(No Model.) 3 Sheets—Sheet 1.

# H. CONANT.

## SPEED INDICATOR.

No. 388,532. Patented Aug. 28, 1888.

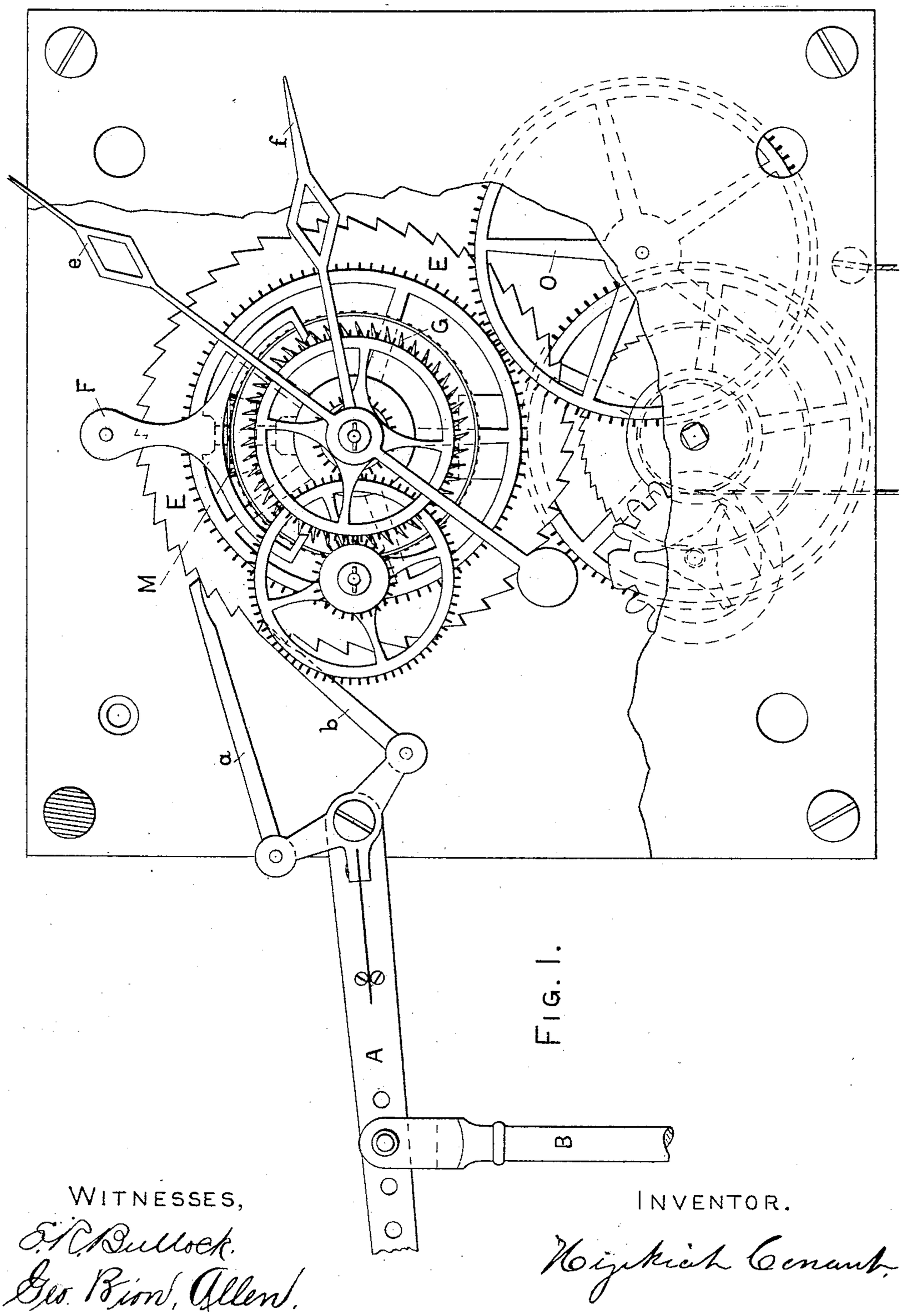


FIG. 1.

