

(No Model.)

2 Sheets—Sheet 1.

J. J. ANDERSON.

SMOKE CONSUMING ATTACHMENT FOR FURNACES.

No. 263,456.

Patented Aug. 29, 1882.

Fig. 1.

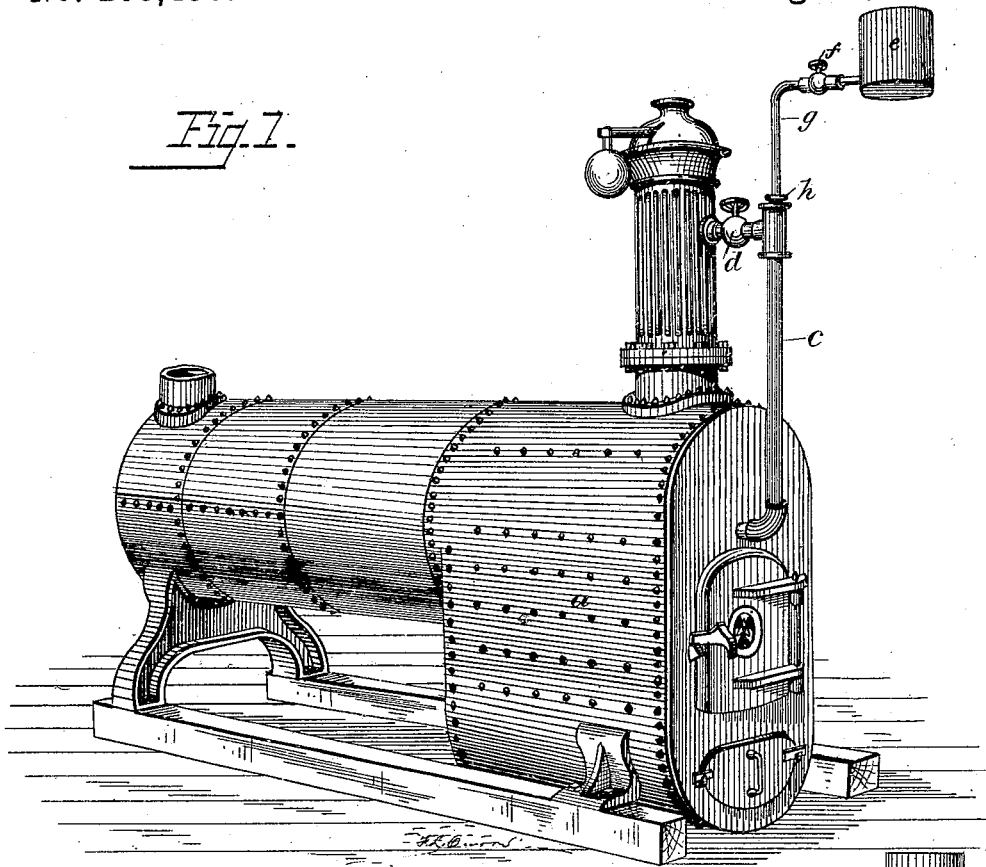
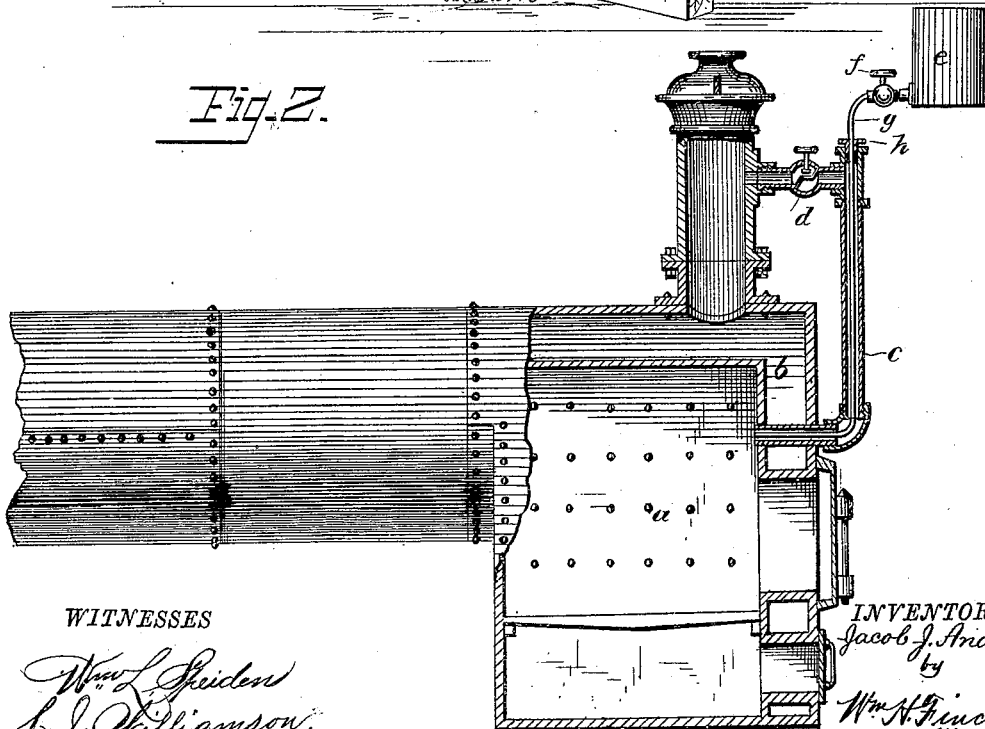


