

(No Model.)

4 Sheets—Sheet 1.

W. ESPLEN.
BOILER FURNACE.

No. 566,389.

Patented Aug. 25, 1896.

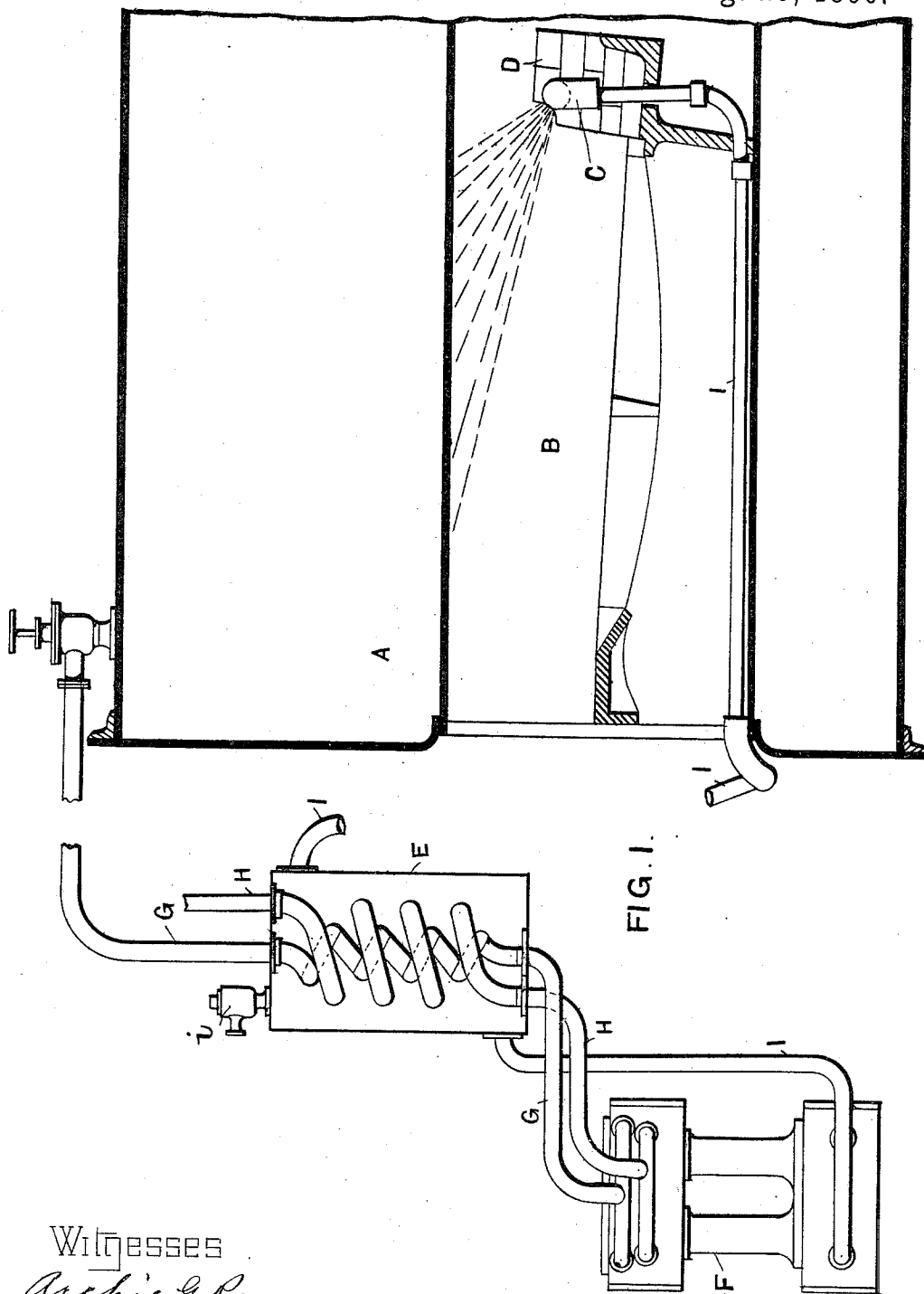


FIG. 1.

