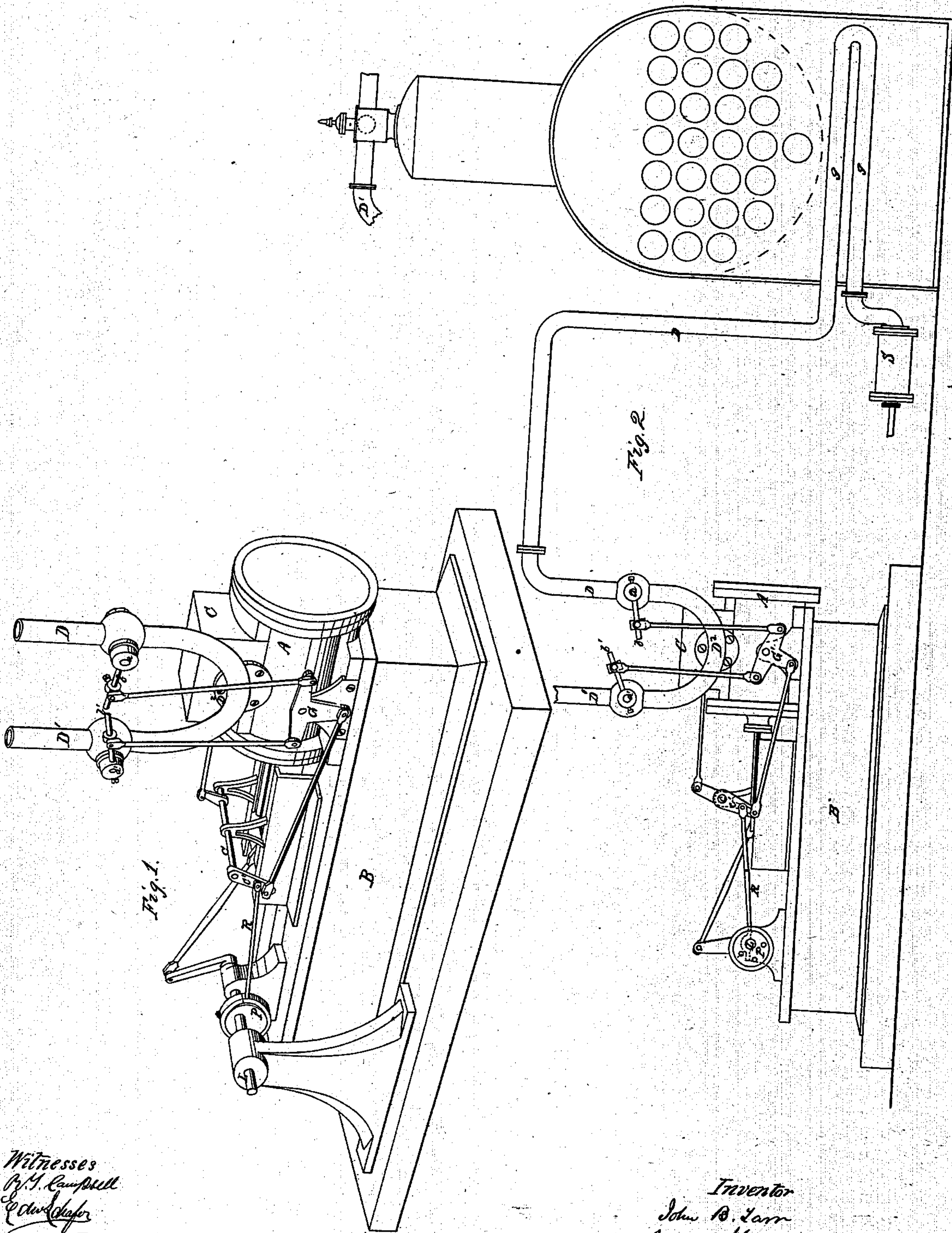


J. B. TARR.

Engine for the Use of Air and Steam Combined.

No. 71,425.

Patented Nov. 26, 1867.



Witnesses
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JOHN BLAKE TARR, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN ENGINES FOR THE USE OF STEAM AND AIR COMBINED.

Specification forming part of Letters Patent No. 71,425, dated November 26, 1867.

To all whom it may concern:

Be it known that I, JOHN BLAKE TARR, of Chicago, in the county of Cook, and State of Illinois, have invented an Improvement in Steam-Engines; and I do hereby declare the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view, showing my invention applied to a horizontal or stationary engine.

Figure 2 is a side elevation of the same with boiler attached.

Similar letters of reference indicate corresponding parts in the two figures.

The object of this invention is to increase the efficiency of steam as a mechanical agent for driving machinery, by employing in conjunction with it highly-heated air under pressure, and mixing this air and steam together in the steam-chest on their way to the cylinder of the engine, thus effecting a reheating or superheating of the steam after it leaves the boiler and while it is confined within the steam-chest and cylinder.

