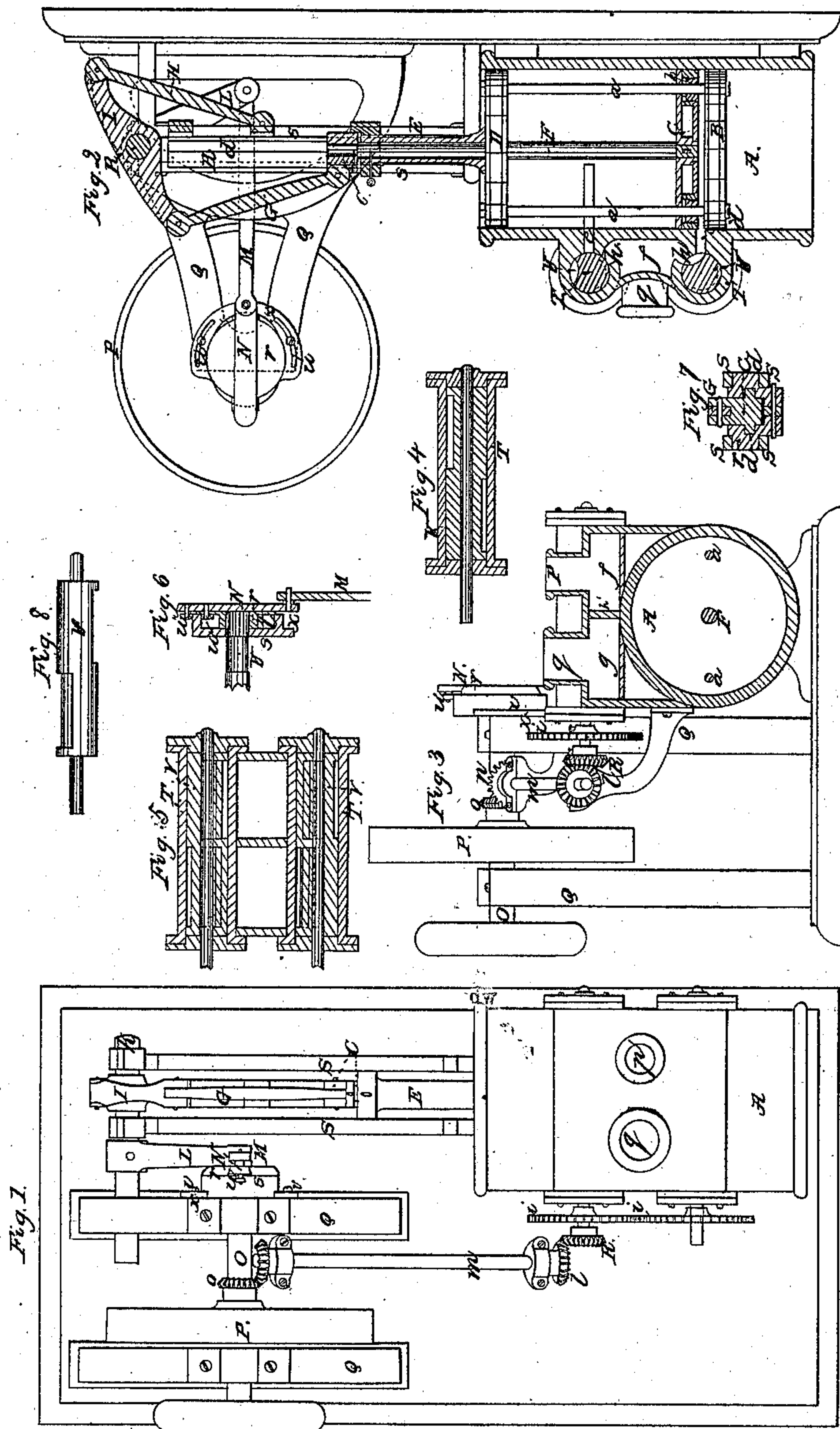


H. O. LOTHROP.
STEAM ENGINE.

No. 66,721.

Patented July 16, 1867.



Witnesses:

Esq. H. Andrews
Samuel N. Pomeroy.

Inventor:

Henry O Lathrop
by his attorney
R. W. Early

United States Patent Office.

HENRY O. LOTHROP, OF MILFORD, MASSACHUSETTS.

Letters Patent No. 66,721, dated July 16, 1867.

IMPROVEMENT IN STEAM ENGINES.

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

TO ALL PERSONS TO WHOM THESE PRESENTS SHALL COME:

Be it known that I, HENRY O. LOTHROP, of Milford, in the county of Worcester, and State of Massachusetts, have invented a new and useful Steam Engine; and do hereby declare the same to be fully described in the following specification, and represented in the accompanying drawings, of which—

Figure 1 is a top view, and

Figure 2 a longitudinal section of it.

Figure 3 is a transverse section, taken through the middle of the cylinder, and its steam-receiving and exhaust-chambers.

Figure 4 is a longitudinal section of one of the valve cases or chambers and its cylindrical valve.

Figure 5 is a horizontal section of the two valves and their chambers.

Figure 6 is a vertical section of the sliding-crank and its cam, applied to the inner end of the driving-shaft of the engine.

A peculiarity of this engine, wherein it differs from many others, consists in its having three pistons arranged within and to operate with one cylinder, the said cylinder being open at each end, the object of the whole being to cause steam on and after entering the cylinder to move one of the said pistons in one direction and the other two in the opposite direction at one and the same time.

