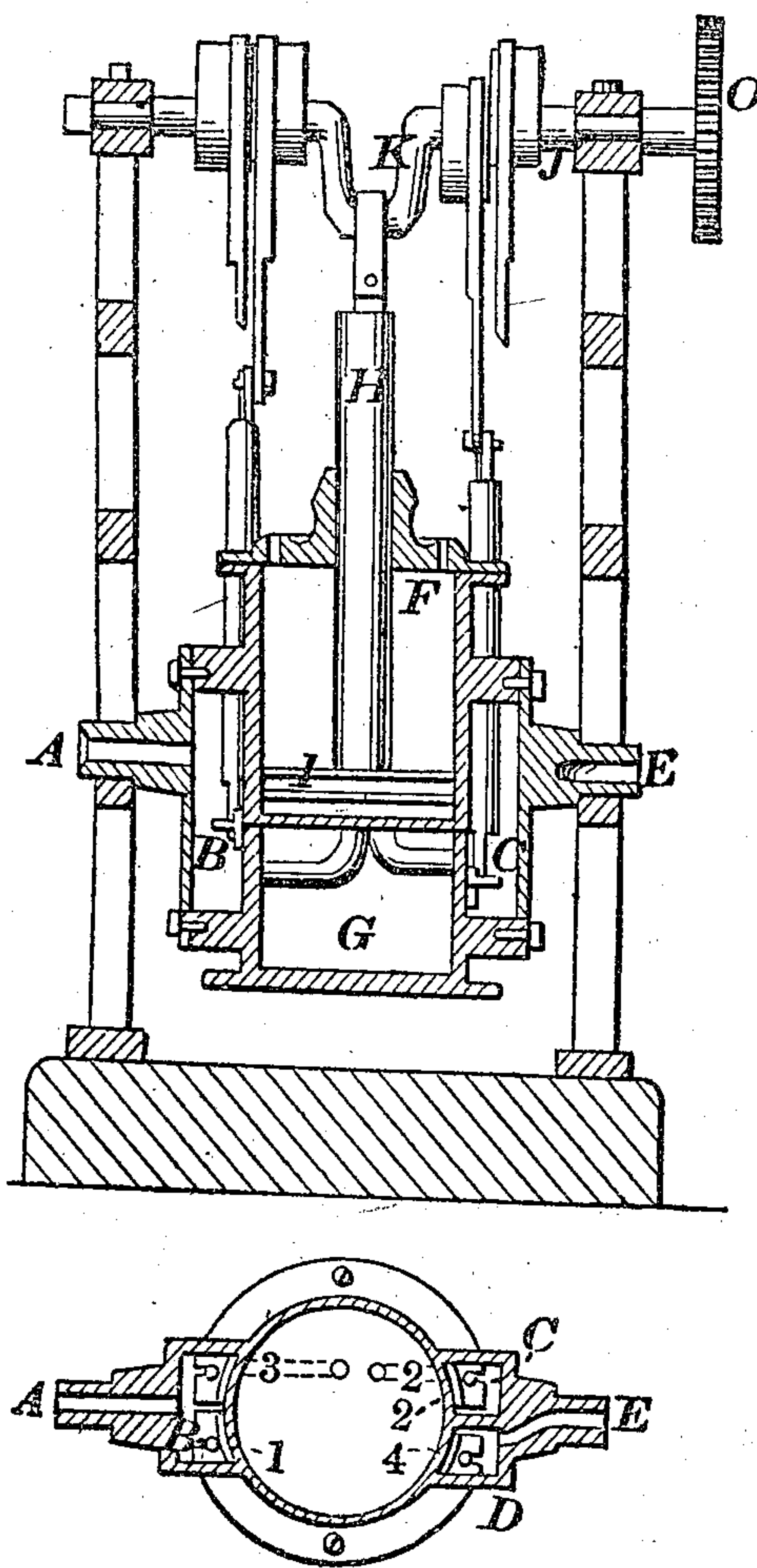


No. 41,229.

G. T. MAY.
STEAM ENGINE.

PATENTED JAN. 12, 1864.



*TAKEN FROM PATENT OFFICE REPORT
1864 VOL. II.
ONLY DRAWING ACCESSIBLE (1911)*

UNITED STATES PATENT OFFICE.

GEORGE T. MAY, OF TOMPKINSVILLE, NEW YORK.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 41,229, dated January 12, 1864; antedated December 30, 1853.

