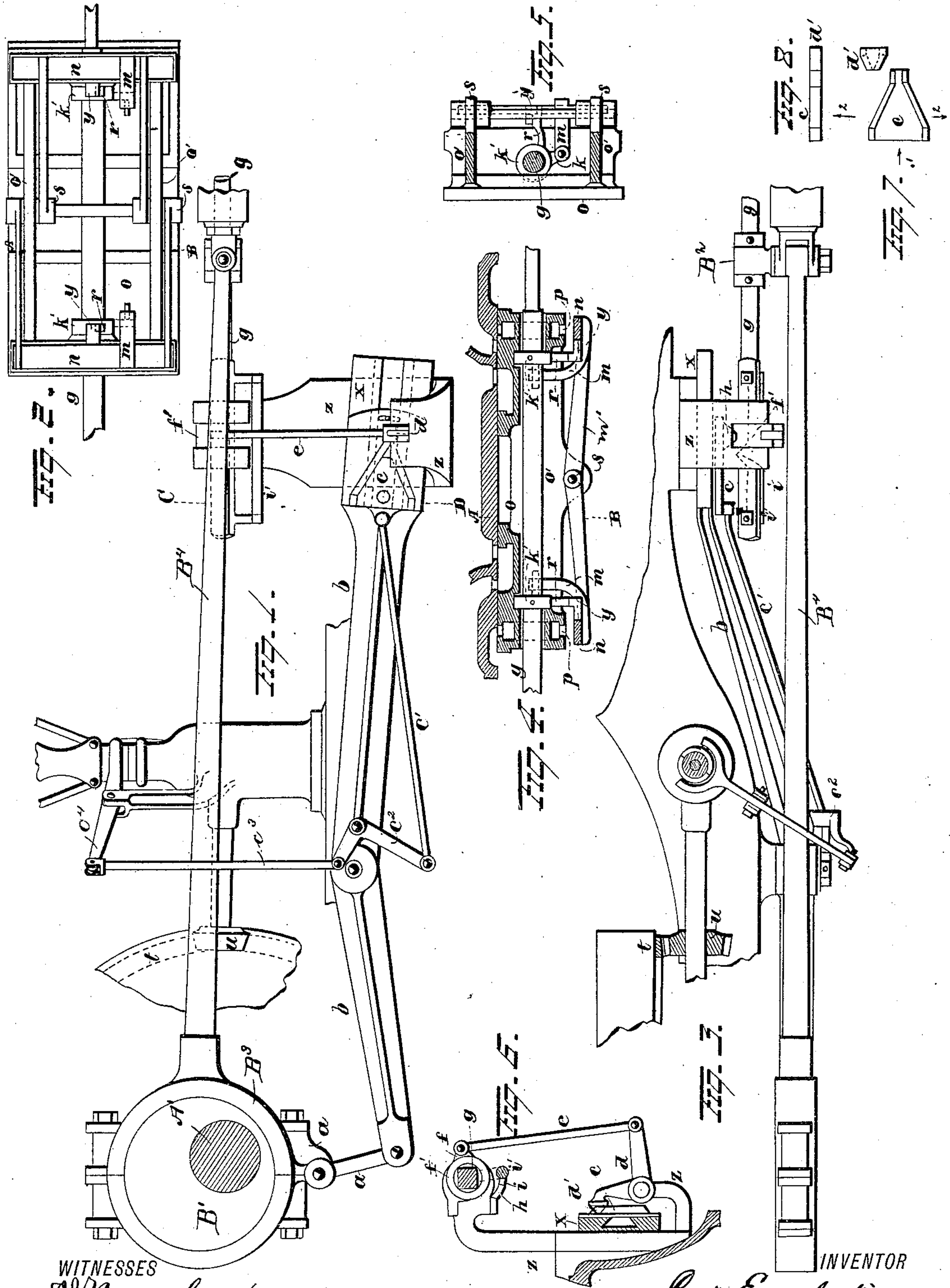


(No Model.)

L. ENGBRETSØN.
CUT-OFF VALVE GEAR.

No. 306,680.

Patented Oct. 14, 1884.



WITNESSES
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UNITED STATES PATENT OFFICE.

LARS ENGBRETSSEN, OF CHRISTIANIA, NORWAY.

CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 306,680, dated October 14, 1884.

Application filed March 27, 1884. (No model.)

To all whom it may concern:

Be it known that I, LARS ENGBRETSSEN, a subject of the King of Norway, and residing in the town of Christiania, Norway, have invented a certain new and useful Improvement in Automatic Cut-Off-Valve Gear; 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.

