T. Gill.

Governor.

No. 92,956. Patented July 27, 1869.

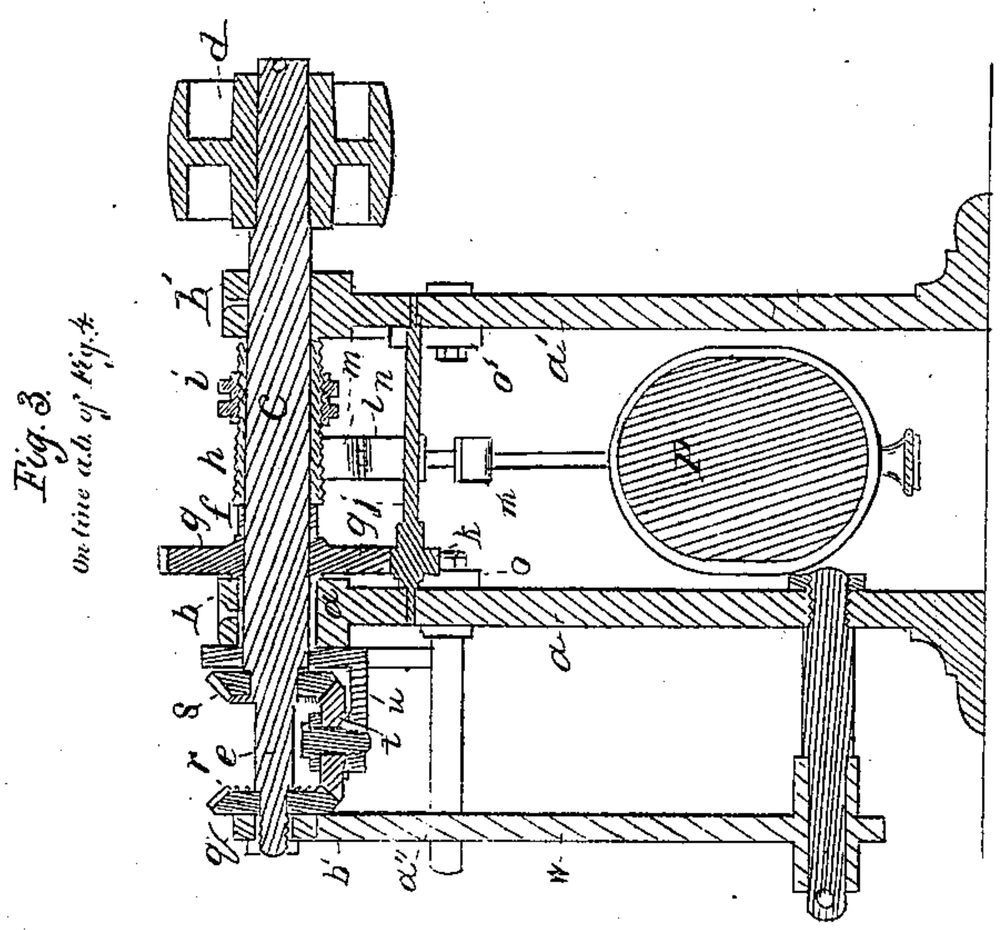

Fig. 3.
On line a.b. of Fig. 4.

