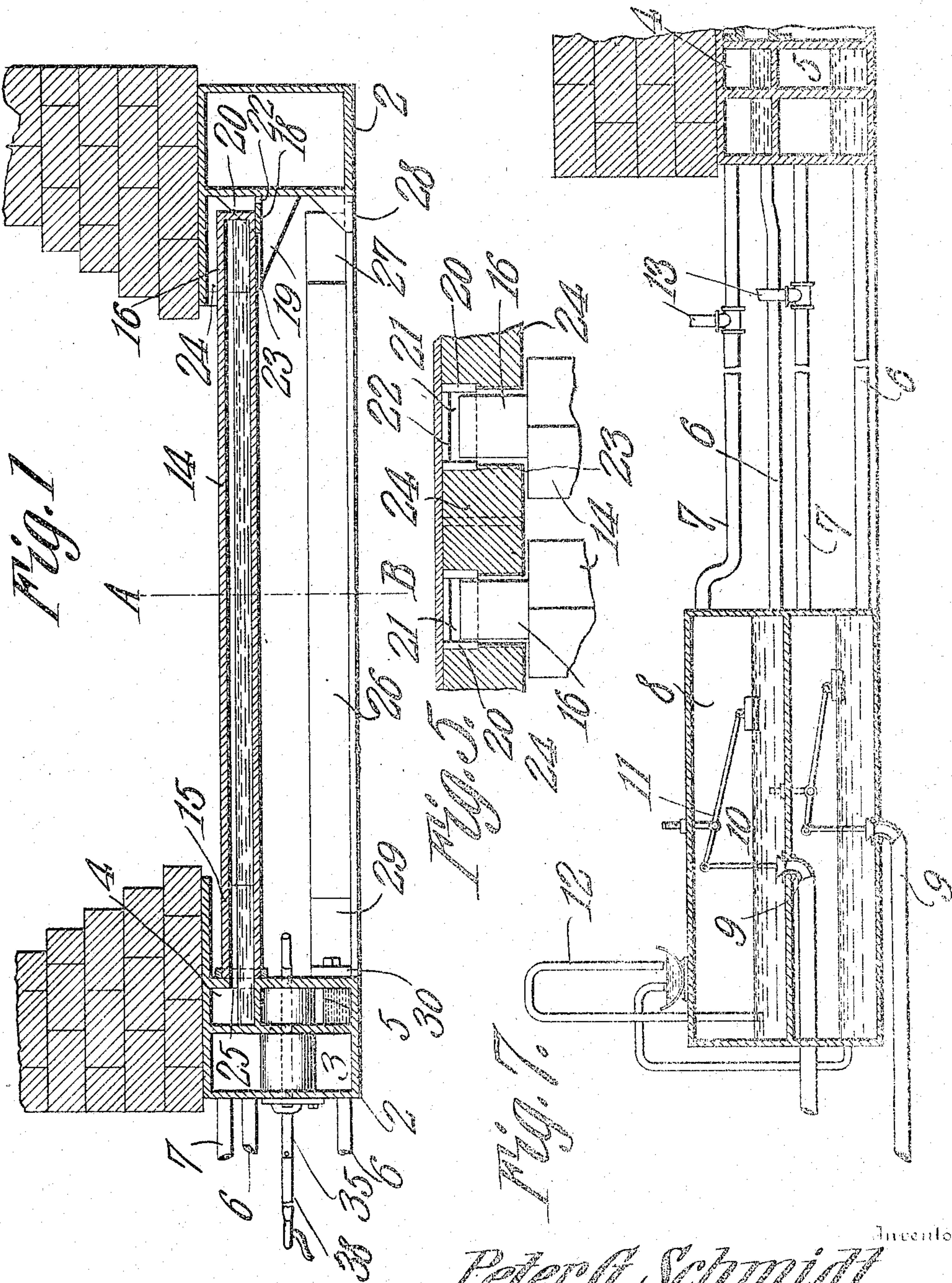


P. G. SCHMIDT.  
GAS PRODUCING FURNACE.  
APPLICATION FILED MAR. 9, 1908.

Patented Aug. 10, 1909.  
4 SHEETS—SHEET 1.

930,563.



