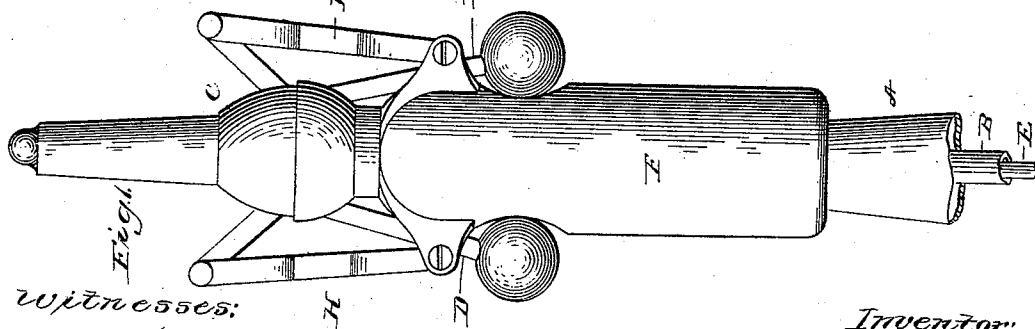
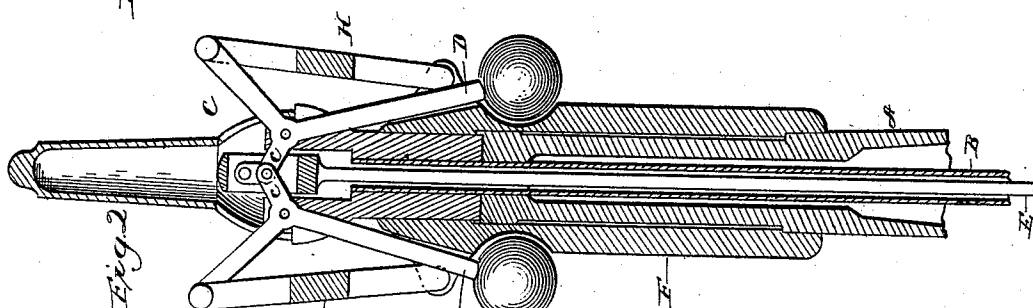
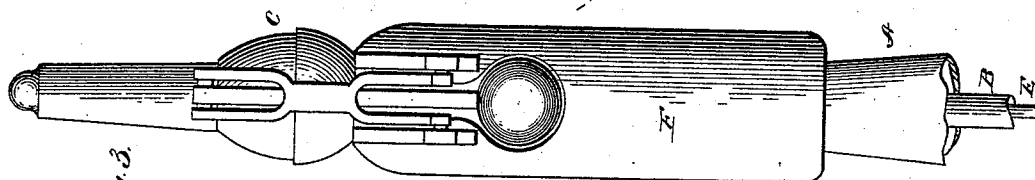
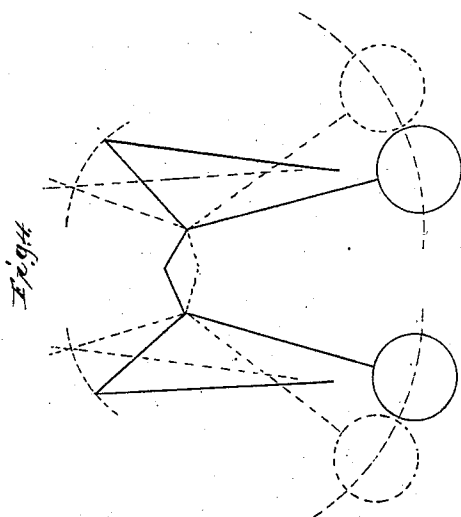


(No Model.)

H. G. SMITH.
STEAM ENGINE GOVERNOR.

No. 530,970.

Patented Dec. 18, 1894.



witnesses:

J. M. Fowler
Thomas Durant

Inventor:
Horatio G. Smith
By: Church & Church
his Attorneys.

UNITED STATES PATENT OFFICE.

HORATIO G. SMITH, OF FITCHBURG, MASSACHUSETTS.

STEAM-ENGINE GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 530,970, dated December 18, 1894.

Application filed February 28, 1894. Serial No. 501,863. (No model.)

To all whom it may concern:

Be it known that I, HORATIO G. SMITH, of Fitchburg, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Steam-Engine Governors; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in governors, such as have weighted pendulous arms (conical pendulum) swung outward by centrifugal force to move or control the movements of the valve, its connections or equivalent direct controlling mechanism for the engine or machine.

