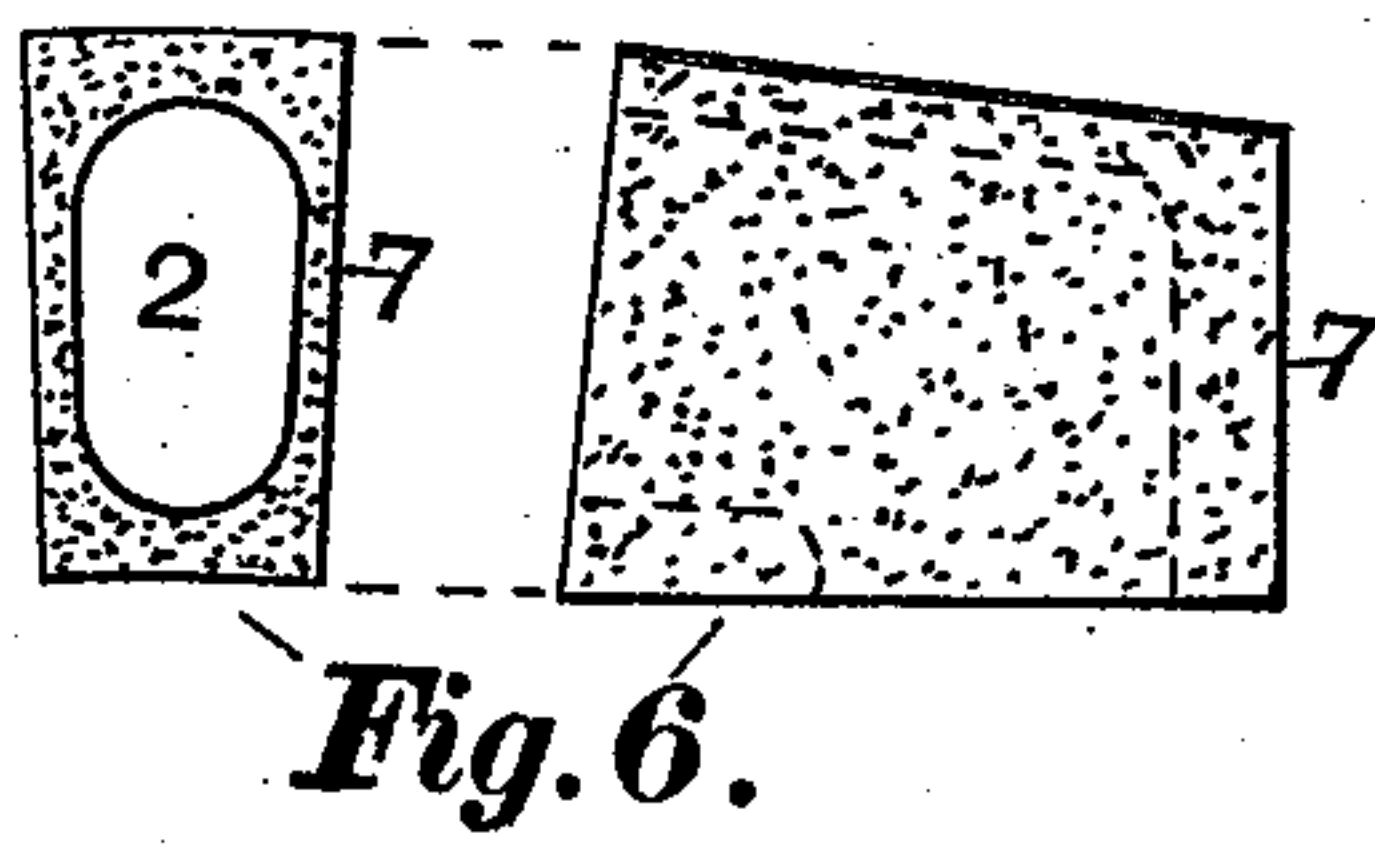
