W. SCULLY.

Boiler-Furnace.

No. 216,900. Patented June 24, 1879.

Fig. 1

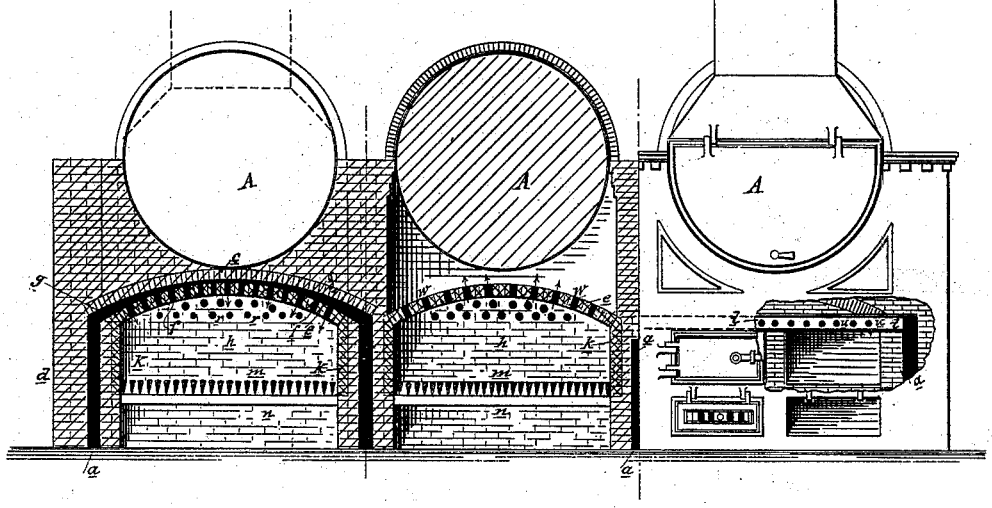


Fig. 2

Fig. 3

Fig. 4

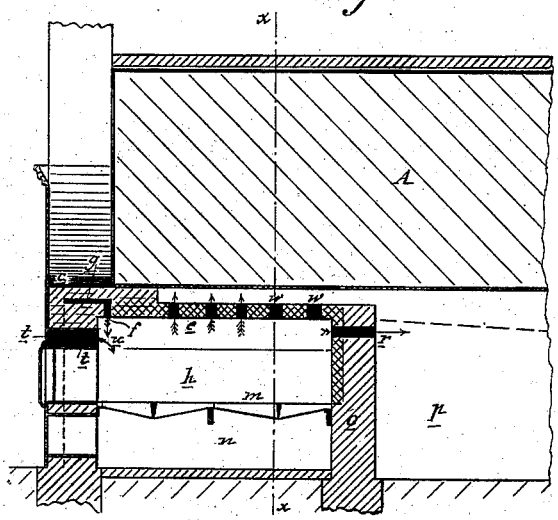
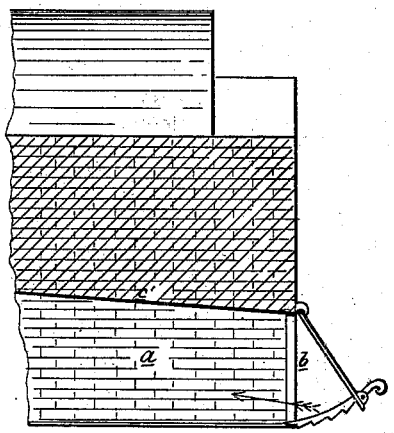


Fig. 5



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UNITED STATES PATENT OFFICE.

WILLIAM SCULLY, OF DETROIT, MICHIGAN, ASSIGNOR TO THE DETROIT IRON AND BRASS MANUFACTURING COMPANY, OF SAME PLACE.

IMPROVEMENT IN BOILER-FURNACES.

Specification forming part of Letters Patent No. **216,900**, dated June 24, 1879; application filed January 24, 1879.

To all whom it may concern:

Be it known that I, WILLIAM SCULLY, of Detroit, in the county of Wayne and State of Michigan, have invented an Improvement in Smoke-Consuming Boiler-Furnaces, of which the following is a specification.

The nature of my invention relates to certain new and useful improvements in the construction of steam-generator furnaces, by means of which smoke and other products of combustion, which pass off wasted to a great degree in furnaces as ordinarily constructed, are consumed as near the point where they are thrown off as possible, and utilized by such combustion in the generation of steam, thereby producing a large economy in fuel.

The invention, while of value with all kinds of fuel, will be found of the greatest utility in those sections of the world where bituminous or semi-bituminous coals are employed in steam-generating furnaces, for these coals throw off at a comparatively low temperature a large amount of gases, which are not consumed in furnaces of ordinary construction, where the necessary oxygen is not admitted at proper points and in a suitable condition to mingle with such unconsumed gases for the purpose of producing perfect combustion.

