

*W. W. Burgoyne,
Reciprocating Steam Engine,*

No. 23,754,

Patented Apr. 26, 1859.

Fig. 4.

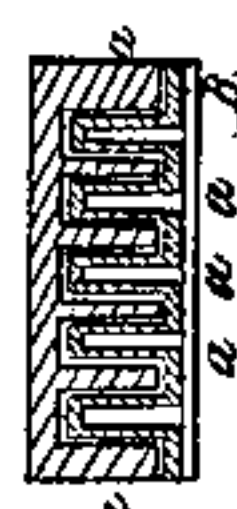


Fig. 3.

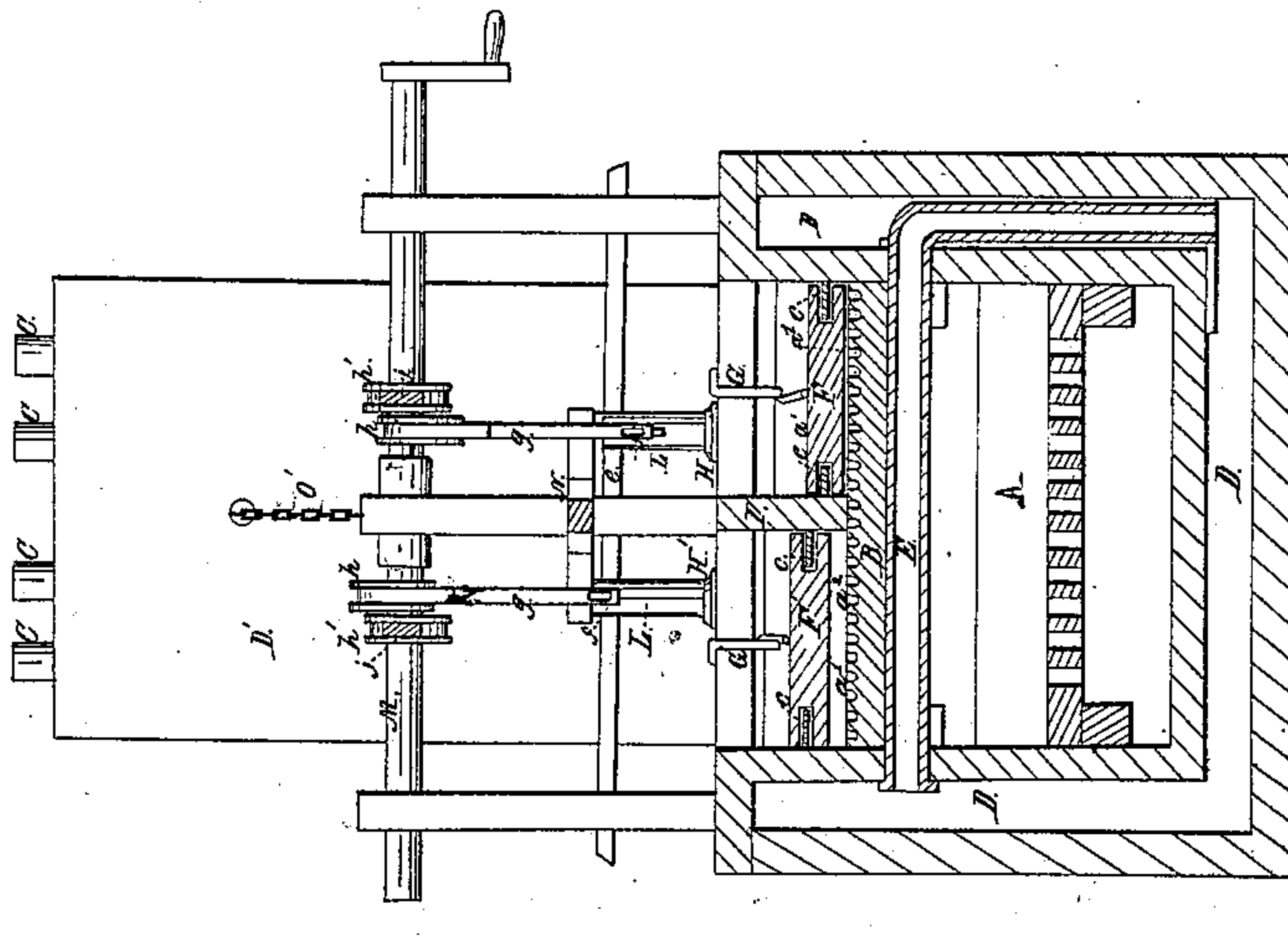


Fig. 2.