Witnesses

*E. H. Smith*  
*Herbert D. Lawson*

*Peter G. Schmidt.*

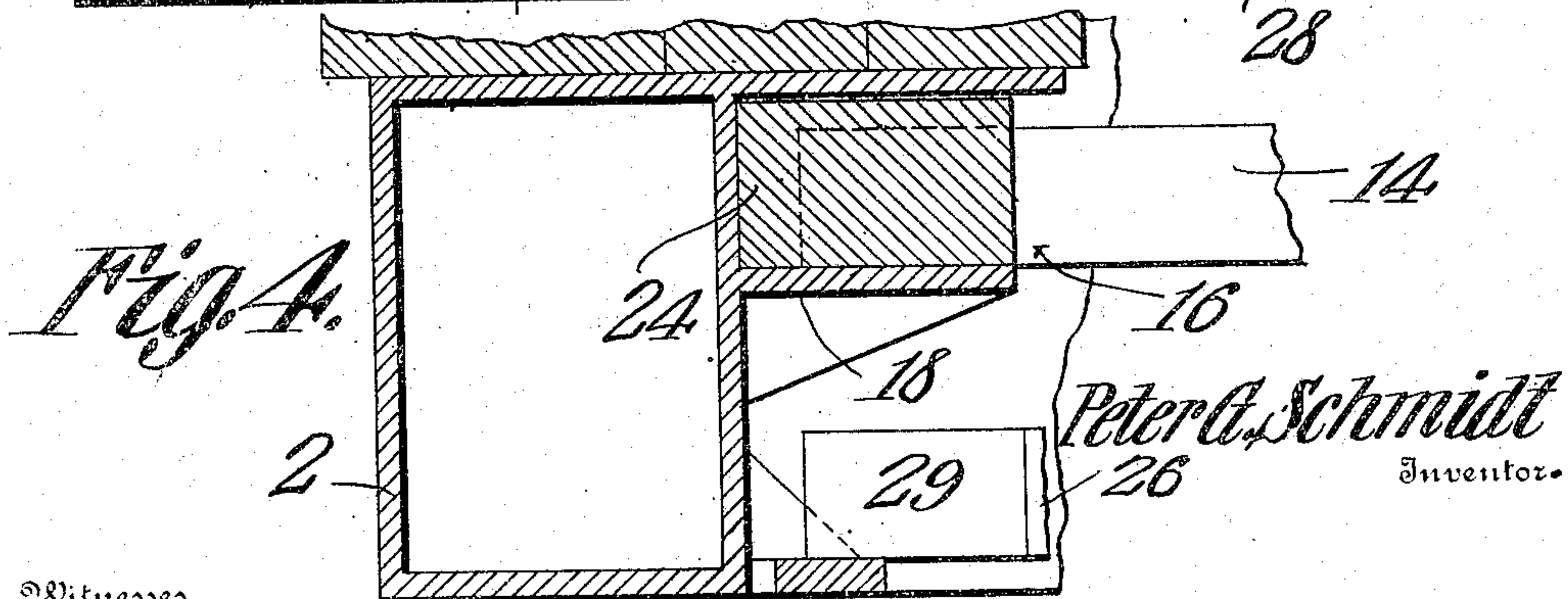
