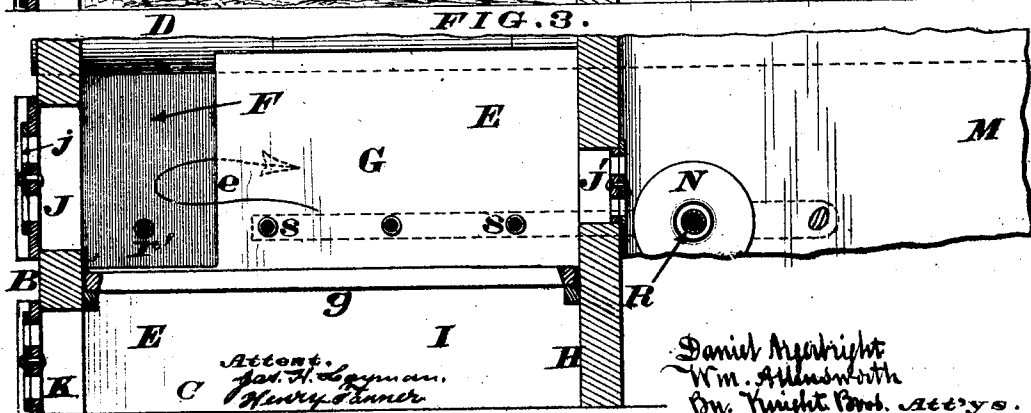
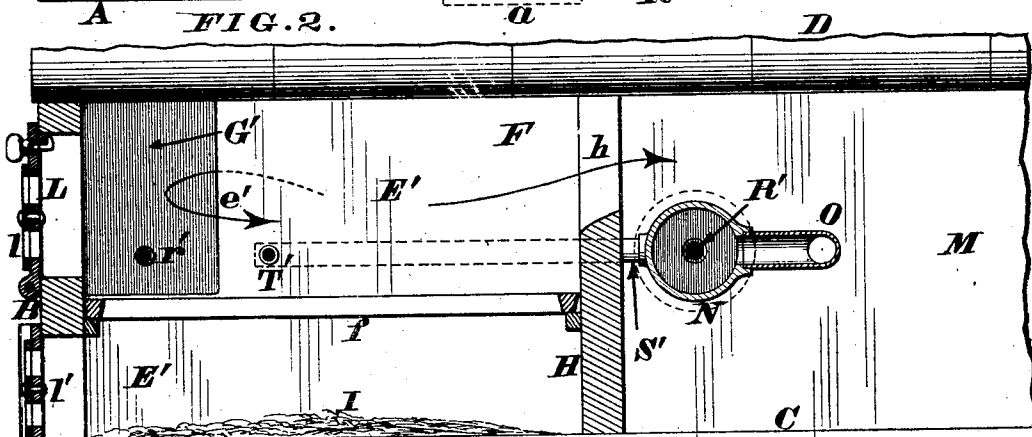
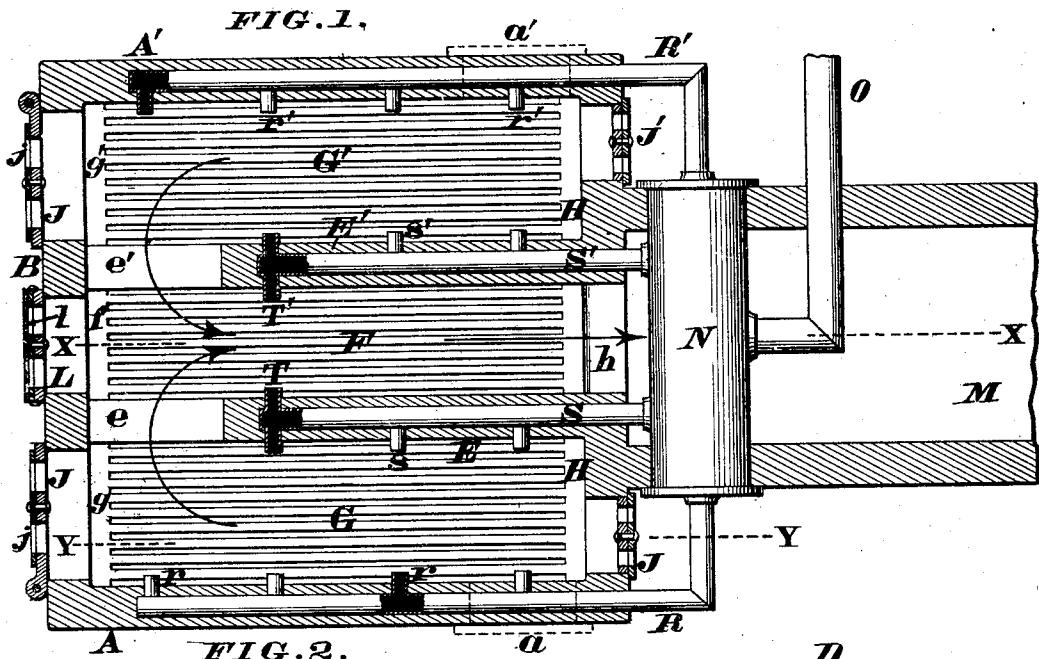


