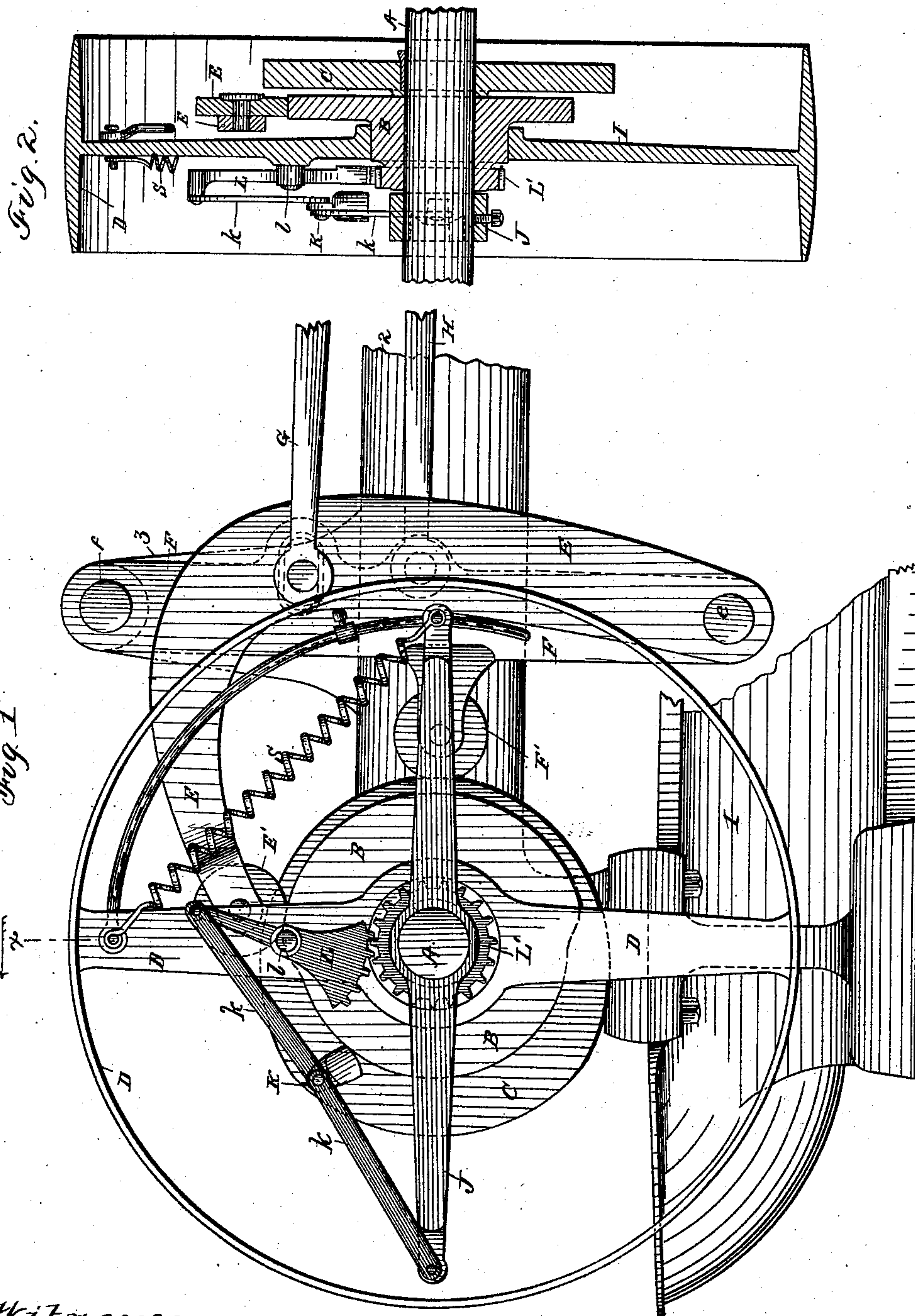


(No. Model.)

LE GRAND SKINNER.  
GOVERNOR AND VALVE GEAR.

No. 287,879.

Patented Nov. 6, 1883.



Witnesses  
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# UNITED STATES PATENT OFFICE.

LE GRAND SKINNER, OF ERIE, PENNSYLVANIA.

## GOVERNOR AND VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 287,879, dated November 6, 1883.

Application filed April 26, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, LE GRAND SKINNER, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Governors and Valve-Gears for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention consists in providing a new and improved automatic cut-off-valve gear for steam-engines.

The scope of the invention will fully appear from following general description and claims.

The invention is illustrated in the accompanying drawings as follows:

Figure 1 is a side elevation of the parts which are on the shaft of the engine. Fig. 2 is a vertical section taken on the dotted line *x*, looking toward the rear of the engine.

The parts are indicated by figures and letters as follows:

1 2 3 are parts of the engine-frame. A is the crank-shaft. B and C are cams on the shaft. D is the drive-wheel. E and F are levers moved by the cams. G is the valve-rod. H shows where the exhaust-valve rod would be in case a double valve is used. J is a fixed arm on the shaft. K is the centrifugal ball, and K K its connecting links or bars. L is a sector-gear, pivoted at *l* on the arm of the drive-wheel D.

