2. Sheets, Sheet 1.

J. Houpt,

Steam Engine.

No. 111,937. Patented Feb. 21. 1871.

Fig. 1.

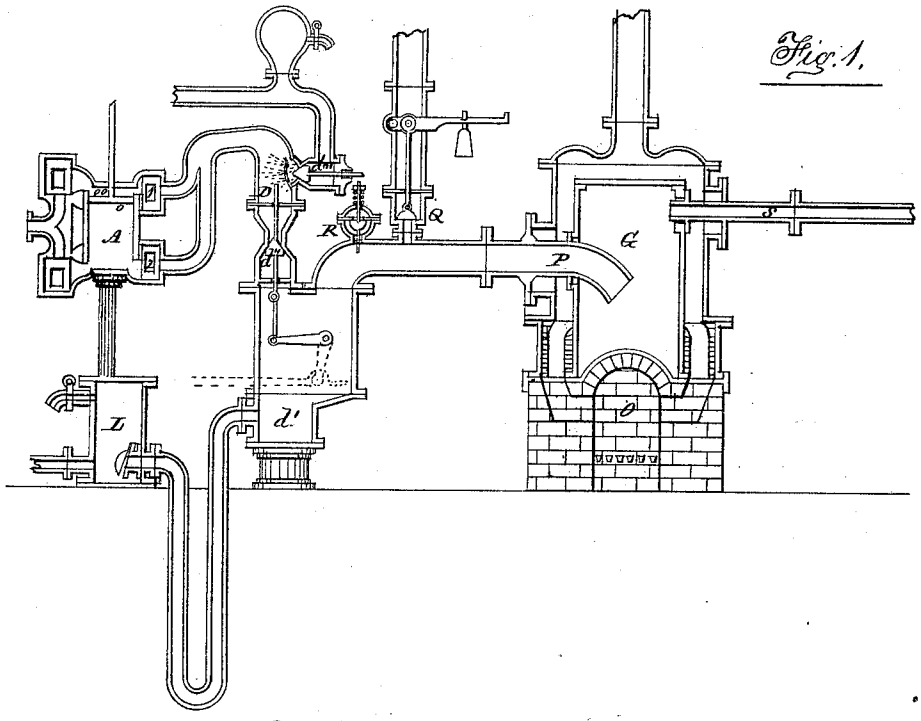
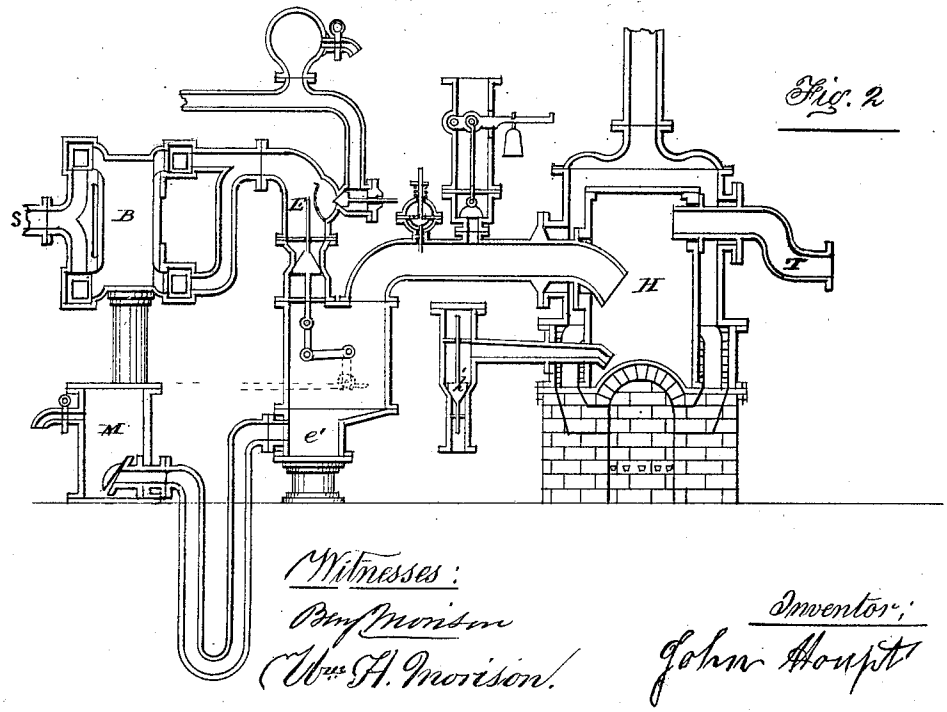


