H. E. Canfield,

Steam Cut-Off.

No. 14,649. Patented Apr. 15 1856.

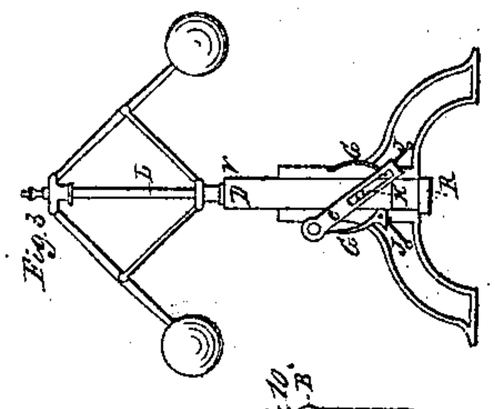
Fig. 3

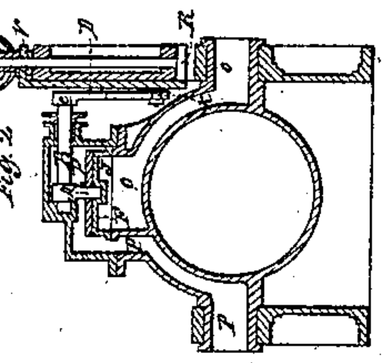
Fig. 2

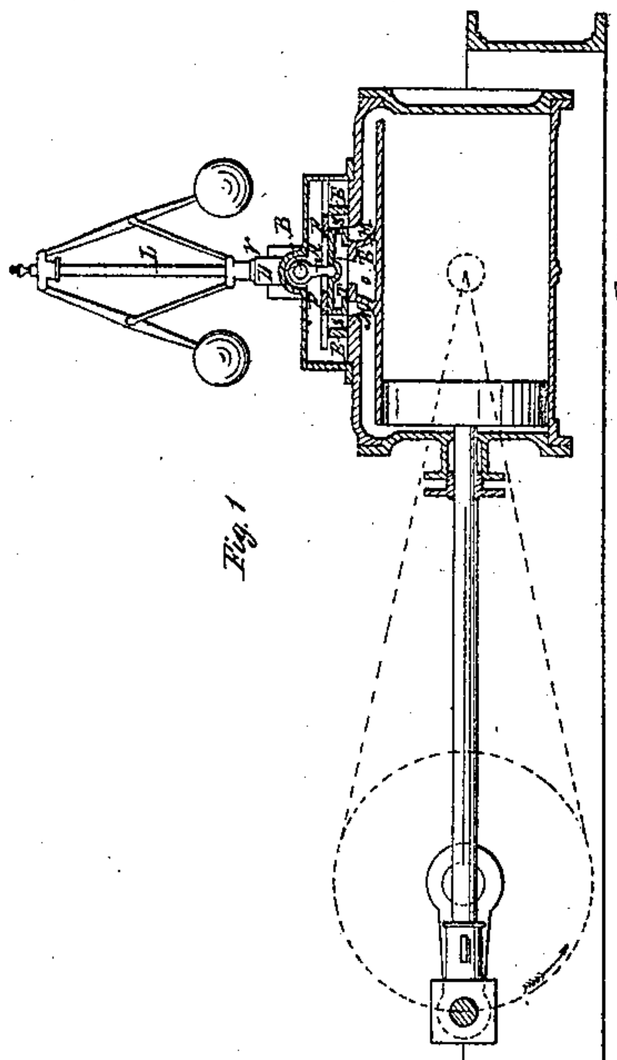
Fig. 1

Fig. 9

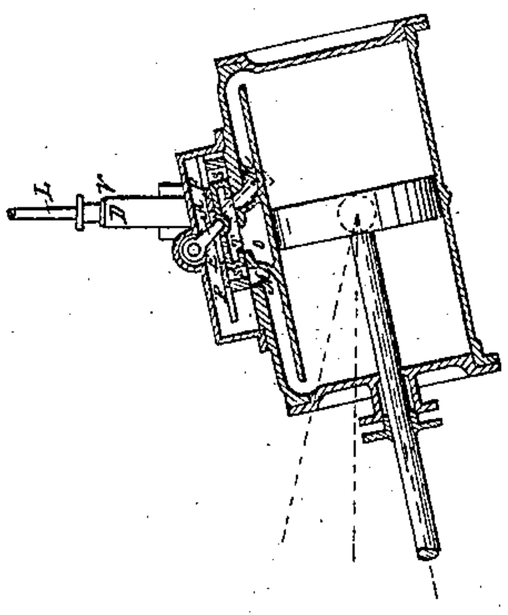
Fig. 4