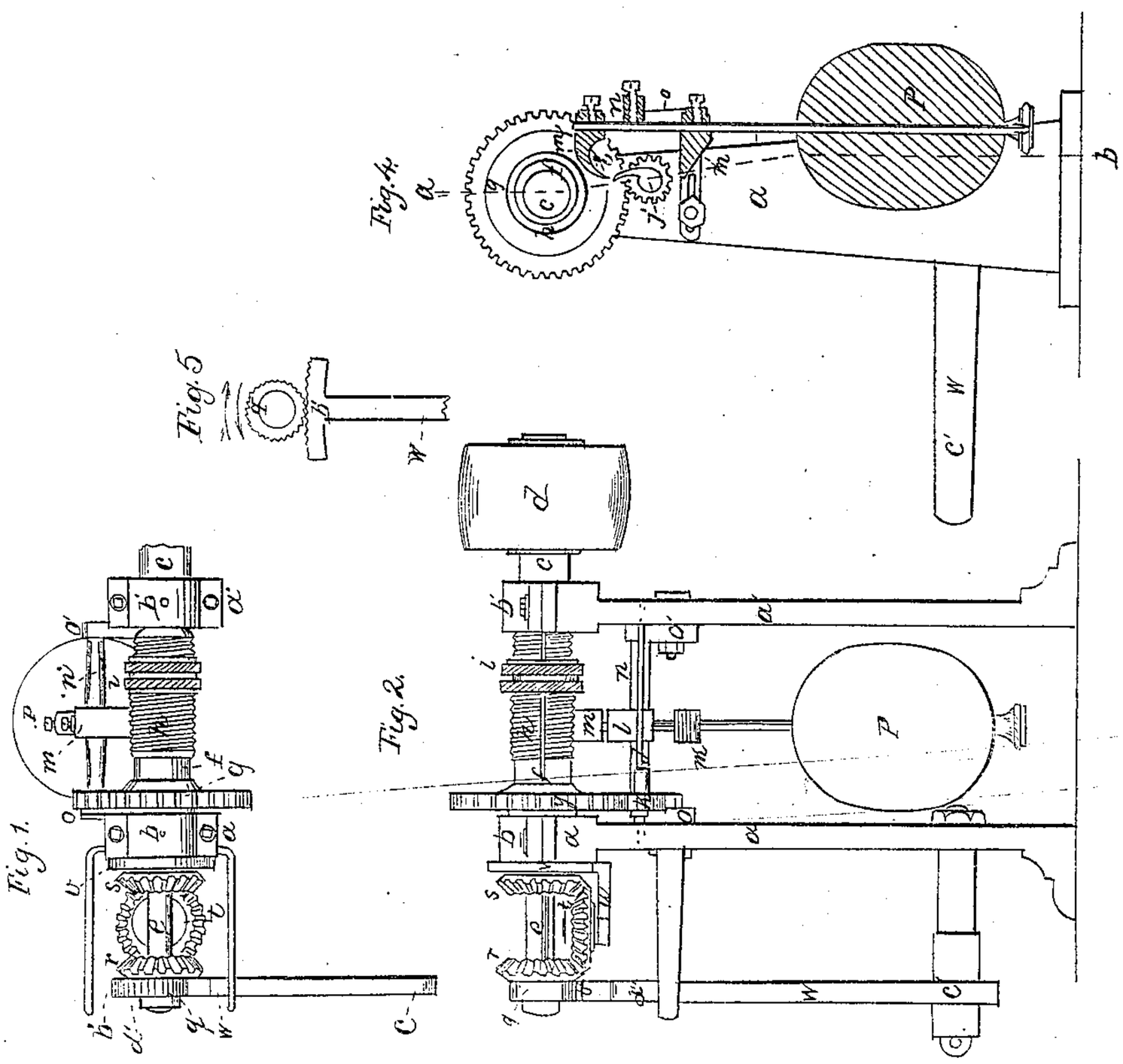

Fig. 4.

Fig. 1.

Fig. 5

Fig. 2.

Witnesses.
Edward. Griffith.
Geo A Loring.

Thomas Gill.
by his Attorney.
Frederick Curtis.

United States Patent Office.

THOMAS GILL, OF WALTHAM, MASSACHUSETTS, ASSIGNOR TO HIMSELF, JOHN STARK, AND JOHN STARK, JR., OF SAME PLACE.

Letters Patent No. 92,956, *dated July* 27, 1869.

IMPROVEMENT IN GOVERNORS FOR STEAM AND OTHER ENGINERY.

The Schedule referred to in these Letters Patent and making part of the same.

To all to whom these presents shall come:

Be it known that I, THOMAS GILL, of Waltham, in the county of Middlesex, and Commonwealth of Massachusetts, have made an invention of a new and useful Governor or Regulator for Steam-Engines or other Motors; and do hereby declare the following to be a full, clear, and exact description thereof, due reference being had to the accompanying drawings, making part of this specification, and in which—

Figure 1 is a plan,

Figure 2, a side elevation,

Figure 3, a vertical central and longitudinal section, and

Figure 4, a vertical and transverse section of my invention, a view of the toothed wheel and segmental rack, to be explained, being shown in Figure 5.

This invention relates to means for governing the valve of a steam-engine, in such manner as to regulate the movements of the valve with the expenditure of very little power, and one which shall detect and instantly equalize the slightest variation of the speed of the engine from a given rate, the only power of any appreciable amount required in the present instance being that required to move the valve upon its seat.

The invention consists in the employment or adaptation of the principles of the ordinary anchor-clock escapement, combined with the driving-shaft of the engine by a friction-connection, and operating in conjunction with a train of bevelled gears, and a toothed wheel, attached to the driving-shaft, and a sectoral rack and lever, connected with the valve, as hereinafter explained, the employment of the escapement enabling the device to be driven with the application of a very small amount of power, while, at the same time, it is very sensitive and effective in its operation.

In the drawings above referred to as accompanying this specification, and illustrating my invention—

a a′ denote two standards or uprights, supporting, in suitable boxes, *b b′*, a horizontal shaft, *c*, one extremity of such shaft being provided with a driving-pulley, *d*, the opposite or front extremity or portion, *e*, of such shaft projecting, beyond the standard *a*, a sufficient distance to receive and support the compound mechanism to be hereinafter explained, it being understood that the shaft *c* is to be driven, in a suitable manner, by power communicated from the engine with which the device is connected, or in any of the ordinary modes adopted in such cases.

A tubular, split, and slightly-tapering sleeve, *f*, encompasses the shaft *c*, and disposed between the standards *a a′*, as represented, the forward end of such sleeve having affixed to it a spur-gear, *g*, while upon the body of the sleeve is cut a male screw, *h*, upon which is screwed a nut, *i*, after the manner of ordinary drill-chucks, the device or chuck thus constructed serving as a friction-clamp or brake, to hold the gear to the shaft under considerable resistance, but to allow of a slip of such gear upon the shaft when its motions are stopped, under conditions and by means as hereinafter referred to, it being, of course, understood, that the further the nut is advanced upon the sleeve, the greater will be the pressure of such sleeve upon the shaft.