D. ARGERBRIGHT & W. ALLENSWORTH.

Smoke-Consuming Furnace.

No. 159,141.

Patented Jan. 26, 1875.



UNITED STATES PATENT OFFICE.

DANIEL ARGERBRIGHT AND WILLIAM ALLENSWORTH, OF TROY, OHIO.

IMPROVEMENT IN SMOKE-CONSUMING FURNACES.

Specification forming part of Letters Patent No. 159,141, dated January 26, 1875; application filed January 2, 1875.

To all whom it may concern:

Be it known that we, DANIEL ARGERBRIGHT and WILLIAM ALLENSWORTH, both of Troy, Miami county, Ohio, have jointly invented a new and useful Smoke-Consuming Apparatus, of which the following is a specification:

This invention relates to that class of apparatus in which the dense smoke and combustible gases emanating from freshly-applied coal are consumed by compelling them to traverse a bed of incandescent coke before said gases escape into the flue or chimney; and our improvement consists in a novel arrangement of furnace for accomplishing such a result. For this purpose we divide the furnace into three distinct compartments or fire-chambers by means of two vertical walls or partitions located inside the furnace, the central one of said chambers being arranged for burning coke, while the two outer ones are adapted for the consumption of coal. These two internal partitions have suitable openings in them near the front of the furnace, in order that all the smoke, gases, &c., generated in the outer or coal chambers may be drawn into the central or coke chamber, and be compelled to traverse the incandescent fuel in the same, escaping into the exit-flue, which latter is located at the rear end of the aforesaid central chamber. One or more pipes are embedded in the outer and inner walls of the furnace, which pipes are carried rearwardly and connected to a drum or cylinder, the latter being located transversely of the flue and in rear of the bridge-wall. Communicating with this drum is a pipe, through which air is forced by means of any suitable blowing apparatus, and the compressed air, after traversing said drum and the pipes embedded in the walls of the furnace, escapes, through suitable nozzles or tuyeres, into the various fire-chambers. These discharging-nozzles are attached to the aforesaid embedded pipes, and project into the furnace a little above the grate-bars, thus directing the jets of heated air into the fuel in such a manner as to cause the most perfect combustion.

Having thus indicated the leading features of our invention, we will now proceed to give a detailed description of the same.

In the accompanying drawing, Figure 1 is a horizontal section through a smoke-consuming apparatus embodying our improvement, the rear end of the flue not being shown. Fig. 2 is a vertical section through the same at the line X X, and Fig. 3 is a vertical section at the line Y Y.

A A' B represent the external walls of the furnace of a steam-boiler, which furnace may be of any suitable size and shape. Located within this furnace, and extending from the floor or base C up to the boiler D, are two vertical walls or partitions, E E', which divide said furnace into three distinct fire-chambers, F G G', of which the central one, F, is arranged for burning coke, while the two outer ones, G G', are adapted for the consumption of coal. The partitions E E' are built solidly from the front B back to the bridge-wall H of the furnace, with the exception of openings *e e'*, which are left in the forward portions of said partitions, for a purpose which will presently appear. *f g g'* are the grate-bars of the various fire-chambers, and beneath said bars are the customary ash-pits I. J are doors at the front ends of chambers G G', and J' are registers at the rear end of said chambers. *j* are registers fitted to the aforesaid doors. K are registers to the ash-pits of chambers G G'. L is a door to the coke-chamber F, said door being provided with a register, *l*. *l'* is a register to the ash-pit of this central chamber of the furnace. *h* is an opening in the bridge-wall H, through which opening the flames escape from central chamber, F, into flue M, which latter may communicate directly with the smoke-stack, or else with one or more return-flues in the boiler D. Arranged athwart the flue M, and somewhat in rear of bridge-wall H, is a drum or cylinder, N, having a pipe, O, attached to it, which pipe communicates with a blowing apparatus of any approved construction. Projecting from this drum are two distinct sets of horizontal pipes, R R' and S S', of which the former are embedded in the outer walls, A A', of the furnace, while the latter are inclosed within the partitions E E', as clearly shown in Fig. 1. These pipes are respectively provided with nozzles or tuyeres *r r' s s'*, which are arranged in horizontal rows parallel with and slightly above the grate bars of the fur-

