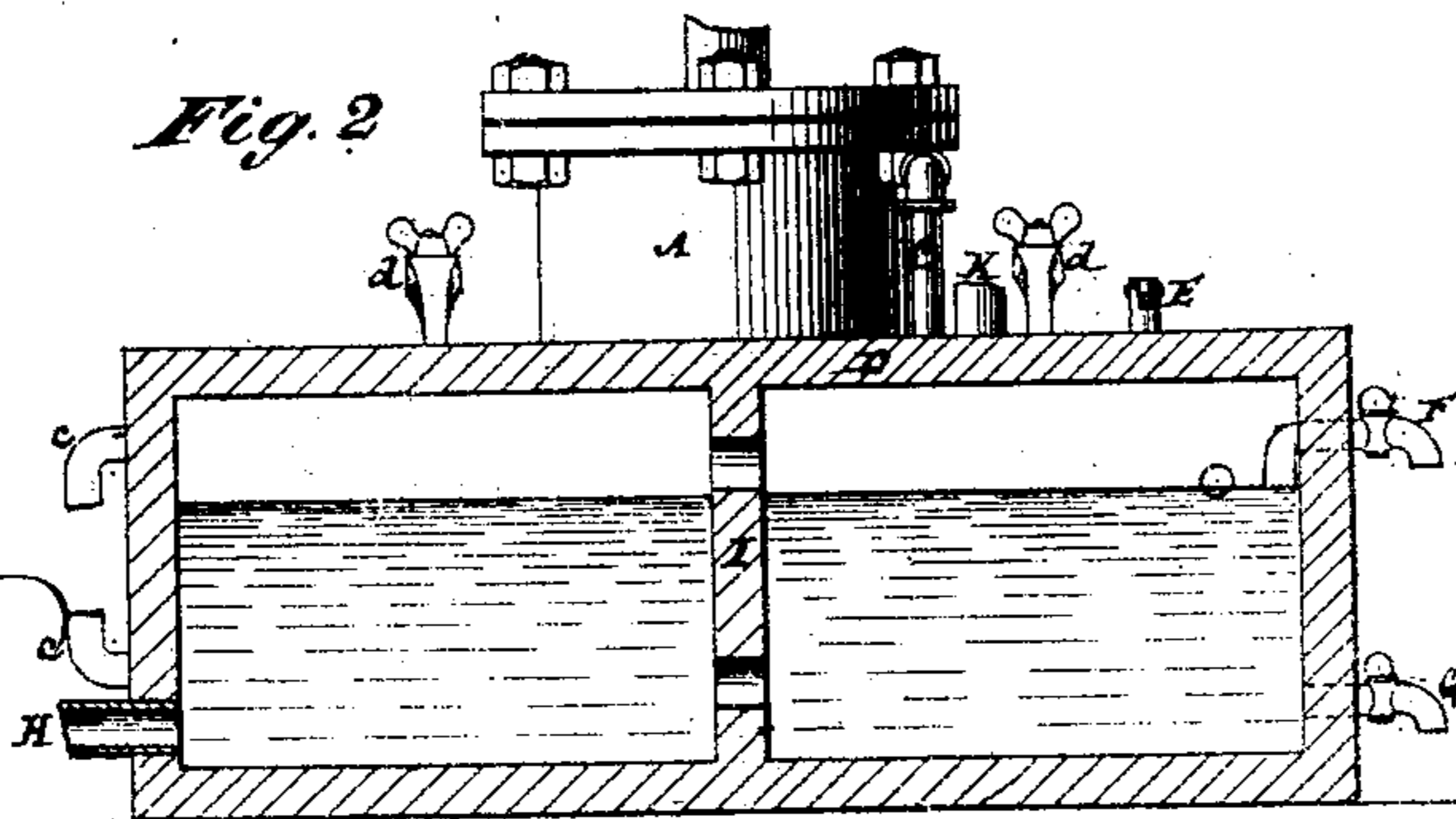
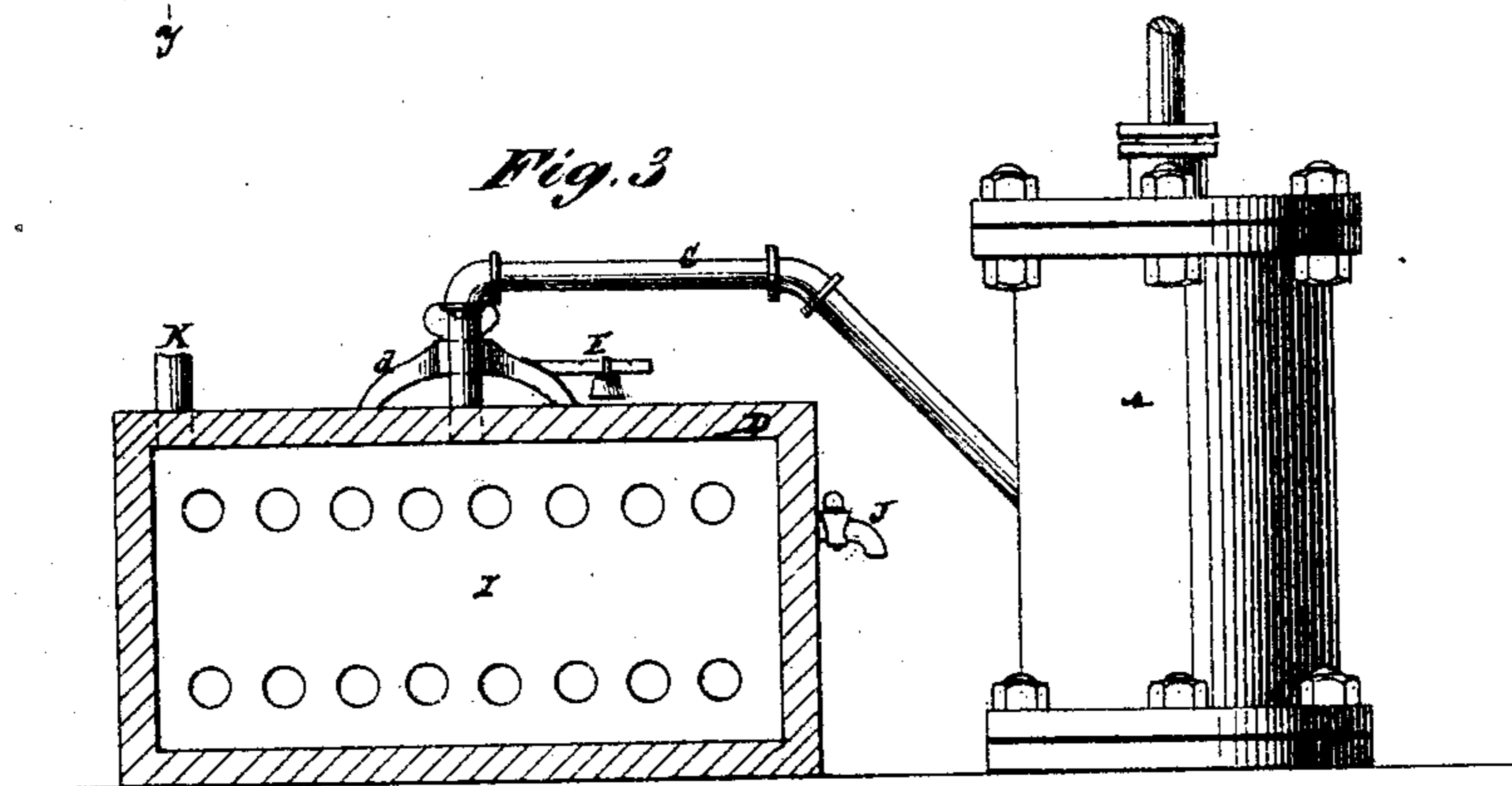
