(No Model.)

C. W. TREMAIN & S. JOHNSON.

STEAM ENGINE.

No. 480,153. Patented Aug. 2, 1892.

Fig 1a

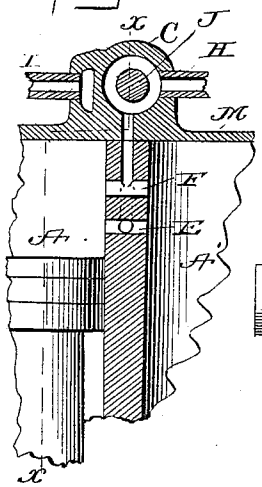


Fig 1

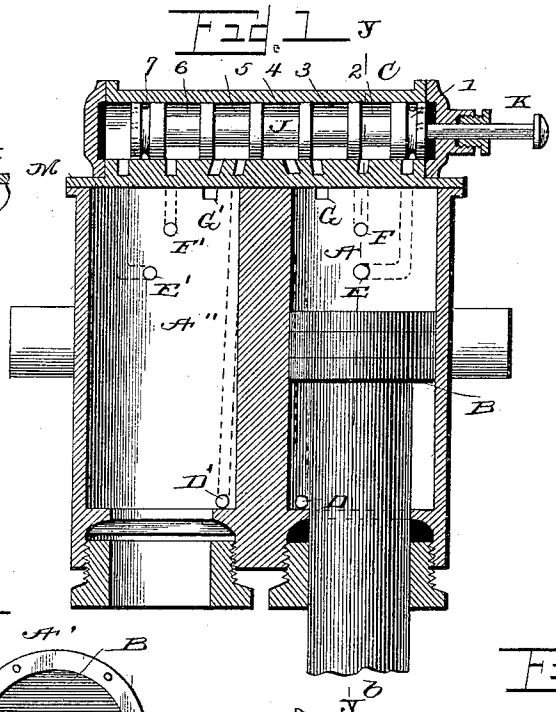


Fig 2

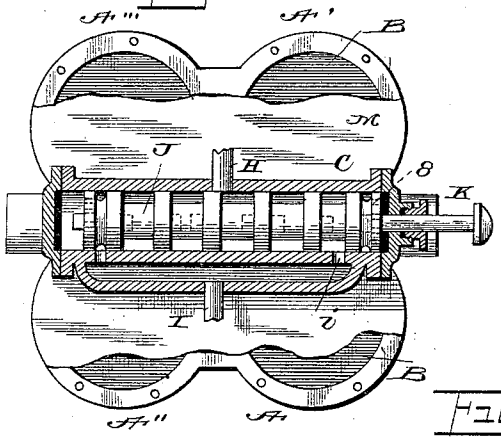


Fig 3

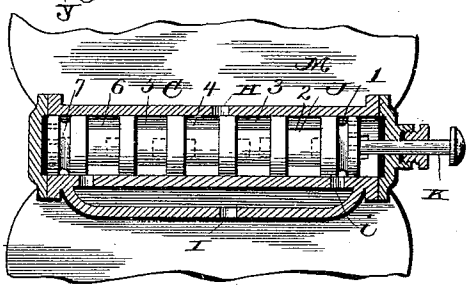
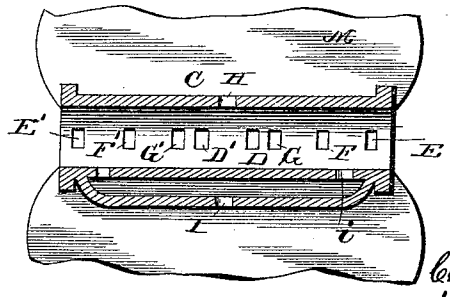


Fig 4



Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES W. TREMAIN AND SANDER JOHNSON, OF PORTLAND, OREGON ASSIGNORS TO THE PROSPECTIVE MINING AND MACHINERY COMPANY OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 480,153, dated August 2, 1892.

Application filed April 19, 1892. Serial No. 429,783. (No model.)

