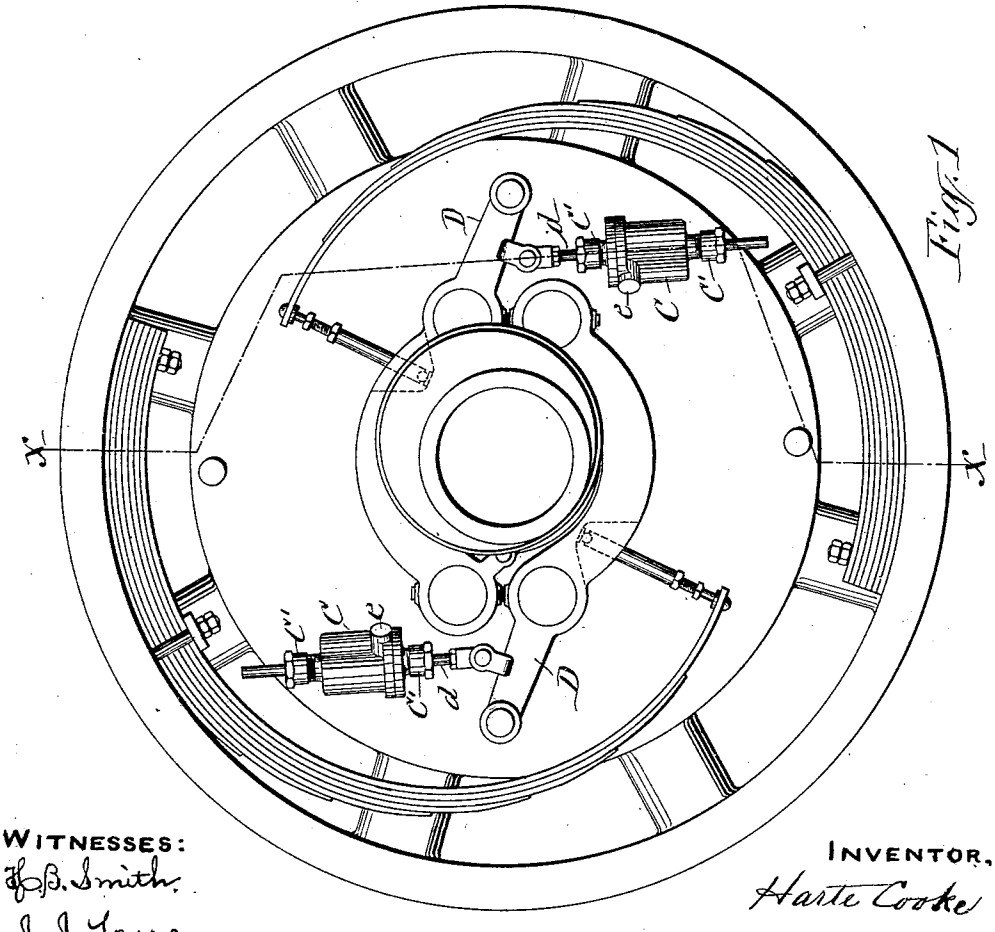


Fig. 1.

WITNESSES:
H. B. Smith.
J. J. Laass

INVENTOR.
Harte Cooke

BY E. Laass
ATTORNEY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 677,064. Patented June 25, 1901.

H. COOKE.

GOVERNOR DAMPER.

(Application filed Sept. 27, 1900.)

(No Model.) 2 Sheets—Sheet 2.

