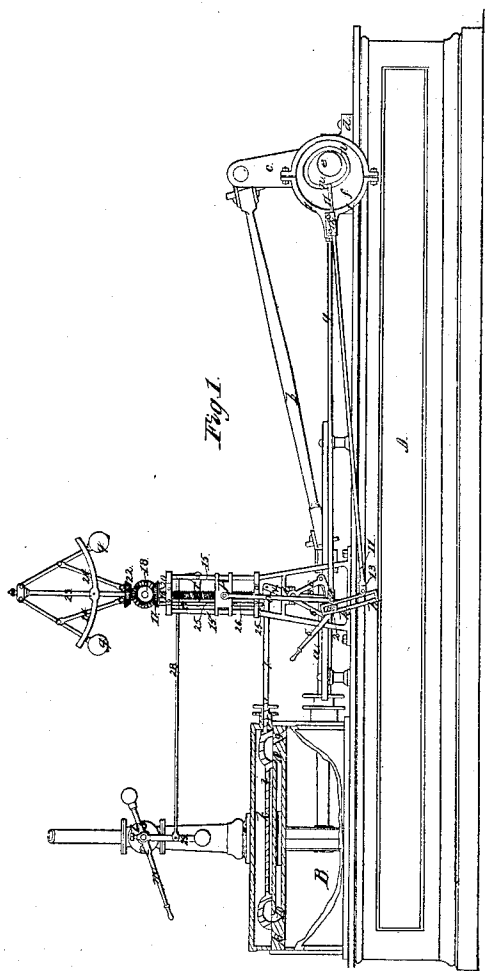
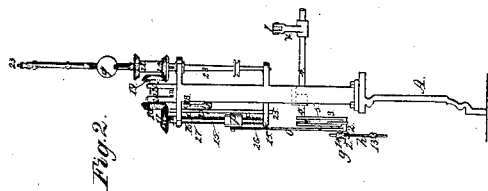


R. H. Tompensa, .
Steam-Engine Valve-Gear.
N^o 10,018. *Patented Sep. 13, 1853.*



Witnesses.
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RICHARD H. TOWNSEND, OF NEW YORK, N. Y.

WORKING THE VALVES OF STEAM-ENGINES.

Specification of Letters Patent No. 10,018, dated September 13, 1853.

To all whom it may concern:

Be it known that I, RICHARD H. TOWNSEND, of the city, county, and State of New York, have invented and made certain new and useful Improvements in the Means for Moving and Actuating the Valves of Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawing, making part of this specification, wherein—

Figure 1, is a side elevation of a horizontal engine with the valve chest shown open to represent the position of the valve and steam ports. Fig. 2, is an elevation of the governor and parts at right angles to Fig. 1.

The like marks of reference designate the same parts.

The nature of my said invention consists in a peculiar combination of the eccentric and cam, the eccentric working as usual when operating on the valve to give the engine steam nearly the entire stroke; the cam so shaped that when it is brought into operation, the valve is moved in such a way as to cut off at the smallest part of the stroke at which the engine is required to work. These motions are combined by means of a sector operated on by the governor, that when the governor balls fall in consequence of the increased power required from the engine diminishing the speed, the eccentric is brought into operation on the valve, and when the engine is doing little work, the operation of the governor by sliding the sector brings the cam into operation to cut off and allow the engine but little steam; the regulation of the position of the sector by the governor thus at any intermediate point or at the extremes, supplying steam and causing the valve to cut off in proportion to the work to be performed. And by a peculiar apparatus in case the valve does not supply the required steam to keep up the momentum, the throttle valve is opened farther, or the reverse operation is performed if the work be thrown off the engine so as to need little steam.

A, is the bed of the engine, carrying the cylinder B; *a*, is the piston rod; *b*, the connecting rod to the crank *c*, on the shaft *e*, supported in pillow blocks *d*. These parts so far may be of any usual character, and

I have shown herein my improvements as attached to a horizontal engine, but by slightly varying the parts, they will be suitable for an inclined or vertical engine.

f, is the eccentric on the shaft *e*, set as usual relatively with the crank; *g* is the eccentric rod from the ring 1, to a slotted sector *h*, through a block or slide in which slotted sector is the crank pin 2, of the rock shaft 4, the outer end of the rod *g* and sector being suspended by a sling *o*, so as to vibrate; and the crank pin 2, is connected by a link 3, setting loose on the rock shaft, and a lever 5, attached firmly to the rock shaft by means of an arm 6, connects or disconnects the valves and eccentric by a notch in the lever as usual.

x, is the arm on the rock shaft with a rod 7 to the valve *i*, in the steam chest *k*, of the cylinder; 8 and 9, are the induction ports, and 10, are exhaust ports of any usual form or character. The parts thus far, working as usual, need no more description

n, is a cam on the main shaft, which may either be a separate fixture or a groove in the body of the eccentric *f*.