My invention relates to an improvement in automatic cut-off-valve gear for steam-engines, the object of the same being to provide a valve-gear for steam-engines which automatically cuts off the admission of steam whenever the regulator indicates too high a speed of the engine, and which therefore causes even working of the engine, however variable the work to be performed.

With this end in view my invention consists in mechanism connecting a rotary rod with the main shaft or other shaft, and with the governor, whereby the rod is rotated and steam cut off by the action of the governor.

My invention further consists in certain features of construction and combinations of parts, as will be hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figures 1 and 2 represent the exterior valve-gear and back of slide in side elevation. Figs. 3 and 4 represent a plan view of the same with the slide-valve and adjacent parts of the cylinder in section on the center of the slide-valve. Fig. 5 is a transverse section of the slide on line A B, Fig. 2. Fig. 6 is a transverse section through exterior valve-gear on line C D, and Figs. 7 and 8 are detached views of V-shaped plate and cam.

A' represents an engine-shaft provided with an eccentric, B', which latter operates the pitman B'. This pitman is connected at one end by the coupling B² to the rotary slide-rod g, which latter operates the slide-valve O. The connection between the shaft g and the coupling B² is a loose one for the purpose of permitting the rod to rotate, as will be hereinafter described. The collar B³ on the eccentric B' is provided on its lower side with a depending bracket, a', to which the upper end of the link a is pivotally secured, the

lower end of said link being pivotally secured to one end of the vibrating lever b. The opposite end of this lever b is provided with a broad bearing-face having a dovetail groove therein, in which the wedge or V shaped piece c rests and moves. The rear or enlarged end of this piece c is connected to one end of the rod c', the opposite end of said rod being pivotally connected to the lower end of bell-crank lever c², which latter is pivoted near the center of oscillation of the lever b. The free end of the bell-crank lever c² is connected to the lower end of the rod c³, the upper end of said rod being connected to the lever c⁴, which is operated by the movement of the governor-balls. The enlarged end X of the lever b rests alongside of the bracket Z, to which is pivotally secured the bell-crank lever d, carrying the cam d'. This lever d is connected at its outer end to one end of the rod e, the opposite end of said rod being connected to the arm f of the sleeve f', which latter embraces a squared portion of the rotary rod or shaft g. The slide-valve O is reciprocated by the rod g, and is provided with ports p, which latter are adapted to be closed by the cut-off valves n. These valves are secured to the arms m', which in turn are pivoted to the ribs O' of the slide-valve frame. The rod g is provided within the slide-valve frame with the sleeves k', having arms k, the latter being connected with the arms m of the valves n. Thus it will be seen that when the shaft g is rotated in one direction the valves n are caused to move and cover the ports p, and prevent the entrance of any steam until the valves move away from the ports.

To prevent an untimely closing of the expansion-valves n, the sleeves k' on the rod g are provided with arms r, adapted to take under nose-pieces y, projecting from the drop-valves, when the drop-valves are open, the arms r being released from engagement with the nose-pieces by the rotary motion of the rod g. The backward rotation of the rod g, and the consequent opening of the valves, takes place only when the ports of the cylinder are closed by the main slide, and it is effected by a cam, i, (shown in dotted lines in Fig. 3 and in full lines in Fig. 6,) connected by the inner face of a frame, i', depending from the rod

g, and adapted to engage a stud, *h*, fixed upon the bracket or hanger *Z*. As the steam-pressure is equal on both sides of the drop-valve, but little power is required to effect the backward rotation of the rod *g*. The normal position of the piece *c* is to the left of the enlarged portion *X* of the lever *b*, and when in such position has no effect whatever upon the valve, which is then operated by the rod *g* in the usual manner. As soon, however, as the speed of the machine is accelerated the piece *c* is moved to the right in the direction of arrow No. 1, and by the oscillatory motion of lever *b* in the direction of arrow No. 2, and comes in contact with the cam *d'* of lever *d* and moves the outer end of said lever downwardly, and consequently turns the rod *g* and closes the valves *n*.

It will be seen that by reason of the piece *c* the commencement of the cutting off depends partly upon the extent to which the governor-balls separate and partly upon the time when the separation takes place, and in any case the steam is cut off the sooner the farther the piece *c* proceeds in the direction to the right before the motion imparted to it by the engine in the direction of arrow 2 causes it to engage the cam *d'*.