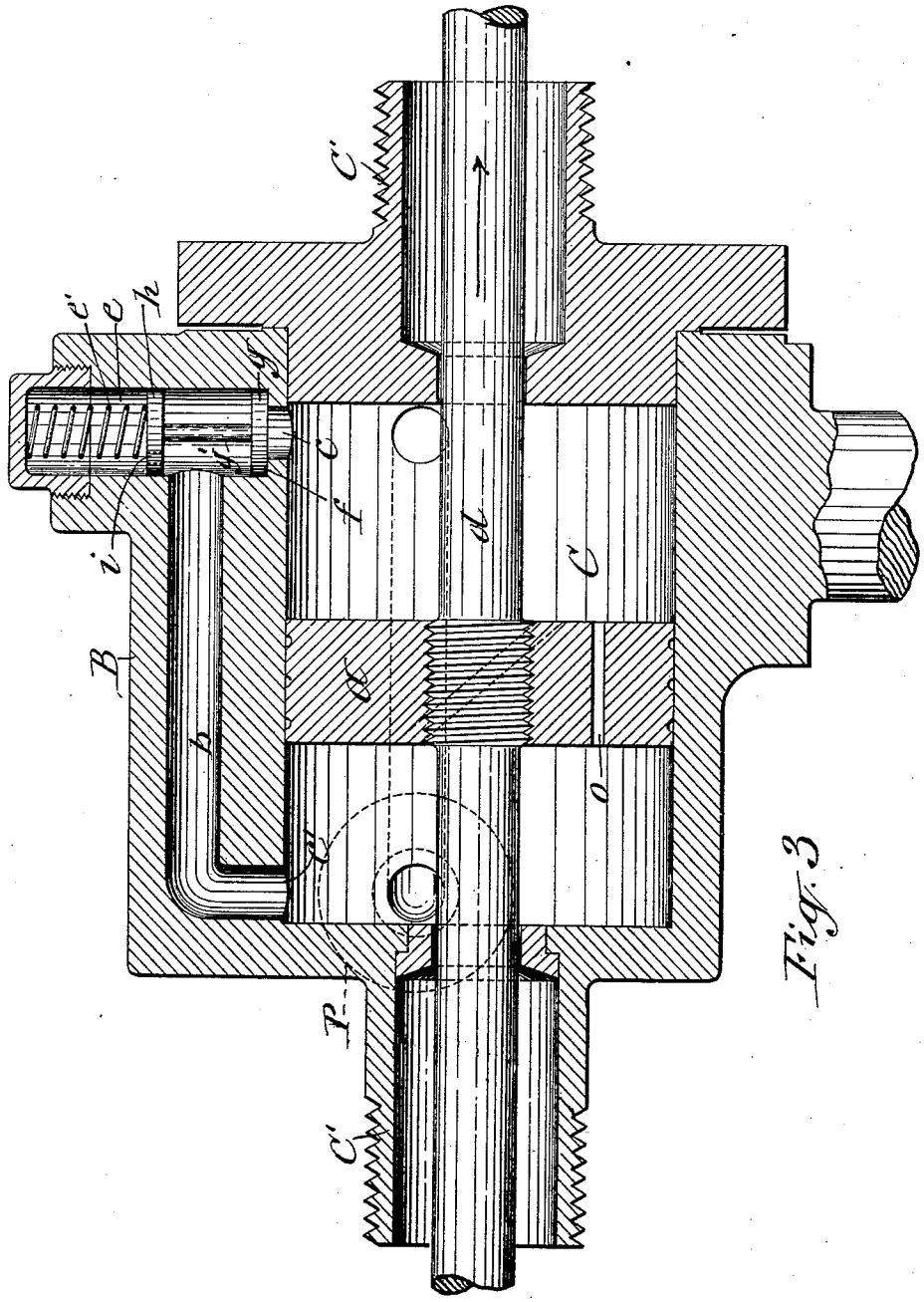


Fig. 3

WITNESSES:
H. B. Smith.
J. J. Laass.

INVENTOR
Harte Cooke
By E. Laass
ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HARTE COOKE, OF AUBURN, NEW YORK.

GOVERNOR-DAMPER.

SPECIFICATION forming part of Letters Patent No. 677,064, dated June 25, 1901.

Application filed September 27, 1900. Serial No. 31,291. (No model.)

To all whom it may concern:

Be it known that I, HARTE COOKE, a citizen of the United States, and a resident of Auburn, in the county of Cayuga, in the State of New York, have invented new and useful Improvements in Governor-Dampers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention consists of an improvement in dash-pots or damping devices such as are ordinarily used to steady the action of centrifugal governors in order that in addition to their usual function they may when connected to steam-engines or other prime movers used for driving alternating-current electric generators in parallel prevent trouble from what is known as the "surging" or "hunting" of the generators.

My said invention causes the dash-pot to give a very heavy damping effect for the very short period of time which is necessary in order to prevent the surging of generators from affecting the governing, but to oppose the tendency of the governor to respond to a change of speed persistent beyond the said short-time period above mentioned by only the comparatively slight damping effect or drag found necessary to give stability to the governor in ordinary kinds of service, this change of damping effect being automatically brought about by the pressure of the fluid in the dash-pot causing a valve, delayed for the said short period by an auxiliary dash-pot, to open an enlarged by-pass passage around the piston of the main dash-pot.