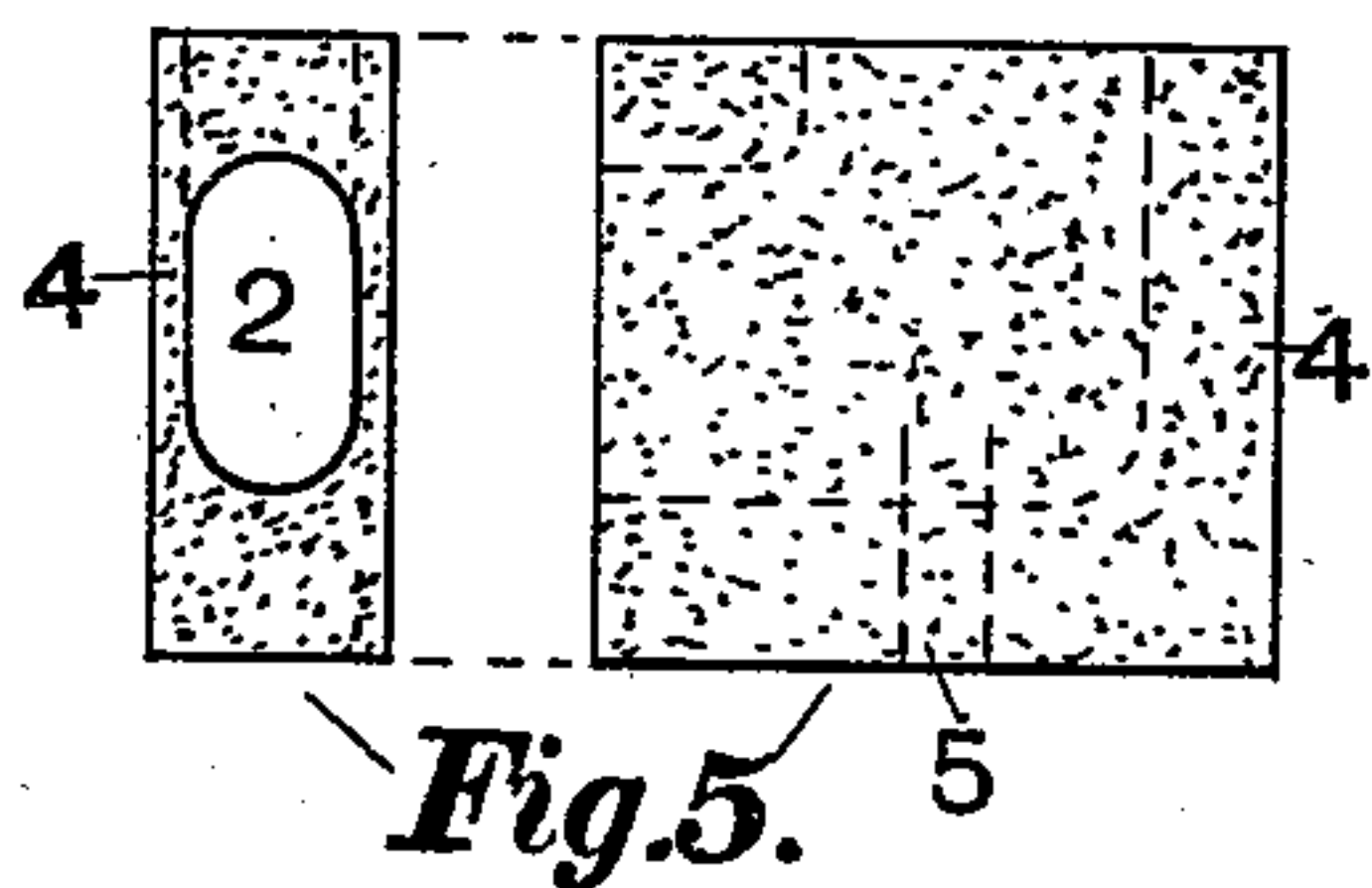
