



[72.]

*F.O. Deschamps,  
Impd. Steam Engine.*

No. 118,915.

Sheet 2.

Patented Sep. 12, 1871.

FIG. 2.

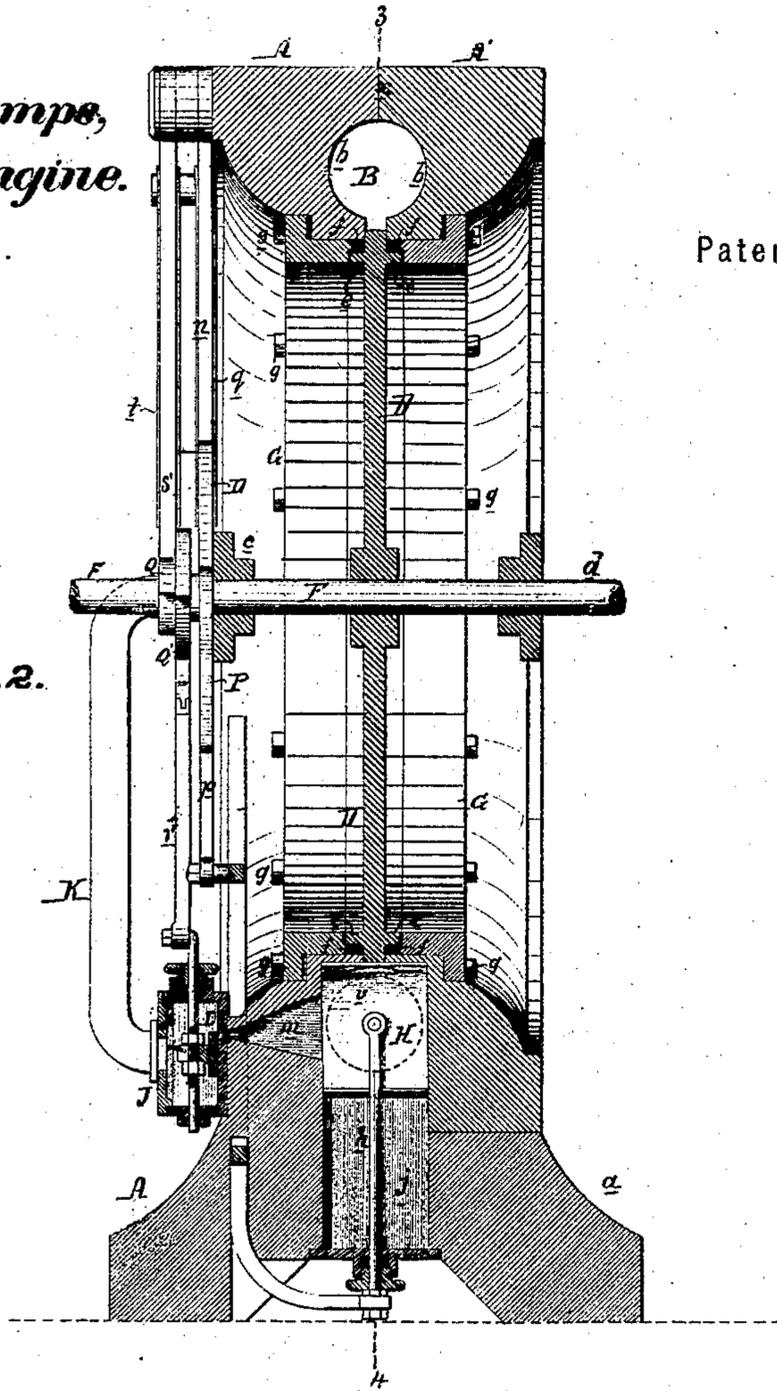


FIG. 4.

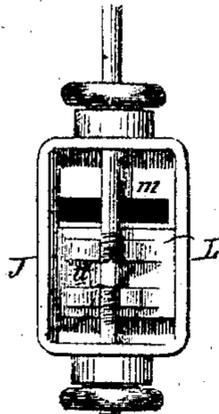


FIG. 5.

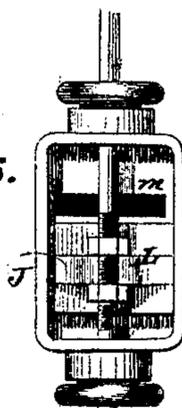


FIG. 6.

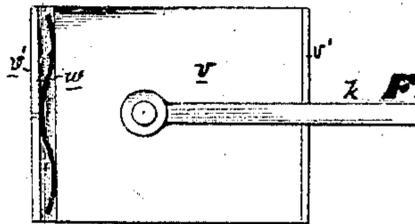
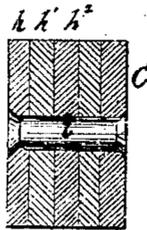
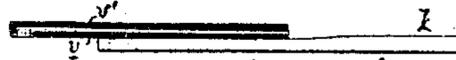


FIG. 7.

