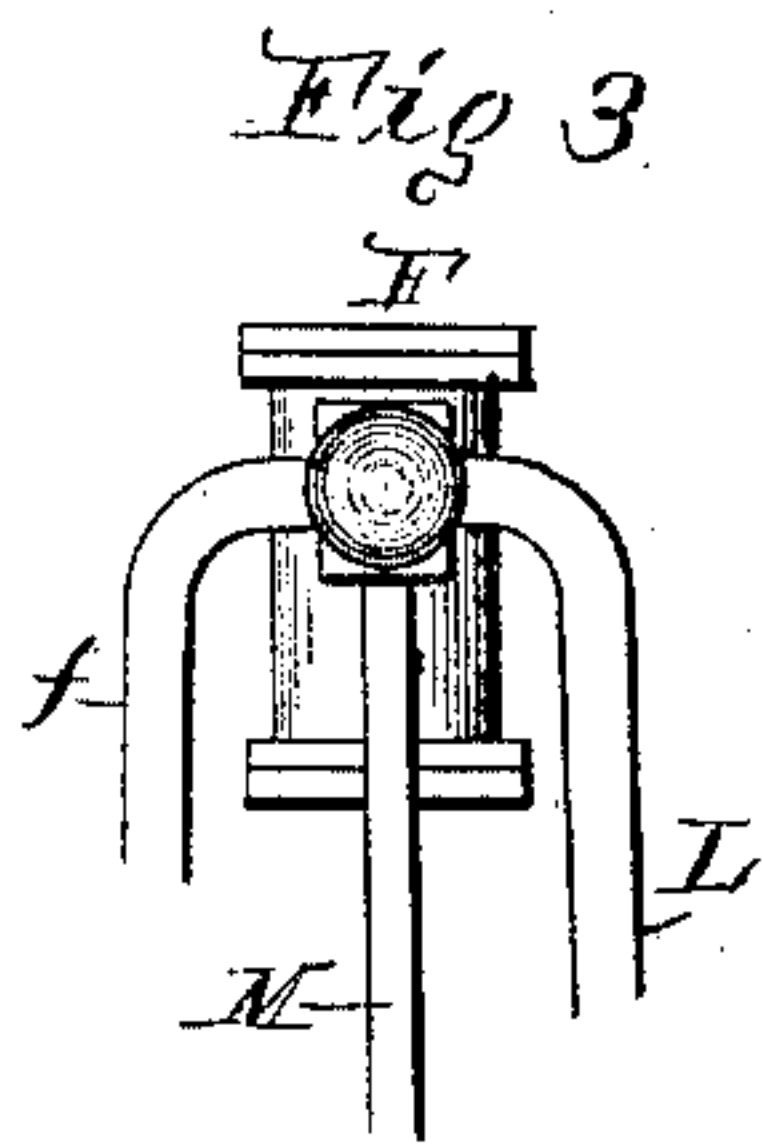
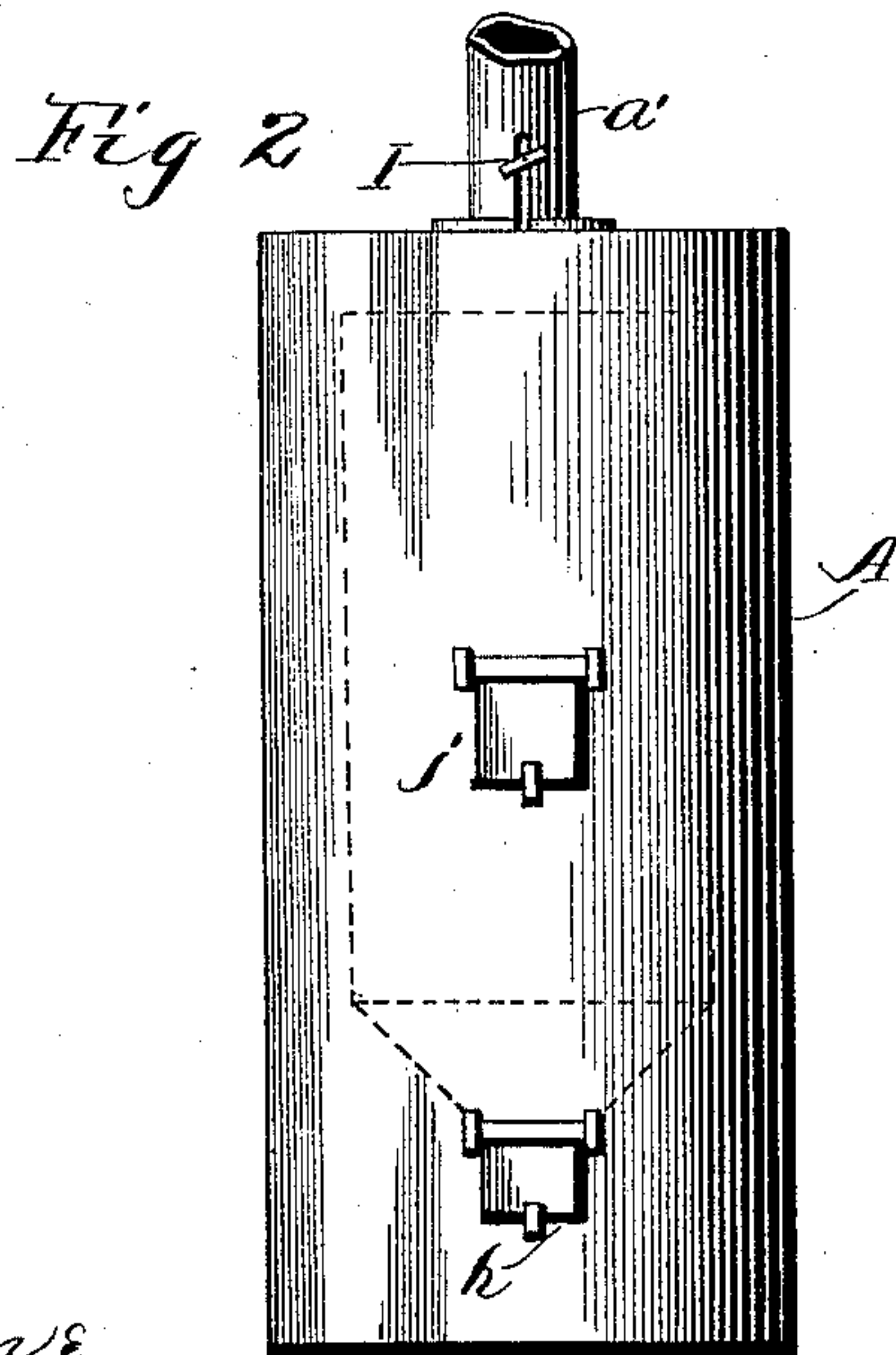


