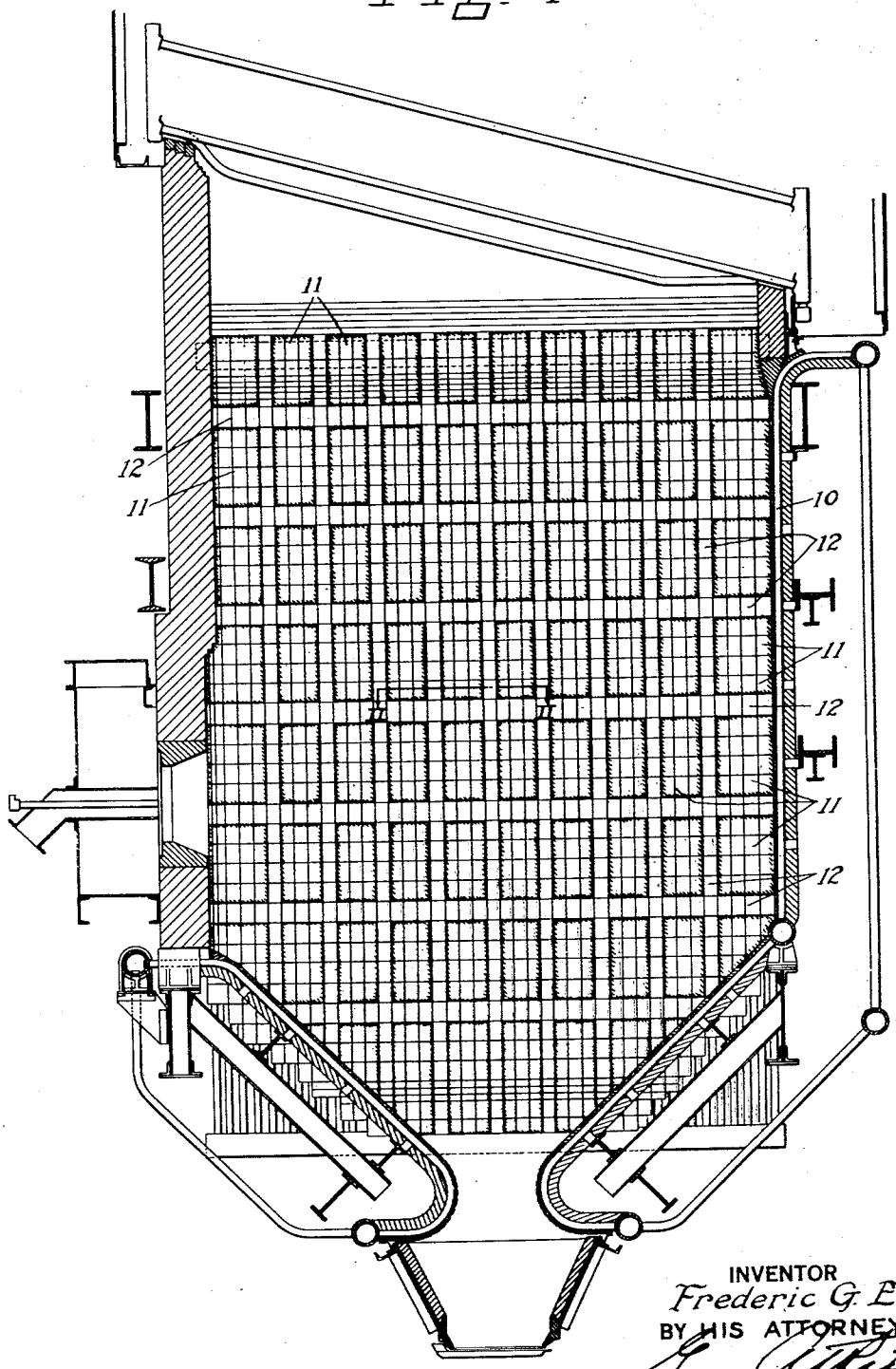
July 25, 1933. F. G. ELY 1,919,324

CONTROL OF FURNACE TEMPERATURE AND FURNACE WALL CONSTRUCTION

Filed April 30, 1931 3 Sheets-Sheet 1

Fig. 1