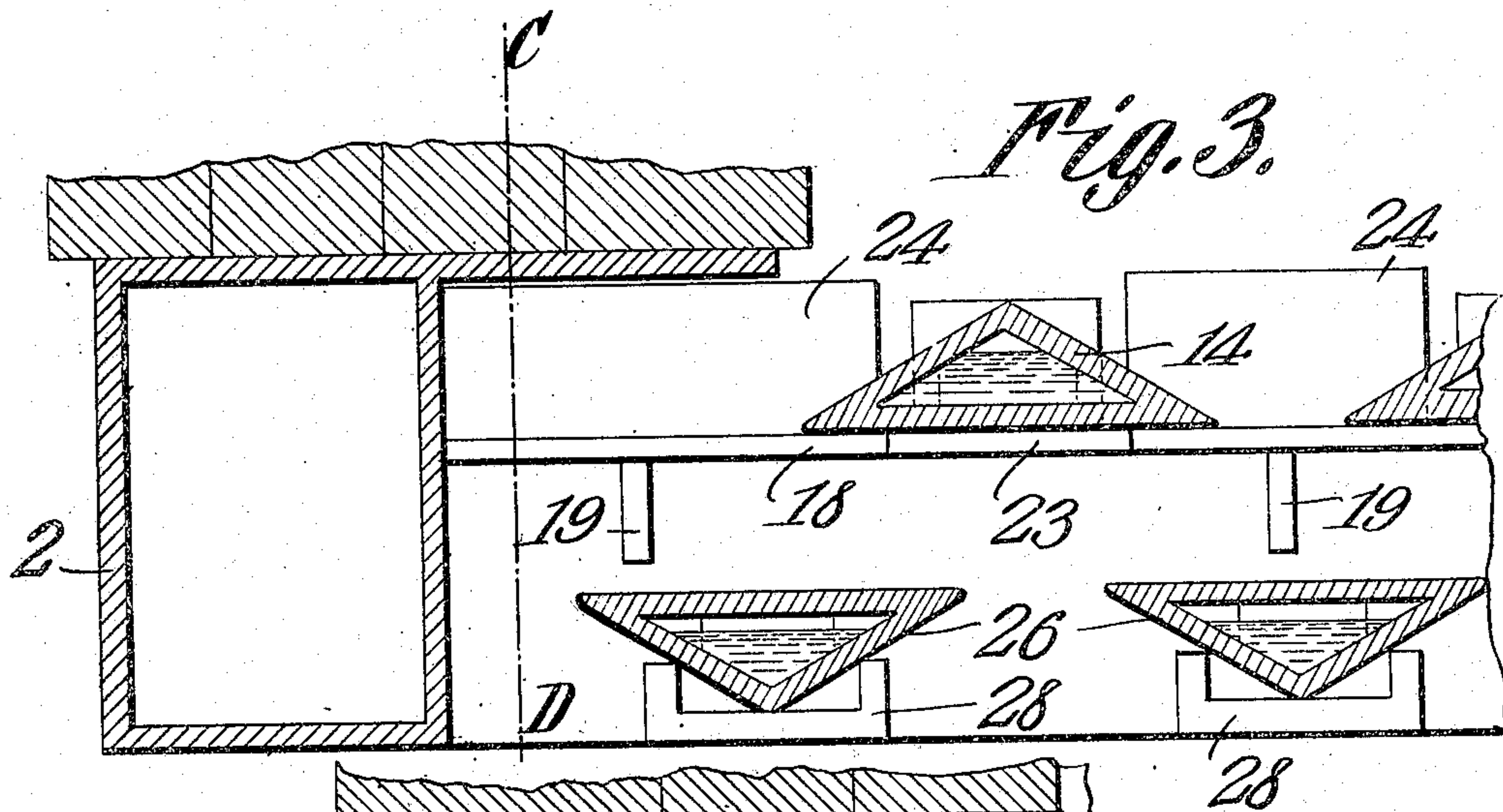
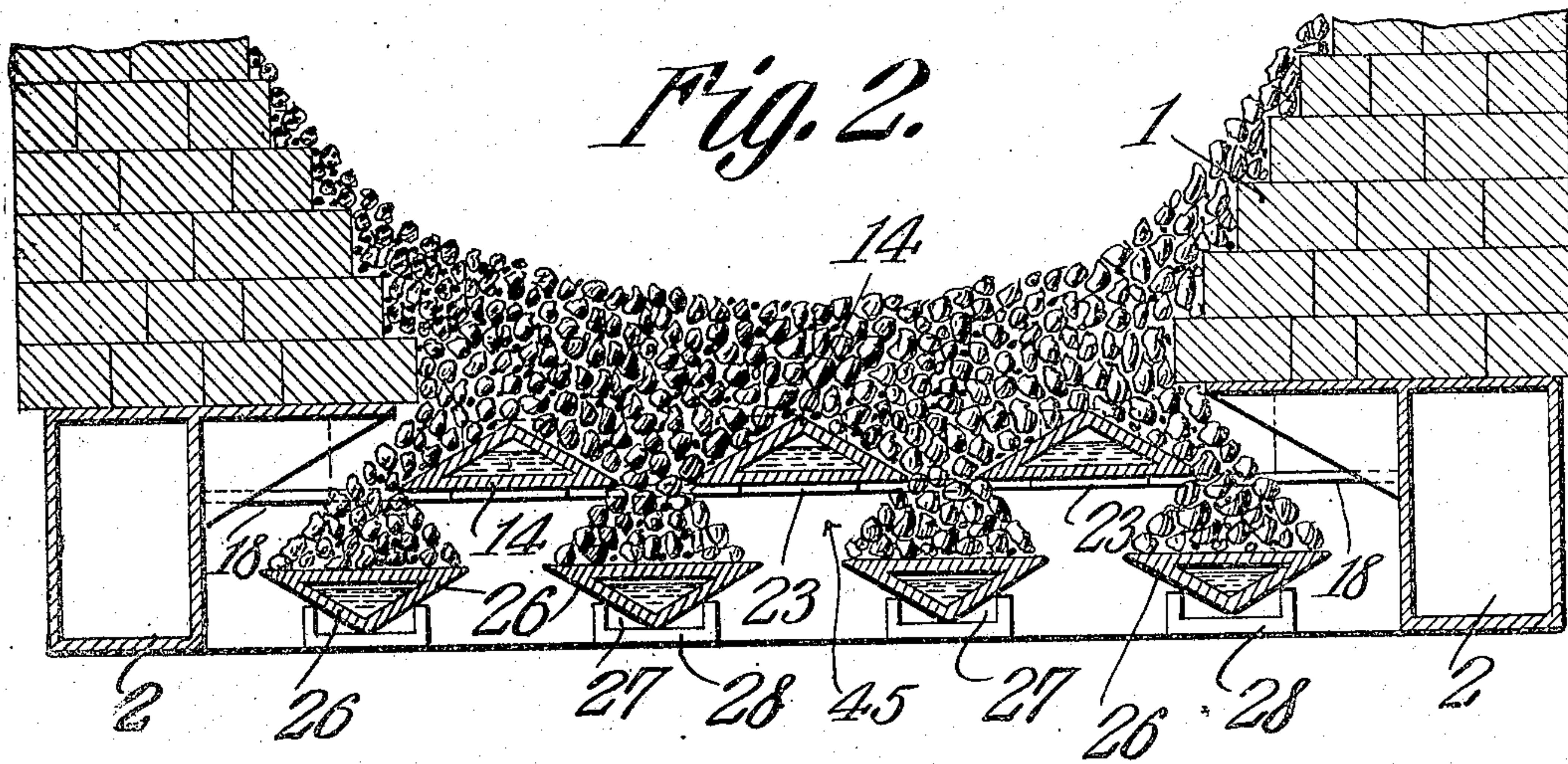
