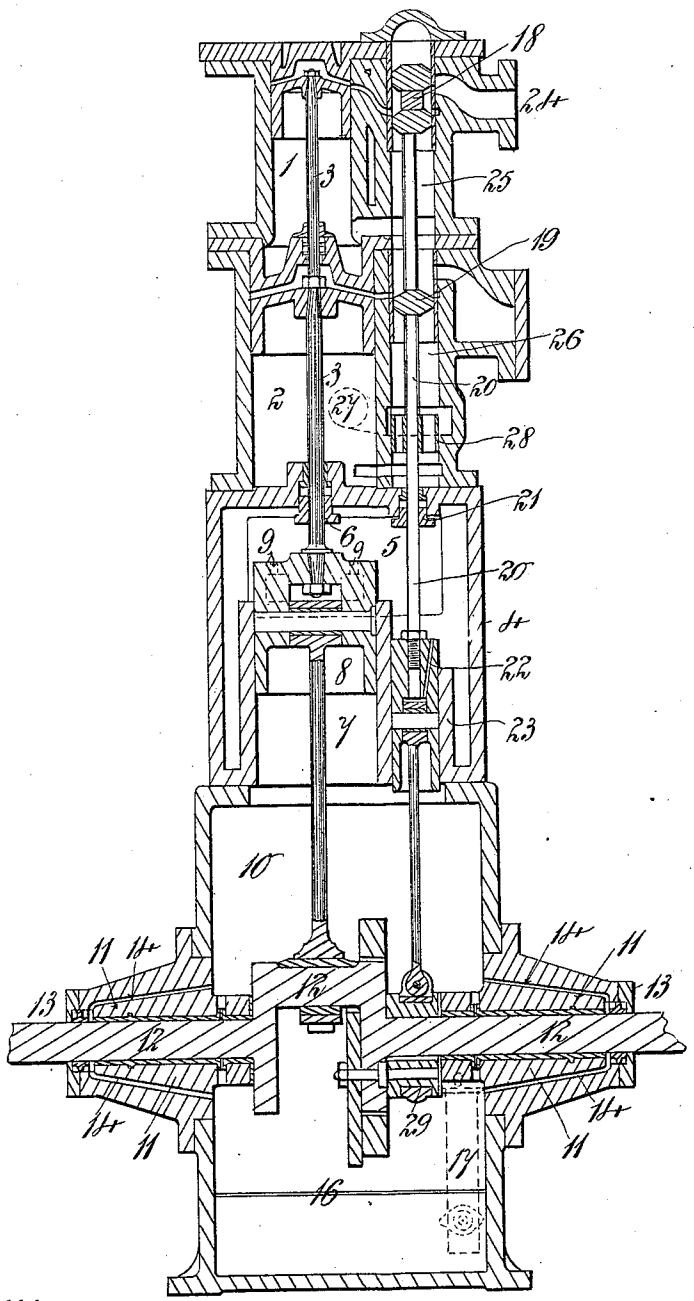
(No Model.) 2 Sheets—Sheet 1.

N. CHANDLER.

SINGLE ACTING STEAM ENGINE.

No. 420,862. Patented Feb. 4, 1890.

Fig. 1



Witnesses.

E. C. Duffy.

H. E. Peck

Inventor.

Noël Chandler

per E. E. Dewey

Atty

N. PETERS. Photo-Lithographer. Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

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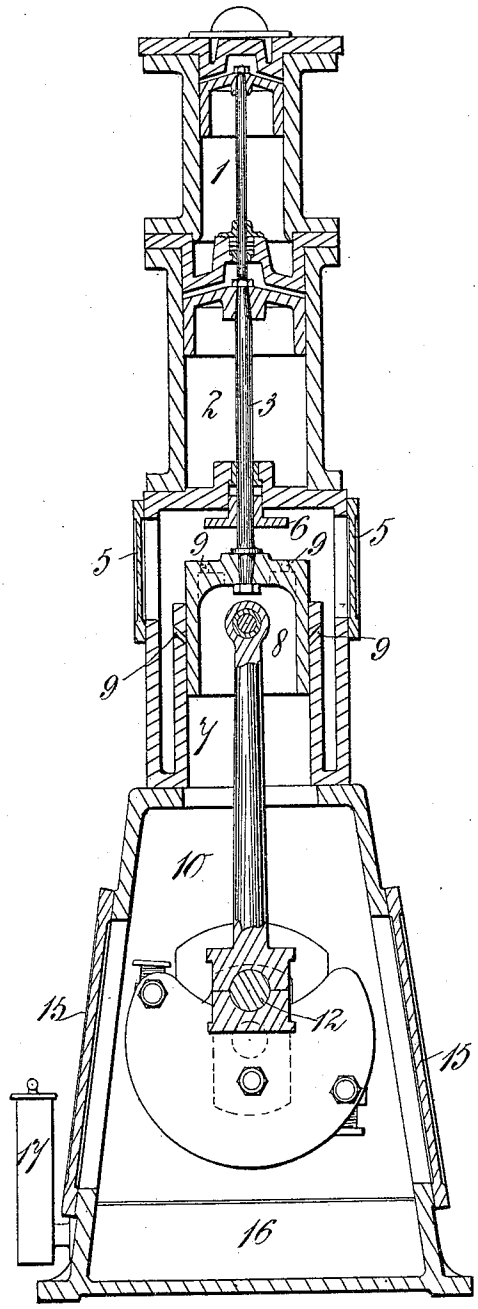
SINGLE ACTING STEAM ENGINE.