Fig. 2



Witnesses:

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Wm. H. Morison.

Inventor:

John Houpt

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2 Sheets, Sheet 2.

J. Houpt,

Steam Engine.

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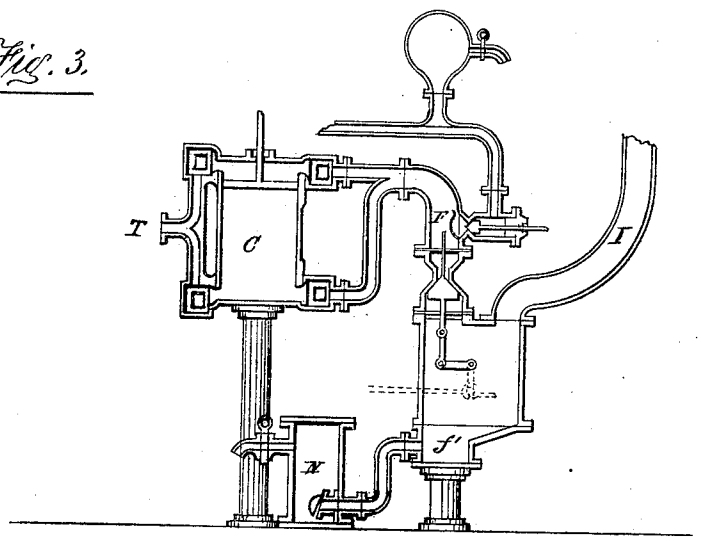
Fig. 3.



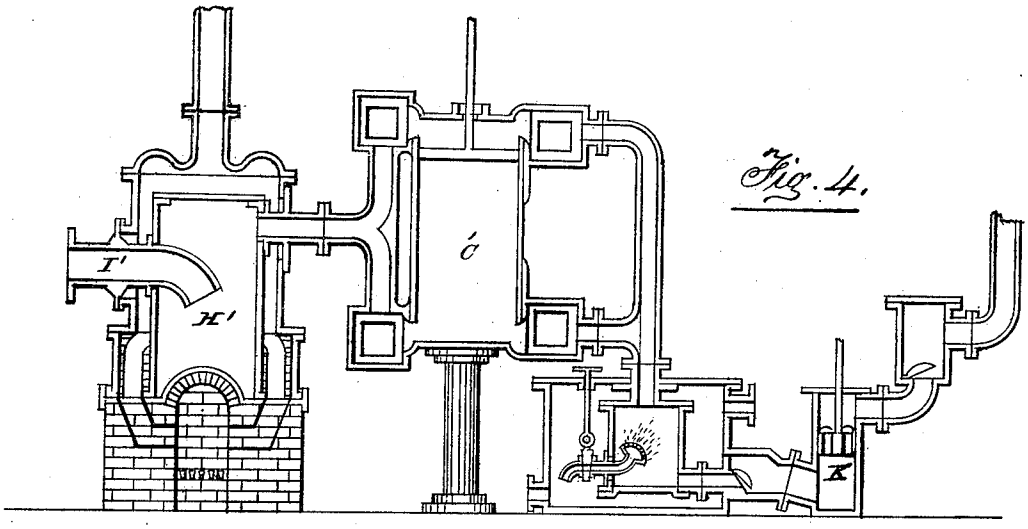


Fig. 4.

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United States Patent Office.

