

(No Model.)

F. W. CROSSLEY, H. P. HOLT & F. H. ANDERSON.

PENDULUM GOVERNOR FOR GAS MOTOR ENGINES.

No. 363,508.

Patented May 24, 1887.

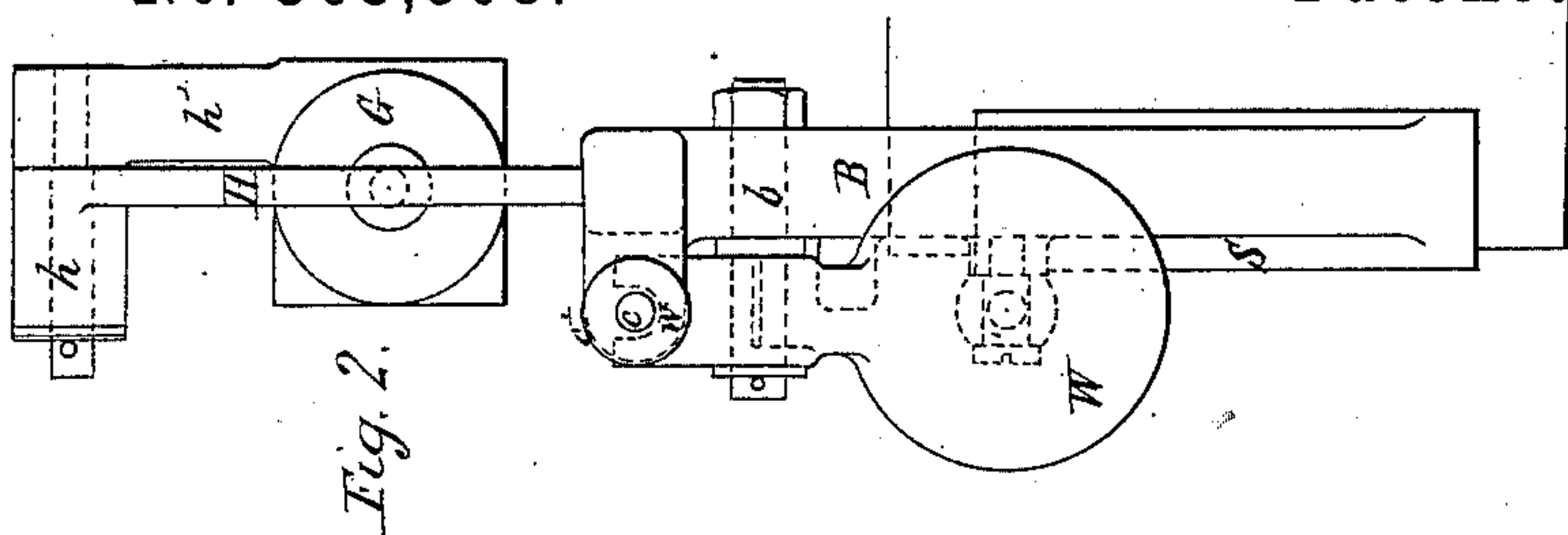


Fig. 2.