11, is a rod sliding through a guide 12, on the ring 1, of the eccentric or other suitable support, on the end of which rod 11, is a pin or roller working in the groove of the cam, the other end of the rod being connected at 13, to the sector *h*. The shape of the cam *n*, is such that if the sector *h*, be raised so that the point 13, comes opposite the crank pin 2, of the rock shaft it will cause the valve *i*, to cut off the steam at the quarter half or any other point of the stroke required, keeping the valve in that position and allowing the engine to work expansively the remainder of the stroke, which operation by a cam alone on the valve is well known.

The sector *h*, is curved from the center of the eccentric; consequently if the points 13 and 14, are equidistant from the center of the eccentric, (as they are at the commencement of each stroke) the eccentric rod and sector could be moved up or down on the pin 2, without moving the valve, consequently it will be seen that the position in which the sector is placed on the crank pin 2, causes either the eccentric or cam to be brought into operation, alone at the extremes, (the sector vibrating on the pin 2, by the motion of the cam or eccen-

tric not in operation on the valve); and at any intermediate point the valve receives a motion the resultant of both the cam and eccentric, cutting off at a point proportioned to the proximity of the pin 2, to either the points 13 or 14. The means used to move the sector on the pin 2, may be of any desired character according to the requirements of the engine, but I prefer that the same should be actuated from the governor so as to be self regulating; for this purpose I have represented the following apparatus.

p, is a block receiving the joint of the upper end of the sling *o*, which block is set on slides 15, and has a screw 16, passing through the same, by the rotation of which the sector is moved and sustained.

g, are the governor balls on the spindle 23, propelled as usual from the main shaft. 24 are slings to a sleeve around the spindle moving on a key, which sleeve carries, at its upper and lower ends miter wheels 21 and 22, facing each other, at a sufficient distance apart not to touch the upper and lower edge of a miter wheel 19, at the same time, so that the governors can rotate without moving said wheel 19, but if the governor balls rise the wheel 19 will be rotated in one direction and if they fall in the other direction, by the miter wheels coming together; this rotation is communicated by miter wheels 17 and 18, to the screw 16; 20, are the supports for the shaft of the wheels 18 and 19. By this means the speed of the engine places the sector *h*, so as to cut off by the valve in proportion to the work required of the engine.

25, is a vertical sliding rod on which are pins 26 and 27 near the extremes of the motion given to the block *p*, and so that the block *p*, in moving to the top or bottom of its slides gives at that point a motion either up or down to the rod 25, which motion is communicated by a right angle crank *r*, and rod 28, to the arm 29 on the spindle of the throttle or stop valve which arm is weighted so that the throttle valve is returned to its usual position when any unusual strain is relieved from the engine, or when the ordinary work is again given to the power after it has been thrown off. I prefer that a lever *m*, be used as now common and that the arm 29 be attached by a screw *l*, so that the engineer can give the engine the ordinary quantity of steam, and then by tightening the screw *l*, attach the

arm so as to act in case of great inequalities of resistance to the power.

Any competent mechanical means such as pulleys bands and clutch boxes may be used to rotate the screw 16, by the governor, or any suitable means may be applied between the governor and the sector so that the speed of the engine regulates the position of the sector.

I am aware that the cam and eccentric have both been used to work the valves of a steam engine, therefore I do not claim them separately; but I am not aware that they have ever been combined by means of a sector thereby bringing either the cam or eccentric into operation alone or together to give the valve a motion between the two extremes of a full supply and a quick cut off as required. And I am also aware that a screw has been moved from a governor to regulate the amount of steam or water supplied as active power to the engine, but I am not aware that the governor has ever been used to bring either the cam or eccentric into operation on the valve by means of the screw or any other suitable device; therefore

What I desire to secure by Letters Patent is:

1. I claim the combination of a cam and eccentric by means of the sector *h*, or its equivalent to operate on the valve or parts that move the same, and cut off or work with the full pressure by the eccentric according to the position of said sector as described and shown.

2. I claim adjusting the position of the sector *h*, by means of the governor through the screw or other suitable means whereby the governor regulates the position of the sector to communicate the desired motion to the valve of the engine from the eccentric or cam or both according to the power required from the engine as specified.

3. I claim the rod 25, and points 26 and 27 to take motion from the block *p* at its extremes of motion and communicate the same by means of the right angle lever *r*, to the throttle or stop valve as specified.

In testimony whereof I have hereunto set my signature this day the twenty-sixth of May, one thousand eight hundred and fifty-three.

R. H. TOWNSEND.

Witnesses:

SAML. TOWNSEND,
LEMUEL W. SERRELL.