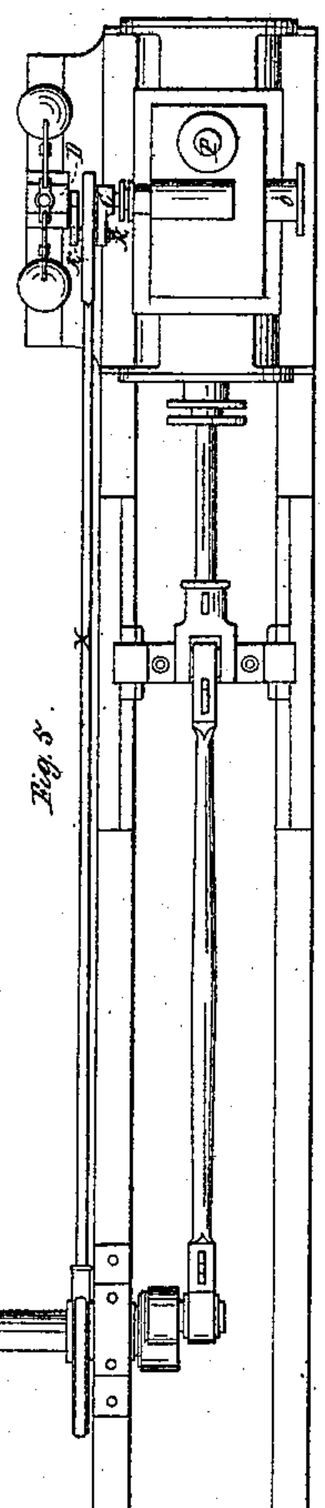
Fig. 5

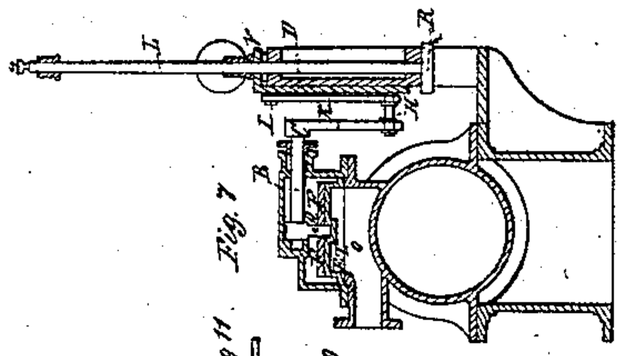
Fig. 7

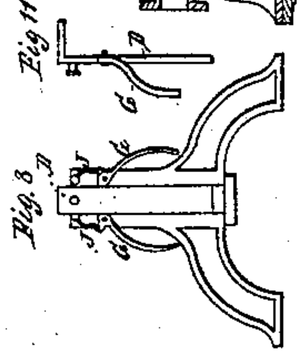
Fig. 11

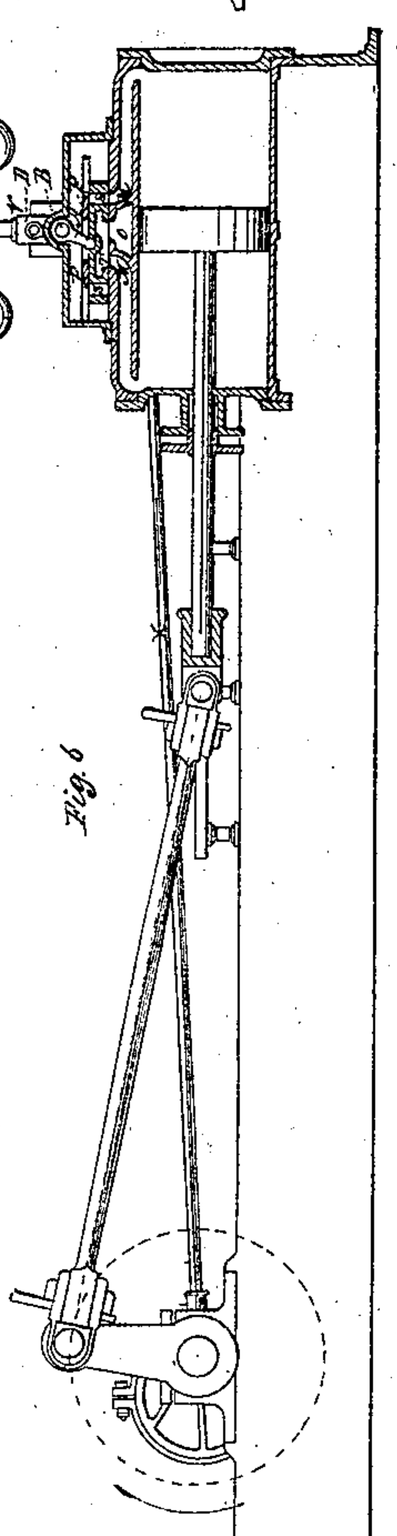
Fig. 6

Fig. 8

Witnesses;
William Dicey
L. Pitten

Inventor;
Henry E. Canfield

UNITED STATES PATENT OFFICE.