Fig. 2.



WITNESSES

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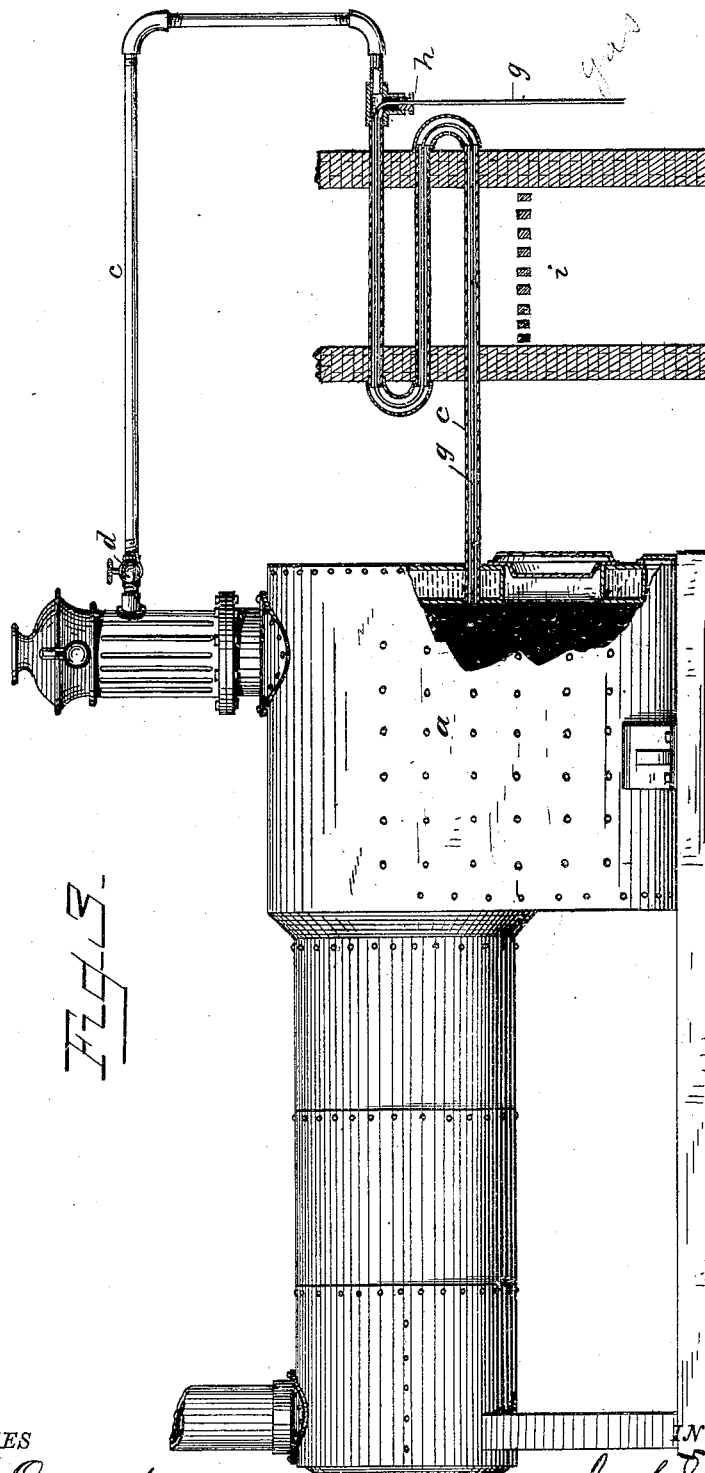
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UNITED STATES PATENT OFFICE.

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SMOKE-CONSUMING ATTACHMENT FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 263,456, dated August 29, 1882.

Application filed July 22, 1882. (No model.)

To all whom it may concern:

Be it known that I, JACOB J. ANDERSON, a citizen of the United States, residing at Rochester, in the county of Beaver and State of Pennsylvania, have invented a certain new and useful Improvement in Smoke-Consuming Attachments for Furnaces, of which the following is a full, clear, and exact description.

The object of this invention is to consume the smoke and soot and increase the draft or facilitate the combustion in furnaces; and the invention is specially designed for application to the furnaces of the various kinds of steam-boilers.