To all whom it may concern:

Be it known that we, CHARLES W. TREMAIN and SANDER JOHNSON, citizens of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of this improvement is to provide an engine, principally intended for use in operating stamps, which shall be simple, compact, of great power in proportion to its size, and not likely to get out of order.

The invention consists in the peculiar construction, arrangement, and combinations of parts whereby these features are secured, and which invention is hereinafter more fully described and then definitely claimed.

In the accompanying drawings, Figure 1 is a section of part of an engine constructed according to our improvement on the line *x x* on Fig. 1ª, which latter figure is intended to show a vertical section through the line *y y* in Fig. 1 at right angles to the section shown in Fig. 1. Fig. 2 is a plan of the engine, also with parts broken away, with the valve set to the right. Fig. 3 is a plan of the valve in the opposite position with the top of the steam-chest broken away. Fig. 4 is a plan of the engine with the cap and valve removed.

Referring to the details of the drawings by letters and figures, A A′ A″ A‴ represent four cylinders, in which work as many pistons B, having large stems *b*, to each of which may be attached a stamp, hammer, or other device to be operated. Between the back and front cylinders are several vertical passages leading from the valve-chest C to different points in the cylinders—viz., one (marked D) runs to the bottom of the cylinder, another one (marked E) runs rather more than one-fourth the way down, another one, the exhaust, (marked F,) runs about one-eighth the way down, and a fourth (marked G) terminates at the extreme top. These are all between the cylinders A and A′, and between the cylinders A″ and A‴ there are corresponding passages D′, E′, F′, and G′. The lower ends of each and all of these passages terminate in horizontal mouths, (see Fig. 1ª,) which communicate with the back and front cylinders of that side of the engine in which they are situated, so that when steam enters either of the passages it runs down to both cylinders on that side of the engine. In like manner the exhaust takes place from both the cylinders on one side at the same time. At each side of the engine is a trunnion on which the engine may be mounted, as shown in my patent, No. 469,187, dated February 16, 1892.

Referring now to the details of the valve and valve-chest, H indicates the inlet and I the exhaust pipes. J is the valve, which is of the piston variety, having seven annular grooves (marked 1, 2, 3, 4, 5, 6, and 7) around it, the opposite ends being perforated to allow steam to pass from the end grooves to the ends of the valve-chest to give motion to the valve. At one end of the valve is shown a projecting head K, which may be used to give motion to the valve by hand in starting the engine.

The operation is as follows: The valve being in the position shown in Fig. 2 and steam being admitted to pass through the pipe H, it enters the middle groove 4 in the valve and passes down passage D, raising both pistons on the right-hand side of the engine, and when they have risen high enough to uncover the mouths of the passage E some of the steam that is below the pistons enters through said passage E into the groove 1, nearest the right-hand end of the valve-chest and, passing through the perforation 8 in the piston-valve, forces the latter over to the opposite end of the valve-chest, as shown in Fig. 3, in which position of the valve the steam that operates it escapes into the exhaust through the exhaust-port *i*. In this position of the valve the groove 3 allows communication between the passages D and G and the steam then acts, expansively operating on the top of the piston, thus using the same steam that raised the piston to return the same and give the blow. The main exhaust-port on this side of the engine is shut off, there being only a small passage open for the escape of the steam from the right-hand end of the valve-chest.

While the pistons of cylinders A and A′ are descending and the valve is in the second potion steam enters the passage D′ and, passing down, raises the left-hand pistons in the same manner as the others until they pass the mouth of the passage E′, when steam enters there, and, passing into the groove 7 and perforations 9, moves the valve back to its original position, the steam in the opposite end of the valve-chest passing through the perforations 8 in that end of the piston-valve into the groove 11 and out at the exhaust-port *i*, as shown in Fig. 3, until the valve has passed so far as to cut off connection between the port *i* and the groove 7. It will thus be seen that the steam that has operated the valve passes out of the right-hand exhaust *i* and that the steam from the top of the cylinder passes out at the opposite port *i*, and the reverse as the position of the valve is changed, the steam that has operated the piston exhausting independently of the steam in the cylinder. The remainder of the steam below the pistons A″ A‴ now passes up port D′ into the groove 5 and down through passage G′ to act on the top of the piston by expansion, as on the other side. While the pistons in the cylinders A″ A‴ are being driven down the steam enters below the pistons in the cylinders A A′, raising them up, as before, and the steam above the pistons in the same cylinders is exhausting through the passage F and groove 2 into the port *i*, which is now wide open, until the pistons have passed the mouth of the exhaust-passage F, when the remainder of the steam above the tops of the pistons acts as a cushion to prevent the pistons striking the cap covering the cylinders. By this time the steam entering passage E has again moved the valve to the opposite or second position and the steam acts on the left-hand cylinders, as before. We have shown four cylinders; but it is evident that a single pair of cylinders, as A A″, may be operated in the same way.