WITNESSES,
E. C. Bullock.
Geo. Biorn, Allen.

INVENTOR.
Hezekiah Conant.

(No Model.)

3 Sheets—Sheet 2.

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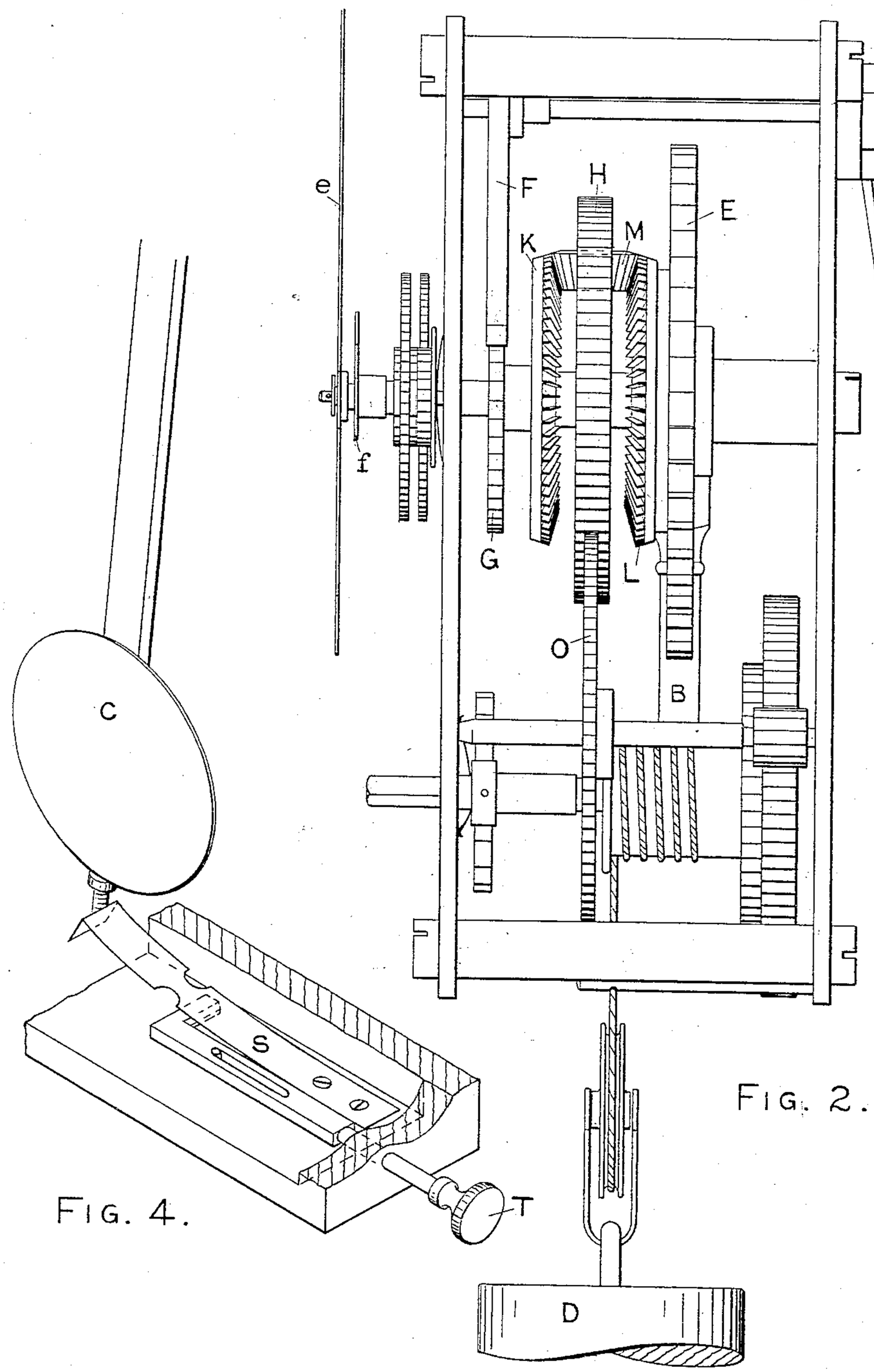


FIG. 4.