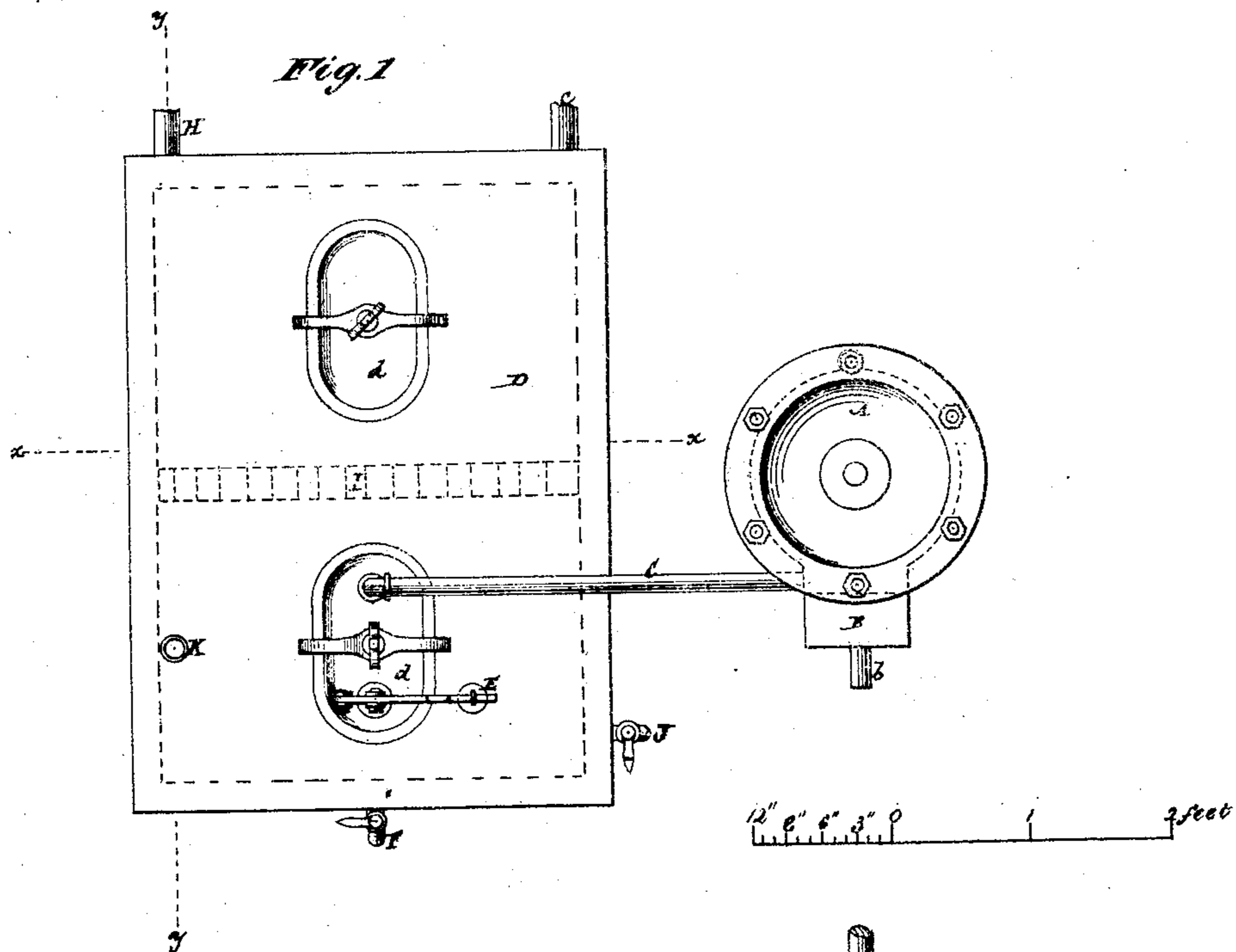