JOHN HOUPT, OF SPRINGTOWN, PENNSYLVANIA.

Letters Patent No. 111,937, dated February 21, 1871.

IMPROVEMENT IN STEAM-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

I, JOHN HOUPT, of Springtown, in the county of Bucks and State of Pennsylvania, have invented certain Improvements in Steam-Engines, of which the following is a specification.

Nature and Objects of the Invention.

My invention relates to the combination of a pluralty of low-pressure engines with a high-pressure cylinder, having a steam-dividing self-clearing jet-condenser and a superheater between, in such a manner that the portion of steam which passes freely through the dividing-condenser will be made sufficient to operate the low-pressure engines; the object of my invention being to economize fuel in the running of steam-engines.

Description of the Accompanying Drawing.

Figure 1 is a vertical central section of a steam-cylinder in communication with a self-clearing jet-condenser, hot well, and superheater.

Figure 2 is substantially a duplicate of fig. 1.

Figure 3 is also substantially a duplicate of fig. 1, with the exception of the superheater.

Figure 4 is a modification of fig. 3, with the addition of an air-pump and superheater.

The superheater of fig. 1 is intended to be connected with the steam-cylinder of fig. 2, and the superheater of fig. 2 is intended to be connected with the steam-cylinder of fig. 3, the first puff of its exhaust steam either escaping at the waste pipe, or entering the superheater of fig. 4, as will be explained.

General Description.

My present invention consists, substantiany, in a combination of a series of the steam-cylinders, self-clearing jet-condensers, and superheaters of steam, described and set forth in the patents granted to me dated May 18, 1869, April 19, 1870, and reissued May 31, 1870, July 19, 1870, and the application "allowed" July 16, 1870, with such modifications as the said hereinafter described combination rendered necessary and proper.

A B C represent respectively the first, second, and third steam-cylinders;

D E F, their respective self-clearing jet-condensers; and

G H, the respective superheaters of the steam coming from the cylinders A and B.

Although the mode of operation of the several steam-cylinders and self-clearing jet-condensers herein set forth have, substantially, been described in the specifications of my reissued patent dated May 31, and application allowed July 16, 1870, it is considered proper to again explain the operation in the present combination in view of the final result.

The steam is supposed to enter A at, say, fifty pounds' pressure to the square inch above that of the atmosphere; to enter B at, say, fifteen pounds' pressure to the square inch above the atmosphere; and to enter C at, say, five pounds' pressure to the square inch above the atmosphere; and on leaving the condenser F to escape into the external atmosphere through the escape-pipe I, see fig. 3; or to enter the superheater H', to supply steam-cylinder C', at, say, one pound to the square inch either above or below the pressure of the atmosphere. The modification shown in fig. 4 is, substantially, an ordinary low-pressure engine arrangement, for the purpose of utilizing the exhaust steam, which, at or above the pressure of the atmosphere, would otherwise escape through the waste-pipe I of fig. 3.

The water of condensation flows into the respective hot wells *d' e'* and *f'* of figs. 1 2 3, and from thence into the respective reservoirs L, M, and N, and from the first-named one, L, the steam-generator may be supplied with a sufficiency of hot water.

The operation of the self-clearing jet-condensers and superheaters, represented in figs. 1 and 2, will be precisely alike, and, therefore, an explanation of the operation of the one will serve as an explanation of the other.

The operation of the valve *d''* divides the exhaust steam coming from the cylinder A into two portions, the first portion passing freely down through the condenser D and thence into the superheater G, from which the next cylinder B will be supplied with steam at a reduced pressure; and the second portion, being arrested and condensed to produce the required vacuum before the piston, is afterward discharged with the water of condensation down into the hot well *d'*, and from which it flows by gravitation into the reservoir L.