FIG. 8.



WITNESSES

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN ROTARY STEAM-ENGINES.

Specification forming part of Letters Patent No. 118,915, dated September 12, 1871.

*To all whom it may concern:*

Be it known that I, FRANCIS OLIVER DESCHAMPS, of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented an Improved Steam-Engine, of which the following is a specification:

My invention consists of a steam-engine, the construction and operation of which are too fully described hereinafter to need preliminary explanation.

Figure 1, Sheet 1, is an exterior view of my improved steam-engine; Fig. 2, Sheet 2, a transverse vertical section of the same; Fig. 3, Sheet 1, a vertical section on the line 3 4, Fig. 2, viewed from a side opposite that shown in Fig. 1; and Figs. 4, 5, 6, 7, and 8, Sheet 2, detached views of parts of the engine drawn to an enlarged scale.

The casing or frame of the engine consists, in the present instance, of two sections, A and A', of cast-iron, the former of which is enlarged at the bottom to form a base, *a*, and is recessed on one side for the reception of the annular section A', which is secured to the same by a number of bolts, the adjoining faces of the two sections being packed or ground perfectly smooth, so as to form a steam-tight joint on the vertical dividing-line *x*, Fig. 2. In each of the adjoining faces of the said sections of the frame is formed a continuous circular groove, *b*, of the semicircular sectional form best observed in Fig. 2, the said grooves, when the two sections are united, forming together an annular chamber, B, which takes the place of the cylinder or cylinders of an ordinary steam-engine, and in which are arranged to slide two pistons, C and C', attached at opposite points to a rotating disk, D, hung to a horizontal shaft, F, which has its bearings in cross-pieces *c* and *d* secured to the fixed frame. On the opposite sides of the disk D, and close to the periphery of the same, are two circular ribs, *e e*, between which and the inner edges of the sections A and A' of the frame is confined packing material *f f*, by adjustable rings G G attached to the said section of the frame by set-screws *g*. The inner edges of these adjustable rings are preferably made of a V-shape, as shown in Fig. 2, so that they may properly compress the packing and prevent any leakage of steam from the annular chamber B around the edges of the disk.

The disk or plate D, instead of being made solid, as above described, might consist of a simple rim connected by arms to the shaft F.

In order that the pistons C and C' may properly accommodate themselves to and freely traverse the annular chamber B, they are each made of a number of loose independent disks, *h h<sup>1</sup> h<sup>2</sup>*, &c., (see Fig. 6,) strung upon a rod, *i*, and the whole is confined between projecting arms *i' i'* of the rotating disk D. Each of these loose disks or plates is to be provided with a split packing-ring similar to those used for ordinary pistons. In the lower portion of the fixed frame, and extending transversely across the annular steam-chamber B, at a point directly beneath the center of the shaft F, is formed a vertical recess, *j*, adapted for the reception of a slide, H, which is attached to and operated by a rod, *k*, passing through a stuffing-box, *k'*, at the bottom of the fixed frame. A similar horizontal slide, H', also operated by a rod, *k*, passing through a stuffing-box, is adapted to a recess, *j'*, which crosses the steam-chamber on a horizontal line drawn from the center of the shaft F.

The slides H and H' are operated alternately by devices hereafter described in such a manner that they shall be drawn slowly outward so as to permit the passage of the pistons, but so that they shall close suddenly behind the said pistons, and form, during a portion of the movements of the latter, steam-tight partitions or heads within the annular chamber. The said slides, in fact, perform the same duty as the heads of an ordinary steam-cylinder, and they are also made to serve as valves to permit the escape of exhaust steam to the discharge-pipes *l l'*, as will presently appear. Steam is admitted at two points into the interior of the annular chamber B through ports *m* and *m'*, arranged close to the sliding heads H and H'. These ports communicate with two steam-chests, J and J', both of which are in free communication with the steam-pipe K; and slide-valves L L within the said steam-chests are so operated as to permit the steam to pass alternately through the ports *m* and *m'* into the annular chamber B. In order that the operation of the engine may be fully understood, let it be supposed that the parts are in the position shown in Fig. 3, steam entering the annular chamber through the port *m* at the rear of the piston C, and between the latter and the sliding head H, which is now closed, and the sliding head H' being in the act of moving back to permit the escape through the pipe *l'* of the steam which had previously acted on the piston C, and so that it may also offer no obstruction to

the passage of the piston C'. The steam entering through the port *m* at the rear of the piston C will force the latter in the direction of the arrow 1, Fig. 3, and will continue to act on the said piston until the latter and the piston C' reach the positions indicated by the dotted line *y y*. The sliding head H' will then be suddenly closed, the steam will be cut off from the port *m* and admitted through the port *m'* at the rear of the piston C', and the sliding head H will be gradually drawn back or opened. As soon as the piston C has passed the exhaust or outlet-passage *l* the steam which had previously acted on the said piston will be exhausted through the said passage, and the live steam admitted through the port *m'* will act on the piston C', and will force the same to the position originally occupied by the piston C, when the valves and sliding heads will again be operated in such a manner as to cause steam to pass through the port *m* and act on the piston C', and so as also to enable the exhaust steam to pass the sliding head H' and escape through the passage *l*.

