

(No Model.)

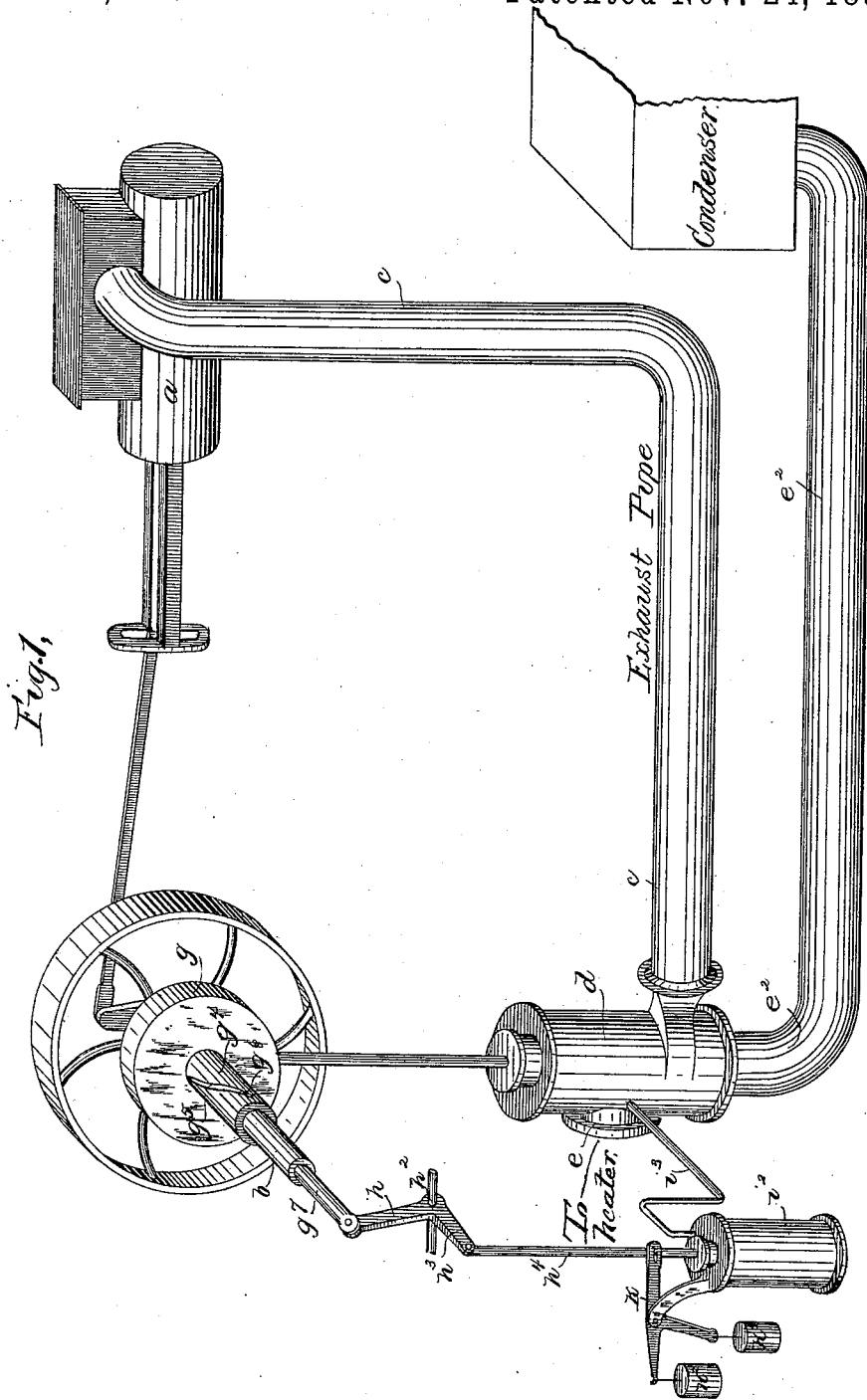
2 Sheets—Sheet 1.

L. I. SEYMOUR.

APPARATUS FOR CONTROLLING THE EXHAUST FOR CONDENSING ENGINES.

No. 463,874.

Patented Nov. 24, 1891.



Witnesses

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H. E. Rice.

Inventor,

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Att'y.

(No Model.)

