

U. WEDGE.  
FURNACE.  
APPLICATION FILED APR. 16, 1908.

946,178.

Patented Jan. 11, 1910.

4 SHEETS—SHEET 1.

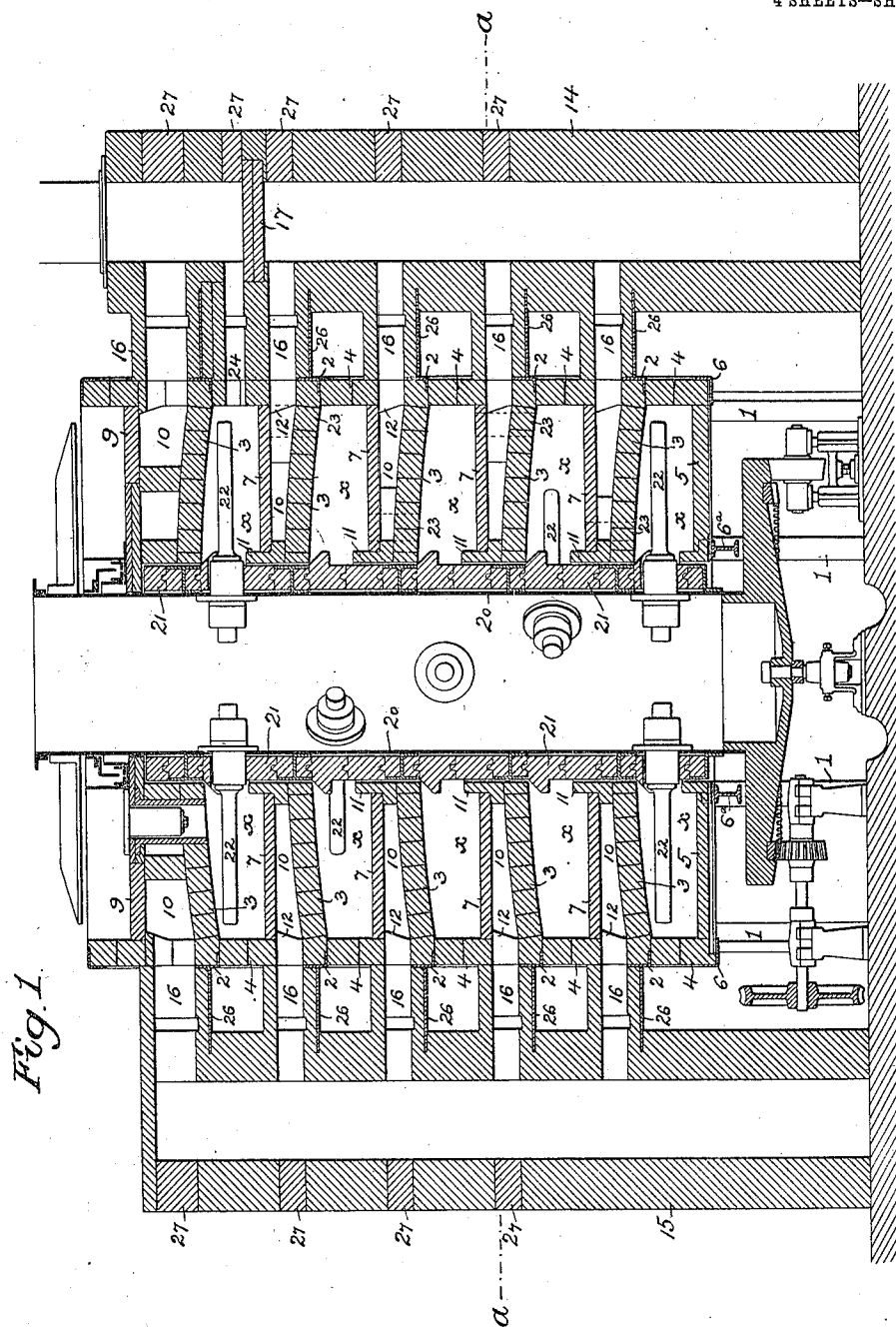


Fig. 1.