W. P. BROWN.  
HEATING APPARATUS.

Patented May 26, 1891.



Inventor  
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# UNITED STATES PATENT OFFICE.

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## HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 452,831, dated May 26, 1891.

Application filed February 4, 1890. Serial No. 339,120. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM P. BROWN, a citizen of the United States, residing at Cherryvale, in the county of Montgomery and State of Kansas, have invented certain new and useful Improvements in Heating Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form part of this specification.

The object of my invention is to provide a simple and economical heating apparatus for heating buildings or railroad-cars, or for use in connection with driers for drying grain, lumber, or other materials or substances, by locating the furnace within a water chamber or boiler, and in so connecting the furnace and boiler with the heating and radiating pipes that the heated products of combustion and the surplus steam may both be utilized for heating purposes, and in so connecting the furnace and boiler with a steam-cylinder or pumping-engine, and with supply and exhaust pipes, that the necessary circulation through the apparatus and pipes may be induced either by pressure or exhaust, as may be desired; and it consists in certain constructions and combinations, all of which are hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings, Figure 1 represents a vertical section through the boiler and furnace, the pipes and connections being shown in elevation. Fig. 2 shows a front view of the boiler in elevation. Fig. 3 is a side view of the air-pump toward the radiator, showing the connection of the pipes thereto.

A designates the water chamber or boiler, which is in the shape of the ordinary vertical boiler, and B is the furnace, which is suspended within and is entirely enveloped by the boiler, so as to leave a space all around for the circulation of water and steam. The furnace is provided with a grate *b*, below which is an ash-chamber *b'* with a conical bottom, from which a passage *H* extends through the wall of the boiler. This passage is for the removal of ashes from the ash-cham-

ber, and also serves as a draft-opening for the furnace. It is provided with a door *h*, by which it may be closed when desired. A flue *a* extends from the furnace through the top of the boiler, and is provided above the latter with a telescopic extension *a'*, which may be disconnected when desired for the introduction of fuel through the flue *a*. The flue or its telescopic extension is provided with a damper or valve *I* for regulating or cutting off the draft.

Instead of introducing the fuel through the top of the boiler and furnace, as above described, it may be introduced through a side opening *J*, which is provided with a door *j*.

C designates a steam-cylinder, which for convenience is shown as being connected with and supported from the side of the boiler. A steam-pipe *c* leads from the top of the boiler to the cylinder and supplies the latter with steam, and *c'* is an exhaust-pipe which leads from the cylinder to the flue of the furnace, the steam being exhausted into the latter.

D designates a radiator or coil which is connected with the furnace B by a pipe *d*, through which the products of combustion pass when the damper or valve *I* is closed, whereby the heat which would otherwise escape with the smoke and other products of combustion is utilized for heating purposes.