The invention consists in inclosing the fire-chamber by a perforated arch extending from the front wall of the furnace to the bridge-wall, and providing, in combination therewith, air-flues in the side walls of the furnace and cross air-flues in the fire-front below the arch, discharging air into the fire-chamber at right angles to each other, as fully hereinafter explained.

In the drawings, Figure 1 is a front elevation of my improved boiler-furnace with the front removed. Fig. 2 is a vertical cross-section on the line *x x* in Fig. 4. Fig. 3 is a front elevation, partially in section. Fig. 4 is a central longitudinal vertical section. Fig. 5 is an elevation of a section of the side wall with a portion broken out to show the sheet-flue and flue-strip.

In the accompanying drawings, which form a part of this specification, A represents a steam-generating boiler set in an arch of brick-work, in the side walls of which are large sheet or flat flues *a*, extending from front to rear, where they terminate in damper-controlled openings *b*, communicating with the outer air. Within these flues are placed the flue-strips *c'*, running in an inclined upward direction toward the front of the furnace from the upper end of the openings *b* in the rear ends of the furnace-walls for the purpose of giving direction to the air-currents admitted at those points.

In order to give a better understanding of the construction of the side walls, I show them in the drawings as double, with a space between them, which forms the sheet-flue above described.

The boiler A rests upon an arch, *c*, sprung from the outer side walls, *d*. Another arch, *e*, extending from the front to the rear end of the furnace proper, or fuel-combustion chamber, *h*, is sprung from the top of the inner side walls, *k*, leaving between it and the arch *e* an air-flue, *g*, from which part of the air from the sheet flues *a* passes downwardly through the perforations *f* into the combustion-chamber *h*. This chamber *h* is provided with fire-grates *m*, which divide it from the ash-pit *n*. The rear end of the arch *e* rests upon the top of the fire or bridge wall *o*, and the only communication between said combustion-chamber and the chamber *p* in rear of said fire-wall is through the perforations or openings *r* in said bridge-wall and through the perforations or small openings *w* in the arch *e*.

The sheet-flues *a* communicate at their front ends with and discharge air into the flue *t* in boiler-front, whence it is discharged into the furnace-chamber through the perforations or openings *u* above the bed of fuel on the grates, and below the perforated arch *e*. The air in its passage through the sheet-flues from the rear end of the furnace-wall has been highly heated in such passage, and is in proper condition upon being discharged through the flue *t* and its perforations *u* to mingle with the unconsumed gases in the furnace-chamber. These gases are prevented from passing over the bridge-wall, as in furnaces of ordinary construction, being confined within the furnace proper by the arch *e* and the bridge-wall, and only allowed to escape from said cham-

ber by passing through the small openings or perforations in said arch and bridge-wall. Being thus retarded, the upper portion of the furnace-chamber becomes to a certain extent a reverberatory chamber, wherein the unconsumed gases are compelled to mingle with the air admitted to said chamber, as hereinbefore described; and this air, heated, as before described, to a proper condition, passes through, with the gases, the perforations in the arch *e*, and are consumed in the chamber formed between said arch and the bottom of the boiler A and the chamber P in the rear of the bridge-wall.

In place of the single arch *e*, there may be constructed two of such arches, situated the one above the other, and in such relation to each other that, after passing through the lower one of the two, the currents may be compelled to reverberate in any desired direction before passing over the upper of said arches, and between it and the boiler, so that the lower arch, in such case, need not extend the whole length of the fire-chamber, while the upper one should so overlap the lower one that no portion of the boiler-surface is exposed to the direct action of the combustion of the fuel proper in the grate.

I do not desire to confine myself to taking the air from the outside at the rear of the furnace-wall, as it may be admitted into the flues formed in said furnace-walls from any convenient or desired point. Preferably, however, I take it from the point hereinbefore described, because of the length of the side flues, whereby the air is exposed to a greater radiation and becomes much higher in temperature than if admitted at other points where its exposure in the flue will be less.

In practice it is found that by the use of a furnace constructed substantially as described, and air admitted to said furnace as shown, after being brought to a proper temperature, no smoke will be thrown off, and the unconsumed gases of combustion will be entirely consumed and utilized to a great saving in fuel. In other words, all the objections to the use of the softer or bituminous kinds of coal will be obviated, so that it may be used in the most populous districts without offense to any.

What I claim as my invention is—

In a boiler-furnace, the combination of the fire-chamber *h*, inclosed by perforated arch *e* and bridge-wall *o*, with the sheet air-flues *a* in the side walls of the furnace and the cross air-flues *g t* in the fire-front, connecting with the flues *a* and discharging at right angles to each other into the fire-chamber below the arch, constructed and arranged substantially as described and shown.

WILLIAM SCULLY.

Witnesses:
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