What is meant by the "surging" or "hunting" of generators may be described as follows: When two generators of a kind are running in parallel, if they are out of phase with each other by even a very small amount there is developed a powerful tendency to bring them into a similar phase, which tendency will increase the speed of the unit that is behind and diminish the speed of the one that is ahead. When the generators are brought into similar phase in this way, they will tend to overrun until the difference in their speeds is overcome by the above-mentioned tendency to come into similar phase, and the process will be repeated, each generator vibrating with respect to the other in the manner similar to a pendulum, but usually with a very short period of vibration. This vibratory movement is called "hunting" or "surging." When the engines or other prime movers driving these generators are provided with properly-sensitive governors, they will ordinarily be acted upon by the changes of speed just mentioned. The governor of the faster-moving unit will tend to decrease its speed, and vice versa in the case of the other unit. Since the governor requires some time to effect such changes of speed, due to the inertia of its parts and other causes by reason of this lagging, the generator will have reached the end of its vibratory movement, above mentioned, before the governor will have begun to act. Therefore taking the case of two units, for example, on the unit which is running slower the governor will not have actually begun to increase its speed on account of its slower running until it is on the return stroke of this vibratory movement and is hence the faster-running unit of the two. In this way the effect of the governor may actually increase this vibratory movement or surging of parallel-running generators until it causes an electrical disturbance, which will prevent their proper performance. I found that in order to prevent this trouble from occurring it was necessary to increase the resistance of the dash-pot such as is ordinarily used to give stability, as mentioned above, by reducing the area of the by-pass around the dash-pot piston to such an extent that it affected very unfavorably the regulation of the speed of the prime mover by the governor, for by this greatly-increased damping effect the governor was made so sluggish that it could not respond quickly to changes of speed caused by sudden changes of load and that this lagging effect was so great that before the governor had time to respond a considerable fluctuation in speed would have taken place. In order to avoid this, I have resorted to the novel construction of the dash-pot as hereinafter described, which is arranged so that the resistance of the dash-pot to a tendency of the governor to respond to a change of speed, persistent beyond the short time-period for which the heavy damping effect is necessary to prevent the governor being affected by the "surging," will cause an en-

larged by-pass to be opened, allowing the governor to be very sensitive to any change of speed persistent beyond the said short time-period.

In the annexed drawings, Figure 1 is a side view of a centrifugal governor equipped with my improved dash-pot or damping device. Fig. 2 is a transverse section of the same, and Fig. 3 is an enlarged longitudinal section of said dash-pot.

Similar letters of reference indicate corresponding parts.

C represents the cylinder of the dash-pot. Said cylinder is pivoted to the governor in the position shown in Fig. 1 of the drawings. The ends of said cylinder are provided with stuffing-boxes C′ C′, the necessary glands of which are omitted in Fig. 3 of the drawings.

a denotes a piston arranged in the cylinder C and attached to a rod *d*, the ends of which pass through the stuffing-boxes C′ C′, as shown more clearly in Fig. 3 of the drawings. One end of the rod *d* is connected to the centrifugal weight D or other suitable actuating part of the governor.

The piston *a* is provided with a small by-pass orifice *o*, forming a limited passage for the oil or other fluid with which the cylinder is charged. The said orifice is small enough to prevent a sudden movement of the centrifugal weight and give sufficient drag upon its movements to prevent the governor from being affected by the surging of the electric generator; but it will allow the governor to adjust itself to very slight changes of speed if of long duration, and when such changes are not of sufficient magnitude to open the by-pass valve hereinafter described, the orifice *o* also serving as a safety device for preventing a dangerous increase of speed in case the by-pass valve accidentally fails to operate.

In order that any tendency of the governor to respond to a change of speed may automatically substitute a comparatively slight drag or damper effect for the heavy drag or damping effect of the said small orifice *o* after the said short time period has elapsed necessary to prevent the governor from being affected by the surging of the electric generator before described, I employ a releasing device which may consist of a valve in a large by-pass communicating with opposite ends of the cylinder C and controlled by an auxiliary dash-pot, as shown in Fig. 3 of the drawings, in which *b* represents the aforesaid by-pass, consisting of a longitudinal channel in a tubular enlargement B on the exterior of the cylinder C. One end of said channel or by-pass communicates directly with one end of the interior of said cylinder, while the opposite end of said by-pass terminates in a cylindrical chamber *e*, which is axially in line with a small radial passage *c*, communicating with the interior of the cylinder C adjacent to the end thereof. The passage *c* extends only part way toward the channel or by-pass *b* and is of a smaller diameter than the chamber *e* to form a shoulder *f* at their junction. Said chamber constitutes the auxiliary dash-pot and serves as a seat for a piston-valve *g*, which is connected by a stem *g′* to a piston *h* and is held on the shoulder *f* by a spring *e′*, bearing on the outer face of the piston *h*. The valve *g* and piston *h* are a sufficient distance apart to be normally disposed at opposite sides of the by-pass, as shown in Fig. 3 of the drawings. The shoulder *f* is a suitable distance from the said by-pass to allow the valve *g* a predetermined degree of travel in the chamber *e* without opening communication between the by-pass *b* and passage *c*. The piston *h* is provided with a small port *i* for the purpose hereinafter explained.