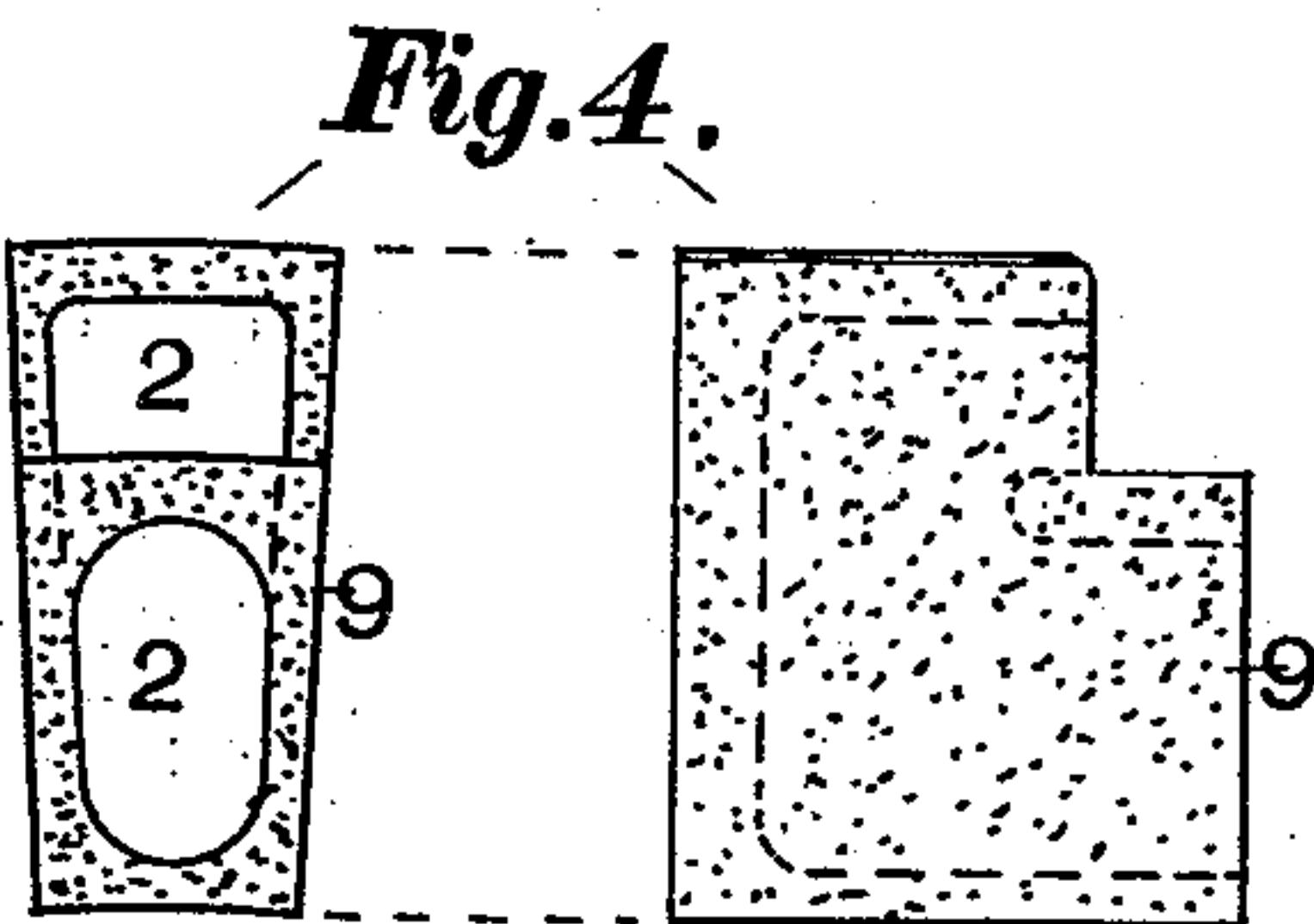
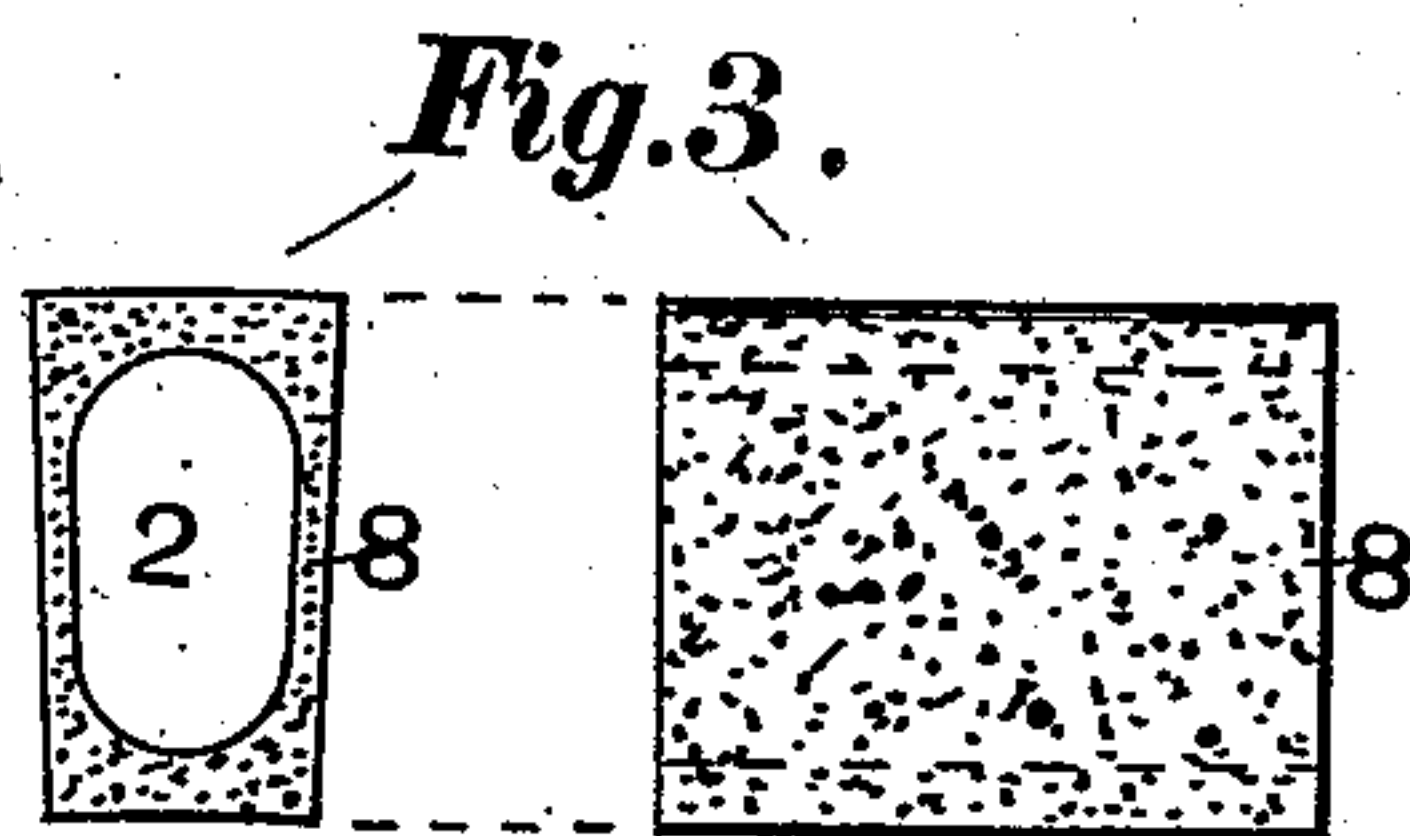
