

E. H. Knight,
Governor.

No 59,418.

Patented Nov. 6, 1866.

Fig. 2.

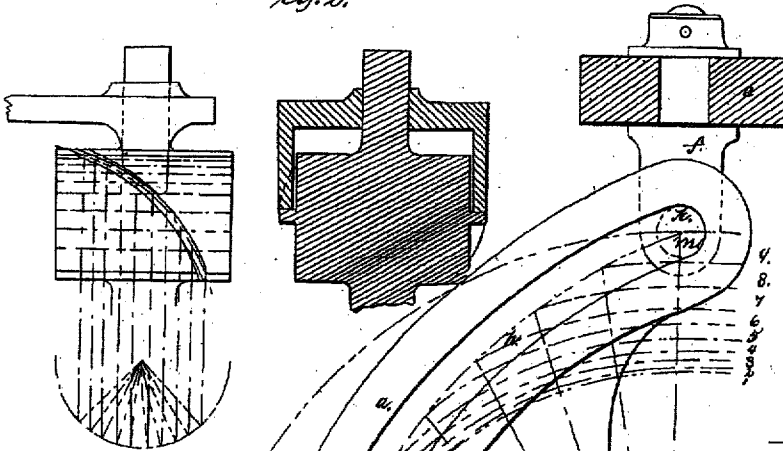
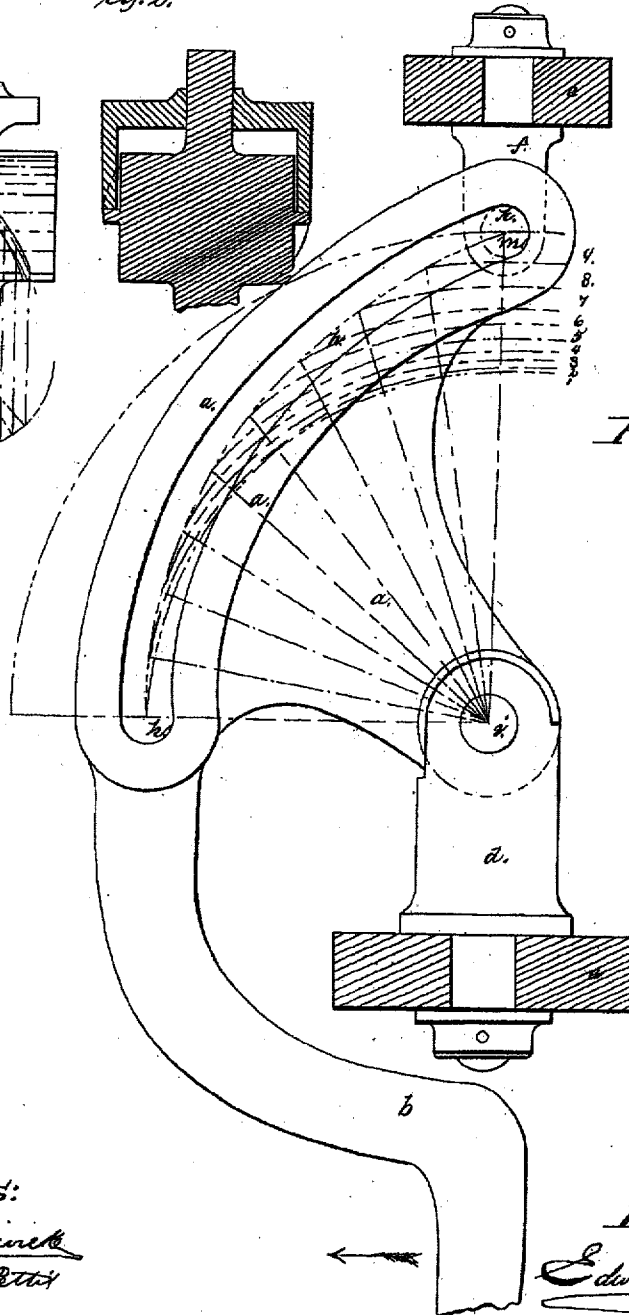


Fig. 1.



Witnesses:

Wm. C. H. H. H. H.
Chas. A. Pettit

Inventor:

Edward H. Knight

UNITED STATES PATENT OFFICE.

EDWARD H. KNIGHT, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN GOVERNORS.

Specification forming part of Letters Patent No. 59,413, dated November 6, 1866.

To all whom it may concern:

Be it known that I, EDWARD H. KNIGHT, of the city and county of Washington, District of Columbia, have made new and useful Improvements in Governors; and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation of the same, sufficient to enable one skilled in the art to which it appertains to construct and use the same, reference being had to the accompanying drawings, which are made part of this specification, and in which similar letters in the different figures refer to corresponding parts.

My invention consists in so constructing the curved arm, toe, tappet, cam-thread, or lifter, as the part may be variously denominated, according to its construction, that it shall give a graduated increasing or decreasing motion to the plate or other device which communicates with the throttle or other valve and regulates the area of steam-opening.

In an ordinary form of tappets or lifters, they lift or depress the plate equal distances with equal vertical motions of the governor-balls, by which action the increase or diminution of the steam-opening is equal in degree with a given motion of the governor-balls at the different portions of their range of motion.