To be more explicit, suppose the piston of cylinder A, moving in its course upward, arrives at *o* near the upper end of the cylinder. Now, the exhaust-valve 1 and the jet-valve *d'''* having just been closed, and the exhaust-valve 2 commencing to open, allow the high-pressure exhaust steam from beneath the piston of the cylinder to escape through the exhaust-valve 2 into the self-clearing jet-condenser D, and immediately on the said jet-condenser becoming sufficiently filled with the exhaust steam to destroy the vacuum existing therein the valve *d''* thereof opens and allows the contained water of condensation to drop down into the hot well *d'*, and by the time the piston of the cylinder A arrives at *o o*, or near to the top of the upward stroke of the piston, the valves 2 and *d''* will be fully opened, and the condenser D will clear itself of all the condensing water and air which may have accumulated therein from the previous condensation, and by the time the crank on the main shaft of the engine (not shown) has passed the dead-center,

and the piston has retured to *o* on its downward stroke, the first puff or main portion of the exhaust steam will have passed out from under the piston and through the open valves 2 and *d''*, in its course through the self-clearing jet-condenser D into the superheater G. The valve *d''* now closes, and the jet-valve *d'''* opens and throws a copious jet-spray of cold water into the condenser D, and thus condenses the remnant or second portion of the exhaust steam, and produces immediately the required vacuum before the piston, and so on.

The superheater G is heated by the small furnace O, by which it is supported and inclosed; and the pipe P, which conducts the steam from the condenser D into the superheater G, has its outlet end curved obliquely downward and laterally, so as to discharge the steam spirally downward into the superheater, and thus favor the required general distribution therein of the steam to be superheated.

The pipe P is also provided with safety-valves Q and R, to prevent the possibility of an explosion or collapse of the superheater.

The superheater G connects, by the pipe S, directly with the supply-valves of the steam-cylinder B, and the superheater H connects, by a pipe, T, directly with the supply-valves of the steam-cylinder C, and the first or main portion of the exhaust steam from the cylinder C escapes into the open air through the waste-pipe I.

A hot-air valve, *h'*, is attached to a pipe, which, at one end, communicates with the interior of the second superheater H, while the other end (not shown) is intended to extend spirally upward through the chimney of the furnace of the superheater G, or any other furnace chimney, whereby it may be kept hot, and to connect with an air-forcing pump, in such a manner that the superheater H may, by the hot air, be kept sufficiently heated without its special furnace, if desired to further economize in fuel.

It is estimated that, if the cylinder A works at fifty pounds high-pressure, the pressure in B will be about fifteen pounds, the pressure in C five pounds, and the pressure at the waste-pipe I one pound or less.

For the purpose of utilizing this waste of one pound to the square inch in the escape-pipe I, and of affording the advantage of a vacuum, the apparatus shown in fig. 4 may be attached by its pipe I' to the waste-pipe I of fig. 3.

This apparatus (fig. 4) is a modification of the apparatus shown in figs. 1 and 2, in so far that an air-pump takes the place of the superheater and produces an exhaust of the air and water in the condenser in the same manner as in the ordinary low-pressure engine, and thus renders available the remnant of steam which otherwise will escape through the waste-pipe I of fig. 3.

It will be understood, without further description or explanation, that the combination described and set forth will, in view of the amount of work derivable therefrom, greatly economize the fuel required to keep the same in motion.

As a modification of the low-pressure engines, shown in figs. 2 and 4, the superheaters therein may be dispensed with, for the sake of economy, by enlarging the superheater G of fig. 1, so as to render it capable of allowing a sufficient expansion of its contained steam to operate, at a pressure of, say, five pounds to the square inch, a series of low-pressure engines, constructed substantially as represented in fig. 3.

Claim.

I claim as my invention—

The combination of a plurality of low-pressure engines with a primary high-pressure steam-cylinder, A, receiving its steam from any suitable steam-generator, and having a steam-dividing self-clearing jet-condenser, D, and a superheater, G, communicating between it and the several low-pressure engines, and operating together, substantially as and for the purpose hereinbefore set forth and described.

JOHN HOUPT.

Witnesses:

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WM. H. MORISON.