It is not necessary that the chamber B should form a complete circle, as when the two pistons are employed the lower half is all that is absolutely necessary for the perfect working of the engine, and the upper half might be dispensed with or be made entirely open. In other words, the said chamber might be made in the form of a semicircle or segment of a circle, providing it were furnished with the two sliding heads and ports with their valves, in which case one-half of the edge of the disk D and the pistons during one-half of their movement would be exposed.

The engine, as above described, is double in all its parts, by which means an almost uninterrupted action of the steam tending to rotate the disk is obtained, without the necessity of employing a continuous circular chamber, while double the power of a single-acting engine is obtained, with much less friction and considerably less expense in building the engine.

Various devices may be used for automatically operating the valves and sliding heads, but I prefer to use the arrangement which I will now proceed to describe. On reference to Figs. 1 and 2 of the drawing it will be seen that the driving-shaft F is provided at one side of the engine with three double cams, one of which, P, acts on and draws back the sliding heads, while the remaining two, Q and Q', serve to open the valves. The double cam P acts on and turns two pivoted arms, *n* and *n'*, one of which is connected by a rod, *p*, to the sliding head H or to a rod attached thereto, while the other is connected in a similar manner to the sliding head H'. The said pivoted arms are provided with springs *q q*, which maintain them in contact with the cams, and serve also to suddenly close the sliding heads after the passage of the said cams. The rods of the valves L L are also attached by connecting-rods *r r* to pivoted arms *s* and *s'*, which are acted on by springs *t t*, and operated by the double cams Q and Q' in the same manner as the arms *n* and *n'*.

I prefer to attach the valves L L to their rods

by a nut and lugs, *u*, as shown in Fig. 4, or by two nuts on either side of a lug on the valve, as seen in Fig. 5; but any other method of attachment which will enable the valve to be adjusted may be employed.

In order to prevent the sliding heads H and H' from recoiling when suddenly closed by the action of the springs *q q*, I construct each of the said heads in the manner plainly shown in Figs. 7 and 8. In other words, each head is formed of two plates, *v* and *v'*, the former of which is fitted against and arranged to slide on the latter, and is connected to the operating-rod *k*. A spring, *w*, is interposed between the two plates, and retains the plate *v'* in its closed position during the slight recoil of the plate *v*.

Several of the features of this engine—as, for instance, the peculiar construction of the frame or casing, the method of packing the edges of the piston-carrying disk, and the self-accommodating pistons—can be used in connection with a pump, in a manner described in a separate application for a patent which I have made, and in which the said features and the mode of applying them are fully illustrated and described.

I claim—

1. The combination of the shaft F carrying two pistons, *c c'*, the curved chamber B through which said pistons pass, and slides H H', and steam-ports arranged as described, so that the said pistons are acted on alternately by the steam introduced between the slide and the adjacent piston, a continuous rotary movement being thus imparted to the shaft.

2. The frame, consisting of the section A with its base *a* and the detachable section A', adapted to a recess in the section A, as set forth.

3. The combination of the disk D, its ribs *e e*, and the packing *f f* confined between the inner edges of the sections A A' of the frames and the said ribs, as described.

4. The said sliding heads, each consisting of two plates arranged to slide one upon the other, and having interposed between them a spring, *w*, for the purpose specified.

5. The piston C or C', adapted to the steam-chamber B and confined between arms *i i*, carried by the shaft F.

6. The said piston, when composed of a number of loose disks or rings, *h h<sup>1</sup> h<sup>2</sup>*, &c., strung upon a rod, *i*, substantially as herein described.

7. The cam or cams P on the shaft F, in combination with the pivoted arms *n* and *n'*, connecting-rods *p p*, and springs *q q*, the whole being arranged for operating the sliding heads H and H', substantially in the manner described.

8. The cam or cams Q on the shaft F, in combination with the pivoted arms *s* and *s'*, connecting-rods *r r*, and springs *t t*, the whole being arranged for operating the valves L L, substantially in the manner described.

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

Witnesses:

F. O. DESCHAMPS.

WM. A. STEEL,  
HARRY SMITH.