To enable others skilled in the art to understand my invention, I will describe one mode of carrying it into effect.

In the accompanying drawings I have represented my invention applied to a stationary high-pressure engine, but I do not desire to be understood as confining it to this form of engine, as it is applicable to other forms of steam-engines. A represents this steam-cylinder mounted upon a bed, B, and provided with a valve-chest, C, slide-valve, exhausting-ports, like any well-known form of stationary engine. D D¹ represent steam-pipes, which connect at their lower ends with a single pipe, D², leading into the valve-chest C, for the purpose of conducting highly-heated air and common steam within the steam-chest, from whence they are allowed to escape into the cylinder, by the reciprocating movements of the slide-valve, and to act alternately upon both ends of the piston in a manner common to high-pressure steam-engines generally. The pipes D D¹ are both provided with oscillating or other suitable forms of valves, the stems a a' of which have arms, b b', secured to them, by which they are moved or oscillated. The arms b b' are connected to the arms of an os-

cillating lever, G, arranged below the pipes D D¹, which lever receives its motions from an arm, c', on the rock-shaft c, which moves the slide-valve. The arm c' and rock-shaft c receive motion from the main fly-wheel shaft L, through the medium of an eccentric, P, and pitman-rod, R, as shown in the drawings. Thus it will be seen that as far as the engine is concerned, there is very little change required to apply my invention to it. The only change really required is the two pipes D D¹ for bringing the steam and air from suitable reservoirs in separate channels, so that this air and steam shall not be mixed until they enter the valve-chest C, said pipes both being provided with valves for letting on and cutting off the steam and air, and alternately and at proper times. The steam-pipe D leads off to a steam-boiler, which may be made as shown in Fig. 2, or of any other suitable form, and the air-pipe D¹ leads off to a series of pipes, g g, which may be arranged within the fire-space of said boiler, as shown, or which may be otherwise suitably arranged. I prefer to have the air-heating pipes within the fire-place or furnace of the boiler for generating steam, for the reason that one fire will answer for heating both the air and the boiler, but, if desirable, a separate air-heating apparatus may be employed. The air is supplied to said pipes g g by means of a forcing-pump, S, of suitable construction, which may be worked by means of the engine, so that the supply of air will be commensurate to the demand. The safety-valves and governor-valve may be arranged in any manner found most convenient. The governor-valve may be applied to the pipe D² leading from the valve-chest to the air and steam-pipes.

It will be seen from the above description that I bring highly-heated air and common steam together in the valve-chest, and at suitable times allow this mixture to enter the cylinder of the engine and act upon the piston. The air should be of a greater degree of temperature than the steam, and its pressure may be equal or greater than the steam used, so that as soon as the two are mixed in the valve-chest the temperature of the steam will be suddenly augmented, which will not only increase its effectiveness upon the piston, but will prevent it from condensing while acting thereupon. By heating the air considerably,

and using common steam, the latter may be superheated and its elasticity increased to an almost unlimited degree after leaving the boiler, and while communication between the boiler and valve-chest is cut off. The introduction of steam and heated air into the valve-chest is effected by means of the valves above described, controlled by the fly-wheel shaft of the engine, so that when steam is let into the valve-chest and the steam-valve closed, the air-valve will be opened, and compressed heated air let into the valve-chest, which will instantly reheat the confined steam more or less, according to the temperature of the air.

I am aware that it has been suggested to employ air mixed with steam as a force for driving engines, such air being forced into a chamber at a cool temperature, and thus mixed with steam therein. In this case it is obvious that the air will instantly abstract from the steam a certain amount of its heat, and hence destroy its efficiency. I am also aware that it has been suggested to mix cool air and steam together in a chamber and raise them to a high temperature before conducting the mixture to the engine. I do not therefore claim broadly as my invention the use of air and steam mixed, as a force for driving engines; nor do I confine my invention to the particular form of engine herein described.

I have shown its application to this well-known form of engine, as one practical mode of carrying it into effect, as one mode of reheating or superheating steam on its way to the engine-cylinder by the application of highly-heated air without raising the temperature of the steam in the boiler or increasing the pressure therein.

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

1. Reheating or superheating steam, after it has left the generator, by means of highly-heated air introduced into the steam-chest under considerable pressure, substantially as described.

2. I claim applying steam and air within the valve-chests or cylinders of engines, by introducing air into said cylinders when the air is heated to a temperature equal to or greater than that of the steam, substantially as and for the purpose described.

3. The steam-pipe D and hot-air pipe D¹, communicating with the valve-chest of an engine, and provided with suitable valves for alternately shutting off and letting on the steam and air, substantially as described.

JOHN BLAKE TARR.

Witnesses:

EDW. SCHAFER,
EDM. F. BROWN.