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Inventor
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by Frank L. Ayer Attorney

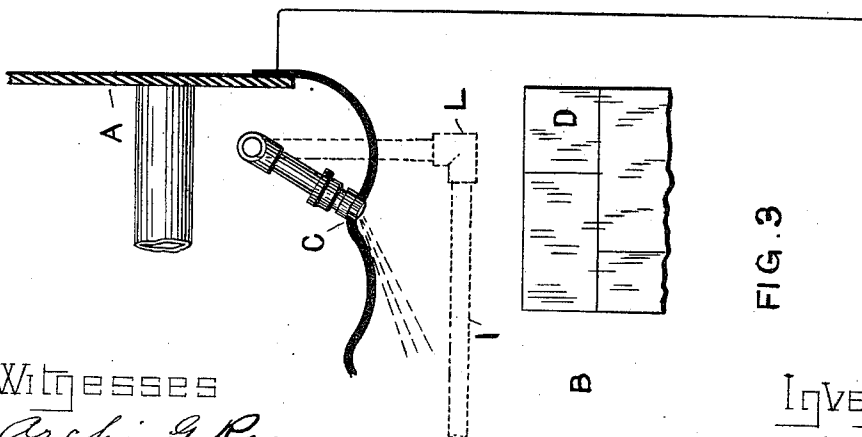
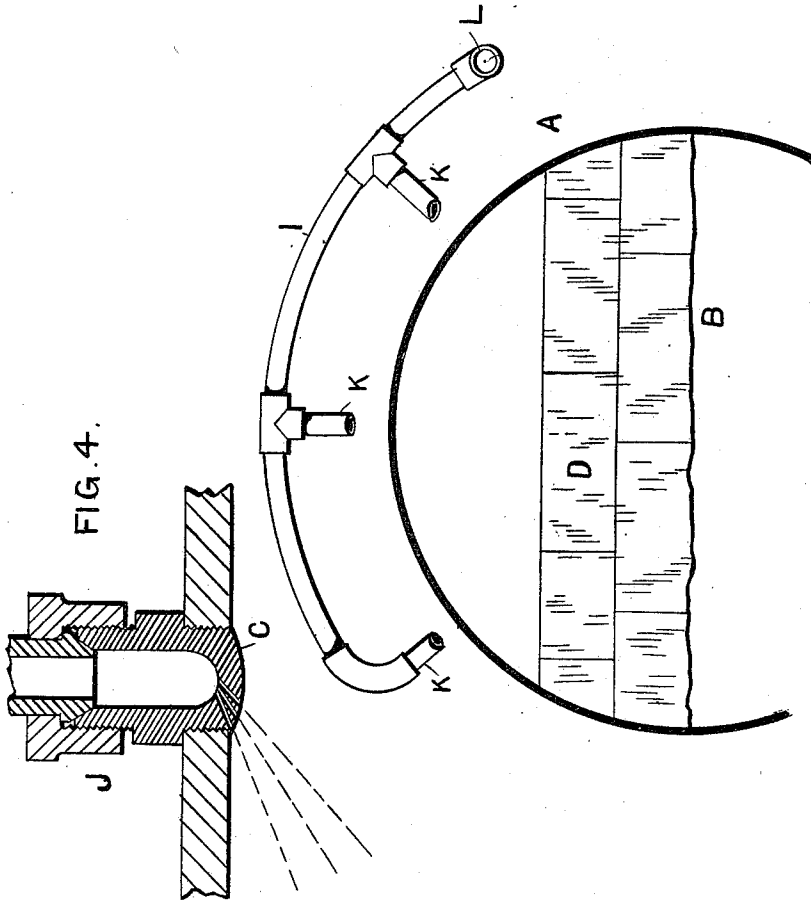
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4 Sheets—Sheet 3.

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FIG. 6.