The invention relates to means for introducing in a finely-divided condition hydrocarbon oils, vapors, or gases, in an artificial or natural state, and steam into the combustion-chamber of furnaces. I may here remark that the introduction of commingled or unmixed oil and steam by an injector in an atomized condition into furnaces as an aid to combustion or as combustible material is old; and my invention therefore consists in the arrangement and simplification of the means for so using oil and steam; and to this end I employ a steam-pipe introduced into the furnace through the water-jacket, its mouth being flush, or nearly so, with the inner surface of the inner wall of the jacket, so as to expose as little as possible of itself to the destructive action of the fire and products of combustion, and into this steam-pipe I introduce such a length of my oil-pipe as will enable the steam surrounding the same to highly heat the hydrocarbon in said oil-pipe, said oil-pipe terminating in the furnace flush with the steam-pipe, so that the steam and oil will enter the furnace simultaneously. If it be found that the oil needs a higher heat than can be obtained from the steam-pipe, the pipes, arranged as described, may be conducted through a furnace or other heating chamber or means, in which case the steam will be more or less superheated, but nevertheless serve as a protector to the oil-pipe, preventing it from reaching such a heat as would cause an explosion or set fire to the hydrocarbon. Such a supplemental heating will be found very desirable where the natural gas of the oil-wells is used. By introducing into the furnace the hydrocarbon simultaneously with the steam the hydrocarbon is saved

from separate ignition and the steam is prevented from being uselessly consumed, and the two are commingled in such proportions under heat and at such time as to utilize to their full extent their smoke and gas consuming and heat-producing properties. The increased and accelerated draft induced by the injection of the steam and hydrocarbon and the lively fire promoted thereby will serve to clear the flues of the boiler of soot. By this much there is an economy of fuel. The heating of the hydrocarbon prior to its introduction into the furnace and letting it in under pressure of the steam in such heated condition I regard as a prerequisite to the success of the operation, for thereby the hydrocarbon is most readily vaporized, thus instantaneously giving up its combustible properties to the fire, and hence most easily and quickly combining with the products of combustion to convert them into gas, instead of allowing them to escape as smoke and soot. Hydrocarbons introduced into furnaces without preliminary heating, while yielding to the fire their richness of carbon, yet do so at too great an expense of the heat, and hence tend to reduce the liveliness of the fire and promote smoke and soot.

The natural gas flowing from oil-wells has heretofore been used as fuel for heating purposes, and has been conducted from the wells to considerable distances in pipes. I utilize such gas so conducted by surrounding the conducting-pipe some distance of its length with the pipe used to convey the steam to the furnace, to thereby heat such gas to a degree sufficient to facilitate its ignition and combustion. It is preferable to heat such gas to a rather high temperature, and if such temperature cannot be obtained readily by the steam-jacket, I lead the gas-pipe surrounded by the steam-pipe into a furnace, the steam in the steam-pipe serving to protect the gas-pipe from becoming too highly heated, as hereinbefore explained.

The invention also consists in superheating the hydrocarbon, particularly the gas, under cover of its surrounding steam and steam-pipe, prior to its introduction with the thereby superheated steam into the furnace, in the manner and for the purpose hereinafter specified and claimed.

In the accompanying drawings, in the sev-

eral figures of which like parts are similarly designated, Figure 1 is a perspective view of a form of steam-boiler and furnace common in the oil regions of Pennsylvania with my invention applied. Fig. 2 is a vertical longitudinal section of the furnace and dome with the oil-supply detached from the dome; and Fig. 3 is a partly-sectional elevation of one mode of superheating the gas.

10 The furnace *a* may be of any construction, and, as furnaces are usually built, is provided with a water-jacket, *b*. A pipe, *c*, is arranged to enter the furnace through this water-jacket—say over the door—and its inner is cut off or stops flush with the inner surface of the inner wall of the jacket, so as to project as little as possible into the furnace, and thus avoid the injurious action of the fire upon it. This pipe *c* is connected at any suitable point—as, for example, the drum or dome—with the steam-space of the boiler, so as to take steam therefrom and conduct it into the furnace, it being understood that in this illustration of my invention the apparatus is connected with a steam-boiler furnace, although it is quite obvious that the invention is applicable to other furnaces where steam can be obtained for supply to the furnace. The pipe *c* is provided with a suitable controlling-valve or stop-cock, *d*. One or more of such pipes may be employed, and they may be introduced into the furnace at opposite sides thereof, if desired, in the same manner as at the front, as just described.