No. 420,862. Patented Feb. 4, 1890.

Fig. 2.



Witnesses
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H. E. Peck

Inventor.
Noel Chandler
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N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

NOËL CHANDLER, OF HEDNESFORD, COUNTY OF STAFFORD, ENGLAND.

SINGLE-ACTING STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 420,862, dated February 4, 1890.

Application filed September 24, 1888. Serial No. 286,276. (No model.) Patented in England April 18, 1888, No. 5,792.

To all whom it may concern:

Be it known that I, NOËL CHANDLER, a subject of the Queen of Great Britain and Ireland, residing at Hednesford, in the county of Stafford, Kingdom of Great Britain and Ireland, have invented Improvements in Single-Acting Steam-Engines, (for which I have obtained a patent in Great Britain, No. 5,792, dated April 18, 1888,) of which the following is a specification.

This invention has for its object improvements in single-acting steam-engines, and comprises an improved form of framing, an improved arrangement of cross-head guide, improved means for lubricating the cross-head, and an improved arrangement of valves. In the framing of the engine there are arranged doors on opposite sides, giving access to the stuffing-boxes of the piston and valve rods. The cross-head is circular in cross-section and works in a correspondingly-shaped guide which is formed inside the framing. This guide is open at the lower end to the crank-chamber, and is lubricated by the spray flung up by the crank. There are holes in the cross-head, through which the lubricating spray can gain access to the piston and valve rods. The valve-rod is guided by a cross-head working in a guide similarly situated to the guide of the piston-rod cross-head. Steam is admitted to the upper or rear side of the piston by a piston-valve, and is exhausted into a chamber or receiver below the valve.

In double or triple compound engines the steam goes successively to the upper or rear side of all the pistons before it enters the exhaust-chamber. There is an exhaust-outlet for this chamber. It is commanded by a sleeve-valve, which throttles the exhaust and keeps a cushion of steam above the piston (or the largest piston, if there be several) to prevent the connecting-rod brasses leaving the crank-pin.

Referring to the annexed two sheets of drawings, Figure 1 is a vertical central section through an inverted single-acting compound engine according to this invention. Fig. 2 is a similar section at right angles to Fig. 1.

The high-pressure cylinder 1 is situated directly over the low-pressure cylinder 2, the two pistons being on the same rod 3. The two cylinders are mounted on a frame or casing 4, which has doors 5 5, giving access to the stuffing-boxes 6 and 21 of the low-pressure cylinder. Within the frame or casing is a bored guide 7, in which works the cylindrical cross-head 8. In the cross-head and in its guide there are bored holes 9 for the passage of lubricant, as will be explained.

The frame or casing 4 stands upon a base or bed 10, (which may be cast in one piece therewith,) to which are connected bushed bearings 11 11 for the crank-shaft 12. These bearings have glands 13 at the outer end to prevent the leakage of lubricant, which is supplied by the passages 14 14. There are doors 15 15 at each side of the base for gaining access to the crank-shaft and other parts of the machinery. Ordinarily the base or bed is kept closed, and oil and water are fed into it to such a depth that at each revolution the crank dips into the oil and drives it upward in spray into the bearings and through the holes in the cross-head and cross-head guide. A perforated partition 16 keeps the liquid in the lower part of the bed comparatively still, while an oil-catcher 17 permits of the level being seen and of oil and water being added as required.

Steam is distributed to the two cylinders by piston-valves 18 and 19, mounted on a common rod 20, which has a stuffing-box 21, accessible through the doors 5 5. The lower end of this rod is guided by a cylindrical cross-head 22, working in a bored guide 23, situated within the frame or casing 4. This cross-head is lubricated in a similar manner to the cross-head 8.