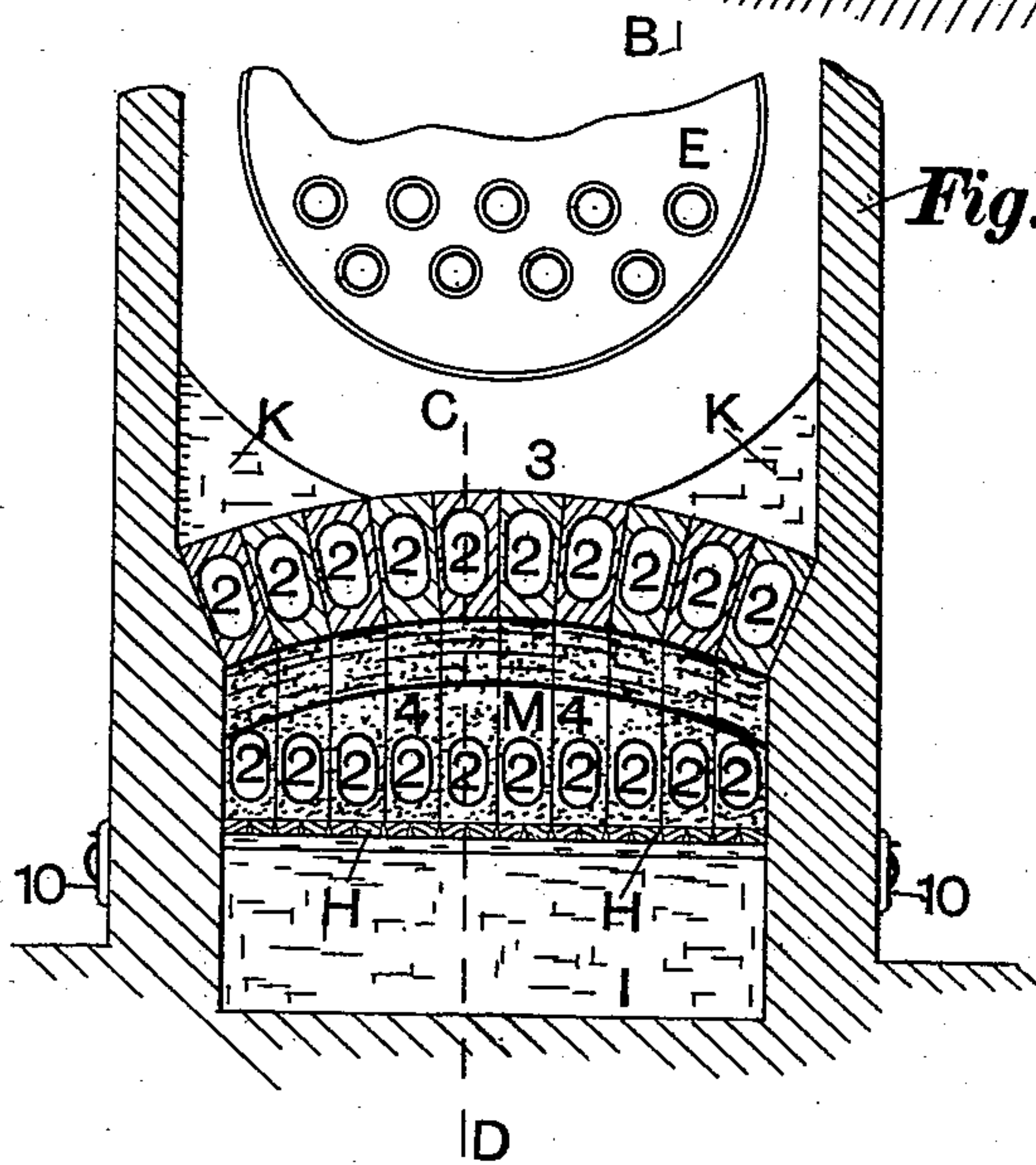