FIG. 2.

WITNESSES,

E. C. Bullock.

Geo. Biorn. Allen.

INVENTOR.

Hezekiah Conant.

(No Model.) 3 Sheets—Sheet 3.

# H. CONANT.

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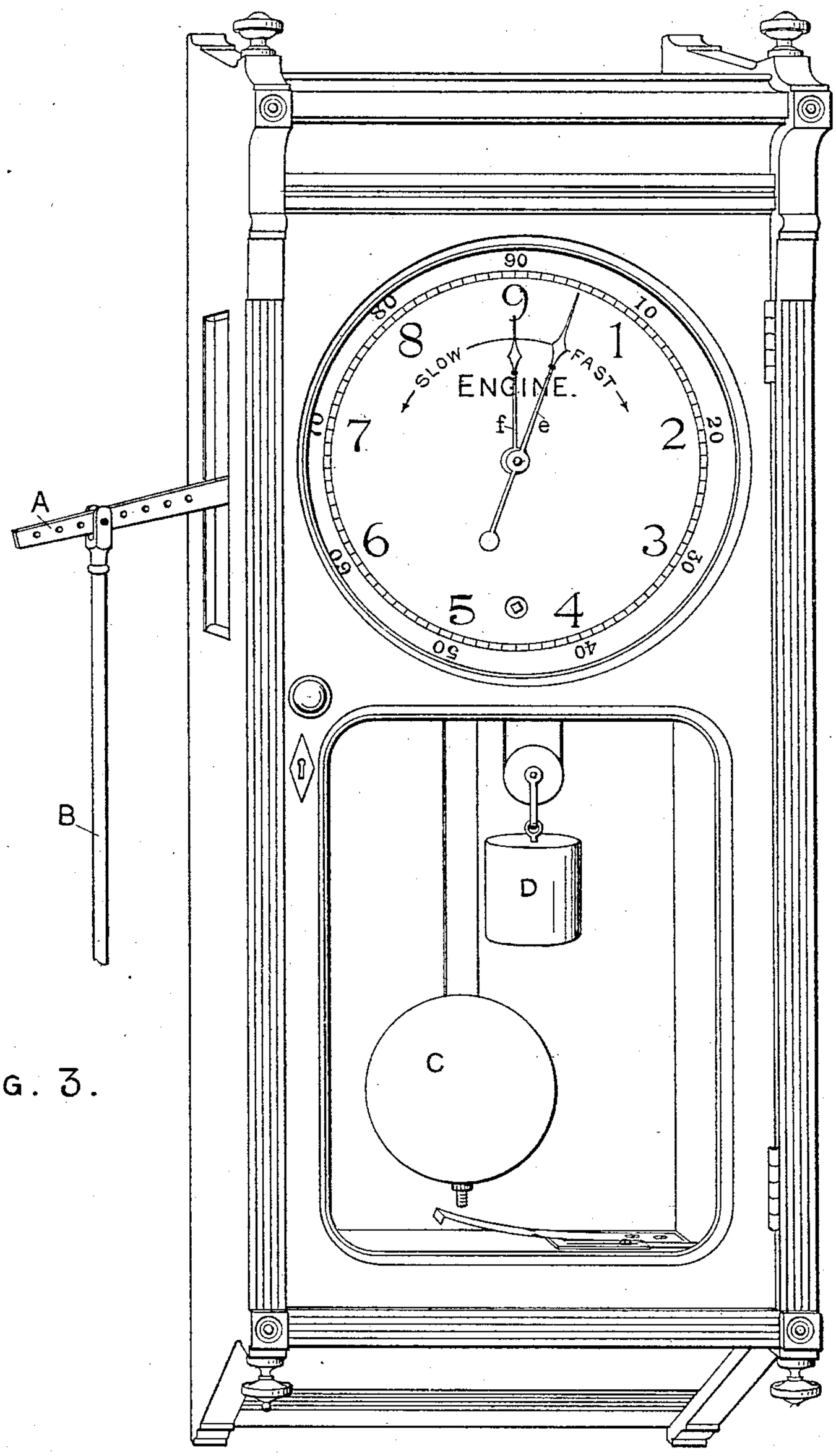


FIG. 3.

