(No Model.)

J. AGATE.

STEAM HEATING APPARATUS.

No. 411,631. Patented Sept. 24, 1889.

Fig. 1.

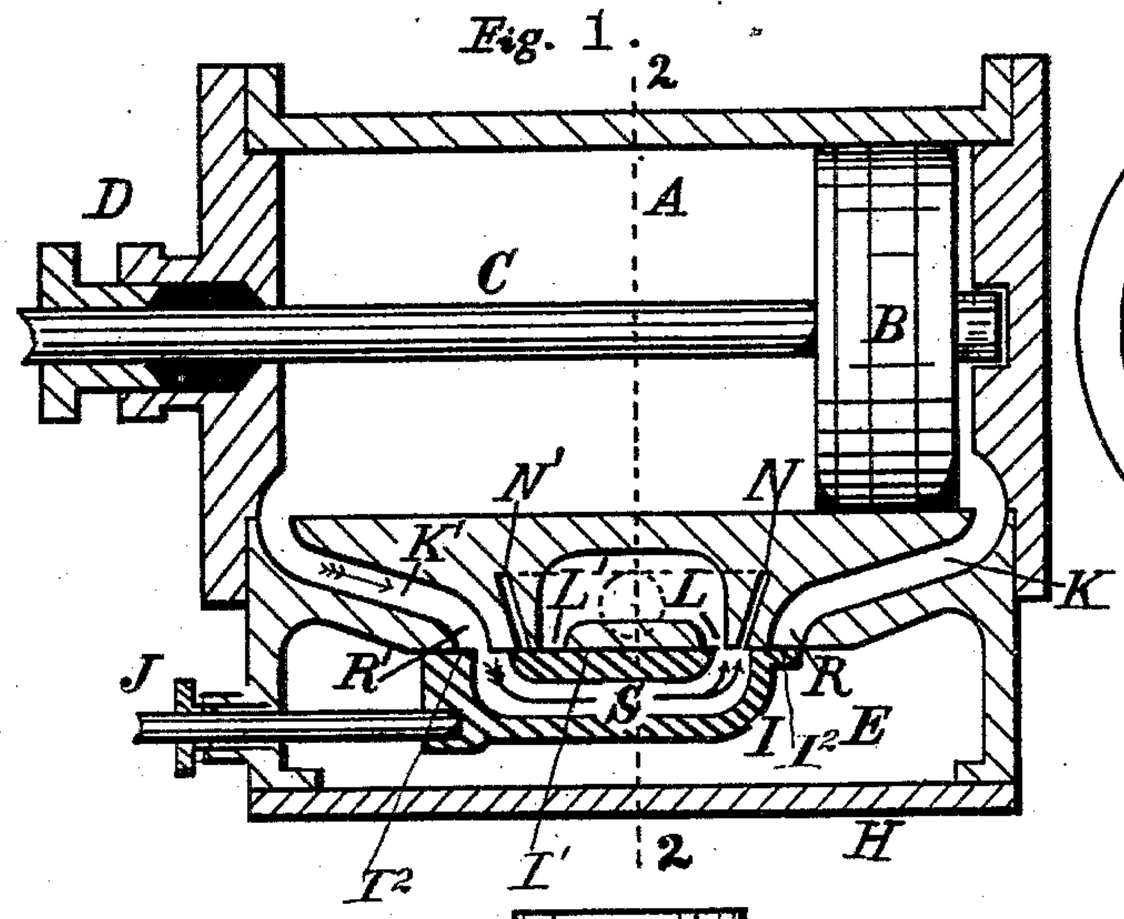


Fig. 3.