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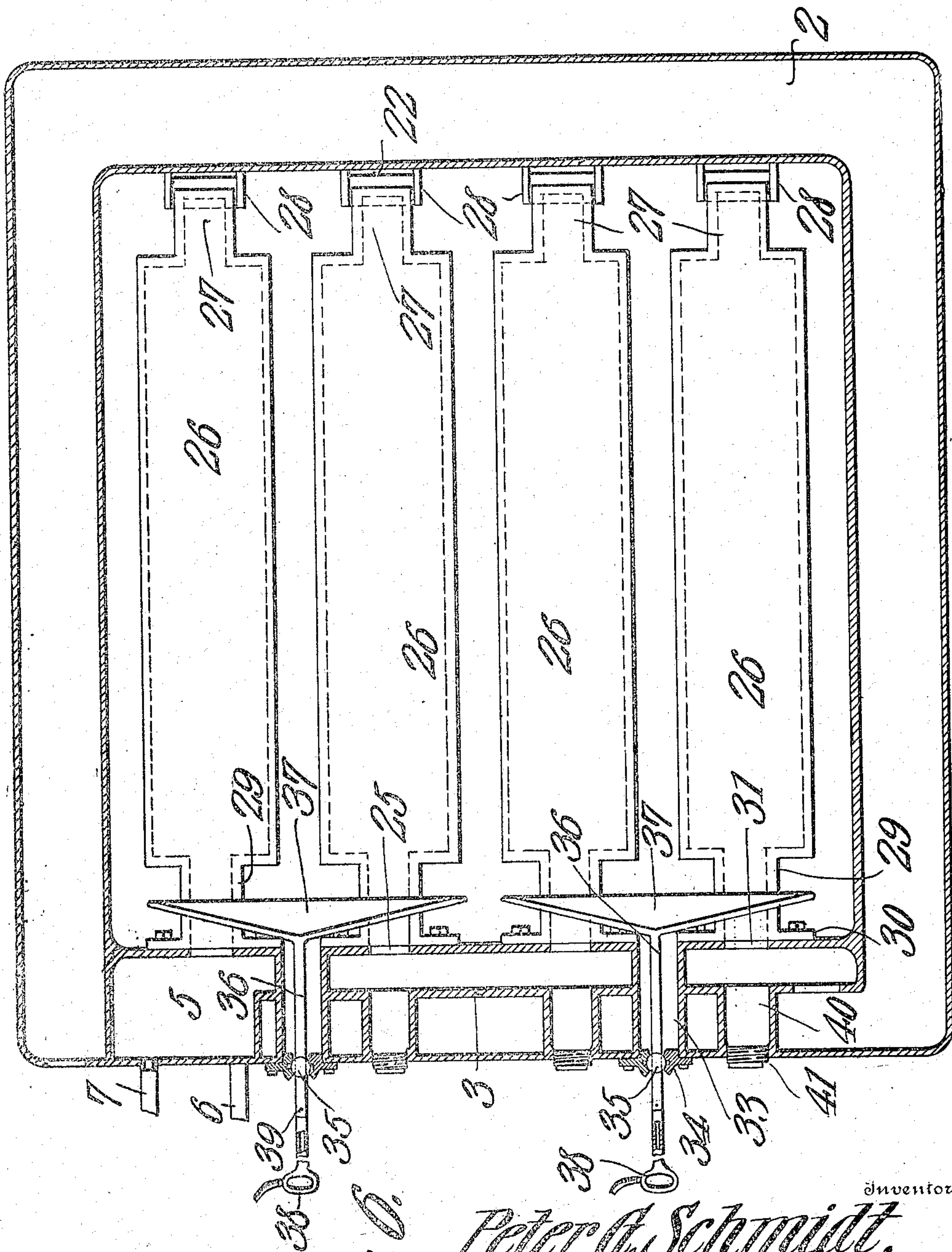