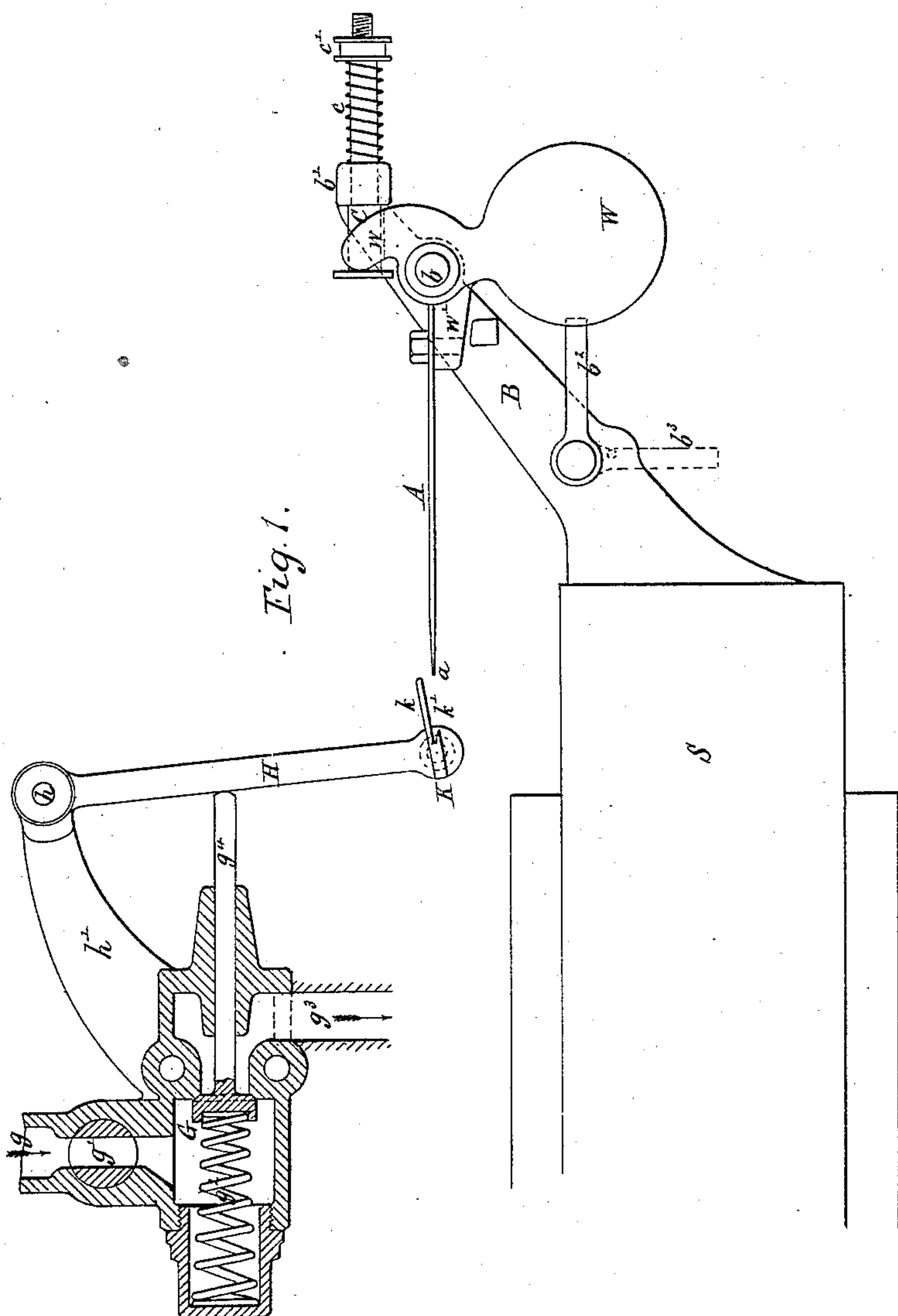


Fig. 1.

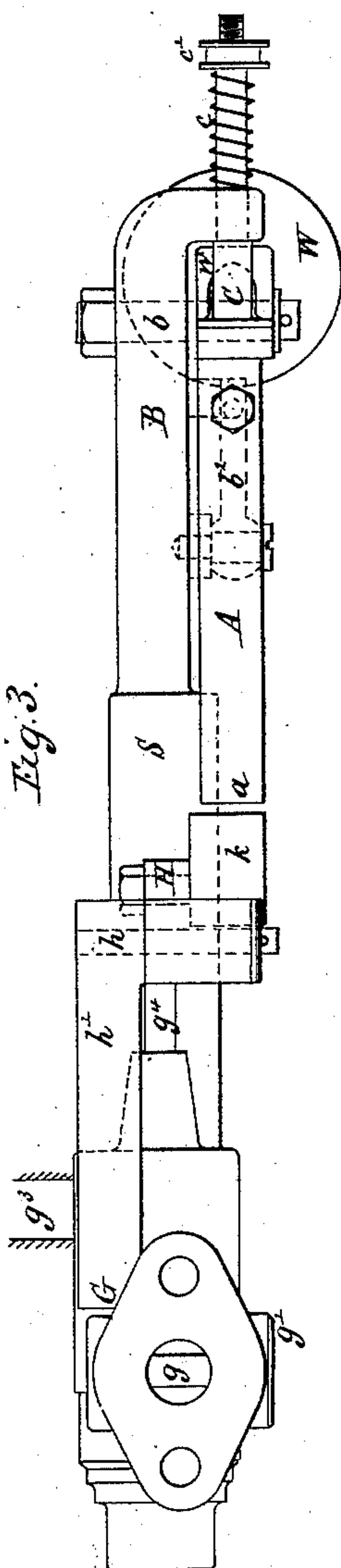


Fig. 3.