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Kate A. Biddle

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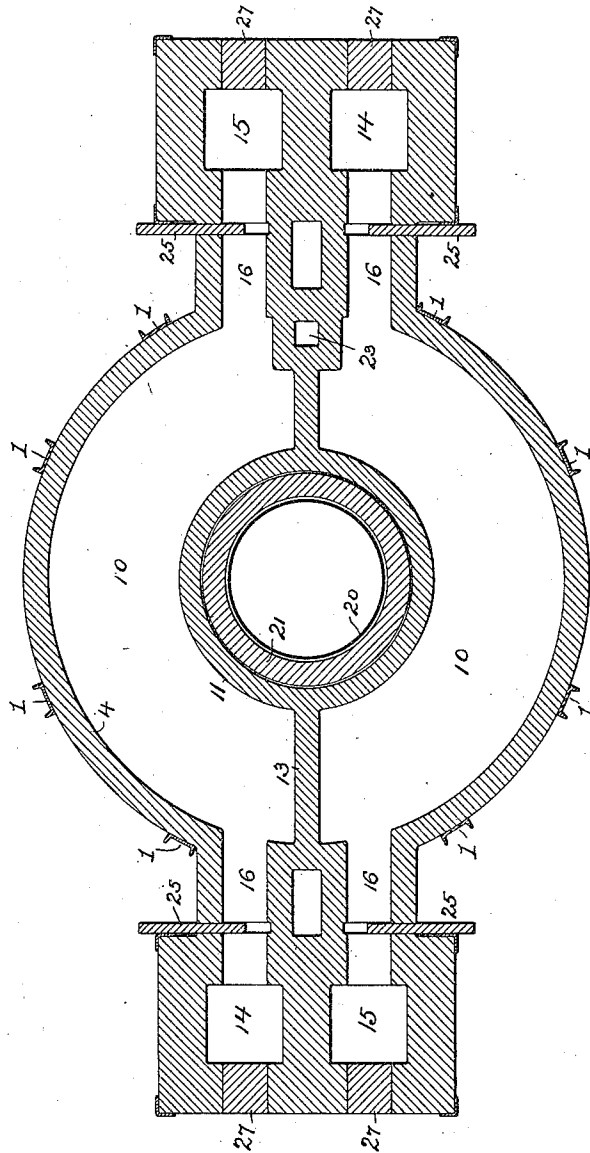
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4 SHEETS—SHEET 2.

Fig. 2.