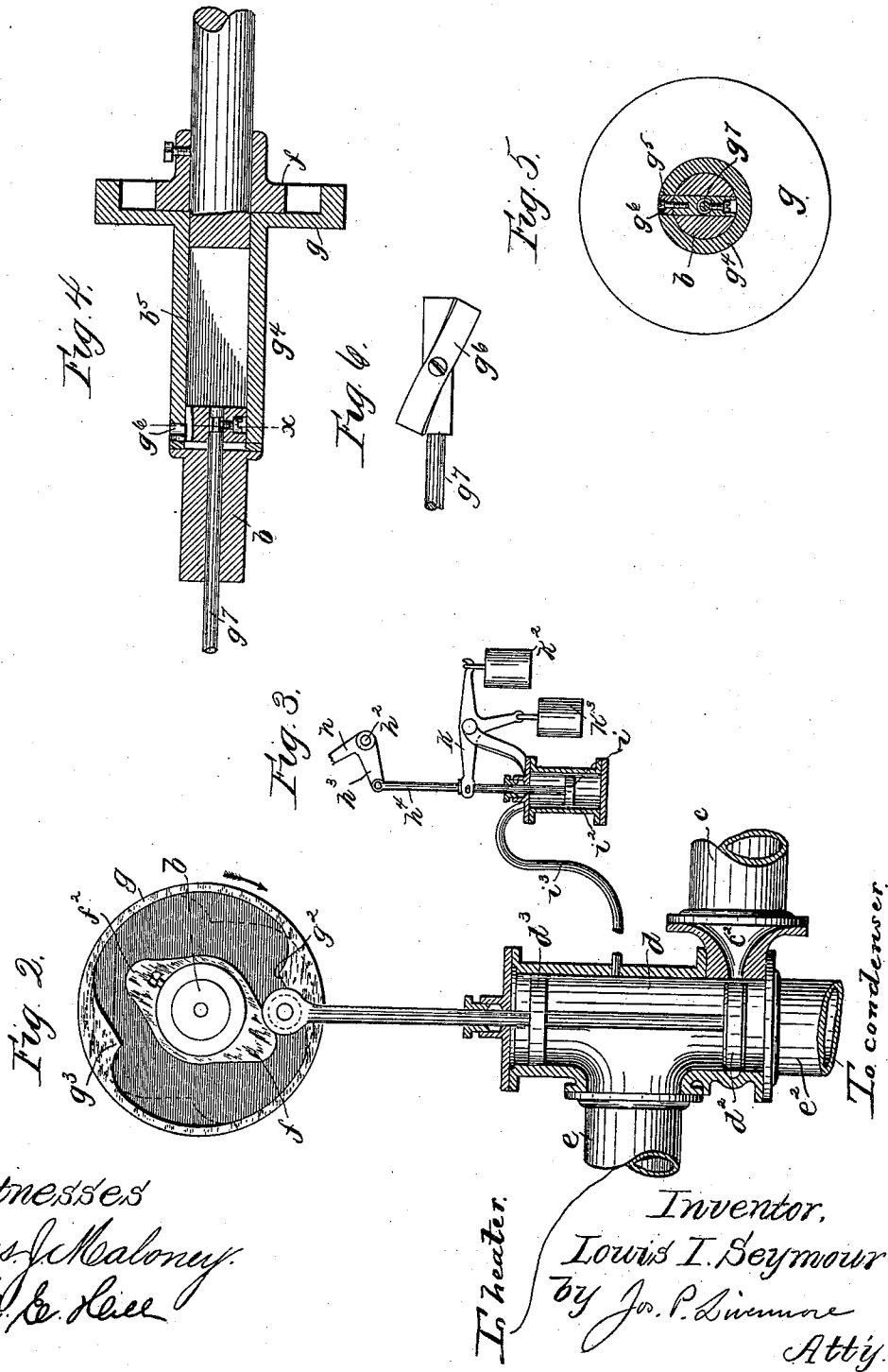
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UNITED STATES PATENT OFFICE.

LOUIS I. SEYMOUR, OF PLYMOUTH, ASSIGNOR OF ONE-HALF TO CHAS. T. MAIN, OF LAWRENCE, MASSACHUSETTS.

APPARATUS FOR CONTROLLING THE EXHAUST FOR CONDENSING-ENGINES.

SPECIFICATION forming part of Letters Patent No. 463,874, dated November 24, 1891.

Application filed January 6, 1890. Serial No. 335,965. (No model.)

To all whom it may concern:

Be it known that I, LOUIS I. SEYMOUR, of Plymouth, county of Plymouth, State of Massachusetts, have invented an Improvement in Apparatus for Controlling the Exhaust for Condensing-Engines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

In many manufacturing establishments in which the machinery is run by steam-power there is use for a considerable amount of steam at a comparatively low pressure for heating and other purposes besides power, and for such purposes the exhaust-steam of the engine, or a portion thereof, may be used after the said steam has performed its work in the engine.