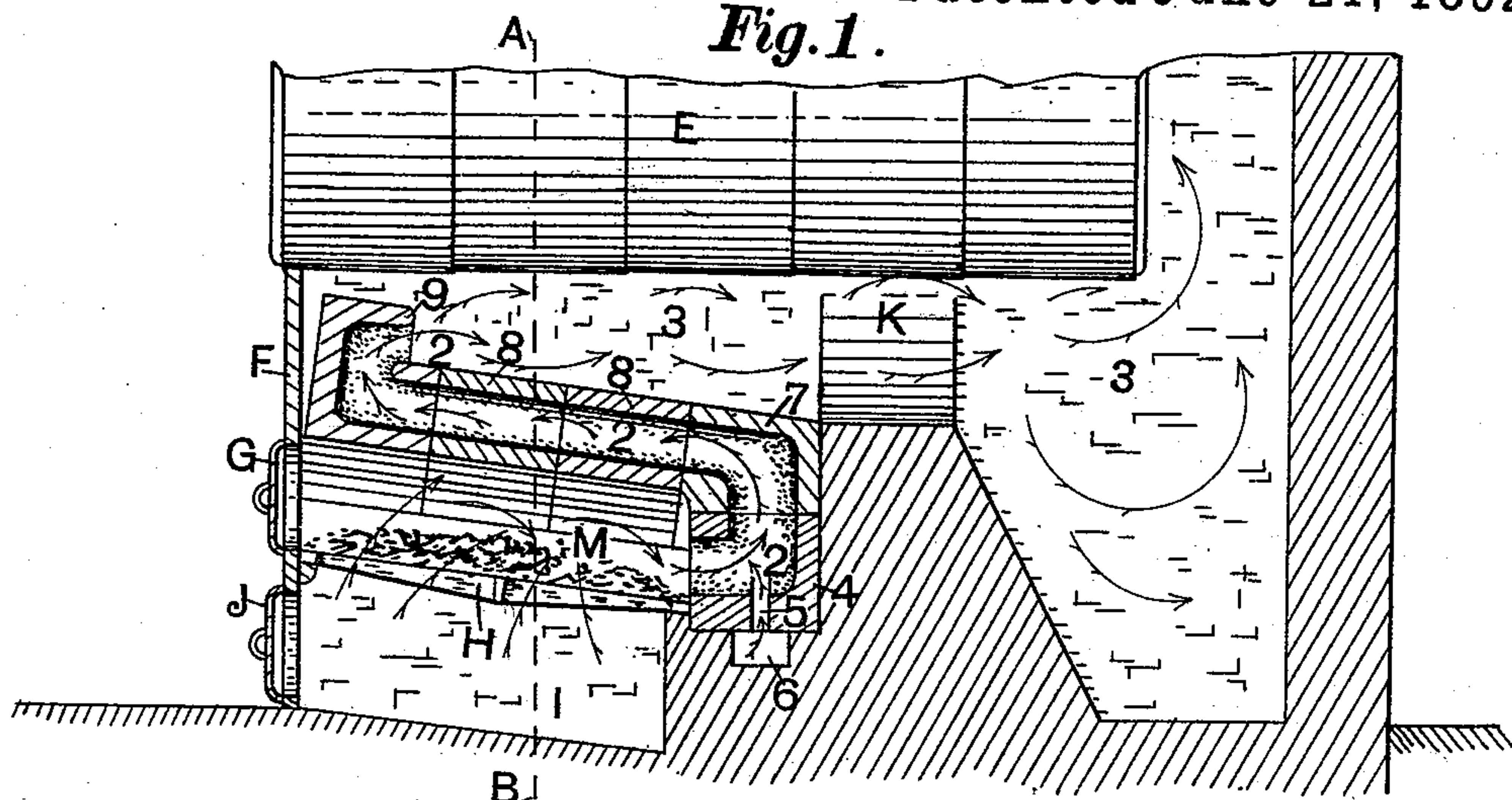