Witnesses:
 L. Fred. Keller
 Parker & Sweet, Jr.

F. W. Crossley, H. P. Holt, and
F. H. Anderson.
By C. S. Whitman -
Attorney

UNITED STATES PATENT OFFICE.

FRANCIS WM. CROSSLEY, HENRY P. HOLT, AND FRANK H. ANDERSON, OF
OPENSHAW, MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

PENDULUM-GOVERNOR FOR GAS-MOTOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 363,508, dated May 24, 1887.

Application filed March 20, 1886. Serial No. 195,933. (No model.) Patented in England January 27, 1881, No. 370.

To all whom it may concern:

Be it known that we, FRANCIS WILLIAM CROSSLEY, HENRY PERCY HOLT, and FRANK HERBERT ANDERSON, citizens of England, all residing at Openshaw, Manchester, in the county of Lancaster, England, have invented a new and useful Pendulum Governor for Gas-Motor Engines, (part of which is patented in Great Britain by Letters Patent No. 370, dated January 27, 1881,) of which the following is a specification.

Our invention relates to a governor for gas-motor engines, applicable more particularly to those of the kind known as the "Otto silent" engine, but also applicable to other gas-motor engines which have their speed regulated, not by varying the quantity of gas supplied for any cylinder-charge, but by entirely suppressing the gas-supply during a revolution or during several revolutions of the engine, whenever the speed has to be reduced. For this purpose we utilize the inertia of a suspended weight, which reciprocates along with the slide or other properly-timed part of the engine, and is so connected to the gas-supply valve that when the speed of reciprocation is moderate it causes the valve to be opened, but when the speed is excessive it allows the valve to remain closed.

We will describe apparatus according to our invention, referring to the accompanying drawings, which show its application to a gas-motor engine of the Otto kind.

Figure 1 is a front elevation with the gas-supply valve shown in section. Fig. 2 is an end view; and Fig. 3 is a plan.

S is a part of the engine slide-valve, which reciprocates to and fro in the usual way for admission and ignition of the cylinder-charge. On a bracket, B, projecting from the end of the slide, is mounted by a pin, *b*, the hanging weight W. A fork, *w*, projecting from W, above the pin *b*, embraces a collar-bolt, C, which is strained against the boss *b'* of the bracket B by a helical spring, *c*, that can be adjusted to give more or less strain by screwing or unscrewing a finger-nut, *c'*. From an arm, *w'*, of the weight W projects an elastic blade, A, terminating in a somewhat sharp-ened edge at *a*. The gas-valve G receives sup-

ply of gas by the branch *g*, which can be closed by a stop-cock, *g'*. The valve itself is pressed by a spring, *g''*, against its seat, beyond which there is the usual passage, *g'''*, leading to the port in the facing, against which the slide-valve S works. The stem *g''* of the valve projects through the end of the valve-box and abuts against a lever, H, which is suspended by a pin, *h*, from a bracket, *h'*, projecting from the valve-box G. At the lower end of the lever H is fixed in an inclined attitude a piece, K, having in its front a notch between a long upper lip, *k*, and a short lower lip, *k'*. On the bracket B is loosely pivoted a rod, *b''*, the end of which enters a shallow notch in the face of the weight W. While W remains in the position shown the rod *b''* remains engaged in its notch; but when W swings away toward the right the rod *b''* drops to the position indicated by the dotted lines *b'''* in Fig. 1, leaving W free to swing to and fro. The spring *c*, being adjusted by the nut *c'* to suit the desired speed of the engine, the action of the apparatus is as follows:

When the slide-valve S makes its stroke toward the left, the weight W accompanies it, provided that the speed of the stroke is not too great, and the edge *a* of the blade A engages in the notch between *k* and *k'*. As the slide-valve continues its stroke toward the left the lever H, moved by A, pushes the valve-stem *g''* and opens the gas-valve G, in opposition to the spring *g''*, the valve G being retained open until the slide-valve S has moved so far back toward the right that the blade A leaves K. The parts *a* and K are so arranged relatively to the ports governed by the slide-valve S that this opening of the valve G coincides with the opening of the supply-port of the cylinder by the slide-valve S. Thus as long as the speed with which the slide-valve S effects its reciprocation is not greater than that due to the normal speed of the engine there is a supply of gas given at every left-hand stroke of the slide-valve S. Should the speed of the engine exceed the normal, then, on the movement of the slide-valve S to the left, the inertia of the weight W, if sufficient to overcome the force of the adjusted spring *c*, or of gravity, in combination, or of gravity alone,

if preferred, causes it to hang back, thus depressing the blade A. The edge *a* is thus made to miss the notch of K, and the slide-valve makes its stroke without opening the gas-valve G.

