

U. WEDGE.  
 ROASTING AND LIKE FURNACE.  
 APPLICATION FILED NOV. 29, 1907.

939,880.

Patented Nov. 9, 1909.

2 SHEETS—SHEET 1.

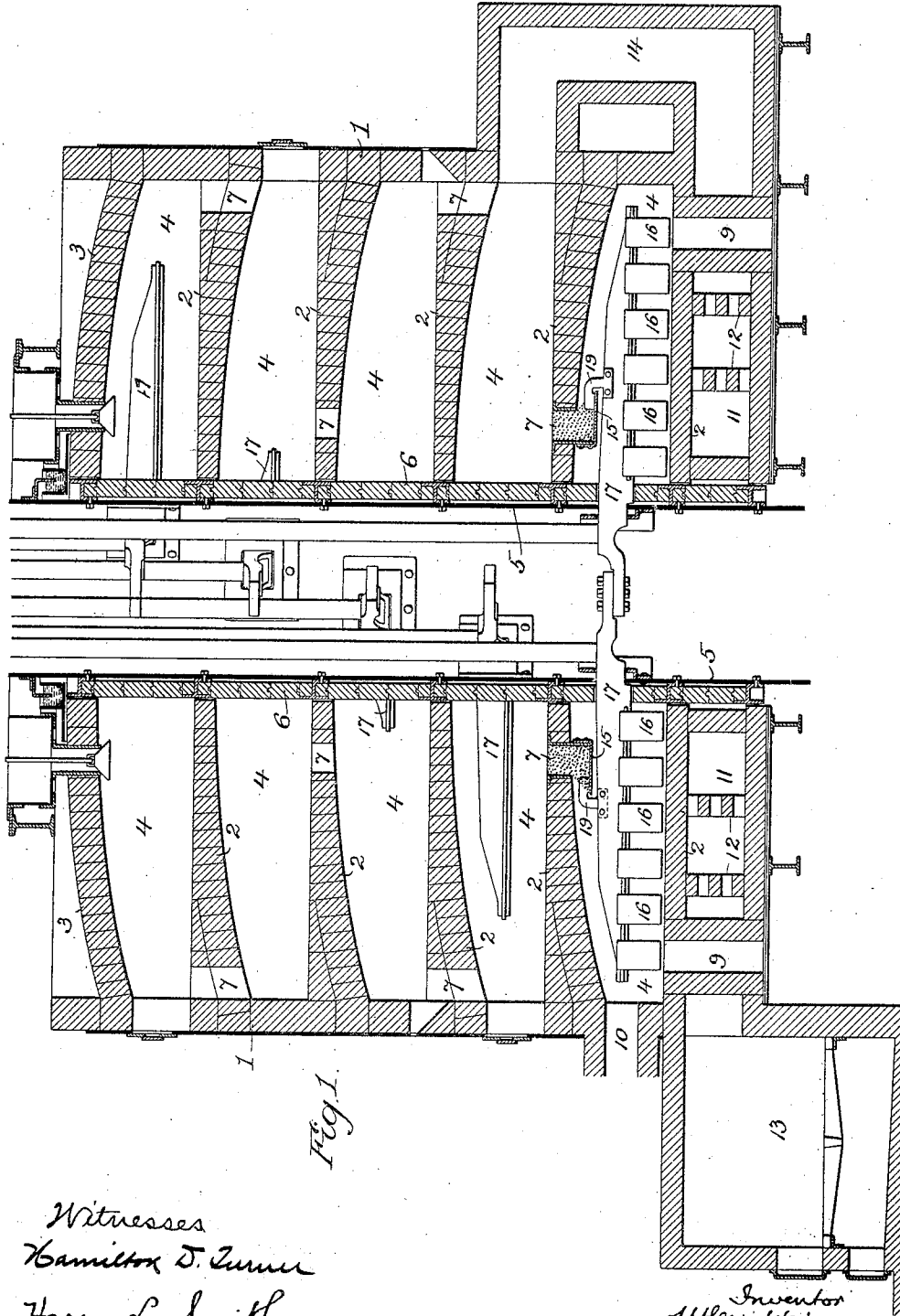


Fig. 1.