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Fig. 2

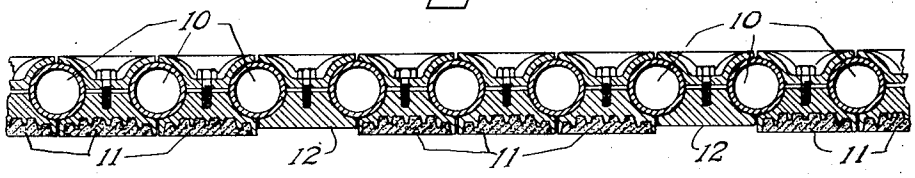


Fig. 4

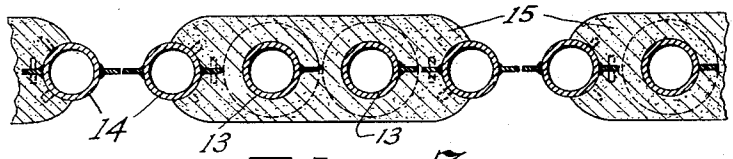
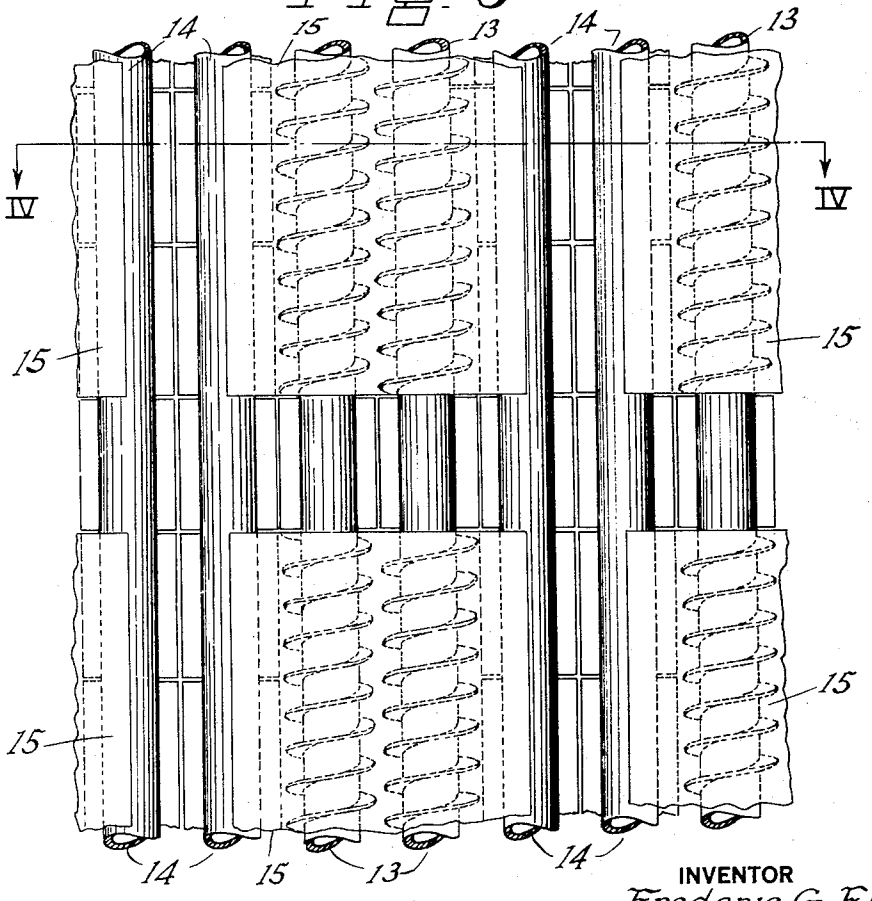


