(No Model.)

P. KIEFER.

STEAM BOILER FURNACE.

No. 263,532. Patented Aug. 29, 1882.

FIG. 1.

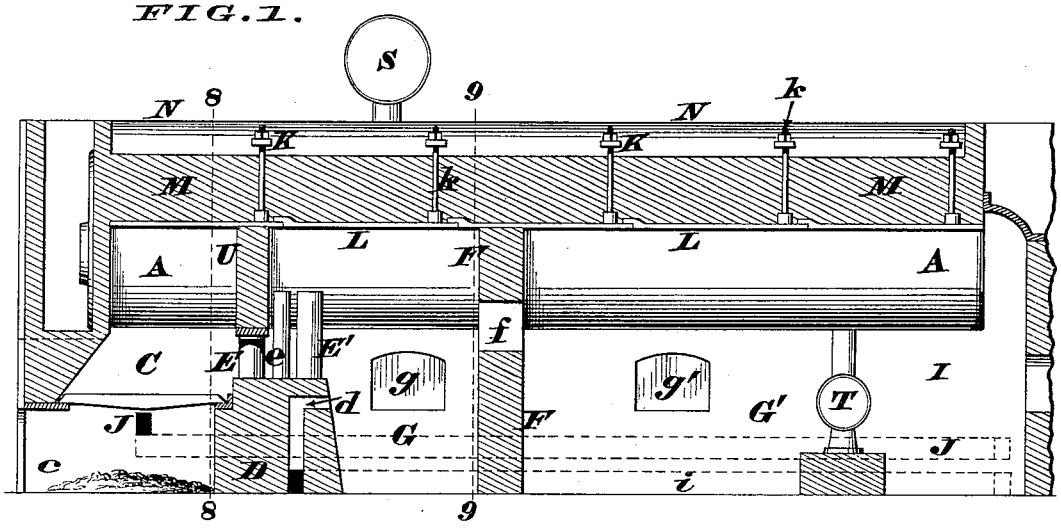


FIG. 2.

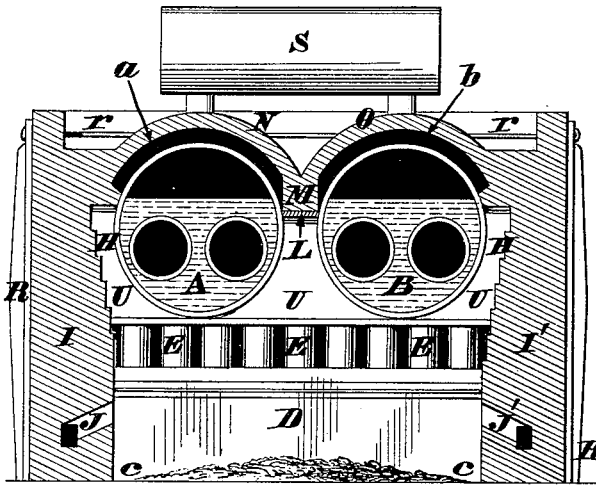


FIG. 3.

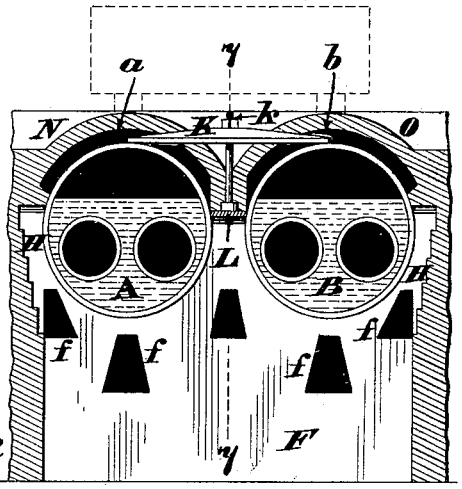


FIG. 4.

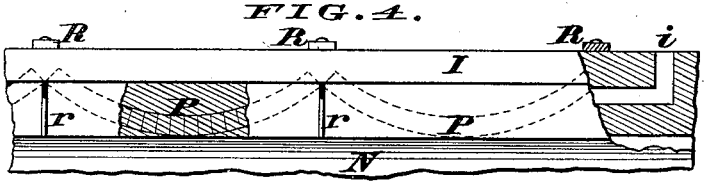


FIG. 6.

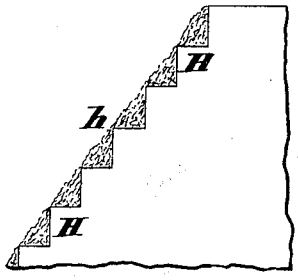
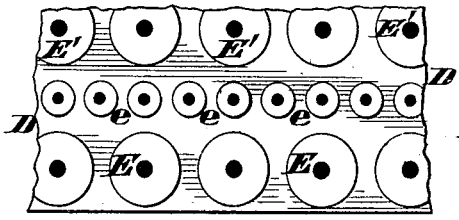


FIG. 5.



Attest.
Saml. S. Sawyer,
John C. Fröhliger

Inventor.
Peter Kiefer
by James K. Layman
Atty.

UNITED STATES PATENT OFFICE.

PETER KIEFER, OF CINCINNATI, OHIO.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 263,532, dated August 29, 1882.

Application filed May 29, 1882. (No model.)

To all whom it may concern:

Be it known that I, PETER KIEFER, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification.