E represents a pipe which connects the steam-outlet from the boiler with the pipe *d* from the furnace. The steam-outlet is provided with a weighted valve *e*, the weight being so adjusted that as soon as the pressure exceeds the amount of steam required to operate the steam-cylinder C the weighted valve *e* opens and the surplus steam escapes through the pipe E into the pipe *d* and passes with the products of combustion through the radiator, whereby the heat which would otherwise escape with the surplus steam is also utilized for heating purposes.

F designates an ordinary air-pump, which is connected with and operated by the piston of the steam-cylinder C. This air-pump is connected by a pipe K with the outlet from the radiator D, and by a pipe L with the furnace below the grate *b*.

The products of combustion—hot-air and steam—are drawn through and from the radi-



ator D and pipe K, and are forced back into the furnace through the pipe L to aid combustion and to be reheated and passed through the pipes again. Should it, however, be desired or preferred not to use the hot air, steam, and products of combustion a second time, they may be discharged into the open air through a branch pipe M, which is connected with the pipe K for this purpose. The pipes K and M are provided, respectively, with stop-cocks *k* and *m*, by which the air, steam, and smoke from the radiator may be thrown either into the air-pump F or into the open air, as may be desired.

An air-supply pipe *f* is provided, through which fresh air is drawn into the pump F to be forced into the furnace. This pipe has a stop-cock *f'*, by which the supply of fresh air is cut off when desired.

G designates a pump for pumping water into the boiler. It is connected with and operated by the piston of the steam-cylinder. The supply of water is drawn through a pipe *g* and is pumped into the boiler near the bottom through a pipe *g'*.

The operation of this apparatus is as follows: Fuel is introduced into the furnace either through the flue *a*, as above set forth, or through the opening J. The door *h* and the damper I are opened to permit a draft through the furnace to start combustion. As soon as the fire is well started and steam begins to be generated the door *h* and damper I are closed and the products of combustion are directed through the pipe *d* into the radiator D. The steam passing from the boiler through the steam-pipe *c* into the steam-cylinder C operates the piston of the latter in the usual manner. The pump F, being connected with the piston of the steam-cylinder, is operated thereby and the products of combustion are drawn from the radiator D through the pipe K, and after passing through the pump are either forced into the furnace through the pipe L, or by closing the cock *l* and opening the cock *n* they are forced out through the pipe N and discharged into the open air. This gives a forced exhaust. Should it not be necessary or desirable to exhaust the air from the radiator by the use of the pump F, the latter is cut off by closing the stop-cock *k*. Then by opening the stop-cock *m* the air, steam, and smoke are turned into the pipe M and allowed to escape into the open air. In such case there will only be a natural circulation through the pipes. When it is not desired to pass the air through the apparatus the second time, but to use fresh air instead, the cock *f'* in the air-supply *f* is opened and the cocks *n* *k* are closed and the cocks *l* and *m* are opened, whereby connec-

tion between the radiator D and pump F is cut off, and the volume of fresh air, after passing through the pump F, is directed into the furnace, to be heated and passed through the radiator along with the products of combustion, as already explained.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a heating apparatus, the combination, with a system of heating pipes or coils, of a furnace and boiler, both connected with the heating-pipes to discharge hot air and the products of combustion from one and the surplus live steam from the other, a steam-cylinder connected to the boiler, a pump operated by the piston of said cylinder, a connection between the said pump and heating-pipes, a discharge-pipe leading from the pump, and a weighted valve in the connection between the boiler and heating-pipes to regulate the flow of steam from the boiler to the heating-pipes, substantially as specified.

2. In a heating apparatus, the combination, with a system of heating pipes or coils, of a furnace and boiler, both connected with the heating-pipes to discharge hot air and the products of combustion from one and the surplus live steam from the other, a steam-cylinder connected to the boiler, a pump operated by the piston of said cylinder, a fresh-air-supply pipe leading to the pump, a pipe leading from the pump to the bottom of the furnace to convey the fresh air thereto, a weighted valve in the connection between the boiler and the heating-pipes to regulate the flow of steam, and a discharge-pipe leading from the heating-pipes, substantially as specified.

3. In a heating apparatus, the combination, with heating-pipes, of a furnace and boiler, both directly connected with said heating-pipes, a steam-cylinder having independent connection with the boiler, an air-pump connected with and operated by the piston of said cylinder, connections between said pump and the exhaust end of the heating-pipes and the furnace, a branch pipe opening into the open air from the connection between the heating-pipes and the air-pump, stop-cocks in said connection and branch pipe, whereby communication is established with the air-pump or with the open air, as may be desired, and a fresh-air inlet connected with the air-pump, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM P. BROWN.

Witnesses:

JOSEPH L. PITTS,  
FANNIE C. DOBSON.