ROBERT MUDGE MARCHANT.

Improvement in Steam and other Engines.

No. 120,298.

Patented Oct. 24, 1871.



Witnesses.

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UNITED STATES PATENT OFFICE.

ROBERT MUDGE MARCHANT, OF LONDON, ENGLAND.

IMPROVEMENT IN STEAM AND OTHER ENGINES.

Specification forming part of Letters Patent No. 120,298, dated October 24, 1871.

To all whom it may concern:

Be it known that I, ROBERT MUDGE MARCHANT, of London, England, have invented certain new and useful Improvements in Steam and other Motive-Power 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 drawing forming part of this specification, and in which—

Figure 1 represents a plan of an exhaust-chamber as connected with the cylinder of an engine in illustration of my invention; Fig. 2, a longitudinal section of the same at the line *yy* in Fig. 1; and Fig. 3, a transverse section taken at the line *xx*.

Similar letters of reference indicate corresponding parts.

My invention consists in an exhaust-chamber, as contradistinguished from a condensing-chamber, into which the impelling heated vapors or gases, as they escape from the cylinder of the engine, are introduced, and, after transferring a portion of their heat to a body of water within said chamber, which water may be utilized, as hereinafter described or otherwise, are passed off from such chamber at an inferior pressure to be used over again, and so on for any number of stages or similar series of operations in succession, thereby utilizing the heat which is ordinarily lost by condensation or by escape of the impelling vapor or gas into the atmosphere. The impelling medium thus worked may be steam, heated air, or mixed gases, and the effective power of the same in the engine will be determined by the difference of pressure in the cylinder of the engine and that of the exhaust-chamber with which such cylinder is connected.

