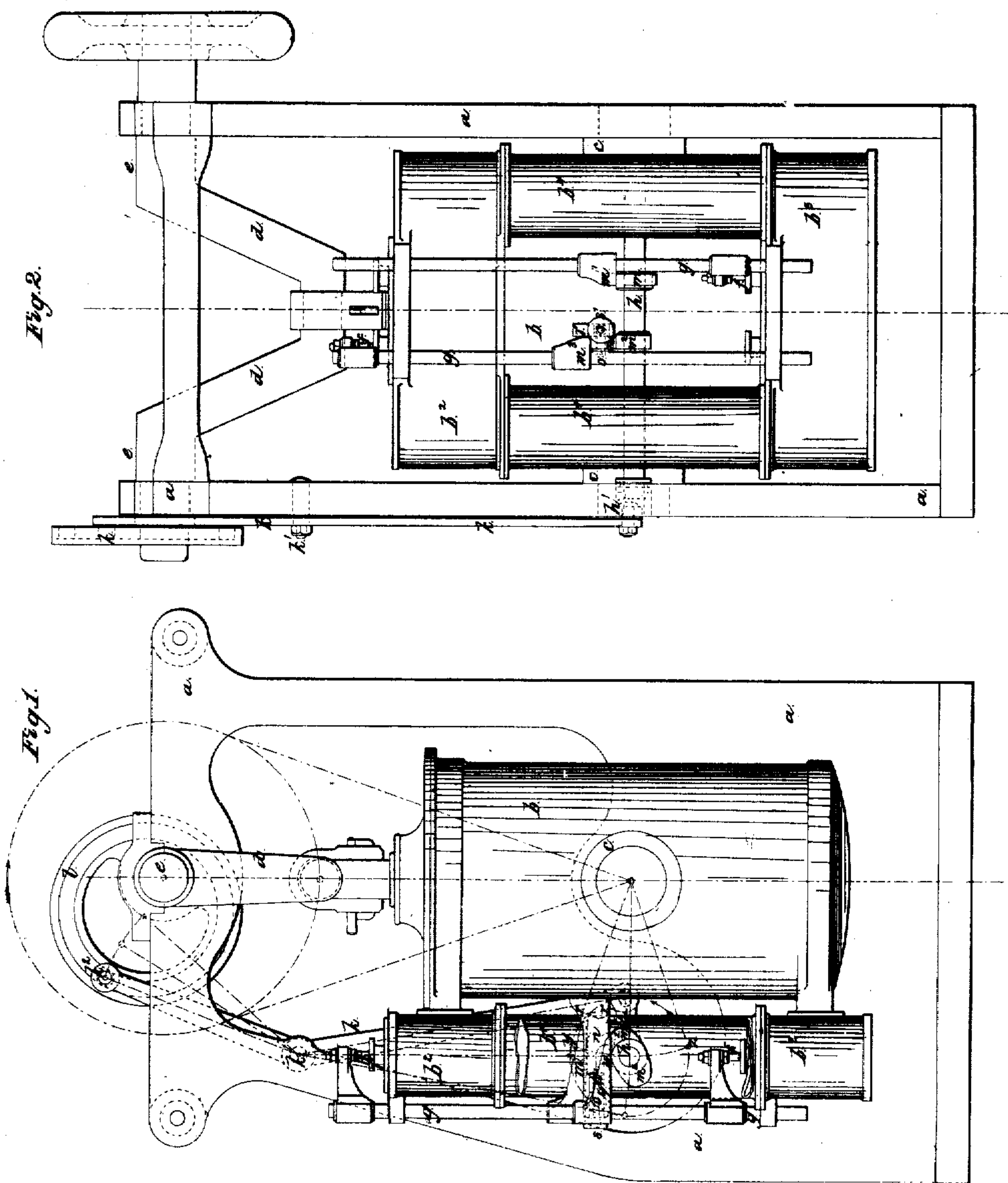


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VALVE GEAR.

No. 22,763.

Patented Jan. 25, 1859.