As is well known, a weight resistance has been used to increase the vertical height of the cone and thereby greatly increase the sensitiveness of the governor, such weight usually being applied so as to directly resist the outward swing of the pendulous arms. The pendulous weighted arms exert a maximum effective power when hanging in planes nearest to parallel with the axis of rotation of their support or when the vertical height of the cone formed thereby is greatest, and a constantly diminishing effective power as they swing out into planes nearer at right angles to said center of rotation and the vertical height of the cone is reduced. Hence as the resistance to be overcome thereby is constant, a greater percentage of the relative and constantly diminishing effective power exerted by the pendulous arms, is expended in overcoming it. Consequently the speed with which the arms move under variations in the speed, of the engine diminishes when moving in both directions from the angle assumed at normal speed, and the sensitiveness of the governor diminishes.

It is the object of my invention to overcome this difficulty and by reducing the effect or leverage of the weight resistance in proportion as the pendulous arms swing out and their power diminishes and by increasing the leverage as the arms swing in, cause them to move with an increasing velocity in each di-

rection, thereby making the governor much more sensitive to variations in the speed of the engine or machine than the old form of governor.

Referring to the accompanying drawings: Figure 1 is an elevation of a governor constructed in accordance with my present invention. Fig. 2 is a section through the same. Fig. 3 is an elevation at right angles to Fig. 2. Fig. 4 is a diagrammatic view illustrating the action of the arms in overcoming the resistance of the weight.

Similar letters of reference in the several figures indicate the same parts.

The letter A indicates the stand or standard upon which the revolving parts are supported; B, the hollow shaft passing through the standard and forming the connection between the rotary head C and some moving part of the engine or machine. The pendulous weighted arms D are pivotally connected to and supported by the head C to swing out and in toward the center on which the head rotates, and in the preferred construction, are connected with the valve or its connections by shorter arms *c* jointed to a valve rod E in any ordinary or preferred manner so as to move said rod as the pendulous arms move out or in.

Head C it will be understood is suitably journaled on the stand or standard and connected rigidly with the shaft B, although these parts may be of any ordinary or preferred construction adapted for the use of a weight to return the valve rod to first position and form the resistance to the tendency of the pendulous arms to stand at right angles to the center of rotation when the engine is running. As shown, this weight lettered F surrounds the top of the standard and base of the head, so as to be capable of rotation thereon and also of moving vertically to a limited extent.

The connection between the weight F and pendulous arm is made as follows: Each arm is provided with an upward extension or projection or supplemental arm projecting at such an angle that when the pendulous arms move out, the supplemental arms will move nearer to a vertical position with relation to

the centers on which the arms swing, and links H connect the outer ends of the upward extensions or supplemental arms and weight, the effect of which construction is to reduce the leverage exerted by the supplemental arms as the pendulous arms swing out, and the points of attachment of the weight supports move more nearly over the centers.

The arms are so proportioned, and the relative angles of the points of attachment of the weight support and centers on which the arms pivot are so arranged, that, as the effective power of the pendulous arms decreases the leverage of the supplemental arms decreases, allowing the arms to move with an increasing velocity, and in moving inward because of diminishing speed, the leverage of the weight increases causing the arms to swing inward with an increasing velocity. This construction makes the governor much more sensitive and secures a quicker action than heretofore.

By the term "effective power" used herein, I mean the power exerted by the pendulous arms which can be utilized for moving the valve connections.

I am aware that lever arms with diminishing effective power have been employed to equalize the pressure of springs employed as the resistance to the outward swing of the weighted pendulous arms, but the effect in such structures is only to secure the same sensitiveness that the device would possess

if weights instead of springs had been employed.

I am also aware that the diminishing effective power of the weighted pendulous arms has been compensated for when a weight formed the resistance, but the mechanisms for accomplishing this result have been complicated and of such nature as to prevent their practical use.

Having thus described my invention, what I claim as new is—

In a governor, the combination with the standard, the rotary head carried thereby, the central shaft for rotating said head, the valve rod and the external independently movable weight, of the pendulous weighted arms, pivoted in the head and each having a short supplemental arm *c* pivotally connected with the valve rod and a relatively long arm *C* projecting outwardly and upwardly at such an angle as to be at its least inclination when the pendulous arm is close to the standard and to stand in its most nearly vertical position when the pendulous arm is at the outward limit of its movement, and links pivotally connected to the arms *C* at the upper end and pivotal connections between the links and weight; substantially as described.

HORATIO G. SMITH.

Witnesses:

LEONARD C. KING,
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