A small horizontal rocker-shaft, *j*, is supported in suitable bearings made in opposite inner faces of the standards *a a′*, and disposed a short distance below, and about in alignment with the driving-shaft, the said shaft *j* carrying a pinion, *k*, which engages with the gear *g*, before mentioned.

In addition to the pinion *k*, the shaft *j* carries a curved tooth, *l*, as shown in the drawings, such tooth operating in conjunction with a pallet, *m*, fixed to a second rocker-shaft, *n*, supported in bearings or brackets *o o′*, making part of the standards *a a′*, the shaft *n* being situated in rear of the shaft *j*, and at a slight elevation with respect thereto, the pallet being provided with a pendulum, *p*, or its equivalent.

The pallet *m* and the curved tooth *l* constitute, substantially, a clock-escapement, the rapid vibrations of the tooth, caused by the gear and pinion, converting it, essentially, into the ordinary escape-wheel of an escapement.

The extreme outer end of the portion *e* of the driving-shaft *c* has a toothed wheel, *q*, applied loosely to it, in such manner as to revolve freely thereon, while upon the inner face of such wheel is affixed a bevel-gear, *r*, as exhibited in figs. 2 and 3 of the accompanying drawings.

A second bevelled gear, *s*, is fixed tightly to the shaft *c*, and near the standard *a*, while between and meshing into the gears *r* and *s* is a third bevelled gear, *t*, the three gears being counterparts of each other, and the latter being supported, independently of the others, upon or by means of an arm, *n*, extending laterally from or making part of a disk or collar, *v*, turning loosely about the driving-shaft, and disposed between the gear *s* and the standard *a*, as represented, and connected with the sleeve *f* or spur-gear *g* by a sleeve, which extends through the bearing *a b*, as shown in fig. 3.

A vibrating bent lever, *w*, is fulcrumed to the lower part of the standard *a*, as exhibited, the upright arm *a″* of such lever having a sectoral rack, *b′*, meshing into the toothed wheel *q*, before mentioned, while the lower and horizontal arm *c′* is connected with the valve of the engine, which the device is to regulate, in a suitable manner, it being understood, that when this

latter arm is at its lowest position, the valve of the engine is full open. Consequently any elevation of this arm will tend to partially close the port.

The above description embraces the component parts and organization of my invention, which, though novel, will be readily understood by mechanics.

The operation of the device is as follows, it being understood that the driving-shaft *c* is in revolution in the direction of the arrow thereon:

It will be obvious, from the above description, that when the friction-mechanism and the escape-tooth are stopped from revolving with the driving-shaft, the toothed wheel *q* is driven, in the direction of its blue arrow, by the legitimate action of the three gears *r s t*, and operating upon the lever *w* in closing the valve-port.

Without the action of the escape-tooth and pallet, and while the friction-device or its equivalent is rotating freely with the driving-shaft, the intermediate gear revolves by and with the others without effect. The toothed wheel *q* is also driven directly by and with the shaft in the direction of its red arrow, and, by depressing the lever *w*, tends to open the port, until the driving-shaft acquires such momentum as to revolve the friction-mechanism and its escape-tooth with such rapidity as to rotate the intermediate gear, *t*, upon its journal a portion of the time, or during the intermittent periods of time, that the escape-tooth is stopped by the pulsations of the pallet *j*. The greater the amount of time consumed in each of such stops, the longer will be the effect of the toothed wheel upon the valve-lever, to close the valve. Consequently the device should be so adjusted, by changing the length of the pendulum-rod, or by other means, as to maintain a medium stand-point between the effect of the two before-mentioned extremes, or so that the toothed wheel shall be at about the centre of the rack *b'*.

Of course, the more rapid the revolutions of the driving-shaft from this medium point, the greater will be the distance travelled by it during each intermittent stoppage of the friction-brake by its escapement, with a consequent increase, as before mentioned, of the partial or whole revolution or revolutions described by the toothed wheel *q*, and of the closing of the valve. *Vice versa*, the slower the revolution of the shaft from the stand-point, the less the amount of time occupied in the stoppage of the friction-brake, and the greater the distance travelled by the toothed wheel, in the proper direction to open the valve.

It is presumed that the above description will be sufficiently lucid and elaborate to enable mechanics conversant, or approximatingly so, with instruments of horology, to understand the use of my invention, as well as to properly adjust it to the needs and characteristics of various engines to which it may be applied.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. The clock-escapement mechanism, substantially such as herein described, to regulate or govern the speed of the engine or other motor with which it is connected, substantially in the manner shown and set forth.

2. The combination, with the aforesaid escapement-governing mechanism, for regulating the speed of the engine or other motor, of the friction-sleeve or device which connects the same with the driving-shaft, substantially as herein shown and set forth.

3. The arrangement, with the escapement-mechanism and friction-brake or sleeve, of the gears *r s t*, toothed wheel *q*, lever *w*, and sectoral rack *b'*, for transmitting power from the escapement to the engine.

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Witnesses:

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GEO. H. SHIRLEY.