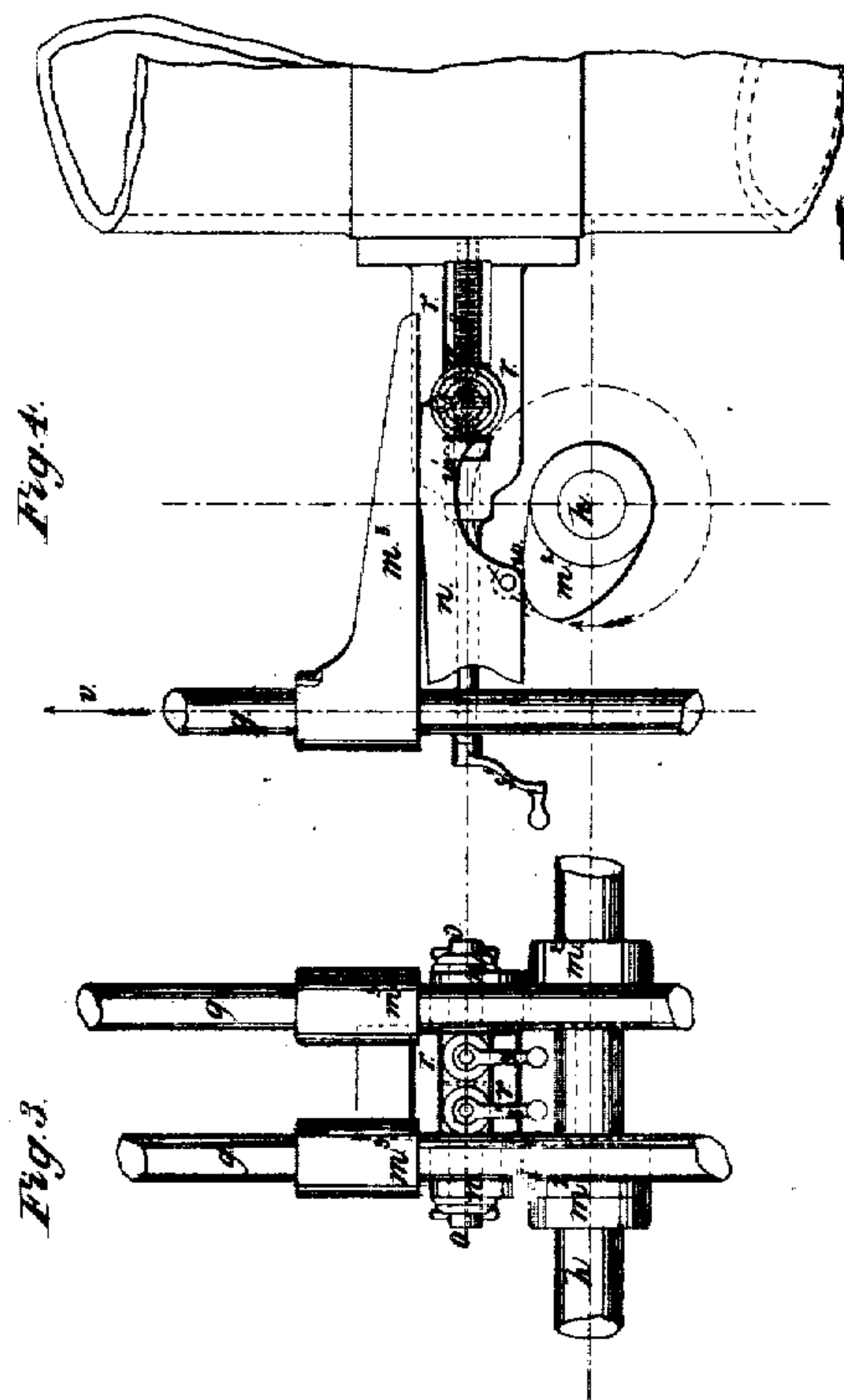
Witnesses
J. Rodger
Chas. A. Whitney

Inventor
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Inventor

Herman Winter

UNITED STATES PATENT OFFICE.

HERMAN WINTER, OF NEW YORK, N. Y.

VALVE-GEAR OF OSCILLATING STEAM-ENGINES.