To all whom it may concern:

Be it known that I, GEORGE T. MAY, of Tompkinsville, in the county of Richmond and State of New York, have invented a new and useful Improvement in Steam-Engines; and I do hereby declare that the following is a full, true, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming a part of this specification.

This improvement is applicable to any kind of steam-engine or to any engine moved by the expansive action of an elastic fluid.

It consists of an additional and distinct cylinder of about half the capacity or more or less of the working cylinder or cylinders of the engine, open to the atmosphere at one end or above the piston, and kept continuously charged at the other end or below the piston, with steam or other confined elastic fluid, the action of the piston when operated by a connection from the working-shaft of the engine having the effect to alternately compress and attenuate the elastic fluid under it, and thereby to greatly diminish or retard with each descending stroke the development of the engine's power effectively during one part of a revolution, and to greatly enhance with each ascending stroke the development of the engine's power effectively during another part of the revolution, this operation of modulating the effectiveness of the developed power of the engine being further assisted by means of a reservoir attached to the cylinder, and, if steam be the force employed, appropriate steam ports and valves, provision being also made in this case for maintaining a sufficient elastic force in the chamber of the cylinder by passing off the contents into a working-cylinder and replenishing from the steam-chest, at favorable points of the revolution, thus, if desired, passing all the steam used by the engine first through the modulator, subject to use there or not, as required.

The object of the improvement is to withhold a needless or injurious expenditure of power during those parts of a revolution where the resisting force is at a minimum, while still admitting of a uniform development of power through the engine proper, and then to exert substantially the whole

power so reserved, in addition to the mean effective power of the engine, at those points of the revolution where the resisting force is at a maximum, in cases where the variation of resistance at different points of a revolution is very great.

I denominate the improvement a "steam-modulator."

Figure 1 is a front elevation of the improvement, with vertical section through cylinder and reservoir. Fig. 2 is a side view, section vertically through the steam-chest B. Fig. 3 is a side elevation of the improvement, with section vertically through the valve-boxes C and D. Fig. 4 is a plan view, section horizontally through the trunnions, steam-chest, cylinder, and valve-boxes.

The improvement is operated by gearing or other equivalent means from the working-shaft of the engine. It is here represented as oscillating to correspond in character with a double oscillating marine engine; but it may be fixed and may be also operated, horizontally, vertically, or inclinedly, to suit the requirements of different engines.

J is the modulator-shaft. K is the modulator-crank. O is a cogged wheel of the gearing. F is the modulator-cylinder open to the atmosphere above the piston by apertures L, L' in the cylinder-head. M is the cylinder-bottom; H, the piston rod, and I the piston. G is the reservoir. Steam enters the steam-chest of the modulator from the boiler through the steam-channel in the trunnion A. B is the steam-chest. There are four "steam-ports," or passages regulated by valves. They are indicated by figures, (numeral,) viz., 1, 2 and 2', 3, and 4. Port 1 admits steam directly into the reservoir G from the steam-chest B. Port 3 admits steam directly into the cylinder-chamber from the steam-chest B. The steam-passage from the cylinder F into the reservoir G is by the ports 2 and 2' through the valve-box C, the whole forming one passage. Port 4 is the place of exit from the reservoir through the valve-box D into the steam-channel of trunnion E, whence the steam, having done its work in the modulator, may pass to the working-cylinders of the engine; or, if desired, the steam-pipe itself may pass around or through the reservoir in any convenient

way, when the two steam-channels of the trunnions A and E would in effect constitute a part of the ordinary steam-pipe from boiler to engine into which the modulator is interposed. The steam-pipe, not being claimed in this improvement, is not shown in the drawings.