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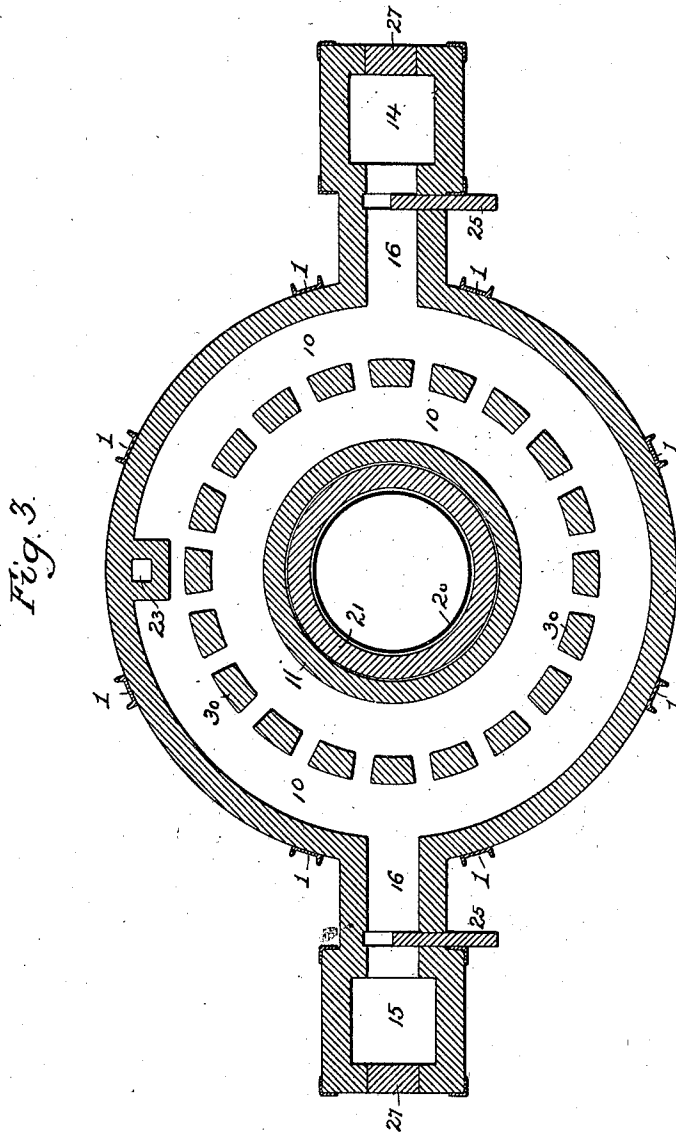
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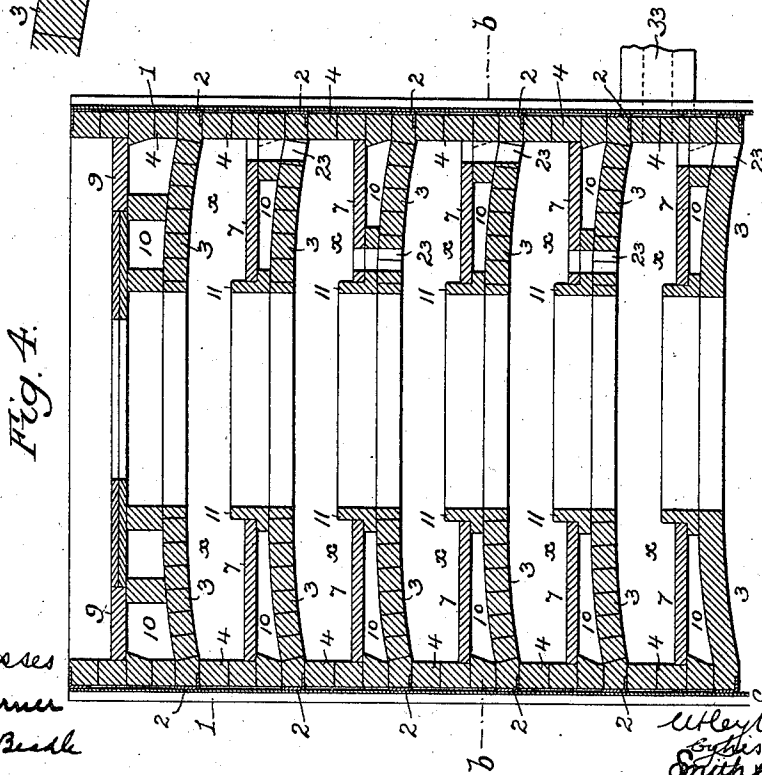
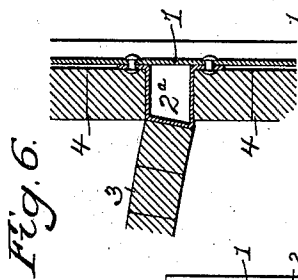
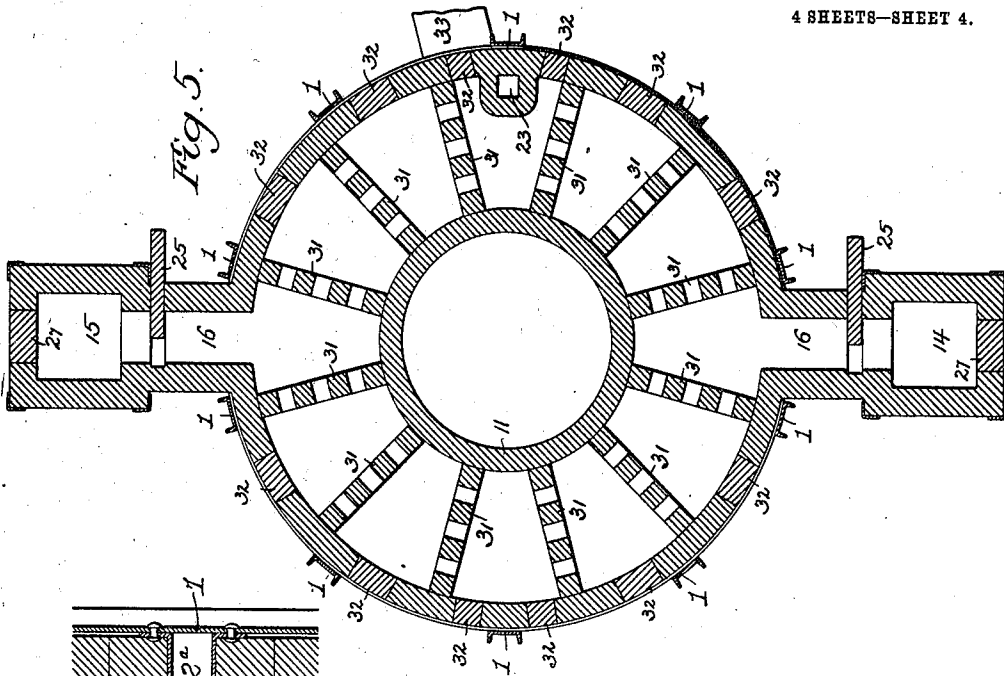
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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