In the mechanism above shown and described the governor is caused to rotate by a pinion, *u*, engaging teeth on the fly-wheel *t*.

From the above it will be readily seen that my invention may be applied to engines of other constructions with slight and not important modifications. For example, the connections between the rotary slide-rod and expansion-valve may be of many different forms and constructions and yet accomplish the same result. In like manner the connections between the rotary slide-rod and cam *d'*, between the engine and piece *c*, and between the piece *c* and the governor may be constructed and arranged in a variety of ways. It is, however, of importance that the motion 2 in Fig. 7 shall be produced by the sidewise movement of the eccentric disk, as this movement occurs at such a time and is of such a nature as to be just what is required for the present object, as will be perceived if the movements of the expansion-valve which are produced thereby are analyzed. It is not, however, essential that this motion should be perpendicular to the slide-rod, and it is not necessarily produced by the main slide eccentric; hence I do not wish to limit myself strictly to the form and construction of parts as shown, but reserve the privilege of making such changes as fairly fall within the spirit and scope of my invention.

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

1. In automatic cut-off-valve gear for steam-engines, the combination, with a governor-eccentric and vibrating lever, of a rotary slide-rod, expansion-valve gear in connection with

said rod, and a device carried by the vibrating lever, and moved by the governor for rotating the rod, substantially as set forth.

2. The combination, with a valve-rod capable of a limited rotation, and an expansion-valve gear connected therewith, of a V-shaped piece operated by the combined motions of the governor and eccentric, and mechanism adapted to communicate the motion of the V-shaped piece to the valve-rod, substantially as set forth.

3. The combination, with a valve-rod capable of a rotary motion and expansion-valve gear connected with the valve-rod and adapted to be operated by the rotary motion of said rod, of a wedge-shaped piece operated by the combined motions of the governor and eccentric, and mechanism adapted to communicate the motions of the wedge-shaped piece to the valve-rod, substantially as set forth.

4. The combination, with a valve-rod capable of a rotary motion and an exterior expansion-valve gear connected therewith, of a wedge-shaped piece adapted to be moved in the direction of its point or edge by the governor, and adapted to be oscillated at right angles to the aforesaid motion by the engine, and mechanism for transmitting the motion of the wedge-shaped piece to the valve-rod, substantially as set forth.

5. In automatic cut-off-valve gear for steam-engines, a lever oscillated by the eccentric, a wedge-shaped piece secured to one end of the lever and caused to oscillate therewith, and an angle-lever pivoted to the oscillating lever, near or at the center of oscillation, the angle-lever being connected to the governor-sleeve and wedge-shaped piece, the whole constructed in the manner and for the purpose substantially as set forth.

6. In an automatic cut-off-valve gear for steam-engines, the combination, with a rotary slide-rod and a slide-valve connected thereto, of expansion-valves secured to the back of the slide and operated by said rod.

7. The combination, with a simple slide and a rotary rod to which said slide is attached and by which it is operated, of expansion-valves located on the back of the slide and adapted to follow the movements thereof.

8. The combination, with a simple slide provided with expansion-valves hinged to its back, of a valve-rod having a rotary motion and provided with armed sleeves connected with the said valves, and adapted to communicate the rotary motion of the valve-rod to the expansion-valves, substantially as set forth.

9. The combination, with a simple slide provided with expansion-valves hinged to its back, of a valve-rod having a rotary motion, sleeves secured on the valve-rod and caused to rotate therewith, said sleeves being provided with arms which hold the valves against untimely action, and further provided with arms connected with projections on the valves

for communicating the motion of the valve-rod to the valves, substantially as set forth.

10. The combination, with a valve-rod capable of rotation, and a wedge-shaped piece
5 operated by the combined motions of the governor and eccentric, of a cam adapted to be moved by the wedge-shaped piece, and an angle-lever connected with a sleeve on the valve-rod adapted to transmit the motion of the
10 cam to the valve-rod, substantially as set forth.

11. The combination, with a valve-rod capable of rotation, and mechanism connected therewith for transmitting the motion of the governor-sleeve to a cut-off gear on the back
15 of the slide, thereby shutting off steam, of a

cam secured to the valve-rod and adapted to engage an arm on a sleeve, the latter being secured on the valve-rod and caused to rotate therewith, whereby the valve-rod is rotated backward and steam-ports opened, substantially as set forth. 20

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LARS ENGBRETSSEN.

Witnesses:

OVE A. OLSEN,
P. DAHL.