HENRY E. CANFIELD, OF NEW YORK, N. Y.

ARRANGEMENT OF MEANS FOR OPERATING CUT-OFF VALVES OF STEAM-ENGINES.

Specification of Letters Patent No. 14,649, dated April 15, 1856.

To all whom it may concern:

Be it known that I, HENRY E. CANFIELD, of the city, county, and State of New York, have invented a new and Improved Mode of Cutting Off Steam in Steam-Engines and Regulating the Said Cut-Off by the Governor; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon.

The nature of my invention consists in the arrangement of spring clamps, sliding bar of the governor and the arm of the rock shaft to give motion to the valves for the purpose of cutting off the steam from the cylinder at different parts of the stroke.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation as applied to an oscillating engine, and also to a horizontal stationary engine.

In the accompanying drawings Figure 1 is a sectional side view of an oscillating engine. Fig. 2 is a sectional end view of the same. Fig. 3 is a side view of the governor and its attachments. Fig. 4 is a sectional side view of the cylinder and valves. Fig. 9 is a top view of the main valve (E) and cut off valve (F). Fig. 5 is a top view of a horizontal engine with stationary cylinder. .Fig 6 is a sectional side view of the same. Fig. 7 is a sectional end view of the same. Fig. 8 is a side view of the springs (G G) and the side (D) as applied to the horizontal stationary engine, and Fig. 10 is a side view of the slotted arm (C). Fig. 11 is an end view of Fig. 8.

The letters of reference indicate the following parts.

A is the lever that moves the main valve.

B is the rock shaft to which the lever (A) is secured.

C is the slotted arm secured to the outer end of the rock shaft (B).

D is the slide which is moved perpendicularly by the governor.

E is the main valve.

F is the cut off valve.

G G are cramping springs.

H is a pin which is moved by the slide (D) in the slot of the arm (C); I, the pin which connects the slide (D) with the slotted arm (C) as shown in Figs. 6, 7, 8, 11.

J J are small springs to return the cramping springs (G G) to their places.

K a lever which should have been mentioned as forming the connection between I and H.

L is the governor; M M, steam ports in the cylinder; O O, exhaust passages; P P, steam passages to the steam chest; R, pulley for giving motion to the governor; S S, steam ports in the main valve (E); T, exhaust chamber in the main valve (E); the other parts will be easily understood without special reference by letters.

Figs. 1, 2, 3, 4, 9, 10, show the application of this improvement to an oscillating engine. Figs. 5, 6, 7, 8, 11, show its application to a horizontal stationary engine. In both of these applications the movement of the valves, for the purpose of causing a variable cut off, are precisely the same but in the means of producing the same motion is slightly different which will be hereinafter explained. The objects obtained in both is the production of a variable cut off, by increasing or diminishing the throw of the main valve (E) while the cut off valve (F) has a fixed and limited travel, and regulating the said throw of E by means of the governor.

Operation: Fig. 1 is a sectional side view of an oscillating engine, with the piston at the forward end of the stroke. The steam ports M M leading into either end of the cylinder are closed by the main valve E. The cut off valve F lies on the top of the main valve. This main valve (E) is provided with two steam ports S S which are alternately opened and closed, by sliding under the cut off valve (F). This cut off valve is shown as resting against the rear end of the steam chest and can move no farther in that direction. By moving the crank in the direction shown by the arrow the main valve (E) is moved toward the rear end of the cylinder, thus allowing the steam to act on the forward end of the piston. If this movement of the main valve (E) is continued far enough in the same direction it will carry the forward valve port (S) under the cut off valve (F), but if the movement of the main valve (E) is not sufficient to carry the forward valve port under the cut off valve (F) by the time the crank has reached the position shown by U then steam will be admitted the entire length of the stroke, as at that point (by the oscillation of the cylinder) the main valve (E) is made to commence its return to the forward end of the

steam chest carrying with it the cut off valve (F) until the said cut off valve is brought in contact with the forward end of the steam chest, at which time the piston will have reached the rear end of the cylinder. By continuing the motion of the crank (in the direction shown by the arrow) the valves will assume the same position, in relation to the cylinder, as is shown in Fig. 6.