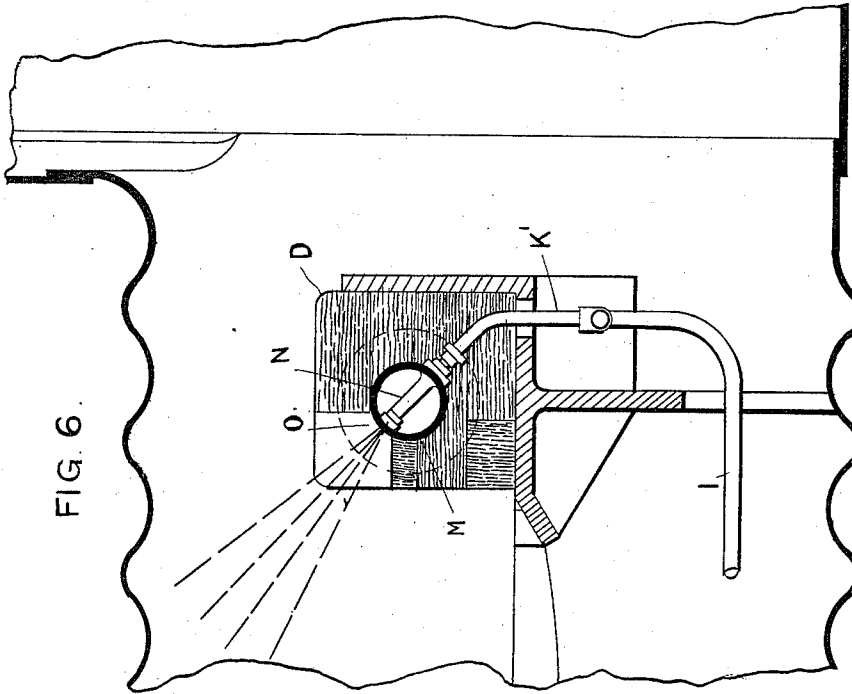
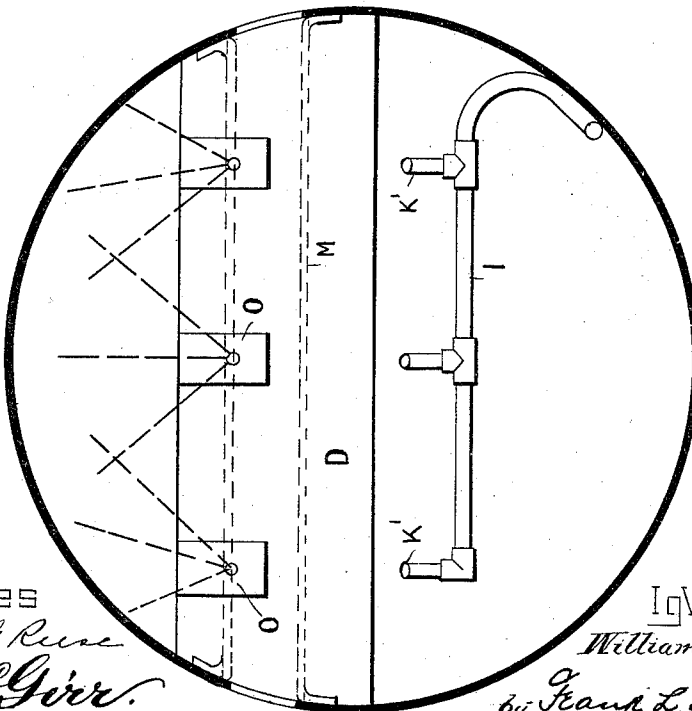


FIG. 5.