5 The supply of gas may thus be entirely suppressed for one stroke or for several strokes, the engine working idly until its speed becomes so far reduced that the edge *a* again engages in the notch of K, and causes a fresh supply of
10 gas to be given. By adjusting the spring *c* by screwing up or screwing back the nut *c'* the normal speed—that is to say, the speed at which *a* will regularly engage in the notch of K—can be made greater or less as desired. When the
15 engine stops, the weight W swinging toward the left raises the blade A, so that if the slide-valve should be moved toward the left the edge *a* passes clear above the lip *k*, failing to open the gas-valve. On the return of the slide
20 to the right the weight W can be propped back by raising the rod *b*² into a position ready for starting the engine afresh, and when the engine is started it will continue in this position until the speed becomes such that W hangs back,
25 releasing the rod *b*², which drops, leaving W free to operate for governing the engine, as above described.

Having thus described the nature of our invention and the best means we know of carrying it out in practice, we claim—

30 1. In a pendulum-governor for gas-motor engines, the combination of the weight suspended from and reciprocating with the slide S, or other proposed time part of the engine, having its swing in one direction resisted up to
35 a certain speed by gravity, and afterward by an adjustable spring, the blade-arm projecting from it and toward a notch at the end of the lever against which abuts the stem of the spring
40 gas-valve, as and for the purpose described.

2. In a pendulum-governor for gas-motor engines, the combination of the weight W, provided with the fork *w*, suspended from and reciprocating with the slide S, mounted upon
45 the bracket B, the rod *b*² pivoted thereto, and the arm A, terminating in a sharpened edge, *a*, to receive the notch in the piece K, secured to the lever H, suspended from the bracket *h*² of the spring gas-valve, as and for the purpose
50 described.

3. In a pendulum-governor for gas-motor engines, the combination of the slide S, or other proposed time part of the engine, provided with

the bracket B, the swinging weight W, and elastic blade-arm A, secured thereto and terminating in a sharpened edge, *a*, for receiving the notch in the piece K, secured to the lever H, suspended from the bracket *h*² that abuts against the stem of the spring gas-valve, as and for the purpose described.

4. In a pendulum-governor for gas-motor engines, the combination of the gas-valve G, through which the stem *g*⁴ projects and abuts against the lever H, at or near its center, and hinged to the bracket *h*², the spring *g*², secured within the gas-valve G, the elastic blade A, terminating in a sharpened edge to receive the notch in the piece K, and weight W, hinged to the bracket B, secured to the slide S of the engine, the spring *c*, and nut *c'* for regulating the speed, as and for the purpose described.

5. In a pendulum-governor for gas-motor engines, the combination of the weight W, provided with the fork *w*, hinged to the bracket B, and reciprocating with the slide S, or other proposed time part of the engine, resisted in one direction by the collar-bolt C, carrying the spring *c*, and finger-nut *c'*, running in the boss *b'*, secured to the bracket B, the elastic blade A, terminating in a sharpened edge, *a*, for receiving the notch in the piece K, attached to the lever H, as and for the purpose described.

6. In a pendulum governor for gas-motor engines, the combination of the slide S, or other proposed time part of the engine, provided with the boss *b'*, secured to the bracket B, the collar bolt C, carrying the helical spring *c*, provided with the fork *w*, and the elastic blade A, terminating in a sharpened edge, *a*, and secured to the arm *w'* for receiving the notch in the piece K, secured to the lever H of the gas-valve, and the rod *b*² for receiving the recess in the said weight, as and for the purpose described.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 23d day of February, A. D. 1886.

FRANCIS WM. CROSSLEY.
HENRY P. HOLT.
FRANK H. ANDERSON.

Witnesses:

ROBT. TOMLINSON,
ROBERT WARDLE,
Notary's Clerks, 56 Brown Street, Manchester.