Figure 1 is a diagram of a cam or lifting-tappet calculated, as shown by the respective ordinates, to move the plate to a greater extent with a given motion at the early portion of its stroke than with an equal motion on its axis at a later period of its stroke.

The ninety degrees embraced in the curve of the cam-shaped tappet being divided into nine equal parts, it will be seen that the amount of vertical motion of the plate moved by it will gradually decrease as the governor-balls ascend. By this means a greater vertical motion of the plate will be attained at low speeds with a given vertical motion of the balls than is obtained by an equal vertical motion of the balls at a higher speed, thereby enabling the governor to make a greater change in the area of steam-opening with a given vertical motion of the balls when running at a low speed than will be obtained by an equal vertical motion of the balls when running at higher speeds. The capacity for automatic adjustment in this respect is a valuable feature in steam-engines,

the form of the curve of the lifter being calculated and adapted to the requirements of any particular case.

In the drawings, *a* is the slotted curved plate or cam, from which is suspended the arm *b*, on whose end the governor-ball is attached. *c* is the plate on which the carriage *d* is placed, the plate *c* being revolved on a vertical axis in a manner familiar to those acquainted with this class of machines. *e* is the upper plate, which also revolves on the said vertical axis, and its carriage *f* carries a pin, *k*, which occupies the slot *h* in the cam *a*, which is journaled by means of the pin *i* in the carriage *d*.

As the plates *c* and *e* revolve the governor-ball will fly upward in the direction of the arrow, which will cause the cam *a* to rotate on its axis *i*, drawing down the plate *e* by means of the traversal of the pin *k* in the slot *h* of the cam *a*. The said slot, as will appear by a comparison of the lengths of the ordinates, will not only, as the cam *a* is rotated, cause the plate *e* to approach the plate *c*, but the cam *a* will have a greater effect at the earlier portion of its motion than at the latter—that is, a gradually-decreasing effect in producing vertical motion of the plate *e*.

It will be perceived (see Fig. 1) that the ninety degrees described by the slot are divided for illustration by ordinates into sections of ten degrees each, and that the point *m* occupied by the pin *k* at one end of the slot is, say, one and a half inch, more distant from the center *i* than the point *n* at the other end of the slot. For the sake of illustration, I have divided this space of one and a half inch into nine unequal parts, (marked, respectively, 9, 8, 7, 6, 5, 4, 3, 2, 1,) which represent, respectively, those proportions of forty-fifths of an inch and a half. Thus, the space marked 9 is supposed to consist of one-fifth of the whole space of one inch and a half, equal to nine-forty-fifths of one and a half inch; the next space, eight-forty-fifths; the next seven-forty-fifths, and so on. Thus, when the plate *a* is rotated ten degrees at the commencement of the upward motion of the governor-balls, the plate *e* is drawn down nine-forty-fifths, equal one-fifth of one and a half inch, and each succeeding ten degrees of motion of the plate having a gradually-decreasing vertical effect upon the plate *e*, which is connected

by a rod or any other mechanical device to the steam-valve.

In Fig. 2 is shown a worm or thread upon a spindle, which is rotated by the swinging outwardly of the governor-balls when they are suspended from carriages adjusted in a horizontal plane, and this thread or inclined plane, instead of having a regular pitch, has a gradually-increasing pitch or twist, or a gradually-decreasing one, according to the end of the worm or thread from which the start is made.

As the governor balls and arms with an increase of speed assume a position more and more nearly radial to their axis of revolution, the spindles from which they are suspended will rotate, if permitted. This motion, more fully explained in another application for patent made by myself, is therein proposed to be utilized in obtaining a rectilinear motion; and I herein propose to make the lifting-thread of an increase or decrease twist, so that the said motion of the governor-balls in a direction approaching the radial shall have the graduated effect described when treating of Fig. 1 of the drawing-attached to this specification.

This improvement in its form (illustrated in Fig. 1) may be used in connection with governor-balls swinging from axes which are themselves adjustable or movable in a horizontal plane; or it may be used attached to governor-balls suspended in any other manner.

This feature of giving a horizontal adjustability to the hinging axis of the governor-balls is the subject-matter of another application for Letters Patent made by myself, and has nothing to do with the present one.

It is not a material point to the present invention whether the governor be so constituted as to cause the plate *e* to rise or to fall by the vertical motion of the governor-balls.

In the former case the lowest point on the impinging surface of the cam will be in contact with the plate or its adjuncts when the balls are at rest, and in the latter case the highest point will be in the said contact under like circumstances of inaction.

I consider it best that the point of impingement of the lifter on the plate should be above the hinging-axis of the governor-ball; but this is not an absolute necessity.

I propose also to attach a plate to the stem, which plate may possess several different curves in slots or on its margin, and the plate, being adjustably attached to the stem, may, by change of position, be made the means of moving the valve at rates adapted to the requirements of varying circumstances.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

A cam attached to the governor-arm, or to the spindle from which the governor-ball is suspended, so constructed, curved, or proportioned as to effect a graduated action upon the device or devices for controlling the area of steam-passage, substantially as herein set forth.

EDWARD H. KNIGHT.

Witnesses:

ALEX. A. C. KLAUCKE,
CHAS. A. PETTIT.