Witnesses  
 Hamilton D. Turner  
 Harry L. Smith

Inventor  
 Uley Wedge  
 by his attorneys  
 Philip Taylor

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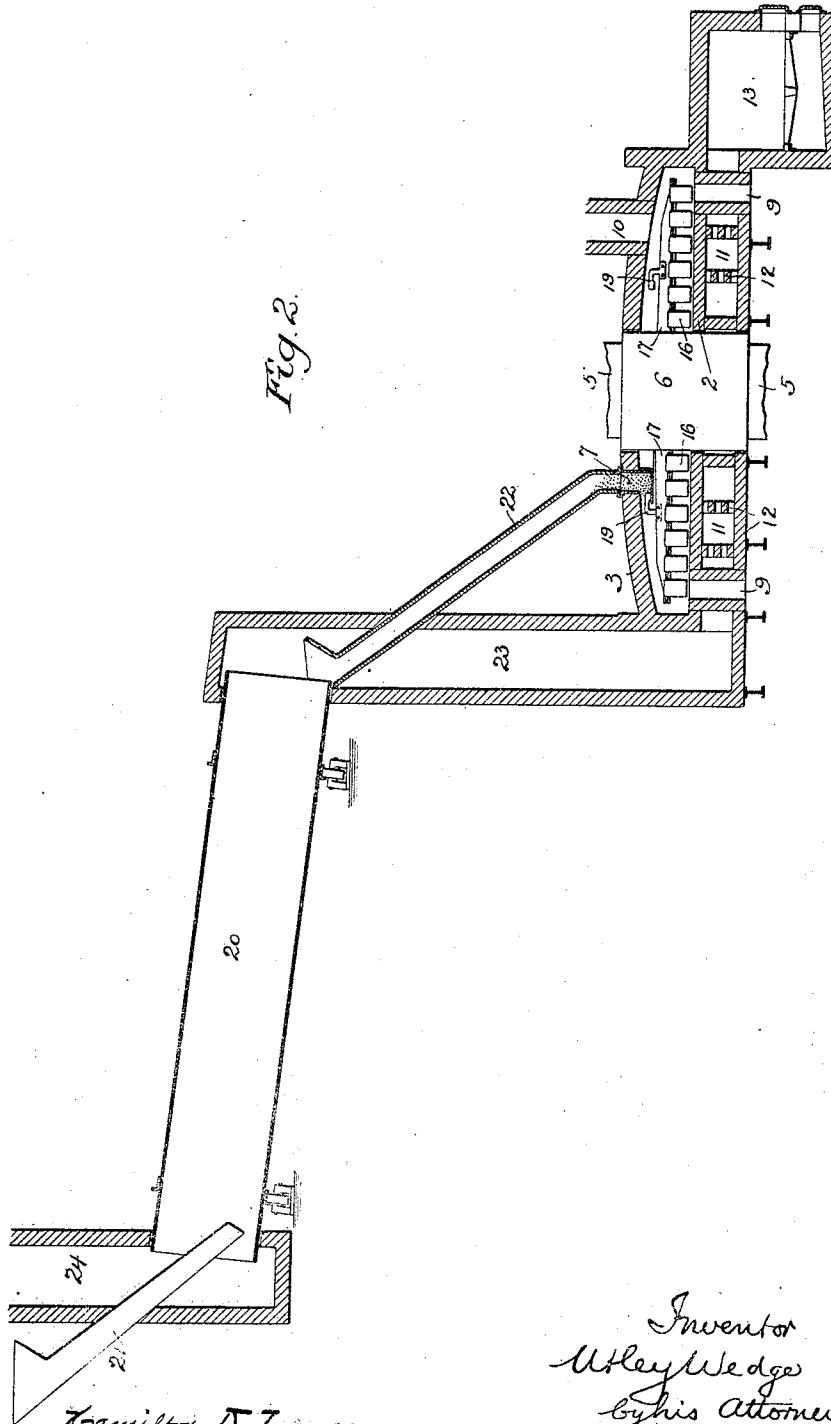


Fig. 2.