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4 SHEETS—SHEET 3.



Witnesses  
*Herbert D. Lawrence*  
Fig. 6.

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By *Charles H. Cochrane*  
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# UNITED STATES PATENT OFFICE.

PETER G. SCHMIDT, OF TUMWATER, WASHINGTON.

## GAS-PRODUCING FURNACE.

No. 930,563.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed March 9, 1908. Serial No. 419,994.

*To all whom it may concern:*

Be it known that I, PETER G. SCHMIDT, a citizen of the United States, residing at Tumwater, in the county of Thurston and State of Washington, have invented a new and useful Gas-Producing Furnace, of which the following is a specification.

This invention relates to gas producing furnaces. Devices of this character such as heretofore constructed have been found objectionable because it has been difficult, when leaving openings large enough for removing ash and clinkers, to prevent the coal from sifting between the ends of the grate bars and becoming wasted. It has also been difficult to properly support the coal within the furnace without greatly interfering with the circulation of the gases. Moreover, it has been necessary to utilize movable grate bars so that material choking the grate might be displaced. Another decided disadvantage usually incident to furnaces of this character has been the difficulty experienced in removing the ash and clinkers from the grate without chilling the interior of the furnace, or without putting the ash pit into communication with the atmosphere and making it necessary to shut down in order to remove clinkers from the grate.

The object of the present invention is to overcome the above and other disadvantages incident to the ordinary gas producing furnaces by providing novel arrangements of grate bars whereby the mass or body of coal or other gas producing material employed is supported in an efficient manner without materially interfering with the circulation of gases whether or not an up-draft or a down-draft is utilized.

A further object is to provide superposed series of grate bars so positioned that the bars of the upper series constitute means for directing the gas producing material upon the bars of a lower series, the bars of the several series being so positioned relative to one another that the material will be banked upon the lower bars to produce longitudinal conduits or spaces between the banks of material through which the gases are free to circulate while passing upwardly or downwardly through the coal.

Another object is to provide grate bars which are so mounted at their ends as to effectually prevent coal or other material from sifting between the ends of the bars

and the walls of the furnace, or from clogging the furnace at these points.