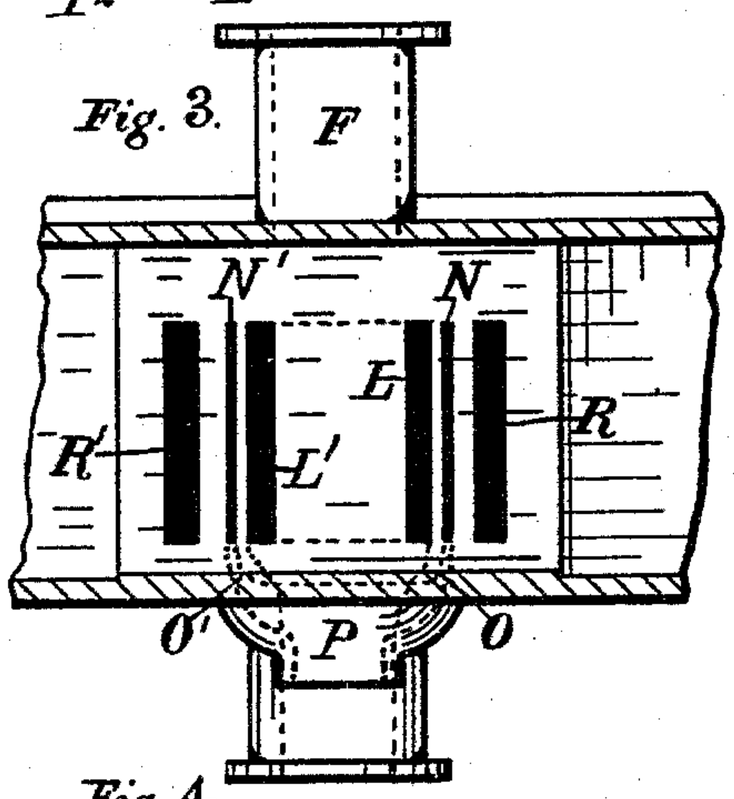
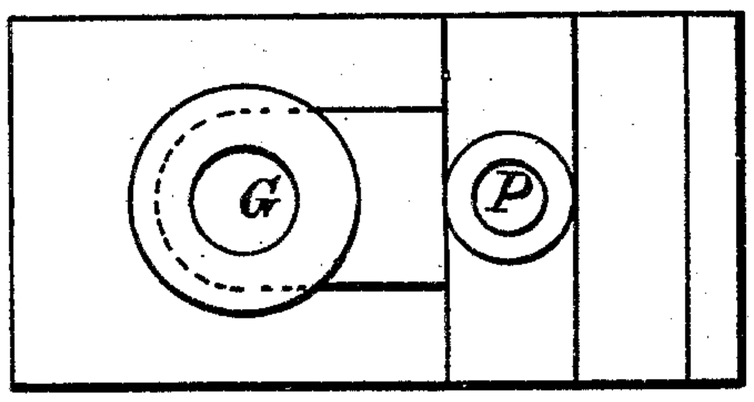


Fig. 4.