The present invention relates to means for utilizing a portion of the exhaust-steam of a condensing-engine for heating and other purposes; and it consists, mainly, in placing the exhaust-pipe of the engine in communication with the pipes or appliances in which the exhaust-steam is to be utilized and with the condenser of the engine, and controlling by means of a valve the passage of the steam from the main exhaust to one or the other of the final delivery points—that is, to the heating system in which the exhaust-steam is utilized or to the condenser—said controlling-valve being independent of the valve that controls the admission and exhaust of the steam with relation to the engine-cylinder, but being operated by the engine, as will be hereinafter described, in a definite-timed relation to the engine-valve that controls the passage of steam to and from the engine-cylinder.

The invention also consists in the specific devices for operating the valve which controls the division of the exhaust between the heating system and the condenser, the said division being regulated in accordance with the pressure in the heating system.

Figure 1 is a perspective view showing the operative relations of the working parts of an engine, having appliances for controlling the exhaust embodying this invention, the supporting frame-work being omitted; Fig. 2, a sectional elevation showing the valve for con-

trolling the division of the exhaust and its operating mechanism; Fig. 3, a sectional elevation of the appliances for automatically varying and regulating the division of the exhaust in accordance with the pressure in the heating system; Fig. 4, a longitudinal sectional detail of the main shaft, actuating-cam, and devices for changing the position of said cam relative to the said shaft; Fig. 5, a transverse sectional detail on line *x*, Fig. 4; and Fig. 6, a plan view of the key by which the cam is shifted.

The engine-cylinder *a*, Fig. 1, may be of any suitable or usual construction, the said engine operating a main shaft *b* in the usual manner, the connections between the piston-rod and main shaft being omitted, as well as the frame-work and valve-gear of the engine, as these parts form no part of the present invention and may be of any suitable or usual construction.

The exhaust-pipe *c* terminates in a valve-chamber *d*, with which it communicates through a port *e*², controlled by a piston-valve *d*², shown as provided with a balancing-piston *d*³. (See Fig. 2.) The valve *d*² is properly constructed to just close the port *e*² when directly over the same, as shown in Fig. 2, and the valve-chamber *d* is provided with two outlets *e*², the former communicating with the heating system or space or receptacle in which the exhaust-steam is to be used, and the latter *e*² communicating with the condenser in which the exhausted steam is condensed to diminish the back-pressure on the piston and thereby increase the power of the engine in the usual manner. When the valve *d*² is moved in one direction from the position shown in Fig. 2, it places the port *e*² in communication with one outlet, as *e*, at the same time closing its communication with the other outlet, as *e*², and if moved in the other direction the reverse operation is performed—that is, the main exhaust *c* is placed in communication with the pipe *e*² and shut off from communication with the pipe *e*. The valve *d*² is thrown from its intermediate position at each stroke of the engine-piston by means of cam projections *f*², carried by the main shaft, (see Fig. 2,) which throw the valve in the direction to place the exhaust-pipe *c* in communication

with the heating-pipe *e*, the said cams being so placed as to open the valve at the beginning of the exhaust movement from the engine-cylinder or when the exhaust-steam is at greatest pressure. A second cam *g*, having cam-surfaces $g^2 g^3$, is also connected to rotate with the main shaft, and in the movement thereof in the direction of the arrow, Fig. 2, the said cam-surfaces throw the piston-valve d^2 in the opposite direction to that in which it is thrown by the projection *f*, thus first closing the port c^2 and immediately thereafter placing it in communication with the passage e^2 and with the condenser.

In the position shown in full lines, Fig. 2, the cam-surfaces $g^2 g^3$ operate immediately after the cam-surfaces $f^2 f^3$, so that with the cams in this position the exhaust-pipe *c* is placed in communication with the heating system *e* for a moment and immediately thereafter is placed in communication with the condenser by the pipe e^2 . If, however, the cam-surfaces $g^2 g^3$ are moved away from the projections $f^2 f^3$ or toward the position indicated in dotted lines, they will operate later in the stroke of the piston and will retain the main exhaust *c* in communication with the heating system for a longer period of time and with the condenser for a shorter period of time during the stroke of the engine, thus delivering more steam to the heating system, and by adjusting the cam *g* upon the main shaft relative to the cam *f* the division of the steam may be varied as desired, a greater or less portion being delivered into the heating system at each stroke of the engine. In order to thus shift the cam *g* with relation to the main shaft while the engine is running, the said cam is connected with a long sleeve-like shaft g^4 , (see Figs. 1, 4, and 5,) provided with a spiral slot or groove g^5 , in which is placed a key or projection g^6 , having a definite angular position with relation to the shaft *b*, its shank moving through a longitudinal slot b^5 in said shaft *b* and being connected with a shifting-rod g^7 , passing longitudinally into a central passage in the shaft *b*. The end of the rod g^7 passes into a bore in the key-piece g^6 and is provided with an annular groove that receives a projection, shown as the end of a screw connected with said key-piece, (see Figs. 4 and 5,) so that the key-piece may revolve with the main shaft about the rod g^7 , but is moved longitudinally in said shaft by longitudinal movement of the said rod g^7 , which itself has no rotary movement. Thus by moving the rod g^7 longitudinally the cam *g* will be turned with relation to the shaft by the spiral slot and key, and thus may be shifted from one position to another with relation to the cam *f*, which is fixed upon the main shaft. The said rod g^7 may be operated in any suitable manner—as, for example, by hand, in which case the operator would shift the same from time to time as more or less steam was required in the heating system. The said mechanism for controlling the di-