The spring *e′* is preferably made weak, so that the valve *g* may yield to a slight pressure of the fluid in the radial passage *c*.

The operation of the described by-pass and auxiliary dash-pot is as follows: The piston *a* gives the heavy drag upon any movement of the centrifugal weight D, caused by the smallness of the orifice *o*, until the pressure applied to the piston *a* by the governor in the direction of the arrow has continued for a sufficient period of time by reason of the pressure of the fluid on the valve *g*, connected to the piston *h*, due to said pressure on the fluid by the piston *a* and the resistance of small orifice *o* to escape of the fluid to force enough fluid from the chamber *e* through port *i* of the piston *h* to the space between said piston *h* and the by-pass valve *g* to allow said valve to move to a position which opens communication between the two ends of the cylinder through the large by-pass *b*, thus greatly reducing the resistance to the motion of the piston *a* and correspondingly reducing the damping effect of the dash-pot on the governor.

A second by-pass valve and auxiliary dash-pot is provided, as indicated by dotted lines at P in Fig. 3 of the drawings, and is arranged to operate in a similar manner when the force tending to move the piston *a* is in an opposite direction to that indicated by the arrow.

By a proper proportioning of the size of the port *i* with reference to the size of the piston *h* of auxiliary dash-pot the time interval before the opening of the by-pass (during which interval the heavy damping effect will be in force) can be determined and can be made of sufficient length to prevent the governor from being affected by the surging of the electric generator, and at the same time the interval may be made brief enough to enable the governor to fulfil successfully its function as a regulator of the speed of the prime mover.

I do not limit myself to the specific construction and combination of the component parts of my invention, inasmuch as they are susceptible of modifications without departing from the spirit of my invention.

What I claim as my invention is—

1. The combination with a prime mover, a

governor consisting of a centrifugal weight whose force is opposed by a spring or gravity mounted on a suitable frame; and a main damper, the moving part of which is connected to said centrifugal weight, said damper having a releasing device so placed as to be automatically operated by the resistance of the said main damper, of an auxiliary damper connected to a moving part of said releasing device as set forth.

2. The combination with a prime mover, a centrifugal governor comprising centrifugal weights controlling the prime mover, a dash-pot comprising a cylinder carried on said governor, the piston-rod connected to an actuating part of the governor, a small by-pass communicating with the interior of the cylinder in front and rear of the piston, and large by-passes communicating with opposite ends of the interior of the cylinder, of auxiliary dash-pots controlling said large by-passes as set forth.

3. The combination with a shaft rotating in unison with a prime mover, a governor-frame, centrifugal governor-weights opposed by springs, and a cut-off eccentric, the position of which is controlled by the said centrifugal weights, of a main dash-pot cylinder mounted on said governor, a piston in said cylinder provided with a small by-pass orifice through it, and having its rod connected to an actuating part of the governor, large by-passes communicating with opposite ends of the interior of the cylinder, and auxiliary dash-pots controlling said large by-passes as set forth.

4. The combination with a shaft rotating in unison with a prime mover, a governor-frame, centrifugal governor-weights opposed by springs, and a cut-off eccentric, the position of which is controlled by the said centrifugal weights, of a main dash-pot cylinder mounted on said governor, a piston in said cylinder provided with a small by-pass orifice through it, and having its rod connected to an actuating part of the governor, large by-passes communicating with opposite ends of the interior of the cylinder, a chamber extending from each of said large passes and in range therewith, a valve in each of said passes, a piston in the chamber connected to said valve and provided with a port, and a spring in the aforesaid chamber pressing upon the piston of the chamber and thereby holding the valve yieldingly to the stop-shoulder as set forth and shown.

In testimony whereof I have hereunto set my hand and affixed my seal before two subscribing witnesses.

HARTE COOKE. [L. S.]

Witnesses:
J. J. LAASS,
H. B. SMITH.