A still further object is to provide sufficient means for engaging the ends of the bars to hold them rigidly against displacement either vertically or horizontally.

Another object is to provide grate bars designed to be cooled by water or other cooling fluid supplied to the interiors thereof, in case of a liquid the fluid within the bars of each of the upper and lower series being maintained at independently predetermined levels by mechanism provided for that purpose.

A further object is to provide means interposed between the series of grates and designed to be actuated longitudinally of the bars for forcing the material from the lower bars after it has been sufficiently coked or consumed, said means being fluid cooled and having a fluid cooled extension detachably connected to it whereby it can be actuated manually without causing discomfort to the operator.

With these and other objects in view the invention consists of certain novel features of construction and combinations of parts which will be hereinafter more fully described and pointed out in the claims.

In the accompanying drawings is shown the preferred form of the invention.

In said drawings: Figure 1 is a vertical longitudinal section through the grate of a furnace embodying the present improvements. Fig. 2 is a section on line A—A, Fig. 1. Fig. 3 is an enlarged vertical transverse section through a portion of the grate and showing more particularly the bar supporting brackets at one end of the furnace and the filling blocks supported thereby. Fig. 4 is a section on line C—D, Fig. 3. Fig. 5 is a horizontal section through some of the filling blocks and showing the adjoining portions of the bars and their brackets in plan. Fig. 6 is a horizontal section through the entire furnace taken on a plane extending between the two series of grate bars. Fig. 7 is a longitudinal section through the mechanism utilized for maintaining the water within the bars at predetermined levels, the connections between said mechanism and the furnace being shown in elevation. Fig. 8 is a plan view of a portion of the grate and showing means whereby liquid and gaseous cooling mediums can be used in the bars.



Fig. 9 is a section on line E—F, Fig. 8. Fig. 10 is a section on line G—H, Fig. 8.

Referring to the figures by characters of reference, 1 designates the retort of the furnace below which is disposed a bosh 2 designed to extend entirely around the grate of the furnace and provided in one end with partitions 3 forming separate non-communicating water heads 4 and 5 which are superposed one above the other. Each of these water heads communicates through a feed pipe 6 and a return pipe 7 with a tank 8 having water inlets 9. A float controlled valve 10 is arranged within each of these tanks for the purpose of regulating the supply of water or other liquid to the tank and maintaining it at a predetermined level. Any suitable means, not shown, may be utilized for adjusting the valve so as to cause it to close when the water reaches any level desired. This means may adjustably support the float carrying lever 11 or can be connected to the valve mechanism at any other point. Each of the tanks has a blow-off pipe 12 whereby excess water or steam can be discharged from the tank if necessary. It is designed, however, to utilize outlet pipes 13 for any steam which might be conducted from the waterheads by way of pipes 7.

The bosh 2 surrounds the choke grate of the furnace which, as indicated in the drawings, consists of upper and lower series of members. The members of the upper series are preferably bars 14 triangular in cross section and provided at their ends with angular necks 15 and 16, respectively. The necks 15 are provided with flanges 17 which are bolted or otherwise secured to the bosh 2 while the necks 16 rest upon a supporting plate 18 which is mounted upon brackets 19 extending from the bosh. Webs 20 extend from the upper face of the supporting plate to the inner surface of the bosh and are arranged in pairs, each pair forming a pocket 21 for the reception of one of the necks 16. Those portions of the plate 18 which are located between the webs of each pair are provided with outlet slits or openings 22 close to the bosh so as to permit the escape of any dust or fine particles which might accumulate between the necks 16 and the bosh 2. The plate 18 is provided between the pockets 21 with extensions 23 which practically close the spaces between the necks 16. Each of these extensions supports a filling block 24 such as a fire brick which is designed to close the space between the pockets and between the bottom of the retort and the plate 18. It becomes impossible therefore for any of the ash or fuel to sift between the necks and become wasted.