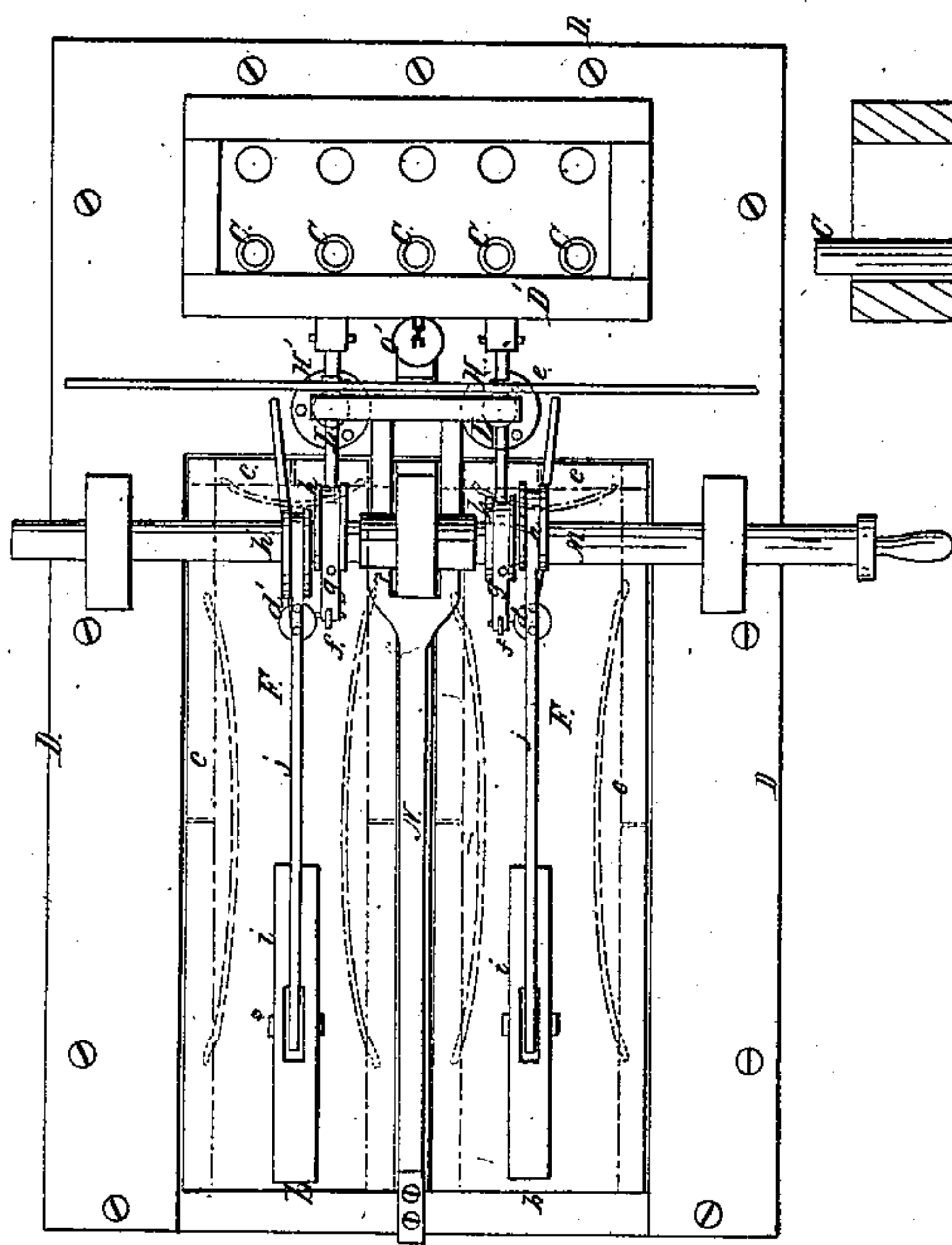