High-pressure steam enters by the branch 24, and is admitted first to the upper end of the small cylinder 1. It is then exhausted into the chamber or receiver 25, which has free communication with the lower end of the cylinder. This chamber or receiver has also a communication with the upper end of the cylinder 2; but this communication is controlled by the valve 19. After the steam has been exhausted from the upper end of the cylinder 1 it is admitted to the chamber 25 and below the piston of cylinder 1, and on the next downward stroke of the piston is discharged into the cylinder 2 above the piston therein,

and on the return or upward stroke passes below the valve 19 into the receiver or chamber 26. This chamber communicates with the lower end of the cylinder 2 and with the exhaust-pipe 27. This latter communication is controlled by the sleeve-valve 28, which, however, offers no impediment to the passage of the steam to the lower part of the cylinder. This valve 28 is adjusted so as to close the exhaust-port as the piston nears the lower end of its stroke to a sufficient extent to insure a compression of the exhaust-steam in the cylinder on the return of the piston. The cushioning action of this steam will absorb the momentum of the moving parts, and so keep the connecting-rod and brasses close on the crank-pin. This valve remains closed during the greater part of the upward stroke of the piston, and so prevents the action of a condenser (into which the engine may be exhausting) from destroying or preventing the necessary compression or cushioning above the piston in the cylinder 2.

The valve-rod is worked by an eccentric 29, that may advantageously be constructed, arranged, and operated in the manner described and shown in another application for Letters Patent filed by me, dated March 29, 1889, Serial No. 305,328.

Engines constructed according to this invention may be made with two or more sets of cylinders similar to those herein described, arranged side by side and working on two or more cranks on a common crank-shaft, the cranks working in one crank-chamber common to all. In this case all the cylinders first receive the working-steam above their respective pistons, and then exhaust it to their under side before passing it on to do work in another and larger cylinder. In some cases engines according to this invention may be made with one cylinder, (non-compound;) but in either and every case the sleeve-valve 28 is always employed to command the exhaust from the last cylinder.

What is claimed is—

1. In a single-acting steam-engine, an intermediate frame or casing situated between the cylinder and the bed or base, and provided with doors or covers which can be removed to give access to the stuffing-boxes of the piston and valve rods, substantially as described and shown.

2. In a single-acting engine, a tubular cross-head guide formed within a frame or casing intermediate between the cylinder and the bed or base, and provided with holes through which lubricant is splashed by the crank, substantially as described and shown.

3. In a single-acting steam-engine, the combination, with a frame or casing intermediate between the cylinder and the bed or base, of two tubular cross-head guides, the one for the piston-rod and the other for the valve-rod, the said guides being provided with holes through which lubricant is splashed, substantially as described and shown.

4. In a single-acting steam-engine, the combination, with a cylinder, a steam-passage connecting the opposite ends of said cylinder and external thereto, and having an exhaust-passage communicating therewith, of a valve arranged to control said exhaust-passage, while admitting of the passage of steam from one end of said cylinder to the other, substantially as herein described.

5. In a single-acting steam-engine, a cylinder having its opposite ends connected by an external steam-passage from which leads an exhaust-passage, in combination with a sleeve-valve arranged to work in said steam-passage, and constructed to admit the passage of steam through itself, while its periphery commands the exhaust-passage, substantially as herein described.

6. In a single-acting steam-engine, the combination of a cylinder, steam-passage connecting its opposite ends and external thereto, an exhaust-passage leading from said steam-passage, a piston-valve arranged to control the flow of steam to and from one end of said cylinder, and a sleeve-valve arranged to work in said steam-passage and admit the passage of steam through itself, while its periphery commands the exhaust-passage, substantially as herein described.

7. In a single-acting steam-engine, the combination, with high and low pressure cylinders fitted with pistons and piston-valves controlling the passage of steam to and from said cylinders, of a steam-passage connecting the opposite ends of the low-pressure cylinder and external thereto, an exhaust-passage leading from said steam-passage, and a valve arranged to control said exhaust-passage, substantially as herein described.

8. In a single-acting steam-engine, the combination of high and low pressure cylinders 1 and 2, each fitted with a piston, connected steam-passages 25 and 26, external to and in communication with the opposite ends of said cylinders, an exhaust-passage 27, in communication with said steam-passage 25, piston-valves 18 and 19, arranged to work in said steam-passages and control the flow of steam to and from said cylinders 1 and 2, respectively, and a sleeve-valve 28, through which steam may pass while its periphery controls said exhaust-passage, said valves 18, 19, and 28 being connected and operating together, substantially as herein described.

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

NOËL CHANDLER.

Witnesses:
W. CROSS,
F. J. BROUGHAM,
Both of 46 *Lincoln's Inn Fields, London.*