Each of the bars 14 is hollow throughout its extent, the end of the neck 16 being closed while the end of the neck 15 is open and designed to register with one of a series

of openings 25 formed in the inner wall of the front portion of the bosh and establishing communication between the bar 14 and the water head 4. As clearly indicated in Figs. 2 and 3 these bars 14 are placed with their broadest faces downward and in the same horizontal plane. As they are spaced apart throughout their lengths it will be obvious that their upper inclined faces form elongated hoppers designed to direct coal onto the bars 26 of the lower series. Each of these bars 26 is of the same construction as the bars 14. They are, however, positioned with their broadest faces uppermost and in the same horizontal plane, each bar 26 being located directly under the space between two of the upper bars. The necks 27 at one end of each of these bars rest within a bracket 28 mounted upon the inner wall of the bosh 2, while the other neck 29 of each bar 26 is provided with flanges 30 bolted or otherwise fastened to the bosh. This neck 29 which is open at its ends registers with an opening 31 whereby communication is established with the water head 5.

A tubular passage 33 extends through the bosh at one end of the furnace and is closed at its outer end by suitable packing 34 in which is mounted a ball 35 capable of partial rotation in any direction. A rod 36 is slidably mounted within the ball and carries a scraper 37 at its inner end so proportioned as to extend across two or more of the bars of the lower series and to contact with them. Rod 36 may be provided with one or more extensions 38 designed to be coupled thereto as at 39. This extension may be tubular and water cooled so that it can be grasped and manipulated without danger of burning the operator.

By referring particularly to Fig. 2 it will be noted that the bars 14 and 26 are so positioned relative to each other that the coal deposited upon the lower bars will be banked thereon with the outer faces of the banks at a proper angle to the horizontal to prevent the coal escaping past the lower bars when fed thereto.

It will be noticed that means are employed whereby access may be conveniently had to the interiors of the various bars of the grate. This means consists of passages 40 extending through the bosh and alining with the openings 25 and 31 each passage being closed by a screw plug 41 or in any other preferred manner.

It will be seen by referring to Figs. 8, 9 and 10 that if it is desired to circulate air or other gaseous fluid through the bars either without or simultaneously with a liquid, pipes 42 can be extended through bushings 43, replacing the plug 41 (Fig. 6). These pipes are closed at their inner ends and provided with holes 44 in their upper portions near said ends for the escape of air etc.



which will cool the bars and flow out into passage or head 4 or 5. Should liquid be used with the air or other gas the vapor or steam generated will be carried out with the 5 air.

Coal when placed within the retort will be fed downward between the bars 14 and onto the flat upper faces of the bars 26 where it will be banked as indicated in Fig. 2. Air 10 conduits or passages 45 will thus be produced between the banks and air or gases will be free to circulate through the body or mass of coal either upwardly or downwardly according to the direction of draft employed. The 15 water contained within the bars will keep them in a comparatively cool state and will circulate back and forth through the pipes 6 and 7. Inasmuch as tank 8 is provided for each series of bars it will be apparent that 20 the level of the water within each series can be maintained at any desired level by means of the float controlled mechanism heretofore mentioned. To remove the material from the lower bars 26 the operator couples the 25 extension 38 to one of the stems or rods 36 and pushes the scraper 37 longitudinally of the adjoining bars so as to force material laterally between said bars. All of the scrapers can be operated in this manner and 30 as they are preferably water cooled there is no danger of the hand of the operator becoming burned thereby. Importance is attached to the novel means employed for mounting the bars and for preventing material from passing through the spaces between 35 the ends thereof. By mounting the bars 14 in this manner only the inclined faces thereof are exposed to the fuel and therefore all of the fuel will be positively directed downward 40 onto the lower bars and none of it becomes wasted. Another novelty is in making a practical grate bar which is of ample size to permit of circulating large volumes of air through it with very little friction and of 45 being able to use the same grate bar as a steam generator which will deliver nominally dry steam.

What is claimed is:

1. In a furnace, superposed series of grate 50 members, the lower members having substantially horizontal upper faces and being spaced from each other to permit the discharge of ash or other residue between them and the upper members being arranged in 55 vertical alignment with the spaces between the lower members, said upper members having inclined upper faces to direct material on to the substantially horizontal faces of the members of the lower series.

2. A grate structure formed of superposed 60 series of members, all of said members being spaced from each other to permit the discharge of material between them, the lower members being disposed in vertical alignment

with the spaces between the upper 65 members, and said lower members having substantially flat upper faces to permit the banking of material thereon.