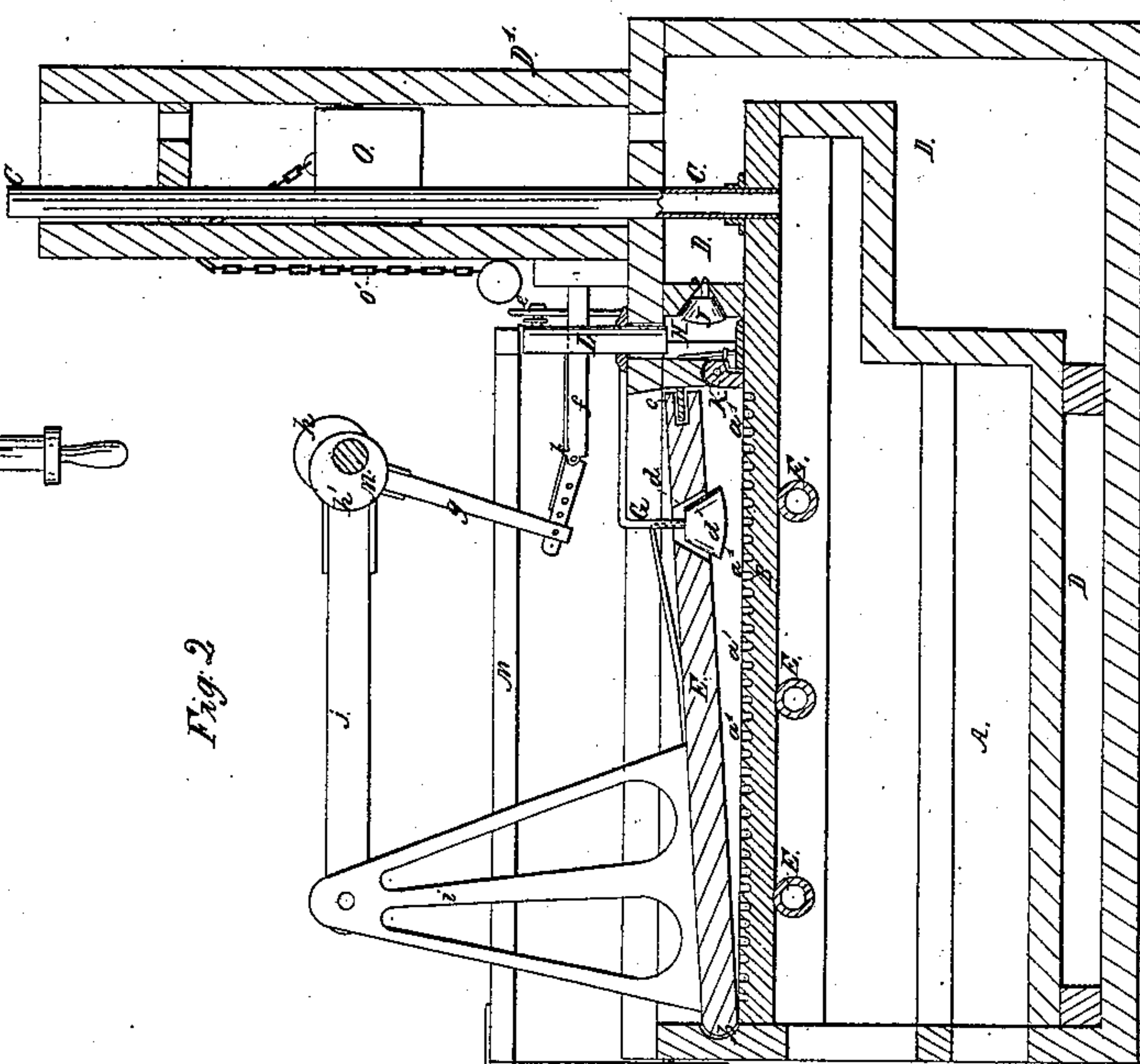