UTLEY WEDGE, OF ARDMORE, PENNSYLVANIA.

FURNACE.

946,178.

Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed April 16, 1908. Serial No. 427,425.

*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 5 Improvements in Furnaces, of which the following is a specification.

My invention relates particularly to that class of furnaces which have a plurality of superposed working chambers alternating 10 with muffle chambers, although some of the features of my invention are applicable to other than muffle furnaces.

The objects of my invention are to simplify and cheapen the construction of the 15 furnace, to facilitate repairs, and to provide for a substantially uniform heating of the various muffle chambers or for a regulation of the heating of the same, if the requirements of the furnace demand such regula- 20 tion.

In the accompanying drawings Figure 1 is a longitudinal vertical section of sufficient 25 of a multiple-hearth muffle furnace constructed in accordance with my invention to provide a proper understanding of those features of construction of the furnace to which my invention particularly relates; Fig. 2 is a horizontal section of the furnace 30 on the line *a-a*, Fig. 1; Fig. 3 is a view similar to Fig. 2, but illustrating a modified type of furnace; Fig. 4 is a transverse vertical section of a furnace omitting the central shaft and its operating mechanism, but illustrating a feature of construction 35 which constitutes part of my invention; Fig. 5 is a sectional plan view on the line *b-b*, Fig. 4; and Fig. 6 is a sectional view illustrating another feature of my invention.

The metal portion of the fixed structure 40 of the furnace is of a skeleton character and comprises a number of vertical posts or columns 1, placed at appropriate intervals around the furnace and carrying rings 2 at the various levels at which the furnace arches 45 3 are to be located. The rings 2 support the outer courses of the brickwork or masonry of which said arches are composed, in order that the arches may be supported independently of the outer wall of the furnace, 50 the latter being built in sections 4 extending from arch to arch, as shown in Fig. 1.

The posts or columns 1 can be steel channel bars, as shown in Fig. 2 of the drawing, and the supporting rings 2 can be composed 55 of angle bars, as shown in Fig. 1, although my invention is not to be considered as

limited in this respect, in fact, I prefer, in some cases, to so construct the rings that they will form appropriate skewbacks for the arches, one instance of such a ring being 60 shown at 2<sup>a</sup> in Fig. 6.