In order to cut off the steam from the cylinder at or before the half stroke of the piston it will be seen that more movement of the main valve (E) is required than is shown in Fig. 6. I will now endeavor to show how this is effected. The movement of the main valve (E in Fig. 1) is produced by the lever A and the rock shaft B (Fig. 2) and the slotted arm C (a side view of the said slotted arm is shown in Fig. 10 and Fig. 3).

D is a slide connected with the governor by a collar V. This collar will allow the governor to turn freely in it but at the same time obliges the governor to carry the slide (D) with it in its perpendicular movements. The slide (D), in Figs. 2 and 3, is provided with a pin (H) which fits in the slot of the arm (C), when the governor balls are down. The pin (H) is at or near the bottom of the slot but as the balls spread the slide D rises and the pin (H) is carried higher up in the slot and an increased travel is given to the rock shaft and the valves which are moved by it. The cause of this increased movement of the rock shaft will be seen by referring to the Figs. 3 and 4. In Fig. 4 the position of the slotted arm on the outside of the steam chest is indicated in red lines, and the position of the pin (H) and the slide (D) is also shown in Fig. 3. It will be seen on reference to Fig. 4 that if the slotted arm was lengthened so as to reach a point horizontally opposite the center of the trunnions, and the pin (H) was placed at that point there would be no motion of the valves, whatever might be the oscillation of the cylinder, but if the pin (H) is carried up in the slot of the arm (C) in the direction indicated by the perpendicular red line then there would be a movement of the main valve of a distance proportioned to the height of the pin in the slot of the arm (C). Now if the pin (H) is carried to the same height in the slotted arm Fig. 4, as is shown in Fig. 3, then the movement of the main valve will have been sufficient to have carried the forward valve port (S) under the cut off valve (F) some time before the cylinder has reached its greatest oscillation, (which occurs about half stroke of the piston) and by this means the communication between the forward end of the cylinder and the steam chest is cut off at such point in the first half of the stroke, as may be indicated by the position of the pin (H) in the slot of the arm (C). The position of the valves in Fig. 4 is the position they would occupy when the cut off had taken place at less than one quarter of the stroke.

So long as the slotted arm (C) is parallel to the slide (D) whatever may be the side pressure on the pin (H) there will be no tendency to move the slide (D) in its perpendicular direction; but as the slotted arm (C) departs from a line parallel with the slide (D) and moves toward the position shown in Fig. 3, it gradually assumes a position that would affect the operation of the governor if not entirely overcome its power. To secure the governor against the effect of this tendency the spring cramps G G are used in the following manner: These spring cramps (G G) are made with a thick stiff head, which head is secured to the frame by a pin near its center and nearly in contact with the slide (D). The form of this head is such that when the upper or spring part of the same is pressed outward the inner part of the head will be brought in contact with the slide (D) and by its pressure at that point so cramp the slide (D) as to prevent any movement of the said slide until the spring part is released from pressure, when it will be thrown back to its place by the action of the small spring (J) and so leave the spring clear of the slide (D) and allowing the latter to assume such position as may be indicated by the governor at a time when the latter can act to the best advantage. By referring to Fig. 3, it will be seen that as the slotted arm (C) departs from a perpendicular position it is brought in contact with one or the other of the springs (G G) for the purpose previously described.

In producing the necessary motion of the valves, in a stationary engine, by means of the lever (A) the rock shaft (B) and the slotted arm (C) it will be necessary to use an eccentric rod of the usual construction. This eccentric rod (X, Fig. 6) is connected with the pin H in Fig. 7. The pin (H) instead of being connected directly to the slide D (as has been previously described in the oscillating engine) is attached to a lever K, which lever at its other extremity is connected to the slide (D) by the pin I. Now if the slide (D) is carried up by the governor it will carry with it the lever K and the pin H with the eccentric rod attached. Now it is evident that the higher the pin H is carried in the slotted arm (C) the greater will be the oscillation of the rock shaft (B) and in this manner produce the same effect on the valves E and F that an increase of travel of the main valve has been shown to produce in the oscillating engine. The cramping springs (Fig. 8, G G) are inverted from the position shown in

Fig. 3 and are acted upon by the slotted arm being brought in contact with their lower ends, for the same purpose, and in a similar manner to that described in Fig. 3.

I claim—

The spring cramps G G as arranged in relation to the sliding bar D of the governor and for the purpose and substantially in the manner shown and described.

HENRY E. CANFIELD.

Witnesses:
WM. DIXEY,
L. PITTKIN.