My improved method of setting steam-boiler furnaces comprises the following novel features: first, a series of readily-removable refractory columns or piers projecting upwardly from the bridge-wall of the furnace, and so arranged as to compel the products of combustion emanating within the fire-box to be divided into numerous thin sheets or currents, which describe a devious path as they circulate around these highly-heated columns or pillars, thereby causing the most complete consumption of smoke, the front row of said piers being so disposed as to support a solid wall of masonry that is carried up close to the boiler, as hereinafter more fully described, and pointed out in the claims; second, an arrangement of horizontal arches in the upper part of the side walls of the furnace, for the purpose of resisting the additional weight of the masonry used in constructing the air-spaces around the boilers, the thrust of these horizontal arches being sustained by the "buck-bars" applied to said side walls, as hereinafter more fully described, and pointed out in the claims.

In the annexed drawings, Figure 1 is a vertical section of my furnace, taken at the line 7 7 of Fig. 3. Figs. 2 and 3 are transverse sections of the furnace, taken respectively at the lines 8 8 and 9 9 of Fig. 1. Fig. 4 is a sectionized plan of a portion of one of the side walls of the furnace. Fig. 5 is a plan of part of the bridge-wall and its accessories. Fig. 6 shows on an enlarged scale the manner of "racking" the interior walls of the furnace.

A B represent twin boilers of the customary return-flue construction, and having at their front ends an ordinary furnace, C, and ash-pit *c*. The rear of this fire-box C is formed by a bridge-wall, D, upon which is located a series of columns, pillars, or piers E E′ *e*, said columns being composed either of fire-clay or other refractory but non-metallic material or materials. These columns, which are preferably cylindrical, are arranged in three parallel rows or ranks, the front row, E, serving to support a solid wall, U, built up closely against the boiler or boilers, so as to compel all the products of combustion to pass through the openings between said pillars E. The rear columns, E′, are of the same diameter as the front pillars, E, and are in line therewith, but are somewhat longer, while the central piers, *e*, are comparatively small in diameter. The rows *e* E′ of the pillars are simply set on the bridge-wall D, being disposed in the manner seen in Fig. 5, so as to divide the flames into numerous thin sheets, that traverse the devious passages between the various barriers E E′ *e*. Furthermore, these barriers are made hollow or tubular, so as to be capable of expanding and contracting without breaking; but it is not designed to have either water or air traverse said tubes.

Situated a suitable distance in the rear of bridge-wall D is another wall or partition, F, completely closing the passage under the boiler, except as said partition is pierced or slotted or otherwise provided with suitable openings, *f*. By this construction a primary combustion-chamber, G, is formed in front of said partition, and a secondary combustion-chamber, G′, in the rear of the same, access to these chambers being afforded by doors *g g′* in the side walls of the furnace.

All the interior walls of the furnace exposed to the most intense heat of the fire are "racked" at H, as more clearly seen in Fig. 6, the various ledges or shoulders thus formed serving to retain deposits of soot and ashes, as indicated at *h*. Consequently the walls are protected by these non-conductors, and will last for an indefinite period of time.

Bridge-wall D has a channel or flue, *d*, communicating with a similar passage, *i*, running longitudinally of and within one of the side walls, I, of the furnace, as seen in Figs. 1 and 4, the object of these passages being to heat air and then discharge it into the primary combustion-chamber, G. J J′ are other similar passages in the opposite side walls, I I′, of the furnace, for the purpose of discharging heated air into the fire-box C and beneath the grate-bars of the same.

Supported on the boilers A B are girders K, through which pass rods *k*, that sustain a series of bearing-plates, L, said plates being adapted to close the space between the boilers and to serve as a foundation for the central wall or

pier, M, from which spring two arches, N O. These arches are of such diameter as to afford annular spaces *a b* between them and the top of the respective boilers A B, which spaces serve to retain dead air. When this air becomes heated, radiation from the steam-chambers of the boilers is prevented.

In order to prevent the weight of the additional masonry N O forcing out the side walls, I I′, of the furnace, said masonry is supported to a certain extent by horizontal arches P, built into these side walls, as seen in Fig. 4. Arches P have their abutments against those portions of the walls where the buck-bars R are located, and as the opposite pairs of said bars are secured by tie-rods *r*, it is evident the furnace will last as long as these rods perform their duty.

S is the steam-drum, and T the mud-drum, of the boilers, of which generators one or more may be used, according to the power required.

The operation of my furnace will be readily understood by referring to Fig. 1, which illustration shows that all the products of combustion emanating within the fire-box C must escape between the pillars E E′ *e*, mounted on the bridge-wall D. Consequently these pillars soon become so highly heated as to ignite any combustible gases that may be carried along with the flames from the fire-box. After emerging from the hot devious passages between these pillars, the flames mingle in the first combustion-chamber, G, and are mixed with the hot air discharged through the flue *d* of bridge-wall D. This combustion-chamber is now completely filled with a smokeless flame, which is temporarily checked in its progress by the partition F, the openings of which, *f*, afford but a limited area for escape. As soon, however, as the flames pass through these openings they again mingle in the second combustion-chamber, G′, and have their exit from the latter by traversing the return-flues of the boiler or boilers.

As a result of the above-described construction of furnace, the smoke is completely burned and the utmost economy of fuel obtained, which reduced consumption of coal is still further increased by surrounding the steam-chambers of the boilers with the hot-air spaces *a b*.

Owing to the manner of placing the series of refractory columns E in the furnace, either one of them can be readily removed and replaced by a new one in case of a column being burned out or otherwise injured.

I claim as my invention—

1. The horizontal arches P, formed in the side walls of the furnace, and having their abutments or bearings sustained by the buck-bars R and tie-rods *r*, substantially as herein described and set forth.

2. The refractory pillars or columns E E′ *e*, arranged on the bridge-wall D, in the manner described, the front row, E, of said pillars serving to support the wall U, which latter is carried up to the boiler, as and for the purpose stated.

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

PETER KIEFER.

Witnesses:
JAMES H. LAYMAN,
PETER KIEFER, Jr.