We have shown the valve-chest L mounted upon a cap M, that covers all the cylinders; but it is obvious that the engine may be so arranged as to have a separate cap for each cylinder or for each pair of cylinders; but we prefer the construction shown, as it is much cheaper, lighter, and more compact, and we therefore deem it far preferable.

What we claim as new is—

1. The combination of multiplex cylinders, a valve-chest for the same, steam and exhaust passages communicating between said valve-chest and the cylinders and each passage terminating in two cylinders, pistons working in said cylinders, and a valve governing the admission of steam to the steam-passages, substantially as described.

2. The combination of a pair of cylinders having four pairs of passages on one side thereof forming steam and exhaust passages, one member of each pair communicating with one cylinder and the other member with the other cylinder in substantially the same position in both cylinders, and all the pairs having their entrances into the cylinders at different distances from the ends thereof, pistons working in said cylinders, and a valve governing the admission of steam to the steam-passages, substantially as described.

3. An engine comprising a valve and valve-chest, four cylinders, and their pistons and having steam and exhaust passages arranged between the cylinders, each passage running from the valve-chest and terminating in a pair of mouths, each mouth of the pair opening into a different cylinder, substantially as described.

4. An engine comprising two pairs of cylinders and their pistons, a valve and its chest arranged centrally between the pairs, and a series of passages running from the chest to and terminating in two cylinders arranged in a line at right angles to the valve and its chest, substantially as described.

5. An engine comprising two pairs of cylinders and their pistons, a valve and its chest arranged centrally over the tops of the cylinders and between the pairs, and a series of passages arranged between the cylinders running from the valve-chest to and each passage terminating in two cylinders, substantially as described.

6. The combination of the four cylinders A, A′, A″, and A‴, corresponding pistons working therein, a cap M, covering said four cylinders, a valve-chest L, mounted on the cap and having passages leading therefrom, each passage communicating with two cylinders, and a valve governing the ingress and egress of the steam, substantially as described.

7. The combination of a valve and valve-chest with a pair of cylinders A A″, pistons B B, working therein, said cylinders having passages D D′, admitting steam beneath said pistons, passages E E′, admitting steam to the ends of the valve-chest, passages F F′, communicating with the exhaust, and passages G G′, communicating through the valve with the passages D D′, whereby the steam operates to strike the blow as well as raise the piston.

8. The combination of a valve and valve-chest with a pair of cylinders A A″, pistons B B, working therein, said cylinders having passages D D′, terminating near the bottom thereof, passages E E′, admitting steam to the ends of the valve-chest, and exhaust-passages F F′, having mouths arranged near the top of the cylinder to be closed by the pistons, whereby the steam in the cylinder above the said mouths of the passages F F′ serves as a cushion for the pistons, substantially as described.

9. The combination, with a cylinder and piston, of a valve-chest and a valve operated by steam from said cylinder, said valve having an exhaust-passage independently of the exhaust from the cylinder, substantially as described.

10. The combination, of two cylinders hav-

ing passages D D′ E E′ F F′ G G′, pistons working in said cylinders, a valve-chest communicating with said passages, and a valve having the annular grooves 1, 2, 3, 4, 5, 6, and 7, said grooves 1 and 7 being open to the ends of the valve-chest, substantially as described and shown.

In testimony whereof we affix our signatures, in presence of two witnesses, this 7th day of April, 1892.

CHARLES W. TREMAIN.
SANDER JOHNSON.

Witnesses:
A. OHLHOFF,
FRANK RUCKERT.