nace. The nozzles *r s* project into one of the outer chambers, *G*, while the nozzles *r' s'* project into the other outer chamber, *G'*. *T T'* are additional nozzles attached to the inner pipes, *S S'*, for the purpose of injecting heated air into the central chamber, *F*.

If preferred, the front doors, *J*, may be omitted from the outer chambers, *G G'*, and they may be supplied with fuel through doors in the sides of the same and near the rear of the furnace, as indicated by dotted lines at *a a'* in Fig. 1.

The operation of our apparatus is as follows: Both of the chambers *G G'* are first charged with coal, which is then lighted and allowed to burn until it becomes thoroughly coked. As soon as this is accomplished the coke is raked through the openings *e e'* and distributed over the grate *f* of central chamber, *F*, after which fresh coal is again applied to the chambers *G G'* and the blowing apparatus set in motion.

There being no exit from the chambers *G G'*, either through the external walls, *A A'*, or the bridge-wall *H*, it is evident that the products of combustion can escape from said chambers only by drawing forward and passing through the openings *e e'* in two separate currents, as indicated by curved arrows in Fig. 1. These currents mingle together near the front of the central chamber, *F*, and the draft of the chimney, aided by the jet-blasts, draws them back, so as to escape through the openings *h* of the bridge-wall into the flue *M*, and in so doing the smoke and all combustible gases are compelled to traverse the mass of highly incandescent fuel in said chamber, thereby consuming these products of combustion and producing a white flame under the boiler.

As this intense flame surrounds the drum *N*, it will be readily understood that the air which is forced through this part of the apparatus becomes highly heated, and the temperature is raised still higher by the air being compelled to traverse the pipes *R R' S S'*, which are embedded in the almost red-hot walls of the furnace.

As a result of this arrangement the air issues from the nozzles *r r'*, *s s'*, and *T T'* at a very high temperature, thereby promoting combustion and economizing fuel, which advantages cannot be obtained where cold air is admitted to the fire-chambers of the furnaces. These numerous jets of highly-heated air conduct the carbonic-oxide gas away from the chamber *G*

G', and as fresh oxygen is mingled with this gas on its passage through the central chamber, *F*, the dense black smoke that usually escapes from the chimney is entirely consumed.

The registers *j J' K l l'* may be adjusted so as to admit sufficient fresh air to produce the most thorough combustion without, at the same time, having a tendency to lower the temperature of the fire-chambers to any undue extent.

In the drawings a single pipe is shown embedded in each of the four walls surrounding the three fire-chambers; but it is evident that two or more pipes may be built within each of said walls, if desired.

Our improvement can be applied to a battery of boilers equally as well as to a single one, or it may be arranged to operate with any kind of furnace that consumes coal.

In applying our improvements to furnaces now in use the pipes *R R'* and *S S'* may be attached to the outer sides of the appropriate walls; but we prefer to embed them as shown, so as not to encroach on the fire-space.

In some cases the drum *N* may be omitted, and the blast-pipes *R R' S S'* may be attached to a tube leading from the blowing apparatus.

For the purpose of firing up, a coke-fire may, if preferred, be first started in the central chamber, instead of waiting for that produced by the combustion in the side chambers.

We claim as our invention—

1. A smoke-consuming apparatus, consisting, essentially, of a furnace composed of three distinct chambers, *F G G'*, whose division-walls *E E'* are provided with openings *e e'*, and whose bridge has a single exit, *h*, when employed in conjunction with the embedded pipes *R R' S S'* and nozzles *r r' s s' T T'*, for introducing a blast of heated air into said chambers, substantially as herein described, and for the purpose set forth.

2. In combination with the blast-pipes *R R' S S'*, applied to a furnace, as described, the exposed drum or cylinder *N*, arranged athwart the flue *M*, in rear of bridge-wall *H*, for the purpose set forth, and herein described.

In testimony of which invention we hereunto set our hands.

DANIEL ARGERBRIGHT.
WILLIAM ALLENSWORTH.

Attest:

GEORGE GREEN,
GEO. H. KNIGHT.