(No Model.)

D. J. MCKENZIE.
FURNACE.

No. 477,263.

Patented June 21, 1892.



WITNESSES:

H. S. Brown.
Edward Cady.

INVENTOR:

Dougal J. McKenzie.
By his attorney Oscar Inell.

UNITED STATES PATENT OFFICE.

DOUGAL J. MCKENZIE, OF CHICAGO, ILLINOIS.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 477,263, dated June 21, 1892.

Application filed March 14, 1892. Serial No. 424,769. (No model.)

To all whom it may concern:

Be it known that I, DOUGAL J. MCKENZIE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Furnace, of which the following is a specification.

My invention relates to a construction of furnace which is specially adapted to use for steam-boilers, but which with slight modification can be used for other purposes.

My objects are to prevent smoke by a construction in which a very high temperature can be maintained and in which complete combustion of the gases from the fuel can be attained before these gases contact with surfaces of a comparatively low temperature; also, the construction of my furnace to be such that it can be easily fitted to the ordinary conditions of furnace side walls, fire-fronts, and grates without the necessity of extensive alterations, and, finally, a construction which can be easily and quickly repaired without highly-skilled help, which objects I attain by the means shown in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of a furnace on line C D, Fig. 2, which embodies my improvement. Fig. 2 is a vertical transverse section on line A B, Fig. 1. Figs. 3, 4, 5, and 6 are side and end views of hollow fire-tile of a form adapted to use in my furnace, and which will be more particularly described hereinafter.

Similar letters and figures refer to like parts throughout the several views.

In this instance E is a steam-boiler; F, the fire-front with furnace-door G; H, the grates; I, ash-pit; J, ash-pit door; K, bridge-wall, these parts being similar in all ordinary furnaces.

In Fig. 1 is shown in section a passage-way 2 from the rear end of the grates H upward, then forward, then upward, and rearward, which passage-way forms an exit for the hot gases of combustion from grates H to the space 3 under boiler E. In Fig. 2 it is seen that there are a number of these passage-ways, each one in this instance being independent of the other. This series of passage-ways is composed of hollow tiles, whose details are shown in Figs. 3, 4, 5, and 6. Fig. 5 is respectively an end and side elevation of tile

4, which forms the base or beginning of the passage-way 2, which tile has a passage within it of an elbow shape, into which passage enters a short vertical passage 5 for the admission of air from a horizontal transverse passage 6 of the furnace, Fig. 1.