The reciprocal movement of the valve-rod is effected by the cams C and B acting upon the levers F and E, as is fully set forth in a separate application of even date herewith, and need not be minutely explained here. It should, however, be kept in mind that the levers F and E in this instance are kept in contact with the cams by a spring of some kind—as, for instance, a small steam-cylinder, as shown in the case referred to, which acts upon the rod G or elsewhere, if desired; and, also, that the lever E is hung on the lever F, and hence the lever E is moved by the lever F whenever that lever is moved, as fully set forth in said application. The movement of the valve-rod is intermittingly reciprocal—that is to say, the reciprocations are made up of two distinct movements in each direction, with a

dwelling between each separate movement. These intermissions and movements may be made variable by changing the relative position of the cams.

In the application above referred to the variation in the position of the cams is effected by a set-screw; hence not automatic. In this instance the invention consists in making the variations automatic, so that the point of cut-off will be regulated by the requirements automatically. To do this I have here connected with the valve-gear shown in the other application a governing device which will change the relative positions of the cams as the requirements dictate.

The governing device which I have here employed is substantially the same as is shown in a patent issued to me October 17, 1882, and in which is what is sometimes called a “combined centrifugal and dynamometric governor.” There is quite a variety of this class of governors, any of which may be applied as easily as the one I have shown. Where it is desired to only regulate the engine by or from its speed, and not from the load upon it directly, a common wheel-governor of any pattern, of which there are many, may be used. The application of any or either of these will be such that a change in the position of the centrifugal balls will roll the cam B on the shaft, and if a simple dynamometric governor should be used the application will be such that a change in the relative position of the fixed arm and the loose drive-wheel will roll the said cam B.

As before stated, the governor here shown is a combined centrifugal and dynamometric, and the application is such that any change of speed or of load will roll the cam B on the shaft and change its position relatively to the cam C, which is fixed on the shaft.

The construction here shown is as follows: The cam C and the arm J are fixed on the shaft A. The cam B is mounted loosely on the shaft between the cam C and the arm J, and on its side is a sleeve, on which the drive-wheel D is mounted. The extremity of the sleeve of cam B is furnished with a cog-gear, L', on it. The sector L is pivoted on the drive-wheel D, and meshes with the cog-gear L' on the sleeve of the cam B. The weight-links K K connect the arm J with the arm of the sec-



tor L, and they also carry the weight K. The arm J and the drive-wheel D are connected together flexibly by a spring, S, so as to change their relative positions as the strain of the belt on the drive-wheel changes. Any such change of position will cause the sector L to roll the cam B, and any change of speed will cause the weight K to change its diametrical position, and thus move the toggles K K, which will move the sector L on its pivot l, and thus roll the cam B. So it will be seen that any change of speed or of load will affect the relative positions of the cams C and B.

As explained in the application above referred to, the gear for moving the rod G from the cams B and C consists, essentially, of two vibrating parts, F and E, of which F is moved by the fixed cam C, and E is mounted on F, so as to be moved by it, and also independently by the cam B, and this last-named vibrating part E carries the valve-rod G. The cams on the shaft have their lifts and drops in opposition, and hence while cam C may be moving the part F in one direction the cam B may be moving the part E in the opposite direction, and thus neutralize more or less the vibration of the valve-rod. The movement, therefore, of the valve-rod depends wholly on the relative positions of the two cams, and this relative position is affected automatically by the governor, as before shown.

I am aware that it is common to use wheel centrifugal governors, and wheel combined centrifugal and dynamometric governors, and wheel dynamometric governors to move an eccentric on the shaft, either to roll it or to shift it, and I do not therefore claim as new such applications of such governors.

What I do claim as my invention is—

1. In the valve-gear of a steam-engine, the combination, substantially as shown, of the following elements: a mechanical movement for converting the continuous rotary movement of the shaft into an intermitting reciprocal movement of the valve-rod, consisting of two cams, one of which is variable on the shaft, and two reciprocating parts, one of which is moved by the fixed cam and supports and moves the other reciprocating part,

which is also moved by the variable cam and carries the valve-rod, a wheel-governor on the shaft, and, finally, means, substantially as shown, for varying said variable cam from said wheel-governor.

2. In the valve-gear of a steam-engine, the combination, substantially as shown, of the following elements: a valve-actuating gear consisting of two cams, one fixed and the other variable on the shaft, and two vibrating parts moved by said cams, one of which supports and carries the other, which latter carries and moves the valve-rod, a centrifugal governor mounted on said shaft, and, finally, means, substantially as shown, for varying said variable cam as the weights or balls of said governor change their position centrifugally.

3. In the valve-gear of a steam-engine, the combination, substantially as shown, of the following elements: a valve-actuating gear, consisting of two cams, one fixed and the other variable on the shaft, and two vibrating parts moved by said cams, one of which supports and carries the other, which latter carries and moves the valve-rod, a combined centrifugal and dynamometric governor on the shaft, and, finally, means, substantially as shown, for varying said variable cam as the parts of said governor are moved by changes in the speed of the engine or the work performed by said engine.

4. In the valve-gear of a steam-engine, the combination, substantially as shown, of the following elements: a valve-actuating gear consisting of two cams, one fixed and the other variable on the shaft, and two vibrating parts moved by said cams, one of which supports and carries the other, which latter carries the valve-rod, a dynamometric governor on the shaft, and, finally, means, substantially as shown, for varying the said variable cam, as the metrical parts of said governor are moved by the exertion of the load upon said governor.

In testimony whereof I affix my signature in presence of two witnesses.

LE GRAND SKINNER.

Witnesses:

JNO. K. HALLOCK,  
ROBT. H. PORTER.