Hamilton D. Turner  
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Inventor  
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Smith & Poyer

# UNITED STATES PATENT OFFICE.

UTLEY WEDGE, OF ARDMORE, PENNSYLVANIA.

ROASTING AND LIKE FURNACE.

939,880.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed November 29, 1907. Serial No. 404,309.

*To all whom it may concern:*

Be it known that I, UTLEY WEDGE, a citizen of the United States, residing in Ardmore, Pennsylvania, have invented certain improvements in Roasting and Like Furnaces; of which the following is a specification.

The object of my invention is to so construct a furnace for roasting, oxidizing, desulfurizing, decarbonizing, chlorinating, chloridizing, etc.; (hereinafter, for convenience, referred to simply as an ore roasting furnace) that the rapid preliminary heating or incipient roasting of the ore can be effected without interference with the subsequent recovery of the vapors or gases which it may be desired to save in whole or in part. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical sectional view of one form of furnace constructed in accordance with my invention, and Fig. 2 is a vertical sectional view of a modified form of furnace embodying certain features of my invention.

Referring, in the first instance, to Fig. 1 of the drawings, 1 represents the outer wall of the furnace, which is preferably of circular form, the interior of the furnace being divided by transverse hearths 2 and a roof 3 into a series of superposed working chambers 4, each provided, by preference, with stirring and conveying mechanism of any appropriate character, mounted upon a central shaft 5, which is preferably sheathed with blocks 6 of refractory material to protect it from the heat, the various working chambers communicating with each other through passages 7, and the lower chamber 40 having ore discharge outlets 9 and a gas outlet flue 10.

Above the furnace may be mounted any suitable feeding device, whereby the green or wet ore is discharged into the uppermost working chamber of the furnace.

Beneath the hearth 2 of the lowermost working chamber of the furnace is a heating chamber 11, preferably provided with brick checker-work partitions 12 which perform the double duty of supporting said hearth and causing distribution of the products of combustion throughout the entire area of the said chamber 11, said products of combustion being derived from a fireplace

13 of any appropriate character, suitably located, or, instead of said fireplace, any available oil or gas burner may be employed.

After the products of combustion have circulated through the heating chamber 11 they pass, by means of a flue 14, to the second working chamber of the series, and thence through the passages 7 in succession to the chambers above the same, finally escaping from the uppermost chamber in any desired manner.

Flow of gas from the lowermost working chamber 4 to that above it is prevented by providing, at the lower end of each of the passages 7 between said working chambers, a shelf 15, upon which the ore collects and accumulates until it has backed up in the passage in quantity sufficient to prevent upward flow of gas therethrough, each passage being open at one side in order that the ore deposited upon the shelf 15 may be removed therefrom in sufficient quantity to properly feed the lowermost chamber of the furnace, the place of the removed bodies of ore being filled by flow of ore from the upper portion of the passage, but the quantity of ore removed at any one time not being sufficient to unseal the passage. The lowermost working chamber thus acts as a muffle furnace, the heat being applied there to externally and no access of the products of combustion to the working chamber being permitted for admixture with the gases driven off from the ore in said chamber, while in the upper chambers of the furnace the products of combustion are permitted to come into direct contact with the ore and therefore effect the drying and preliminary heating of the same much more rapidly than if it were treated entirely in a furnace of the muffle type.

Any desired means may be employed for removing the ore from the sealed passages between the lowermost working chamber of the furnace and that above the same. When the stirring and conveying devices of the furnace consist of blades 16 carried by arms 17 on the shaft 5 a simple means of accomplishing this result is by providing said arms 17 with suitable scrapers 19, overlapping the outer portions of the shelves 15, as shown, so as to scrape the ore from said shelves as the scrapers are carried around by the arms 17, the ore flowing down onto

the shelf again in the rear of each scraper, in order to prevent the unsealing of the passages 7.

