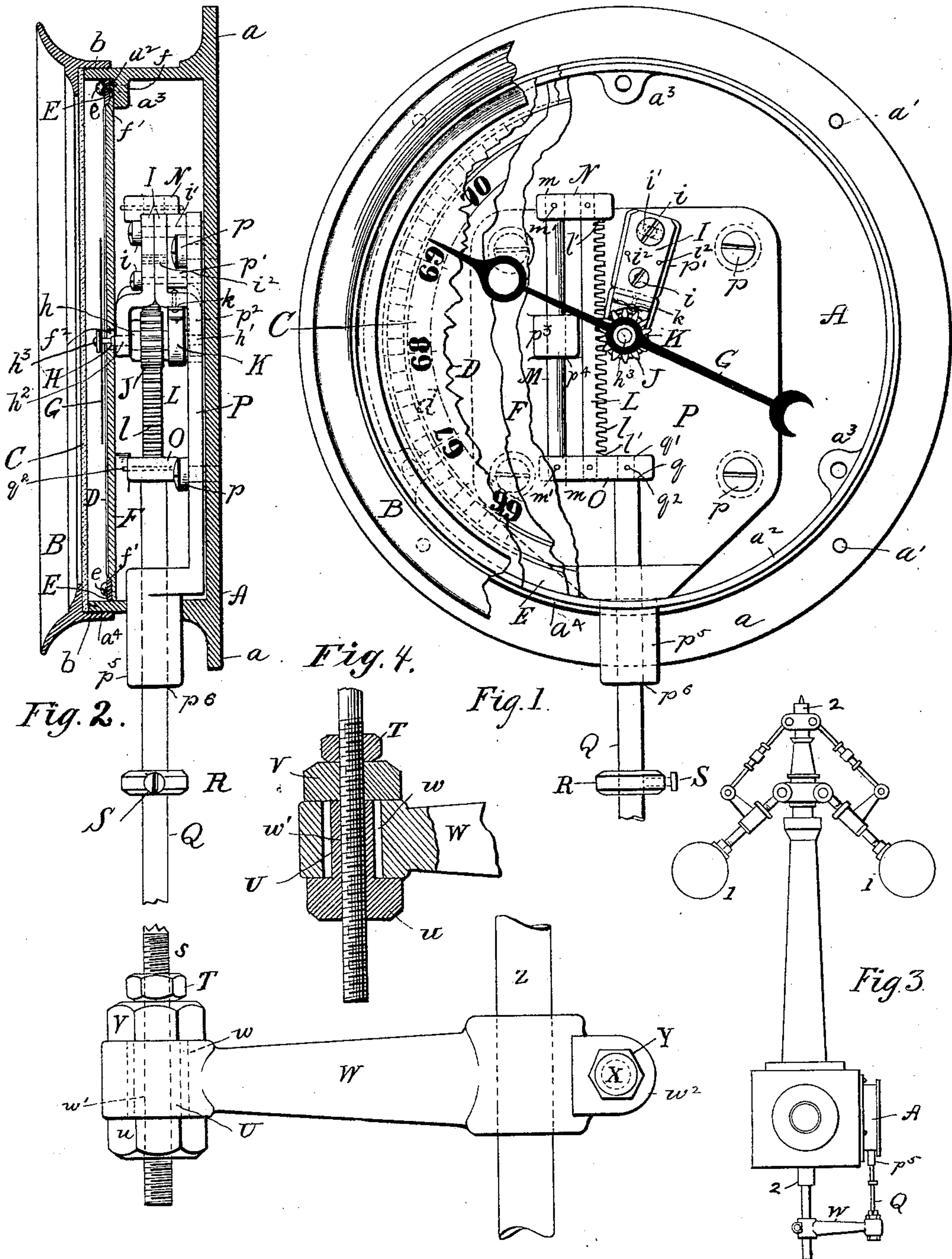


(No Model.)

G. LEVERICH.
SPEED INDICATOR.

No. 435,433.

Patented Sept. 2, 1890.



WITNESSES:

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GABRIEL LEVERICH, OF SOUTH ORANGE, NEW JERSEY.

SPEED-INDICATOR.