vision of steam between the heating system and condenser is, however, capable of automatic regulation by the following mechanism: The rod g^7 is connected with one arm of a lever *h*, Figs. 1 and 3, pivoted at h^2 and having its other arm h^3 connected by a rod h^4 with a governing-piston *i*, (see Fig. 3,) working in a cylinder i^2 , communicating by a pipe i^3 with the heating system *e*.

The pressure of the steam from the heating system upon the piston *i* may be counter-balanced in any suitable manner, as by a lever *k* and weights $k^2 k^3$, so that the piston *i* will be moved up or down in the cylinder by slight variations in the pressure in the heating system. The weight k^2 , for example, may just about balance the normal pressure required, and the weight k^3 , being normally below the fulcrum of the lever *k*, affords increased resistance as the said lever turns to move said weight k^3 from such position.

The connection between the piston *i* and cam g^3 is such that increase in pressure in the cylinder i^2 tends to move the cam toward the position shown in full lines, Fig. 2, thus diminishing the length of time that the exhaust flows into the heating system, and decrease in pressure tends to move the cam from the position shown in full toward that shown in dotted lines and to increase the time that the exhaust communicates with the heating system, and the supply of the exhaust to the heating system is thus regulated, so as to keep a nearly-constant pressure in said heating system, the supply being varied according to the draft of steam from the heating system. For example, if the draft of steam from the heating system increases it tends to diminish the pressure therein, thus permitting the piston *i* to move upward and throw the cam *g* toward the dotted-line position, Fig. 2. The heating system will then receive exhaust from the engine during a longer period in each stroke until the pressure in the said heating system is sufficiently increased to move the piston downward and throw the cam *g* back again and thereby prevent further increase of the pressure in the heating system, so that the said pressure may be maintained within narrow limits of variations.

By having the valve that controls the division of the exhaust independent of the engine-valve, as in the present invention, it is possible to vary the said division at any time, as may be required, although the mechanism by which the said controlling-valve is operated and its movement varied may itself be varied widely without departing from the invention, whereas if the engine-valve itself were constructed so as to deliver the exhaust-steam into two independent branches or ducts it would not be possible to vary the said division, as each of said ducts would receive a definite portion of the exhaust-steam at each stroke of the engine.

I claim—

1. The combination, with an engine-cylin-

der having a main exhaust-duct that receives the exhaust-steam from the engine, of two branch ducts connected with the said main exhaust-duct, one leading to a condenser and the other to a system in which the exhaust-steam is utilized, and a valve located at the junction of said main and branch ducts that is independent of the engine-valve and controls communication of said main exhaust-duct with said branches, and actuating mechanism for said controlling-valve operated by the engine, whereby it places the main exhaust-duct in communication with one of said branches during a portion of each stroke of the engine and with the other of said branches during the remainder of the stroke, substantially as described.

2. The combination, with an engine-cylinder having an exhaust-duct, of two branch ducts, connected with said exhaust-duct, one leading to a condenser and the other to a system in which the exhaust-steam is utilized, and a valve controlling communication of said exhaust-duct with said branches, cams on the engine-shaft that throw the said valve at each stroke of the engine to place the exhaust-duct into communication with one of said branches, and other cams on said engine-shaft throwing the valve in the direction to place the exhaust-duct in communication with the other branch, the latter cams being

adjustable with relation to the former, substantially as described.

3. The combination, with an engine-cylinder having an exhaust-duct, of two branch ducts connected with said exhaust-duct, one leading to a condenser and the other to a system in which the exhaust-steam is utilized, a valve controlling communication of said exhaust-duct with said branches, cams fixed on the engine-shaft for throwing the valve to place the exhaust-valve in communication with one of said branches, other cams for throwing the said valve to place the exhaust-duct in communication with the other of said branches, and a sleeve supporting the latter cam and capable of rotation upon the engine-shaft, said sleeve being provided with a cam-groove, and a key longitudinally movable in the engine-shaft co-operating with said cam-groove, whereby the position of the sleeve and its valve-actuating cams may be varied with relation to the cams fixed on the main shaft, substantially as described.

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

LOUIS I. SEYMOUR.

Witnesses:

ROBERT A. BROWN,
JOHN A. SKAKLE.