Fig. 1.



Witnesses:

*R. H. Fenwick
B. Banks Allen*

Inventor:

W. W. Burgoyne

UNITED STATES PATENT OFFICE,

WILLIAM W. BURGOYNE, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 23,754, dated April 26, 1879.

To all whom it may concern:

Be it known that I, WILLIAM W. BURGOYNE, of the city and county of Washington and District of Columbia, have invented a new and useful Improvement in Steam Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a plan or top view of an engine constructed after my invention. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a vertical transverse section of the same, and Fig. 4 is a modification of the evaporating-plate.

Similar letters of reference in each of the several figures indicate corresponding parts.

The plan on which I propose to produce steam is by jetting heated water upon a plate and between a rising and falling piston, the former suitably heated to convert water into steam instantly.

The main object of my invention is to avoid the use of a closed steam-boiler for making and containing steam, and also avoid the necessity of holding steam confined ready for use, and thus prevent explosions and economize room and expense, in effecting a combination of an engine with the motive agent, as presently described.

The nature of my invention consists in the employment of the following elements in combination, in the manner hereinafter specified, for the accomplishment of the above-named object, to wit: A water-jacket open to the atmosphere, inclosing the fire-chamber and smoke-stack and isolating by water the piston-chamber, a steam-evaporating plate forming the crown-plate of the fire-box, a supply-pump for jetting in the water upon the evaporating-plate, and a piston which is hung so as to reciprocate in the path of a circle or in a straight line when operated upon by the evaporating steam, and in its movement rotate the driving-shaft of an engine.

By my invention I am enabled to always keep the water at a nearly boiling-point and introduce it in this state onto the evaporating-plate in jets in just such quantities that at each successive stroke of the piston a fresh supply will be necessary, and thus a perfect and available use of the steam, as fast as produced, accomplished. I am also enabled to

keep the side and ends of the piston-chamber isolated with water, and thus while the bottom or evaporating-plate of said chamber is intensely heated the sides and ends are kept comparatively cool.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A represents the fire-box adapted for my invention. The crown-plate B of this fire-chamber is corrugated, as at *a a*, Fig. 4, or furnished with a series of hemispherical recesses, *a'*, in its upper surface. This crown-plate, as will be presently described, forms the evaporating or steam-producing surface.

C C C C are smoke-pipes communicating with the rear end of the fire-box.

D D' represents a water-jacket for inclosing the fire-box and the smoke-pipes and isolating the sides and ends of the piston-chamber. The stack or elevated reservoir D' of this jacket incloses the smoke-pipes, while the part D incloses the sides, bottom, and rear of the fire-box, as shown.

E E E are a series of tubes passed under the evaporating-plate and made to communicate with the water-jacket at both sides of the evaporating-plate, one end of each of said pipes extending down at right angles to the bottom of the fire-box, so that water will ascend through the same as fast as the more highly-heated water in that portion of the pipes which is directly exposed to the fire passes toward the upper and rear portion of the jacket. These pipes are used to support the evaporating-plate against the action of the strain, as well as to aid in heating the water.

In the drawings I have shown my invention arranged to operate two pistons, and therefore the description will refer to the same as thus applied. However, in practice I intend to employ it either for one or two pistons.

F F represent two hinged pistons arranged above the evaporating-plates in piston-chambers F' F', which are isolated by water at their sides and ends, being hinged at their ends *b b* and left loose at their opposite ends. These pistons are packed at their sides and ends with spring-packing *c c*, as shown in Fig. 1 in red color and in Figs. 2 and 3 in black. The pistons F F may be arranged to move at right angles to the evaporating-plate instead of in the path of a circle. Each of the pistons is furnished with an exhaust-passage, *d*, in its top, said passage being kept closed while the

piston is descending by means of a suspended conical valve, *d'*, as presently described.

G G are stops for opening the exhaust-valves at the completion of the upward stroke of the pistons.

H H are two reciprocating pump-chambers arranged intermediately between the water-jacket and the evaporating-chambers formed by the pistons and the evaporating-plate. These pump-chambers are divided by a partition, I, and the introduction and discharge of the water from the same are controlled by means of a conical valve, J, and a flap-valve, K, as shown.