Witnesses

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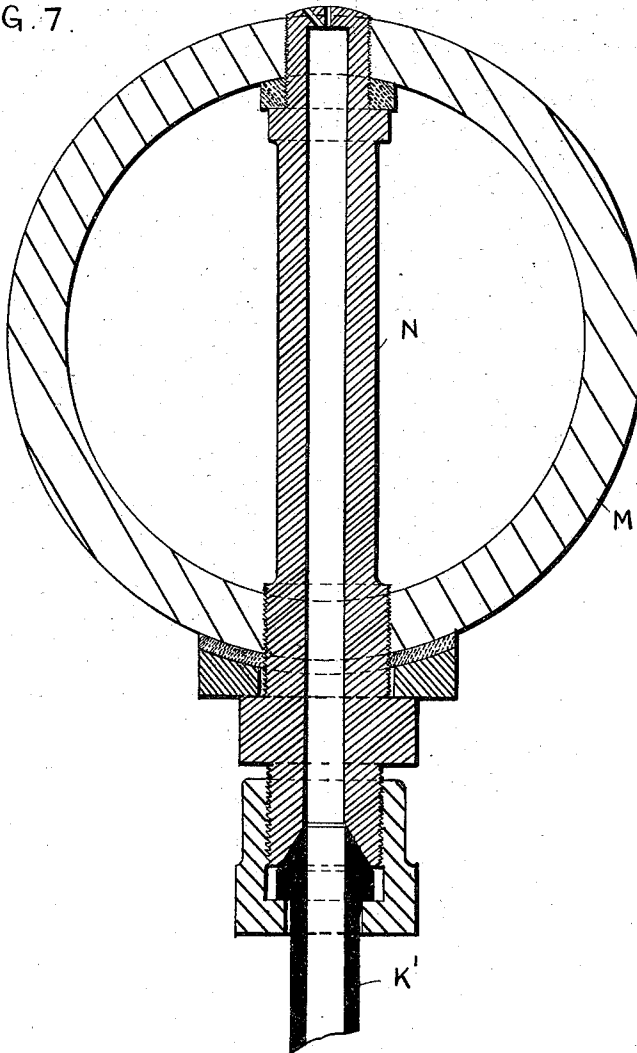
4 Sheets—Sheet 4.

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FIG. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM ESPLIN, OF LIVERPOOL, ENGLAND.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 566,389, dated August 25, 1896.

Application filed May 14, 1895. Serial No. 549,327. (No model.) Patented in England July 25, 1894, No. 14,297.

To all whom it may concern:

Be it known that I, WILLIAM ESPLIN, consulting engineer, a subject of the Queen of Great Britain, residing at Liverpool, in the county of Lancaster, in the Kingdom of England, have invented certain new and useful improvements in or relating to obtaining more perfect combustion in steam-boiler or other furnaces and flues and in apparatus therefor, (for which I have obtained a patent in Great Britain, No. 14,297, dated July 25, 1894,) of which the following is a specification.

This invention relates to the economizing of fuel in heating-furnaces; and it has for its object to obtain a greatly-increased economy of fuel by means of a more complete combustion in any kind of heating-furnace, but especially in steam-boiler furnaces. It is well known that coal or other combustible material employed in furnaces, flues, or the like does not undergo complete combustion by reason of the insufficiency of the supply of oxygen which is necessary for such combustion. The quantity of air usually supplied to heating-furnaces is frequently insufficient to provide the amount of oxygen which is essential to complete combustion.

Now, according to my invention, I obtain a more complete economy of fuel by keeping the combustion under control and by consuming the smoke. This I accomplish by introducing into the flues against the current of the effluent gases and in the hottest part of the furnace compressed air or compressed air and oxygen in a series of fine jets. All attempts in actual practice of introducing compressed air in this manner have hitherto resulted in partial failure, owing to the fact that the pipe or nozzles are destroyed in a very short time by the great heat of the furnace at this point. My invention is designed to overcome this, and it will be understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section through a furnace-flue and boiler, showing one way of carrying out the invention; Fig. 2, a transverse section of a furnace-flue, showing another arrangement in which two or more nozzles enter the furnace at different points in the circumference; Fig. 3, a sectional view

at right angles to Fig. 2, showing how the nozzles are arranged in a boiler having corrugated furnace-plates; and Fig. 4, an enlarged section of a nozzle attached to an ordinary furnace-plate.

Referring to the drawings first, A is the boiler; B, the furnace; C, the nozzles; D, the furnace-bridge.

Referring to Fig. 1, I bring the air-supply pipe I through the ash-pit to the bridge D and arrange the nozzle at C, but in such a manner that the compressed air shall be introduced into the furnace at the hottest part in a series of fine jets delivered from fine holes, slits, or the like in an angular direction and contrary to the current of the effluent gases. The nozzle C is built up in the brickwork of the bridge with only its perforated portions uncovered by brickwork, thereby preventing the burning of the nozzle by the abnormal heat of the furnace at this point. The supply-pipe I is regulated by a cock or other regulator, so that the instant the attendant notices any smoke appearing he can let in a little more air or air and oxygen.