Fig. 6 shows, respectively, an end and side elevation of tile 7, which is also provided with an elbow-shaped passage-way, tile 7 being superimposed upon tile 4, the passage-way in each tile registering where they come in contact. There are a number of tiles 8, Fig. 3, which when in position form an arch over the grate-bars H, and tiles 8 have a passage-way which registers with the passage-way in tiles 7. Close to fire-front F is a series of tiles 9, which form an arch with tiles 8; but the passage-way in tiles 9 has a U shape, the lower part of the passage-way registering with the passage-way of tiles 8; but the upper part of the passage-way in tiles 9 is so formed that the gases of combustion passing up through the long passage 2 are projected along the bottom of the boiler in a rearward direction in space 3.

As shown and described, the series of passage-ways 2, formed by the several tiles, has an S shape, the course of the hot gases from the fuel on grates H being shown by the arrows.

One of the principal objections to ordinary arches in furnaces that span the space over the grates from one side wall to the other is that the arches must be made very heavy in order to withstand the effects of expansion and contraction, and this weight, being sustained by the side walls of the furnace, necessitates either very strong walls or a system of bracing which in certain situations causes considerable annoyance.

The hollow tiling used in my construction can be made very light and is particularly adapted to the making of a passage-way for inclosing the gases of combustion within the limited size of an ordinary furnace until complete combination of the gases is attained and resulting in a very high temperature at the rear end of the grate-bars and within the rear end of passage 2, where air from passages 6 and 5 is admitted in any desired quantity by means of registers 10 at each side of the furnace, which guard the ends of pas-

sage 6. The space M above the grates I will call the "fuel-chamber" and space 3 under the boiler I will call the "heating-chamber" for convenience in explaining the manner of operation, the arch of tile, consisting of parts 7, 8, and 9, serving as a division-wall between chambers M and 3.

In operation it is intended that the coal shall be so distributed upon grates H in chamber M that the portion near the furnace-door G forward toward the center of the length of the grates shall go through the process of coking, while the portion of fuel at the extreme rear end of the grate-bars is raised to a very high temperature, which fuel as fast as it is consumed is replaced by that near the center of the length of the grates. The amount of air necessary to produce perfect combustion of the gases of the fuel not being admitted at the grates H, the air-passages 5 from transverse chamber 6 have been provided and the exact amount of air admitted to attain the best results by means of the registers 10, (shown in Fig. 2,) and while the mixed air and gases are on their way through the highly-heated passages 2 the desired combination takes place, after which the gases are drawn out into chamber 3 to contact with the boiler or any other object to be heated. I claim that the series of passages 2 have a great advantage over any ordinary system of brick arches, since the volume of gases from the fuel is divided into a number of separate streams, which are closely surrounded by highly-heated walls, where rolling currents are produced, thoroughly mixing the air admitted at passages 5, and the high tempera-

ture causing an almost instantaneous combination of the elements to produce carbonic dioxide before the hot gases are lowered in temperature by contact with any surface of a comparatively low temperature.

I claim as my invention and desire to secure by Letters Patent—

1. A furnace having a fuel-chamber M and heating-chamber 3, heating-chamber 3 above fuel-chamber M, a horizontally-disposed arch consisting of heat-resisting material separating chambers M and 3, and passage-ways 2 within said arch connecting the rear end of chamber M with the front end of chamber 3, substantially as shown and described.

2. A furnace having a fuel-chamber M and heating-chamber 3, one above the other, and a horizontally-disposed top for said fuel-chamber, said top separating said chambers, said top consisting of hollow tile, the hollow portions of said tile registering with each other and forming passage-ways for the gases of combustion from the rear end of said fuel-chamber to the front end of said heating-chamber, substantially as described.

3. In a furnace as described, auxiliary air-passages capable of admitting a supply of air within the passage-ways 2 at the rear end of said passage-ways, for the purpose stated.

In testimony that I claim the foregoing I have hereunto set my hand this 4th day of March, 1892, in the presence of witnesses.

DOUGAL J. McKENZIE.

Witnesses:

S. LAING WILLIAMS,
OSCAR SNELL.