The mode of operating the improvement is as follows: The piston being at half-stroke, the three steam-ports 1, 2 and 2', and 3 open, and the port 4 closed, the pressure upon the piston will be approximately the same per inch as the pressure in the boiler, the communication being free. Let the ports 2 (2' remains permanently closed) and 3 be closed and the piston ascend. At the end of the ascending stroke the pressure upon the piston is reduced by expansion of the steam to about one-half of what it was at the half-stroke. The enhancing effect of the modulator upon the engine's work is now at a minimum. As soon as the upper dead-point is well passed, let the ports 2 and 3 be opened again, and the port 4 be now also opened. At the half-stroke in descending, the pressure in the cylinder will again be about equal with the boiler-pressure, or rather greater; but now it will be against the piston, and detractive from the engine's effective work. By opening the port 4, port 1 having previously been and remaining open, steam has flowed freely through the reservoir and from the modulator by the steam-channel in trunnion E to the working-cylinders; and now, port 4 being closed at the half-stroke, the reservoir is filled substantially with fresh steam from the boiler. Let ports 1 and 3 be now also closed, port 2 remaining open. As the piston descends, the steam below it is driven from the cylinder-chamber and compressed into the reservoir beneath. At the end of the descending stroke the detraction from the engine's effect is at its maximum. On the lower dead-point close the port 2, and as the piston again commences ascent open the port 2. (In practice this opening should be so gradually effected that the equilibration of steam-pressure should occur at about one-fourth of the piston's ascent.) The enhancing effect of the modulator is then at about one-fourth of the ascent, at a maximum. Open now the ports 1 and 3, and at the half-stroke of the ascent the steam-pressure on the piston will be again about equal with the pressure in the boiler, and all the ports will be restored to the condition from which the start was made.

Eccentrics on the modulator-shaft may be arranged to readily effect the necessary motion of valves adapted to the ports; and each revolution of the modulator-shaft will then cause a repetition of the above described process.

The ratio of revolutions of the modulator-shaft to one of the working-shafts may be varied as necessary to meet the requirements of particular cases. If one modulative process only is required in a revolution, the modulator piston-rod may be cranked directly to the working-shaft.

The arrangement of the ports and valves

may also be modified to vary the operative effect of the modulator as may be necessary for the various purposes to which it may be applied.

If desired in any particular case, the reservoir may be dispensed with and two ports be only used, one to admit and the other to emit steam.

In practice the ports should be as large and the valve-boxes as small as they can consistently be made.

The cylinder above the piston being open to the atmosphere, the cylinder-head and stuffing-box are to be constructed, mainly, with a view to serving as a guide and support for the piston-rod.

The advantages that I claim for this improvement are that for purposes where the object is better attainable by an intermittent exertion of greater force than by a constant exertion of less force the motive power may be more effectively exerted, and that the great waste of power and the violent shocks and jars that would result from the use of ordinary engines as they are for such purposes may also be by the employment of this improvement greatly modified.

The valves, with their valve-rods P P' P'' P''' and the eccentrics N N' N'' N''', are not claimed by me as composing a part of this described invention. Any kind of valve and valve motion may be used to suit the views of the constructor. Neither do I claim, formally, for the exact disposition of the parts of the invention as described, provided they be substantially so, because in practice it will be necessary to conform to very different conditions in various cases. Nor do I claim at all for any component part of any kind of steam or air engine as now known or used. Nor do I claim any part or parts of the machine described in Letters Patent issued to J. F. Winslow, January 14, 1862, wherein the device and process differ from mine—first, in that the pressure of steam in the boiler or steam chest is there substantially the steam-pressure on the piston during its operation; and, secondly, in that the said device is not designed to exert reaction in any way to modulate the engine, but is clearly intended to expend all the power exerted upon its piston in producing a mechanical result, as a ram or hammer, at other and foreign points, altogether different from the purpose of my device, which is for alternately compressing a volume of steam cut off from the boiler-pressure into a space very much smaller than that due to it from the boiler-pressure, and attenuating the same to a bulk very much greater than could be obtained if the boiler-pressure were not cut off from the piston for that purpose, the whole effect of the process in the "steam-modulator" resulting in modulative reaction, plus and minus, upon the engine.

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The reservoir G, in connection with a modulator-cylinder, F, substantially as specified.

2. The combination of a modulator-cylinder, F, reservoir G, piston-rod H, piston I, steam-ports 1, 2 and 2', 3, and 4, steam-chest B, and valve-boxes C and D, substantially as and for the purpose set forth.

3. The same, in combination with a crank, K, shaft J, and gearing O, or equivalent connection, with the main shaft of the engine, substantially as and for the purpose set forth.

4. The art or method of modulating the mechanical effect throughout the revolution of an engine by means of the reaction obtained from a volume of steam or other elastic fluid,

cut off at the appropriate moments of time from the boiler-pressure, (if steam, or equivalent, if other fluid,) and submitted to the process of alternate compression and attenuation under a piston operated from the engine, said process of compression and attenuation being effected within a combined modulator cylinder and reservoir, substantially as described.

GEORGE T. MAY.

Witnesses:

A. COUPER,
JOHN PRATT.