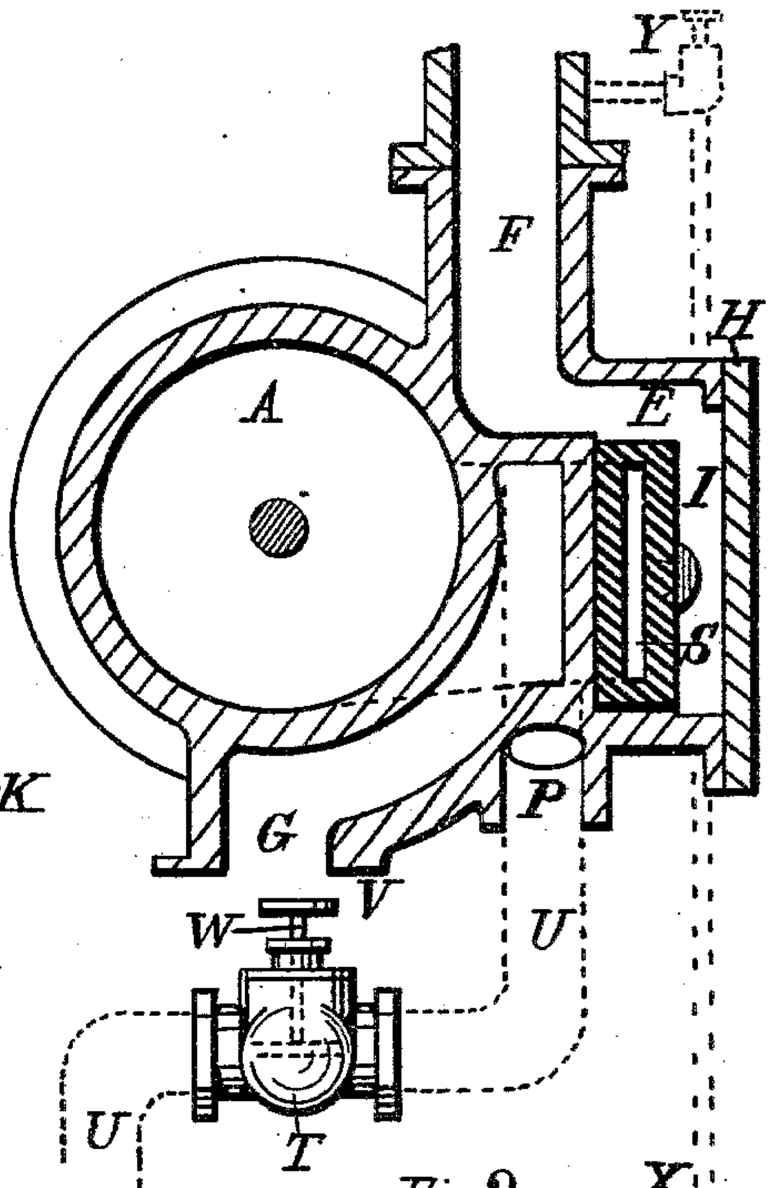
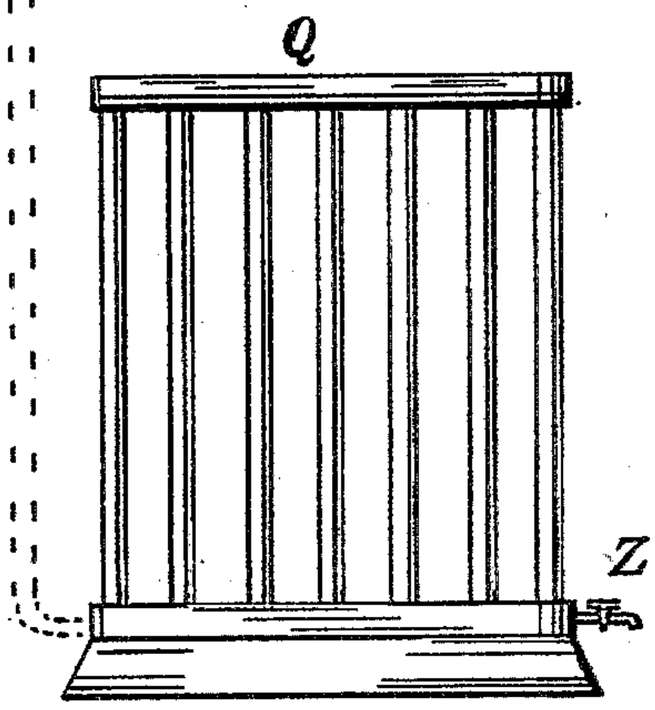


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN AGATE, OF PITTSFORD, NEW YORK.

STEAM-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 411,631, dated September 24, 1889.

Application filed March 27, 1889. Serial No. 304,989. (No model.)

To all whom it may concern:

Be it known that I, JOHN AGATE, a citizen of the United States, residing at Pittsford, in the county of Monroe, in the State of New York, have invented certain Improvements in Steam-Heating Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to an improvement in steam-heating apparatus, having for its object the utilization of a portion of the exhaust-steam from an ordinary steam-engine, said portion of the exhaust being taken from the cylinder by an improved construction of the valve mechanism at or nearly at the termination of the power strokes of the piston.

My invention is fully described and illustrated in the following specification and accompanying drawings and the novel features thereof specified in the claims annexed to the said specification.

In the accompanying drawings, representing a steam-engine and heating apparatus adapted to carrying my invention into practical effect, Figure 1 is a longitudinal section through the steam-cylinder and valve-chest. Fig. 2 is a transverse section of the same on the line 2 2, Fig. 1. Fig. 3 is a side elevation of the steam-chest and ports, partially in section. Fig. 4 is an inverted view showing the exhaust-passages at the bottom of the cylinder.

In the accompanying drawings, A is a steam-cylinder, B the piston, and C the piston-rod, all of which are of any ordinary construction and connected to operate a crank-shaft in any usual or preferred manner.

E is the steam-chest; F, the inlet steam-passage, and G the exhaust-passage for the bulk of the steam. The steam-chest is constructed in any ordinary way, its walls being cast with the cylinder and provided with the cover H, or constructed in any other suitable way.

I is the valve-slide, located within the steam-chest and operated from an eccentric on the crank-shaft by the valve-rod J and suitable connections.