L L are two pump-pistons working in said chambers. These pistons are connected together by a cross-head, *e*. They are also connected by levers *f f* and connecting-rods *g g* to eccentrics *h h* of a driving-shaft, M, as shown. The steam-pistons are also connected to eccentrics *h' h'*, of said driving-shaft by means of arms *i i* and connecting-rods *g' g'*, as shown, or in any other manner which may be found in practice better adapted for effecting their reciprocation. The cross-head *e* is extended in length, so that it shall provide a leverage at each end, whereby to start the pumps when it is desired to set the engine in operation.

N is a brake for controlling the extent of the movement of the pump-pistons and then regulating the supply of water at each stroke to the evaporating-surface. The levers *f f* of the pump-pistons are jointed at *k* and furnished with a spring, so that when the brakes are applied to the pumps in a manner to stop or nearly stop the supply of water to the evaporating-surface the driving-shafts, eccentrics, and connecting-rods of the pumps and steam-pistons shall not have their usual movements interfered with. These levers are also furnished with a series of adjusting-holes, so that the length of the stroke of the piston may be regulated by forming the connection between the connecting-rods and levers at a point nearer to or farther from the fulera of said levers.

O is a float for indicating the height of the water in the elevated portion of the water-jacket.

Operation: Water is introduced into the jacket in any appropriate manner until it rises at least as high as the float O, Fig. 2, in the elevated portion of the jacket. The fire is started in the chamber A. The water in the jacket and stack becomes heated almost to the boiling-point. At this stage the pumps are operated by hand through cross-head *e*, so as to draw a suitable quantity of water into the chamber H through the valve J and force the same in jets or a thin stream under the valve K and between the evaporating-surface and the steam-piston F. As soon as the heated water is thus introduced it is converted into steam, this being facilitated by the spherical globules being allowed to fall into the cells of the evaporating-surface and pressed compactly by the piston in the descending movement it

makes just as the crank passes over the dead-center and before it begins to lift the piston. The steam thus produced exerts a powerful force against one of the pistons and lifts it, and thus opens the other pump and throws the other piston into a position for being elevated by the steam which will be produced under it in a moment. As water is jetted under this piston, the steam which raised the other piston is exhausting through the passage *d*, the valve of said passage having remained closed by the action of the spring and pressure of steam until the piston nearly completed its stroke, when the stop G came in contact with the valve and resisted its further ascent with the piston. The engine now having been started, its operation continues, one piston receiving and the other exhausting alternately. To stop the engine momentarily or lessen the supply of water, the front end of the brake N is raised, so that its cross-head bears down upon or stands nearer to the upper ends of the pump-pistons. To lessen the stroke of the pump-pistons, so as to have the engine work continuously with a small amount of steam, the levers *f f* are shortened by forming the connection between the connecting-rods and the same at a point nearer the fulera on which the levers turn.

This engine is exceedingly simple, and with it a great many of the connections now used are rendered useless, and, what is most important, the necessity of employing a separate closed boiler for making and confining steam avoided, and the use of an open water-jacket in connection with a steam-engine of the character herein described rendered practicable.

The sides and ends of the piston-chamber and the piston are kept isolated by water, and thus extraordinary expansion and contraction, and consequent imperfect working, avoided.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The employment of the following elements, in combination, for the accomplishment of the within-described object, to wit: a water-jacket, D D', open to the atmosphere, inclosing the fire-chamber, piston-chamber, and smoke-stack, a steam-evaporating plate, B, forming the crown-plate of the fire box, a supply-pump, H, for jetting in the water upon the evaporating-plate, and a piston, F, which is hung or arranged so as to reciprocate in the path of a circle or in a straight line when operated upon by the evaporating steam, and in its movement operate the driving-shaft of an engine, substantially as and for the purposes set forth.

2. The manner herein described of making steam between an intensely-heated plate, piston, and the isolated or comparatively cool sides of the piston-chamber, substantially as and for the purposes set forth.

Witnesses: WM. W. BURGOYNE.

R. W. FENWICK,

G. YORKE ATLEE.