The hearth 5 of the lowermost working chamber *x* of the furnace is supported upon a ring 6 on the posts 1, and upon transverse girders 6<sup>a</sup>, but the hearths 7 of the other 65 working chambers *x* and also the roof plate 9 of the furnace are supported upon the arches 3, and in the case of a muffle furnace are raised above said arches to an extent sufficient to provide heating chambers 10, of the 70 desired capacity, between the arch and hearth. In the furnace shown in the drawing this result is attained by supporting the bricks or tiles of the hearth upon the tiles 11 located at the inner portion of each arch, and 75 upon supporting ledges 12 on the wall sections 4 of the furnace, although any other desired means of supporting the furnace hearths at a desired distance above the arches may be adopted without departing from the 80 essential features of my invention. An intermediate, annular, perforated, supporting wall 30, may for example, be used, as shown in Fig. 3 or more than one of such walls may be employed, or the tiles constituting the 85 hearth may be mounted upon perforated radial walls 31, such as shown in Fig. 5 and the outer wall of the furnace may have openings, provided with suitable removable closures 32, for the insertion of implements 90 for removing accumulations of soot, dust or the like from the heating chamber. The lower hearth of the furnace may also, if desired, be supported upon a bottom arch, in the same manner as the other hearths, such 95 construction being shown in Fig. 4.

Each of the heating chambers of the furnace shown in Figs. 1 and 2 is divided by a 100 transverse wall 13, into two semi-circular passages and at each side of the furnace are erected a pair of flues 14 and 15, each communicating through connecting flues 16 with each of the heating chambers of the furnace.

Each of the flues 16 is preferably supported upon a metal plate 26, secured to one 105 of the rings 2, and embedded in the structure of the flue with which the flue communicates. Access to the flues for cleaning or other purposes is provided by openings in the outer walls of the flues 14 and 15, these 110 openings being normally closed by plugs 27. In the present instance, the flue 14 at the left

hand side of the furnace, communicates with the flue 15 at the right hand side of the furnace through the heating chamber passages on one side of the partition walls 13, while  
 5 the flue 14 at the right hand side of the furnace communicates with the flue 15 at the left hand side of the same through the heating chamber passages on the opposite side of said partition wall.

10 Between the topmost heating chamber and the first heating chamber below the same each of the flues 14 has a transverse partition or cut-off 17, and, in the operation of the furnace, the lower portion of each flue  
 15 14 is in communication with a suitable fireplace from which the products of combustion flow into the lower portion of the flue, in which they are free to rise until they meet the partition or cut-off 17, said products of  
 20 combustion passing through the connecting flues 16 to the respective heating chamber passages of the furnace and after passing through the latter flowing through the opposite flues 16 into the flues 15. All of the  
 25 products of combustion from each flue 15 can pass through its respective passage of the uppermost heating chamber to the opposite flue 14 at a point above the cut-off 17 therein, and can escape from said stack  
 30 through a suitable outlet at the top of the same.

Each of the furnace hearths and arches has a central opening for the reception of the central rotating shaft 20 of the furnace,  
 35 which is protected from the heat by a covering or sheathing of refractory bricks or blocks 21, and carries the arms 22 which project into each of the working chambers of the furnace and are intended to be  
 40 provided with stirring and feedings blades, whereby the bodies of ore or other material deposited upon the hearths of the various working chambers are stirred or agitated and spread and moved either in-  
 45 wardly or outwardly upon said hearths, the various working chambers being connected, in the usual manner, by means of passages 23, in order that the material fed onto the uppermost hearth will be caused to pass  
 50 over the hearths in succession from top to bottom, to be finally discharged from the lowermost hearth 5 into any suitable receptacle. The central shaft 20 is rotated by appropriate mechanism, preferably located  
 55 at the bottom of the furnace, the supporting posts 1 being extended in the form of legs, as shown in Fig. 1, in order to elevate the lowermost hearth to a sufficient extent to permit of the proper disposal of the  
 60 shaft-rotating mechanism below it. The upper end of the shaft projects above the fixed structure of the furnace and carries suitable means for automatically feeding the ore onto the hearth of the uppermost  
 65 working chamber, but as the construction

and location of the shaft-rotating and ore-feeding devices form no essential part of my present invention any further or more specific reference to them in this specification will be unnecessary.