WITNESSES,

E. C. Bullock.
Geo. Bird Allen.

INVENTOR.

Hezekiah Conant.

# UNITED STATES PATENT OFFICE.

HEZEKIAH CONANT, OF PAWTUCKET, RHODE ISLAND.

## SPEED-INDICATOR.

SPECIFICATION forming part of Letters Patent No. 388,532, dated August 28, 1888.

Application filed April 14, 1888. Serial No. 270,699. (No model.)

*To all whom it may concern:*

Be it known that I, HEZEKIAH CONANT, a citizen of the United States, residing at Pawtucket, in the county of Providence, Rhode Island, have invented a new and useful Speed-Indicator, of which the following is a specification.

The object of my invention is to secure a convenient and certain method of showing constantly the rate of speed of a revolving shaft, whether of a motor or attached to an engine or motor of any kind in such a manner that when the shaft to be observed is revolving at its standard speed the hands or pointers will remain stationary, and when the speed falls short or exceeds said standard rate by ever so small an amount the indicator shows such difference by moving its hands forward or backward, as the case may be, whenever the difference has arisen, thus showing constantly to the manager or attendant how much time or how many revolutions said shaft has gained or lost since the start, and that without any written or mental calculation whatsoever. I attain this by means of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a front view of the works having the dial removed and a portion of the supporting-plate broken away. Fig. 2 is a side view of the same. Fig. 3 is a perspective view of the instrument complete as it appears in actual operation. Fig. 4 is a perspective view of the device for stopping and starting the pendulum.

Similar letters refer to similar parts throughout the several drawings.

The manner in which this indicates can be best understood by referring to Fig. 3. It resembles a clock, and has two hands that indicate when the observed shaft or engine is at its true speed by pointing to the figure 9, which is the zero-point. If the shaft in its course has exceeded the appointed rate or fallen short of the same, the long hand moves toward the word "Fast," if gaining, and toward "Slow," if losing, and the small divisions passed over may be seconds of time or single revolutions, as desired and planned. The short hand has a relative motion to the long hand of one to nine in the instrument here described.

There is a lever, A, projecting from the left-hand side of the clock, having a rod, B, which is assumed to have a direct connection to the shaft or engine whose revolutions we wish to observe. The rod B is actuated by the said shaft or engine to move up and down, or in some way to impart a reciprocating motion to the lever A, so that every upward or forward movement represents one revolution of the shaft. There is a pendulum, C, shown in the lower part of the clock, and a weight, D, will act, as in an ordinary clock, to impel an escapement that keeps the pendulum in motion. Now it is well known that a pendulum is the best device to measure time into equal parts, and in this instrument is so adjusted that the long hand *e* of the dial will revolve exactly once in two minutes. The short hand *f* will move across one of the divisions marked by numerals in the same time and complete a circuit of the dial in eighteen minutes. We will now assume that the engine to be observed is running at its full speed and the pendulum of the clock is in motion and the hands are both pointing to the figure 9. Now, so long as the speed is at the proper and desired rate, the hands will remain stationary; but if the engine gains or loses upon the pendulum the hands register that gain or loss upon the dial as fast as established, no matter how much or little, or how long or short the time occupied in making it. Thus it will be apparent to the manager of a large factory as he passes near to the indicator whether the speed has varied, and to what extent, since the start.