K K′ are the steam-passages between the steam-chest and the cylinder.

As indicated in Fig. 1, the exhaust-passage is divided and provided with the two ports L L′, opening into the steam-chest.

N N′ are supplementary exhaust-ports located immediately inside of the main exhaust-ports L L′, and connected by suitable cored passages (indicated by the dotted lines O O′ in Fig. 3) with the supplementary exhaust-passage P, from which a pipe leads to a suitable radiator or manifold.

The mouths of the passage S divide the face of the slide-valve into parts I′ I′ and 1^2. The former are each wider than a port R or R′ and the latter about equal in width to the distance between ports N N′, while each mouth of the passage S is about equal to a port R or R′. As represented in Fig. 1, the slide-valve is supposed to be moving to the left at the end of the piston-stroke and live steam is about to be admitted at port R. The port N has just permitted the escape of steam not entirely expended and is about to be closed prior to the entire opening of exhaust L. The construction is such and so proportioned and arranged that a portion of the exhaust-steam can be separated while yet it has some pressure and an available amount of heat and conducted to the radiator, and the remainder of the exhaust-steam after its expansion subsequently forced out of the port L, port N being at this time closed. This special operation is characteristic of my improvement upon prior devices, which either failed to divide the exhaust-steam or divided it after escape from the valve, and therefore after too great expansion, or failed entirely to utilize exhaust-steam before its complete expansion.

The operation of my invention will be understood from an examination of the longitudinal section, Fig. 1, in which the piston B is represented at the right-hand end of its stroke and live steam is about to enter the cylinder through the passage K as soon as the valve I in its movement uncovers the port R. The steam issuing through the passage K′ and the port R′ travels through the passage S, cored in the valve I, and escapes at first through the supplementary exhaust-port N, and then, as the valve moves farther toward the left hand, partially through the sup-

plementary exhaust-port N and partially through the main exhaust-port L. The further movement of the valve closes the supplementary exhaust-port N, and the escape of the great bulk of the steam from the cylinder takes place through the main exhaust-port L and the exhaust-passage G. A similar operation takes place at the other end of the stroke. The check-valve T is inserted in pipe U, leading from the supplementary exhaust-passage P to the heater Q, which check-valve may be provided with the threaded stem W and a hand-wheel V, by which the amount of its opening is regulated so as to vary the quantity of the steam transferred to the heater Q or to shut off entirely the flow of steam thereto.

In order to provide for warming the radiator when the engine is not running, I connect it with the boiler directly by the pipe X, provided with throttle-valve Y.

It is obvious that by varying the position and dimensions of the supplementary exhaust-ports N N′ relatively to the main exhaust-ports L L′ or the movement of the valve the quantity of steam taken from the cylinder at each stroke may be controlled. The pressure of the steam in the heater will hold the check-valve T closed when it exceeds the pressure in the supplementary exhaust-passages, and by limiting the opening of the check-valve any desired amount of steam may be admitted to the heater.

It is obvious that many changes and modifications may be made in my invention without departing from the leading principle thereof, which consists in removing or discharging a certain amount of the steam at or near the end of the power-stroke, when the reduction of pressure in the cylinder is of no practical consequence.

It is obvious that my invention may be applied to many different types of steam-engines and steam-valves, and that it may be applied to any of the purposes for which steam-heating apparatus heated by live steam direct from the boiler are now employed, such as heating buildings, factories, warehouses, railroad-cars, and other purposes. It is also more economical than any direct system of steam-heating.

The heater is provided with any ordinary drip or trap, as indicated at Z.

I claim—

The steam-cylinder and piston and the steam-chest provided with passages K K′ and with the supplementary exhaust-ports N N′, located between said passages, and the exhaust-ports L L′, the slide-valve I, having passage S and solid face parts I′ I², each face I² having a width greater than that of port R or R′ and equal to or a little wider than that of the ports N L or N′ L′, and the face I′ being equal to the distance between the ports N N′, whereby the valve is adapted to cover all said passages and ports during the admission of steam to the cylinder, and then upon suitable movement to uncover first a supplementary port, and then to cover the same and uncover an exhaust-port L or L′, all in combination with a radiator and a pipe having a check-valve communicating with said supplementary ports and with the radiator, substantially as set forth.

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