SPECIFICATION forming part of Letters Patent No. 435,433, dated September 2, 1890.

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To all whom it may concern:

Be it known that I, GABRIEL LEVERICH, a citizen of the United States, residing in South Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Speed-Indicators, of which the following is a specification.

A prime mover, actuated by steam, water, or other similar agent, is, under changes of load or of pressure of the operating medium, subject to variations of speed. To control these variations and to confine them between narrow limits usually a regulating mechanism is introduced, an essential part of which is a conical pendulum or "governor." In operating such a prime mover it is often important to know at a glance, and definitely, how many revolutions are being made in a unit of time, as a minute—that is, the rate of speed.

The object of this improvement is to supply a speed-indicator, which may be cheaply made and readily attached, for the purpose of showing constantly the speed of a moving machine or of any member thereof which may drive a speed-governor.

Accompanying, and a part of this specification, are the drawings.

Figure 1 represents a front elevation of the indicator with a part of the face removed; Fig. 2, a central vertical sectional elevation; Fig. 3, a view of a speed-governor showing its connection with the indicator, and Fig. 4 is a detail sectional view hereinafter referred to.

The open cylindrical metallic case A is closed by the glass C, held in place between the edge a^4 and the flanged ring B, the latter being secured to the case by the threads b or otherwise. The shallow chamber thus formed dust-tight and accessible contains the working parts of the indicator. These parts are carried by the frame P, attached to the case by the screws p , and with the frame may, whenever necessary, be removed from the chamber. By screws through the holes a' in the flange a , the indicator may be secured to a suitable part of the frame of the prime mover or of the moving machine in a convenient position for service. The rack L at its ends is mortised into the rack-arms N and O, with the shoulders l' formed on the upper and lower teeth of the rack, close against the inner flat surfaces of the latter. Back of the

rack, parallel to it and in the same plane, is the cylindrical rod M, which at its ends passes through the holes m in the arms and is fastened by the pins m' , the rack, arms, and rod thus forming a stiff frame, as shown, and preferably thus made, although the rack and arms may be, if desired, in one piece. In the hole p^6 , central through the cylindrical lug p^5 , a part of the frame and projecting outward through the sides of the case A, slides the cylindrical indicator-rod Q, the upper end of which, reduced in size and with a shoulder q , is entered into the hole q' through the arm O, and fastened by the pin q^2 . Similarly in the hole p^4 , through the lug p^3 , also a part of the frame, slides the rod M. These two rods fit their holes and are in lines parallel to and in the same plane with the rack.

Fastened to a third lug p' of the frame by the screws i are the two similar bent brackets I. These collectively form a yoke and carry the pinion J on its spindle H, which, with the shoulders h bearing against the inner surfaces of the brackets, is free to revolve on its pivots $h' h^2$. To lessen the depth of the chamber, a hole p^2 is cut out of the base of the frame, which receives the bent arm of the inner bracket and a part of the spindle, as shown.

The teeth of the pinion engage with the teeth l of the rack. Preferably, to eliminate any play between them they should be of an involute form. To adjust their contact, the upper hole i' through the brackets for the screw i is slotted. To keep the brackets together as one when adjustment is being made, the steady-pins i^2 are put through them, as shown. In some cases, to reduce still further the possibility of the pinion having a slight motion independently of the rack, a spiral spring K is inserted centrally around the spindle, one end of the spring being attached thereto and the other end k to the bracket or frame, and under stress sufficient to keep the working teeth in contact on the same side throughout the entire movement of the rack.

Resting on the circular rabbet a^2 within the case A parallel to and a small distance from the glass C is the index-plate F. It is held in place by the screws f into the lugs a^3 of the case. The outer end of the spindle H projects through a central hole f^2 of the plate

and carries the index-hand or pointer G, secured by the nut h^3 or otherwise to the spindle so as surely to rotate with it. The annular graduated index d , upon which the pointer
 5 designates the number of revolutions per unit of time—as one minute—made by the prime mover or other machine to which the indicator is attached, may, when the latter is to be applied to different machines, be drawn
 10 upon a sheet of paper D, tightly stretched over the plate by the flat ring E, let into the circular rabbet f' and held by the screws e , all as shown; or, for indicators to be applied to similar machines, the index may be engraved
 15 or otherwise put upon the plate itself in enduring lines and characters. Preferably, the index should be delineated, the pointer placed, and the relation between the diameter of the pinion and the entire movement of the rack
 20 chosen, so that for a mean or normal speed of the machine to which the indicator is applied the pointer will be vertical, and between the extreme variations of speed observed it will traverse almost an entire circle.