Referring to Figs. 2, 3, and 4, in an ordinary furnace-boiler with cylindrical or curved top to the furnace I may instead of locating the nozzle or nozzles C in the furnace-bridge screw them into the crown, allowing only their ends to project beyond the surface into the flue and arrange the perforations in the nozzles on one side, so as to point in a direction which will meet the draft. The air-supply pipe L is carried through the boiler, so that the heat thereof will further heat the air before being injected into the furnace. Instead of having a single nozzle C, I may form in some cases an arched pipe I, Figs. 2 and 3, and have two, three, or more pipes K, leading to nozzles entering the furnace-chamber at different points in the circumference, and in order to enable these nozzles to be attached with greater ease I form them each in a separate piece and attach them to the pipe by a screw-coupling J, Fig. 4. With boilers having corrugated furnace-plates I place the nozzle C in a corrugation, with the jets pointing in such direction as to meet the draft, as shown in Fig. 3. In order to secure even more perfect combustion, I propose to further heat the air-supply before delivery to the

furnace. To effect this, I provide an air reservoir or receiver E. The air is heated in this by passing the compressed air through suitable pipes or coils.

5 In Fig. 1, F is the device for compressing the air; G, the steam-pipes for heating the air; H, the steam-exhaust pipes; I, the air-pipes; i, a safety-valve to let out any surplus air, so as to avert the risk of explosion.
10 If preferred, exhaust-steam may be employed for heating a jacket around the receiver E.

Referring now to Figs. 5, 6, and 7, in these Fig. 5 is a transverse section through the boiler, showing a variation of my device; Fig.
15 6, a longitudinal section near the center line; Fig. 7, a sectional view through said center line. In these K' K' K' are three branch pipes from the pipe I, supplying the hot air. The pipe I can, if desirable, pass through a hollow fire-bar instead of through the ash-pit, as shown. Pipes K' are united to a nozzle N,
20 which is screwed through holes in the pipe M, so that the extreme end of the nozzle projects slightly beyond or is level with the surface of the pipe M. This pipe M is buried in the brickwork except at the points where these nozzles project, where a radiating-opening is formed, so as to allow the jets of hot air to escape backward into the furnace, as
25 shown at O. The working of this variation is similar to those already expressed. The advantage, however, of the arrangement is that the nozzles are completely protected by a water-jacket. I do not, however, limit myself to this particular form of water-jacket,
30 as an almost infinite variety of water-jackets can be made for such pipes.

By means of the above arrangements the compressed air is heated to a considerable
40 extent before being forced into the furnace or flues by the compressor.

The mode of action is as follows: The furnace being lighted, compressed air is passed through the jets C. The result is a powerful
45 induced draft of air above the bars and a very vivid combustion is caused in the furnace. The air coming out of the bridge or at

the crown of furnace in a direction contrary to the hot effluent gases causes a vivid combustion. The smoke is burned and heat
50 raised in a much shorter period than by the ordinary arrangements. Moreover, a considerable economy in fuel is effected. The attendant can regulate the admission of air by a cock. Thus just after firing he can admit a
55 larger quantity of air to overcome the smoke than at other times.

I declare that what I claim is—

1. In a furnace, the combination of an air-compressor, a series of nozzles located adjacent to the fire-box and having slits or perforations, air-pipes connecting said air-compressor and nozzles, a closed receptacle in the path of said air-pipes and through which the
60 air passes, a steam-coil in said receptacle connected with the exhaust of the air-compressor, and a second steam-coil in said receptacle through which the live steam of the compressor passes, substantially as set forth.

2. In a furnace, the combination of an air-compressor, a series of nozzles located adjacent to the fire-box and having slits or perforations, air-pipes connecting said air-compressor and nozzles, a closed receptacle in the
70 path of said air-pipes and through which the air passes, means for heating said receptacle, and a relief-valve on said receptacle, substantially as set forth.

3. In a furnace, the combination of an air-compressor, a series of nozzles embedded in
80 the bridge-wall of the furnace with only a small portion exposed, slits or perforations in said exposed portion, a water-jacket embedded in said bridge-wall and through which said nozzles pass, and air-pipes connecting
85 said air-compressor and said nozzles, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WM. ESPLIN.

Witnesses:

G. C. DYMOND,
W. H. BEESTON.