Specification of Letters Patent No. 22,763, dated January 25, 1859.

To all whom it may concern:

Be it known that I, HERMAN WINTER, mechanical engineer, of the city, county, and State of New York, have invented certain
5 new and useful Improvements in the Valve-Gear of Steam-Engines, and that the following description, taken in connection with the drawings, is a full, clear, and exact description thereof.

10 In the drawings, Figure 1 is a side elevation of an old oscillating engine with my valve gear attached thereto, one of the side pipes being represented as broken away in order to show parts of the valve gear. Fig.
15 2 is a front elevation of the same, and Figs. 3 and 4 are respectively front and side elevations of portions of the valve gear on a larger scale, and with a slight modification of the arrangement of the parts.
20 This valve gear is of that species in which the valve stems receive their motion through the agency of cams secured upon a revolving shaft, which revolves in equal time with the main shaft of the engine, and in the
25 drawings I have for the sake of clearness omitted that portion of the gear which actuates the exhaust valves; premising, however, that such valves may be worked by the same lifters that move the steam valves
30 when the latter are open through the whole or nearly the whole of the stroke; but when the steam valves act as cut off valves also then the exhaust valves may be moved by distinct cams keyed upon the same shaft
35 that carries the cams which move the steam valves, either of which arrangements are well known to engineers. And the nature of the first part of my invention consists
40 first in causing a shaft attached to an oscillating cylinder to revolve, by means of the combination of a crank on such a shaft, with a cam on the main shaft of the engines by means of a lever all acting substantially
45 as specified. And the nature of the second part of my invention consists in combining a cam upon a revolving shaft, with an adjustable swinging toe and with a toe attached to a lifter or its equivalent, for moving a valve
50 the combination being substantially such as specified.

In the drawings the frame of the engine is shown at *a a a* the cylinder at *b*, trunnions at *c* crank at *d* and main shaft at *e*, the engine being on the lower dead center with
55 valve gear so adjusted that it will turn the crank in the direction of arrow *x* Fig. 1.

The upper valve chest is shown at *b²* the lower at *b³* and the side pipes at *b⁴*, there being in the engine also proper passages from the steam and exhaust pipes connecting with
60 the hollow trunnions, proper nozzles into the cylinder and proper partitions and valves and their immediate accessories within the valve chests all made in any manner known to engineers.

The valve stems are shown at *f f* and the lifters which are attached to and move them at *g g*. 65

On any convenient fixtures that oscillate with the cylinder, for instance the side pipes
70 themselves is supported a shaft *h* and upon that shaft is keyed a crank such as *h'* with a suitable crank pin, the distance from the center of the shaft to the center of the pin being equal to half the angular motion that
75 the center of this shaft will oscillate through during the oscillations of the cylinder. The center of the shaft shown in the drawings will oscillate from *z* to *y*, and the throw of this crank is such that it will just describe
80 the circle passing through these points. Attached to this crank pin in the way that connecting rods or radius bars are usually attached, is a lever *k* pivoted to some stationary point as at *k'* and thence continued far
85 enough to admit of a roller or pin *k²* secured to it being acted upon by a cam *l* keyed upon the main shaft of the engine. Now if the cam be supposed to be removed and the engine turned over by hand, then
90 that part of *k* between its pivot and the crank *h'* would act as a radius bar and cause the crank pin to oscillate between the points *z* and *y* from one to the other, causing
95 the shaft *h* to move through the same angular distance but never forcing it to move through a complete revolution; but if some force were applied to the pin to throw it over centers when it was on the dead points, then the shaft *h* would make a complete
100 revolution at each revolution of the main shaft *e*. The cam *l* performs this duty, being so shaped and keyed upon its shaft in a manner well known to those conversant
105 with laying out cams and determining their position on shafts, that it leaves the lever to act as a simple radius bar, except in the vicinity of the points *y* and *z* when it acts upon the lever *k* causing its crank-pin-end to move away from the cylinder at or about
110 the time the crank pin is at *y* and the same end to move toward the cylinder when the

crank pin of crank h' is in the neighborhood of the point z . The lever therefore acts on the crank much in the same manner that two cylinders act upon the same crank shaft, when coupled at right angles to each other, each helping the other over centers and causing the shaft to revolve, without the aid of a fly wheel the lever acting as a radius bar to move the crank through certain portions of its revolution and by the aid of the cam acting as a lever to turn the crank through certain other portions of its revolution. It follows from this theory of motion of the shaft, that the cam may if desired by only a segmental cam or not complete as it is only necessary that it should act during two small portions of each revolution of the crank.