In Fig. 1, I have, for convenience, shown the stirring and conveying blades 16 on the lowermost arms 17 only, but in practice all of the arms 17 are intended to be thus equipped.

In that embodiment of my invention shown in Fig. 2, the working chamber 4 of the muffle furnace receives its supply of ore from an elevated rotary kiln 20, such as is commonly employed in the manufacture of cement, this kiln being slightly inclined and the wet or green ore being supplied through a suitable spout 21 to the elevated end of the kiln, and, after flowing downwardly through the same, being discharged through another spout 22 into the working chamber of the muffle furnace wherein it is treated in the same manner as in the lowermost working chamber in the furnace shown in Fig. 1.

The products of combustion from the heating chamber 11 pass through a flue 23 to the discharge end of the rotary kiln 20, then flow through the same in contact with the downwardly traveling mass of ore therein, and finally escape through a suitable discharge flue 24, whereby the drying and preliminary heating of the ore is effected by direct contact of the products of combustion therewith, and the final treatment of the ore for the recovery of the gases therefrom is effected in a muffle furnace, communication between the latter and the rotary kiln 20 being prevented by sealing the lower end of the spout 22, and providing for the removal of the ore therefrom by scrapers 19 on the stirrer arms 17 in the same manner as in the furnace shown in Fig. 1.

Although, in each of the embodiments of my invention which I have shown, but one muffle chamber is employed for the recovery of the gases driven off from the ore by the heat, it will be evident that a plurality of such chambers may be employed, if desired, the passage between the first muffle chamber and the chamber above the same, to which the products of combustion are admitted, being sealed against the passage into the latter chamber of the gases generated in the muffle chamber below the same.

The term "open member" as used in certain of my claims is intended to mean a member through which the products of combustion from the heating furnace are caused to pass in contact with the material under treatment, as distinguished from a "muffle member" in which said products of combustion are excluded from contact with said material, and each of said members may comprise any desired number of treating chambers. The arrangement of the members of the furnace may also be reversed, if de-

sired, that is to say, the material under treatment may first pass through the muffle member, and then through the open member.

I claim:—

1. A furnace in which are combined an open member in which the heating gases have access to the material under treatment and a muffle member from which said heating gases are excluded, means for collecting the gases produced in said muffle member, and a central shaft carrying, in both the open and muffle members of the furnace, means for stirring and conveying the material on the hearths thereof.

2. A furnace in which are combined two members operating successively upon the material under treatment, one of said members being an open member in which the heating gases have access to the material under treatment and the other a muffle member from which said heating gases are excluded, means for collecting the gases produced in the muffle member of the furnace, and a central shaft carrying means located both in the open and muffle members of the furnace and serving to stir and convey the material upon the hearths of the same.

3. A furnace in which are combined an open member to which the heating gases have access, a muffle member from which the heating gases are excluded, and means whereby the material under treatment is caused to pass first through the open member and then through the muffle member.

4. A furnace in which are combined two members, operating successively upon the material under treatment, one of said members being an open member and the other a muffle member, the communication between said members having a seal whereby flow of gas therethrough is prevented.

5. A furnace in which are combined an open member, a muffle member, and means whereby the material under treatment is caused to pass first through the open member and then through the muffle member, communication between said members having a seal whereby flow of gas therethrough is prevented.

6. A furnace having a plurality of working chambers through which the material under treatment is caused to pass in succession, a terminal chamber or chambers of the series constituting part of a muffle furnace, and another chamber or chambers permitting access of products of combustion to the material under treatment as it passes through the same.

7. A furnace having a plurality of working chambers through which the material under treatment is caused to pass in succession, a terminal chamber or chambers of the series constituting part of a muffle furnace, and another chamber or chambers per-

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mitting access of products of combustion to the material under treatment as it passes through the same, the communication between the muffle furnace chamber and the open working chamber being sealed against the passage of gas therethrough.