To illustrate my invention, I will describe the same as applied to what I term a "white cloud engine," that embodies a process of obtaining motive power, secured to me by Letters Patent, No. 115,877, bearing date June 13, 1871, and which consists of compressing air in progressive stages and passing it at each stage through water, whereby the air is saturated during compression, and then passing such saturated compressed air through a heater, from which it passes in a highly expanded condition to the cylinder of the engine. In carrying out this process a series of pumps is used, the same operating upon the general principle described in Letters

Patent No. 110,380 and 112,060, issued to me on the 20th of December, 1870, and 21st of February, 1871; and in which the plungers used to compress the air work under water which is confined under or between a volume or volumes of the air under compression, by causing the air to pass or be delivered by the beat of each pump, and by its lighter specific gravity, through the water from below to a storage-chamber or pipe for transfer of the air from pump to pump, each successive pump increasing the pressure and the saturated compressed air as it comes from the last pump in the series passing to the heater, from which in its changed or expanded condition it is supplied to the cylinder of the engine.

In the accompanying drawing, A represents the cylinder of an engine operated as just described; B, its valve-box; and *b*, the inlet pipe for the heated air, or air and vapor combined, as it comes from the heater. C is the exhaust-pipe from said engine. This exhaust-pipe, instead of opening into the atmosphere or connecting with a condenser, is made to connect with a close exhaust-tank or chamber, D, that is kept loaded by a safety-valve, E, to an inferior pressure to that at which the mixed vapor enters it, and which inferior pressure is maintained by the draught made on said chamber by one of the pumps of the series. F is an inlet-pipe, which should be provided with a cock for supplying the tank with water up to a certain level that leaves the requisite space above the water for the exhaust mixed gas or vapor entering by the pipe C. A glass water-gauge may be attached at the connections *cc* to determine the level of the water in said exhaust-tank or chamber. G is a blow-off cock, for clearing the tank occasionally or as required. H is a pipe arranged within a few inches of the bottom of the tank, at or near its one end, which pipe is designed to connect with a feed-pump, and should be furnished with a cock between the tank and said pump to regulate the supply of water passing off from the tank to the stage process pumps hereinbefore referred to. I is a perforated partition across the tank, between the exhaust-pipe C and water-outlet H, to prevent agitation of the water in the tank by rush of the exhaust mixed gases or vapor into said chamber, and to prevent the passage of grease or foreign matter from that side of the partition on which the exhaust-pipe C is arranged

to the opposite side thereof. J is a grease-cock, to be used occasionally for the purpose of clearing the surface of the water in the side or end portion of the tank with which the exhaust-pipe C connects. *d d* are man-hole covers or lids to the tank D. K is a pipe for carrying off the mixed gases or vapor from the tank at a reduced pressure to that at which they entered by the exhaust-pipe C, and serving to convey the same, after having imparted a portion of their heat to the water, for further use, as required—as, for instance, to the first pump or either of the succeeding ones of the stage process series, there to mingle with the air, gas, or vapor contained therein, and the whole being afterward pumped forward till the requisite working pressure is attained, when it is again passed through the heater and back to the engine. In this way and by means of the exhaust-tank or chamber D the whole heat of the mixed gases or vapor, excepting the little that is lost by radiation from the tank and its connections and from the working devices, may be utilized. A check-valve should be arranged between the connection of the pipe K and first or other pump in the series, to which said pipe conveys the mixed gases or vapor from the tank to prevent any backward action into the exhaust-tank before the working pressures

are obtained. The water in the tank D is first raised to the boiling temperature by the exhaust mixed gases or vapors escaping from the engine, and afterward retained at such temperature by the passage of said mixed gases or vapors through the tank.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The combination, with the cylinder of an engine, of an exhaust-chamber loaded to and maintained at an inferior pressure to that of the spent gas or vapor passing from the engine to said chamber for the further utilization of the exhaust gas or vapor, substantially as specified.

2. The exhaust-tank or chamber D provided with a safety or pressure-regulating valve, E, a perforated partition, I, an exhaust-inlet, C, and outlet K, a water-inlet, F, and outlet, H, all arranged for operation in relation with the cylinder of the engine, the exhaust-pipe from which connects with said chamber, essentially as herein set forth.

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