35 *e* is a reservoir of suitable construction, provided with a faucet or stop-cock, *f*, and adapted to supply hydrocarbon oil—as petroleum or the natural gas from oil-wells—to a pipe or pipes, *g*, equal in number to the number of steam-pipes *c*. This pipe *g* enters the steam-pipe *c* through a suitable stuffing-box, *h*, and, passing down through the same, ends in the furnace flush with the steam-pipe, so that the supply of hydrocarbon and steam will enter the furnace simultaneously, thereby effecting the results and obviating the dangers hereinbefore stated. Of course the pressure of steam issuing from the steam-pipe will have the effect of atomizing the hydrocarbon immediately upon its issuance from its pipe without burning it, and as the steam surrounds the oil-pipe for some distance beyond its entrance into the furnace the oil will be heated to such an extent that the work of the steam in atomizing it is greatly facilitated, and hence it is atomized and vaporized with a much less expenditure of steam and heat, thereby economizing the fuel in the furnace, and with the results before named. The natural gas hereinbefore referred to may be introduced in a similar manner, bearing in mind the precautions to be observed in previously heating the same.

I have shown in Fig. 3 one mode of superheating the gas. The steam may be taken from the dome of a boiler, as before, through pipe *c*, and the gas-pipe may enter said steam-pipe through a stuffing-box, *h*, arranged as

shown, and the two pipes thus connected be passed one or more times through any furnace, *i*, metallurgic or for other purposes, in any suitable manner, as indicated in the drawings, or otherwise, and then led into the boiler-furnace, as before. The coils of the pipes may be wholly within the superheating-furnace or not, the arrangement being purely optional.

It will be observed that when the hydrocarbon is highly heated, with its surrounding steam-pipe, in a furnace prior to its discharge into the smoke-consuming furnace, the steam is dried and superheated, thus facilitating its decomposition and that of the hydrocarbon, increasing the rapidity of action of the hydrocarbon and steam in the furnace, and saving the waste of caloric and fuel in such furnace.

The application of my invention to furnaces requires but the exercise of ordinary skill, the only alterations necessary being the connections for securing the steam-pipe to its source of supply and in the water-jacket. Such connections may be made by means of suitable couplings tapped in.

It will be noticed that the hydrocarbon oil or gas is conducted through the steam-pipe in a separate pipe, whereby the said hydrocarbon is wholly out of direct contact with the steam until it arrives at the point of delivery. The steam being thus kept separate from the hydrocarbon, the flow of the latter is unimpeded.

It is commonly estimated that only about fifteen per centum of the intrinsic value of the natural gas is obtained by the present mode of using it; but by my mode of heating it prior to its use I utilize from eighty to ninety per centum.

A saving of about fifty per centum of fuel is effected in the furnace by my mode of consuming the smoke.

It is old to provide an injector to introduce oil and steam into furnaces, the oil-pipe being surrounded in the injector only by the steam; but the steam heat obtained by this construction, owing to the small space, is wholly insufficient to raise the oil to the heat I require. Hence I surround my oil-pipe with a steam-jacket for a considerable portion of its length.

What I claim is—

1. A smoke-consuming attachment for furnaces, the same consisting of a steam-pipe and a hydrocarbon-pipe surrounded by said steam-pipe from at or near the steam source, and both entering the furnace flush with each other and with the inner wall of the furnace or fire-box, substantially as shown and described.

2. The combination of a hydrocarbon supply and a steam supply with pipes leading from each, the hydrocarbon-pipe entering the steam-pipe at or near the source of supply of steam through a stuffing-box, and extending thence its length, and ending flush with the steam-pipe in the furnace or fire-box, whereby the hydrocarbon is subjected to steam heat prior to its introduction into the furnace, substantially as shown and described.

3. The improvement in apparatus for utiliz-

ing steain and hydrocarbons as a medium for
effecting the consumption of smoke and soot in
furnaces, the same consisting in a hydrocarbon-
pipe, a surrounding steam-pipe, into which the
5 hydrocarbon-pipe enters at or near the source
of supply of steam, a stuffing-box to render the
connection of the two pipes steam-tight, and a
furnace provided with a water-jacket, through
which the pipes enter into the furnace, the said
10 pipes ending in the furnace flush with each
other and with the inner surface of the inner
wall of the water-jacket, substantially as shown
and described.

4. The improvement in the art of utilizing
15 steam and hydrocarbon oil or gas as a medium
for effecting the consumption of the waste pro-

dusts of combustion, the same consisting in
conveying the hydrocarbon in a pipe through
a surrounding steam-pipe and subjecting the
hydrocarbon in its pipe, while surrounded by 20
the steam in the steam-pipe, to superheating to
heat the same, while the hydrocarbon is kept
out of direct contact with the steam until the
two arrive simultaneously at the immediate
point of delivery, substantially as described. 25

In testimony whereof I have hereunto set my
hand this 22d day of July, A. D. 1882.

JACOB J. ANDERSON.

Witnesses:

WM. H. FINCKEL,
GEO. M. FINCKEL.