3. In a grate structure, superposed series 70 of fuel supporting members, all of the members being spaced apart to permit the discharge of material between them, the upper faces of the upper members being inclined to permit the ready discharge of material therefrom, and the upper faces of the lower 75 members being substantially flat to receive said discharged material, said lower members being disposed substantially in vertical alignment with the space between the upper 80 members.

4. In a grate structure, upper and lower series of spaced grate members, said upper 85 members having inclined faces for directing material into the spaces therebetween, the members of the lower series being spaced from each other to permit the discharge of 90 ash or other residue between them, said lower members being of greater width than the spaces between the upper members and arranged to receive and support all material discharged between said upper members.

5. The combination with a furnace; of upper and lower series of grate members, the 95 members of the lower series being disposed below and of greater width than the spaces between the upper members and having horizontal upper faces, and means for permitting the circulation of a cooling medium through the members of each series.

6. The combination with a furnace; of upper 100 and lower series of grate members, the members of the lower series being disposed below the spaces between the upper members, means for permitting the circulation of a cooling medium through the members of 105 each series, and means for maintaining the cooling medium in each series at a predetermined level.

7. The combination with a furnace; of upper 110 and lower series of grate members, means for permitting independent circulations of a cooling medium through the members of said series, and means for maintaining the cooling medium in each series at a predetermined 115 level.

8. The combination with a furnace; of upper 120 and lower series of similar grate members, the members of the upper series having their lower faces in the same horizontal plane the members of the lower series being disposed below and wider than the spaces between the upper members and having flat 125 upper faces in the same horizontal plane, the members of the lower series being spaced from each other to permit the discharge of ash or other residue between them.

9. The combination with a furnace; of a bracket supported therebelow and having



pockets, grate members, necks extending from the members and seated in the pockets, and devices interposed between the necks and supported by the brackets for filling the spaces between the necks.

10. The combination with a furnace; of a bracket supported therebelow, grate members, necks extending from the members and bearing upon the brackets, means for preventing lateral displacement of the necks relative to the bracket, and filling blocks interposed between the bracket and retort and between the necks.

11. The combination with a furnace, and a bosh thereunder, of superposed series of hollow grate members surrounded and supported by the bosh, and means for permitting independent circulations of separate bodies of a cooling medium from the bosh and through the members of the respective sections.

12. The combination with a furnace and a bosh thereunder; of superposed series of hollow grate members surrounded and supported by the bosh, means for permitting independent circulations of a cooling medium from the bosh and through the members of the respective series, and separate means for maintaining the cooling liquid in each series at a predetermined level.

13. A grate comprising upper and lower series of spaced tubular grate members angular in cross section, the members of the upper series having their upper faces converging downwardly, and constituting hoppers, and the members of the lower series having their upper faces disposed in the same horizontal planes and below and wider than the spaces between the upper members, and means for permitting separate circulations of a cooling medium through the respective series.

14. A bar support for gas producing furnaces comprising a bracket having pockets therein, and blocks filling the spaces between the pockets.

15. A support for grate bars comprising a bracket, webs thereon forming bar receiving pockets, and filling blocks supported by the

bracket and between the pockets, said blocks extending beyond the pockets.

16. In a furnace, a plurality of upper grate bars separated from each other to permit the discharge of material therebetween, a lower series of bars parallel with said upper bars and disposed below the spaces between the upper bars, said upper bars constituting means for feeding fuel on to the lower bars, and said lower bars being of a width determined by the angle of pile of the fuel, such width being sufficient to prevent the direct passage of fuel over the edges of said bars by gravity.

17. The combination with a furnace; of a lower series of spaced grate members therein having horizontal top faces and each shaped to support banked material and a series of upper grate members lapping and disposed to direct material onto the lower members, the space between the upper grate members being of such width as to prevent the feeding of material beyond the angle of pile of a bank which may rest upon the lower grate members.

18. The combination with a furnace; of superposed series of hollow grate members therein, means for permitting the circulation of a cooling medium through the members, and means for maintaining said medium at a predetermined level in each series of members.

19. The combination with a furnace and a bosh thereunder; of superposed series of hollow grate members surrounded and supported by the bosh, each member having one end opening into the bosh, and float controlled means for each series of members for maintaining a cooling medium within each series at a predetermined level.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

PETER G. SCHMIDT.

Witnesses:

B. NORUM,  
CHARLES PLATNER.