In the steam engine having one piston only in a cylinder, the steam, during stroke of the piston, will act against one end of the cylinder and also against the piston, the said end remaining stationary. Consequently the piston has to travel the entire length of the cylinder during each stroke; but with my improvement or invention each piston, during a stroke, travels but about one-third the length of its cylinder. In the drawings—

A denotes the cylinder, and B C D the pistons. The two exterior pistons, B D, are connected together by rods *a a*, which extend through the middle piston C and stuffing-boxes *b b* applied thereto. The rod E of the piston D is tubular, and receives in its bore the rod F of the piston C, which slides freely through the said rod E. Connecting-rods G H join the two pistons to a lever, I, fixed on a rocker-shaft, K, provided with an arm or crank, L. A connecting-rod, M, jointed to the arm L and to a crank, N, serves to transmit motion from the arm L to the crank N, the latter being applied to a driving-shaft, O. There is or should be a fly-wheel, P, on the shaft O, the said shaft being suitably supported by standards Q Q. The cross-head *c* of the piston-rod F slides in guide grooves *d*, made in a carriage, R, which is affixed to the tubular piston-rod E, and slides between two sets of parallel guides S S, arranged as represented, a transverse section of such guides and carriage being shown in Figure 7. Two cylindrical cases T T', for reception of two cylindrical valves U U', placed on the top of the cylinder A, there being ports, *d e*, leading from the cylinder into such cases, the same being as represented in fig. 2. Between the valve cases is a steam-receiving chamber, *f*, and a steam-exhaust chamber, *g*, they being separated by a partition, *h*, (see fig. 3.) Passages *h h* lead from each of such chambers into the valve cases. The valves U U' revolve freely within the chambers, and each valve is recessed on opposite sides, in manner as shown in figs. 2 and 4, and also in Figure 8, which is a side view of one of the valves. The shafts of these valves are connected by two gears *i i*, duly affixed on them where they project beyond the valve cases. One of such shafts carries a bevel-gear, *k*, which engages with another such gear, *l*, fixed on a shaft, *m*. This latter shaft carries a bevel-gear, *n*, which works into another such gear, *o*, fixed on the driving-shaft O.

The steam for operating the engine enters the receiving-chamber *f* by a pipe or conduit, P', and is exhausted through a conduit, *q*, leading out of the exhaust-chamber *g*. In its operation on the pistons, the steam will first pass through the port *d* and between the pistons B C, and by its pressure against them it will move them in opposite directions. Next, the steam will enter the port *e*, and will act against the two pistons C D, and will drive them in opposite directions, the exhaust steam between the pistons B C being discharged into the exhaust-chamber. The movements of the pistons will produce a continued rotary motion of the shaft O. The crank N is so applied to a head, *r*, fixed to the end of the shaft O, as to be capable of sliding diametrically across such end. Embracing the shaft O, and fixed to standard Q, is a cam-plate, S'. It is formed with a cammed groove or recess, *t*, to receive a stud, *u*, extending from the sliding-crank N. The periphery of the plate S' is parallel to the groove, and a roller or stud, *u'*, extending from the slide-crank, works against the said periphery. The cam-plate S' is fastened to the standard Q by screws *v v*, going through circular slots *w w*, made in a flange,

projecting from the plate. This mode of affixing the cammed plate to the standard admits of its being properly adjusted, as circumstances may require. Each of the projecting portions *ww* of the cam-plate *S'* is to cause the piston or pistons, for a short time, while the crank may be passing either of the dead-points, to be stationary, which would not be the case were the wrist of the crank to turn in a circular orbit. The purpose of this is to prevent the steam from acting on the pistons a short time, viz, at the passage of each dead-point, it being caused to act on them when the crank may have attained an advantageous position for the connecting-rod to propel it. This effects a saving of steam in comparison to what would be required were the wrist of the crank to travel in a circular orbit.

By the employment of three pistons in a cylinder in manner, and with two of them connected as set forth, the pressure of the steam, such as is usually exerted on the head of a cylinder, is employed to effect a movement of one of the pistons when two of them are departing from one another. Therefore, with the force of steam acting on one piston to propel it, we have the addition of that by which the other piston is propelled in the opposite direction, the two, by their joint action, causing a movement of the rocker-shaft in one direction. The cylinder, being open at each end, renders it easy to gain access to the external pistons for any purpose.

I am aware that engines have been made with two, three, or four pistons in one cylinder, and therefore I do not claim such. What I do claim as my invention in the above-described engine, is as follows:

1. I claim the combination or mechanism whereby the two rods *FF* of the engine pistons are enabled to effect rotary motion of the crank *N* or its shaft *O*, as set forth, such combination consisting of the cross-head *c*, the slide or carriage *R*, the connecting-rods *GH*, the shaft *K*, the lever *I*, the arm *L*, and the connecting-rod *M*, the whole being arranged and applied together substantially as specified.

2. I also claim the mechanism or combination by which the piston is held stationary for a period during the passage by and beyond the dead-point of the crank, such being for the purpose hereinbefore described, consisting in the stationary cam-plate *S'* and the sliding and studded crank *N*, constructed, applied together, and to the standard *Q* and the shaft *O*, substantially in manner and to operate as specified.

3. And I also claim the combination of such mechanism, or its equivalent, with one or more cylinders, their piston or pistons, and a crank, so connected with the piston or pistons as to be capable of being revolved thereby.

4. I also claim the combination or mechanism for supplying steam to and discharging it from the cylinder and its three pistons, as specified, the said mechanism consisting of the two rotary valves *UU'*, their cases *TT'*, and inlet and exhaust-chambers *fg*, and ports, constructed and arranged together and with the pistons and cylinder, substantially in manner and so as to operate as specified.

HENRY O. LOTHROP.

Witnesses:

R. H. EDDY,

F. P. HALE, Jr.