If proper shaped cams such as m were keyed upon this shaft they might act directly upon feet or toes such as m' (see Fig. 2) attached to the lifters and would cause these lifters to move so as to actuate valves to which they might be attached, and by such cams and toes I usually intend to move my exhaust valves and the steam valves also when they are not also to act as cut off valves, or when the engine is so arranged as to cut off at one fixed point only.

As I am well aware of the great advantages derivable from the use of a variable cut off I have devised a simple method regulating the time during which a valve operated by a revolving cam shall remain lifted on uncovering its port, this part of my invention being most clearly illustrated in Figs. 3 and 4. In these figures the shaft which carries the cams is shown at h , and the cams themselves are represented at m^1 , m^2 . The lifters or valve rods are shown at g g and the valves are to be connected in some proper manner so as to follow the motions of these lifters; upon the lifters are secured toes or feet m^3 m^4 , and between these toes and the cams are pivoted adjustable swinging lifters such as n n ; the pivots of these lifters being at o o ; these pivots are in sliding boxes q q which may be moved to and fro in guides or ways r r by means of screws s s provided with proper handles such as s' s' . These swinging toes lie between the cams and the toes keyed to the lifters the arrangement being such, that when the cam arrives at the position shown in Fig. 4 it will act either upon the swinging toe or a small friction roller attached thereto and cause the lifter to move in the direction of the arrow w thus lifting the steam valve from its seat or causing it to uncover its port; but when the greatest projection of the cam has passed by the toe the latter will follow down the side of the cam being forced to do so either by the weight of the lifter and valves or by means of

proper springs or weights attached either to the one or the other. The swinging toe follows the cam downward even when the greatest projection of the cam is rising, for the reason that the former is hollowed out as clearly shown in the drawings from the roller or point w toward the point w' ; and the period when the toe will commence to descend will depend upon the position of the point w for if the screw be turned so as to move that point nearer to the lifter the swinging toe will commence to descend and consequently permit the valve to close sooner, whereas if w and the toe be moved in the opposite direction the valve will shut later. Precisely the same combination of parts is represented in Fig. 1 but in that figure the cam is represented as revolving in the opposite direction, and the swinging toe is consequently pivoted on that end of it nearest to the lifters, with its curve exactly the opposite of that shown in Fig. 4. With either of these arrangements the point or period when the valve commences to open its port will remain the same in all positions of the adjustable swinging toe and the lead will therefore always be the same whatever may be the point of cut-off.

The precise mechanical devices for moving the swinging toe so as to adjust the point of cut-off are immaterial, as any that will permit its pivot to be moved to and cause it to be held in a given position will answer the purpose and be equivalents of the screw, nut, handle and sliding carriage.

In order to unhook the engine I intend to apply a coupling of any proper kind at some convenient place in the shaft which carries the cams that move the valves, so that the engineer may at pleasure prevent this shaft from following the revolutions of the crank.

I claim as of my own invention—

1. The method substantially as herein specified of causing a shaft by means of which the valves of an engine are moved to revolve, through the agency of a cam, a lever, and a crank, and the oscillation of the cylinder to which the shaft is attached all the parts being substantially such as specified and acting in combination substantially in the manner described.

2. I claim, the combination of a toe keyed to some rod which actuates a valve or valves, with an adjustable swinging toe and a revolving cam the combination being substantially such as herein set forth, to serve the purposes described.

In testimony whereof I have hereunto subscribed my name on this 25th day of November A. D. 1858 in the city of New York.

HERMAN WINTER.

In presence of—

L. K. RODGERS,

CHAS. A. WHITNEY.