The mechanical arrangements are best seen in Figs. 1 and 2. Fig. 1 represents the mechanism with the dial-plate removed and a portion of the movement-plate broken away, showing a front view of the train and works. The rod B, actuated by the engine, and lever A are seen at the left, from which two pawls, *a* and *b*, act upon a ratchet-wheel, E, which is made with a sufficient number of teeth, so that when the engine runs at its correct speed it will make a complete revolution in exactly one minute of time. In front of this ratchet-wheel is seen an ordinary escapement-anchor, F, which is acted upon by the ratchet-escapement wheel G. This is also rated to revolve once in exactly one minute, but in a contrary direc-

tion to the wheel E. In Fig. 2 the ratchet-wheel E is seen at the right and the pendulum, anchor, and escapement at the left. There are two bevel-gears, K and L, which are fast and actuated by the ratchet-wheels mentioned, the ratchet-wheel E actuating the bevel L and the ratchet G actuating the bevel K. The large wheel H is the only wheel fast to the shaft that carries the long hand *e* of the dial, so that can only revolve with it. This wheel carries a small bevel, M, mounted with its axis radial to the axis of the wheel, as shown, which connects the two bevels K and L. It is now easy to see that if the two bevel-wheels revolve in contrary directions at the same rate of speed the small wheel M will revolve idly between without any impulse to move wheel H in either direction; but if the wheel E is stopped and the pendulum is in motion the weight D will impel the same, and the wheel K, revolving, will carry the wheel M, and thus impel the wheel H to move with it, but at a rate one-half of the wheel K, and thus carries the long hand around, as said before, once in two minutes. On the other hand, supposing the pendulum is stopped and the engine is in motion, the wheel H is forced around in the opposite direction at the same rate, and this action, it will be seen, reverses the movement of the clock-train that is impelled by the weight D, and therefore while this condition of things lasts the weight is gradually but surely wound up. Thus it will be seen that when the engine is at the rate of the pendulum the weight remains stationary, as well as the hands, and will require no winding until the engine has lost time enough in the total to run the weight completely down, requiring several hours of quiet to accomplish.

Fig. 4 represents a device for stopping and starting the pendulum by pulling out and pushing in a knob, T. A spring shaped as shown and marked S is screwed to the bottom of the case and rests with one end resting upon the arm of an L-shaped metal block secured by a guiding groove in its position, and is so arranged that when the knob T is pulled out it moves its farther end under the spring and raises it to the position shown in the drawings. This spring is slender, and if the pendulum is not at the time in the proper position to be caught by it it passes of its own momentum and depresses the spring till it has passed the point of it, which rises and catches the pendulum in the manner shown in the drawings. Now when the knob T is pushed in the spring S falls and liberates the pendulum, which allows it to swing and act as before.

The influence of the weight D on the clock mechanism is transmitted through gear-wheel O to the wheel H and through the bevel-wheels M and K to the pendulum-escapement, which influence is exerted to keep the pendulum in motion even though the wheel H shows no motion, as when the engine is running at the normal speed.

The instrument here described is adapted to register and indicate the speed of a steam-engine going at forty-five revolutions per minute, and one revolution of the long hand will show that the engine has lost or gained ninety revolutions, as the motion of the hand forward or backward indicates; or it will indicate two minutes of time if divided into one hundred and twenty parts instead of ninety. The wheel E can be actuated by a worm meshing into teeth on its periphery, or in any other convenient manner, as I do not confine myself to any special method of imparting motion to the wheel E, but can use any well-known and convenient appliance.

I am well aware that speed-indicators have been constructed wherein a time-keeping movement has been associated with a motion from an engine or revolving shaft in various ways; but this special manner of using the device or combination to show the actual departure constantly of the observed engine or shaft from its true and normal speed by means of a differential motion is substantially new, and

What I do claim, and desire to secure by Letters Patent, is—

1. A differential speed-indicator consisting of a clock-gear for keeping time, a gear for connection with and operation by an engine, and a differential gear in mesh with both the clock-gear and engine-gear, and provided with indicator-hands arranged to move forward or backward according to the predominance of motion in the clock or engine gear, substantially as described.

2. A differential speed-indicator consisting of a clock-gear for keeping time, a gear for connection with and operation by an engine, and a differential gear consisting of a bevel-wheel, L, connected to the engine gear, a bevel-gear, K, connected with the clock-gear, and an intermediate gear, H, carrying upon a radial axis within its plane a bevel-pinion, M, arranged in mesh with both the bevel-gears L and K, and a set of indicator-hands connected to the gear H, substantially as and for the purpose described.

HEZEKIAH CONANT.

Witnesses:
E. R. BULLOCK,
GEO. BION ALLEN.