25 To prevent too great a movement in either direction of the rack, accidentally or otherwise, and consequent injury to the working parts, the stop R on the indicator-rod Q is adjusted to bring up at the upward limit
 30 against the bottom of the lug p^5 and made fast by the screw S. At the downward limit the arm O brings up against the top of this lug.

The balls l of a conical pendulum, or the
 35 equivalent parts of other rotative governors, at a given speed revolve in a certain normal plane, and at a greater or less speed in another normal plane at one or the other side of the first. Therefore the central governor-shaft 2
 40 connected to these balls or equivalent parts will move with them as the speeds vary over spaces proportionate to the spaces between these respective planes. On this shaft preferably, or another attached thereto having a
 45 like lineal movement without rotation, as the operating-shaft Z, is the arm W, adjusted to position and held fast by the two-jawed clamp w^2 , the bolt X, and the nut Y. At the
 50 outer end of this arm, in the cylindrical hole w , is carried the spool U, which, to permit a slight transverse movement, is somewhat less in diameter than the hole, and between its
 fixed flange u , and its screw-flange V, loosely clasps the arm.

55 On the lower end of the indicator-rod Q are the threads s . Centrally through the spool is the hole w' , also threaded. When in position the spool, as a nut, is screwed on the rod and fixed by the lock-nut T. By this arrange-
 60 ment it will be seen the working-length of the indicator-rod may be changed, and thereby the relative position of the pointer to the divisions of the index adjusted; also, if the shaft and rod are not strictly in parallel lines,
 65 a side stress on the latter while moving up or down is prevented. It will be noticed that

in operation the rack will have a lineal reciprocating movement strictly proportionate to the spaces between the normal planes, in which at different speeds the balls or equivalent parts of the governor revolve, and there-
 70 fore the pointer will constantly exhibit on the index the rate of speed of the prime mover or other machine to which the indicator is attached.

75 My invention differs from the ordinary speed-indicators which are connected with some rotating portion of the engine itself, for my connections are made directly from the rack of the indicator to a moving element of
 80 the speed-governor, and are therefore external to and independent of any portion of the engine proper. By these connections I utilize the vertically-moving part of a speed-governor and avoid the necessity of employing special
 85 mechanism for operating my rack.

Having thus described my invention, I claim—

1. The combination, with a speed-governor having a vertically-movable rod, of a speed-
 90 indicator also having a vertically-movable rod for operating the mechanism thereof, and a direct connection between the two rods, whereby the said indicator will be operated
 95 by the said governor.

2. The combination, with a speed-governor and a speed-indicator, each having a reciprocating rod in a plane parallel to the other, of
 100 a direct connection between the two rods, whereby the indicator-rod will be operated by the rod of the governor, substantially as described.

3. A speed-indicator embodying an index, a pointer rotating upon an axis, a pinion upon
 105 said axis, a rack engaging the said pinion and having an extension or rod, in combination with a speed-governor having a reciprocating rod and an arm extending therefrom and connected with the rod of the indicator-rack, substantially as described.

4. A speed-indicator having a reciprocating rod for operating it, in combination with a
 110 speed-governor having a reciprocating rod and an arm extending therefrom and adjustably secured to the indicator-rod, substantially
 115 as described.

5. The combination, with the casing of an indicator and an operating rod or shaft projecting into the same from the outside, of a
 120 frame secured inside the casing carrying the internal mechanism and having an extension which passes through the walls of the casing and forms a bearing for the operating rod or shaft.

In witness whereof I have hereunto signed
 125 my name in the presence of two subscribing witnesses.

GABRIEL LEVERICH.

Witnesses:

WM. A. ROSENBAUM,
 THOMAS K. TRENCHARD.