8. A furnace having a fireplace or other fuel burner and a plurality of working chambers through which the material under treatment can pass in succession, a terminal chamber or chambers of the series constituting part of a muffle furnace, and being externally heated by the products of combustion from said fuel burner, and another chamber or chambers of the series directly receiving said products of combustion and causing them to contact with the material under treatment.

9. A furnace having a fireplace or other fuel burner and a plurality of working chambers through which the material under treatment can pass in succession, a terminal chamber or chambers of the series constituting part of a muffle furnace, and being externally heated by the products of combustion from said fuel burner, and another chamber or chambers of the series directly receiving the products of combustion and causing them to contact with the material under treatment, communication between the muffle furnace chamber and the adjoining working chamber being sealed against the passage of gas therethrough.

10. A furnace having a plurality of working chambers disposed one above another and through which in succession the material under treatment is caused to pass, a fireplace or other fuel burner, a heating chamber in communication therewith and disposed below the lowermost working chamber, and communication between said heating chamber and a chamber or chambers above said lower chamber.

11. A furnace having a plurality of working chambers disposed one above another and through which in succession the material under treatment is caused to pass, a fireplace, or other fuel burner, a heating chamber in communication therewith and disposed below the lowermost working chamber, communication between said heating chamber and a chamber or chambers above said lower chamber, and a sealed communication between said lower chamber and the chamber above the same, whereby the escape of gas from said lower chamber into said upper chamber is prevented.

12. A furnace having a plurality of working chambers disposed one above another and through which in succession the material under treatment is caused to pass, a fireplace or other fuel burner, a heating chamber in communication therewith and disposed below the lowermost working chamber, communication between said heat-

ing chamber and a chamber or chambers above said lower chamber, and means for distributing the products of combustion in the heating chamber.

13. A furnace having a plurality of working chambers disposed one above another and through which in succession the material under treatment is caused to pass, a fireplace or other fuel burner, a heating chamber in communication therewith and disposed below the lowermost working chamber, communication between said heating chamber and a chamber or chambers above said lower chamber, and means for distributing the products of combustion in the heating chamber, said means also constituting a support for the floor or hearth of the working chamber above said heating chamber.

14. A furnace having a plurality of working chambers disposed one above another and through which the material under treatment is caused to pass in succession, a shelf for causing the piling up of the material under treatment in the passage between a lower working chamber and a chamber above the same, and means for effecting a gradual removal of material from said shelf.

15. A furnace having a plurality of working chambers disposed one above another and through which, in succession, the material under treatment is caused to pass, means for externally heating a lower working chamber and for internally heating, by the direct flow of products of combustion through, a chamber or chambers above the same, a shelf cooperating with the passage between the lower working chamber and the chamber above the same, and serving to back up the material under treatment in said passage, and means for gradually removing the material from said shelf.

16. A furnace having a plurality of working chambers disposed one above another and through which, in succession, the material under treatment is caused to pass, a shelf cooperating with the passage between a lower chamber and a chamber above the same and serving to back up the material under treatment in said passage so as to seal the same, a rotatable shaft having a projecting arm in said lower chamber, and a scraper mounted on said arm and serving to remove the material under treatment from said shelf.

17. A furnace having a plurality of working chambers disposed one above another in the same structure, through which chambers in succession the material under treatment is caused to pass, means for externally heating the lowermost chamber of the series, and means for internally heating, by direct flow of the products of combustion through, a plurality of the chambers above the same.

48. A furnace having a plurality of working chambers disposed one above another in the same structure, through which chambers, in succession, the material under treatment is caused to pass, means for externally heating the lowermost chamber and for internally heating, by direct flow of the products of combustion therethrough, a plurality of chambers above the same, and means for sealing against the flow of gas the communi-

cation between the lowermost chamber and the chamber above the same.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

UTLEY WEDGE.

Witnesses:

HAMILTON D. TURNER,  
KATE A. BEADLE.