By supporting the furnace arches and their superposed hearths upon an outer metal structure or framework in the manner described, the sections 4 of the inclosing wall of the furnace, being relieved from  
 70 weight and crushing strain, can be constructed of lighter and cheaper material than usual, in fact, any material (asbestos cement or other asbestos compound for instance) may be used which is capable of re-  
 8 sisting heat and providing a gas tight inclosure for the working chambers of the furnace, or for the working and heating chambers, when the furnace is of the muffle type.

As the support of the furnace hearths and arches is not dependent upon the integrity of the inclosing walls, but is effected independently of the same, it will be evident that any section or sections of said inclosing wall can be removed when it is desired  
 9 to gain access to an arch or hearth for the purpose of repairing the same. Such repairs can, therefore, be effected with much greater facility than in furnaces in which the hearths and arches are supported by the  
 10 outer masonry walls, which do not permit of the removal of any considerable portion of the outer wall without endangering the stability of the furnace.

Although the outer metal framework of my improved furnace must possess the strength necessary to carry the masonry structure, it will be less expensive than the complete metal incasement with which the external wall of a furnace of this type is usually provided, consequently the construction of the furnace is cheapened and its erection is facilitated. An incasement of light sheet metal, composed of removable sections may, however, be employed in connection with the skeleton frame of the furnace, if the masonry walls of the furnace are not gas tight, or if for any other reason, the use of such incasement would seem to be desirable, or such of the advantages of my invention will be attained even if the metallic casing is heavy enough to carry rings, preferably of the skewback type shown in Fig. 6, upon which the masonry structure of the furnace is supported.

It will also be evident that the idea of constructing the furnace with a metal framework, upon which the arches, hearths, or like elements of the masonry structure are supported independently of the inclosing walls, is a feature of construction which is applicable to furnaces in general having superposed working chambers, whether such furnaces are or are not of the muffle type, and this feature of my invention is also of

value in the construction of a furnace having upper and lower sections separated by an air space for the purpose of cooling the adjacent portions of the furnace, or for the reception of feeding devices whereby the material treated in the upper section of the furnace can, in its passage to the lower section, have added to it other material with which it may be advisable to mix it prior to its treatment in the lower section of the furnace.

I claim:—

1. A furnace having a masonry structure inclosing the working chambers of the furnace, a series of vertical metal posts disposed around said furnace, and a series of superposed horizontal metal rings carried and supported vertically by said posts and serving to support the masonry structure of the furnace.

2. A furnace having a masonry structure comprising a series of superposed arches, and hearths mounted thereon so as to provide a heating chamber between them, a series of vertical metal posts disposed around said furnace, and a series of superposed horizontal metal rings carried and supported vertically by said posts and serving to support the successive arches of the furnace.

3. A furnace having a series of superposed arches each with hearths mounted

thereon so as to form a heating chamber between them, and inclosing walls extending from each hearth to the arch above it, a series of vertical metal posts disposed around said furnace, and a series of superposed horizontal metal rings carried and supported vertically by said posts and serving to support the successive arches of the furnace.

4. A furnace composed of superposed sections each containing a working chamber with a metal frame upon which said superposed sections are supported independently of each other, said supporting frame projecting below the hearth of the lowermost working chamber to form supporting legs upon which the masonry structure of the furnace is elevated.

5. A furnace having superposed working chambers and a metal supporting structure having horizontal rings upon which the weight of the masonry structure is borne, said rings forming skewbacks for the furnace arches.

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

UTLEY WEDGE.

Witnesses:

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KATE A. BEADLE.