Fig. 3



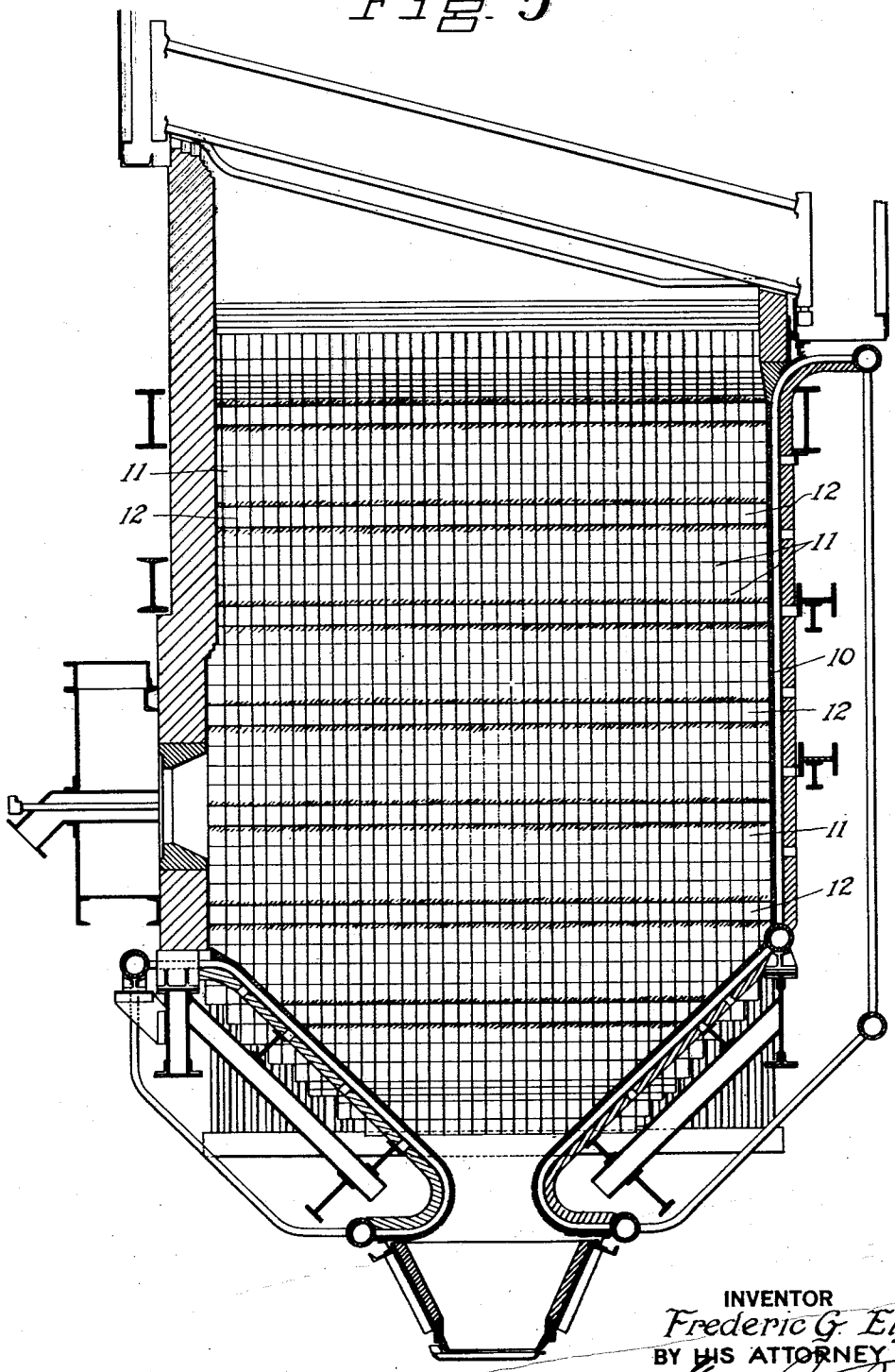
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Filed April 30, 1931 3 Sheets-Sheet 3

Fig. 5



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UNITED STATES PATENT OFFICE

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CONTROL OF FURNACE TEMPERATURE AND FURNACE WALL CONSTRUCTION

Application filed April 30, 1931. Serial No. 533,973.

My invention relates to the control of furnace temperature, especially by means of the design and construction of the furnace walls. It relates particularly to furnaces, upon the walls of which ash and slag collect. The invention is useful in connection with furnaces having water cooled walls.

One object of the invention is to control furnace temperature by the design and construction of the furnace walls.

Another object of the invention is to provide a furnace wall to which ash and slag will adhere only in limited amounts. A further object is the provision of such a wall in which ash and slag coated thereon will have its surface broken up into sections of small area. Other objects will become apparent upon consideration of the present specification.

The invention is shown by way of illustration in the accompanying drawings, in which—

Figure 1 is a view of the inside surface of a furnace wall comprising tubes with refractory brick covering the same;

Fig. 2 is a section on the line II—II of Figure 1,

Fig. 3 is an elevation of another furnace wall constructed in accordance with the invention,

Fig. 4 is a section on the line IV—IV of Fig. 3, and

Fig. 5 is an elevation of a furnace wall showing another form of the invention.

An important feature of modern furnace operation is the control of temperature within the furnace. The necessity for such temperature control has become more marked with the increased utilization of fluid fuels and the increasing tendency toward more rapid combustion in the furnace.

Furnace temperature may be controlled by the construction of the furnace walls, and various constructions of furnace wall have been used for this purpose. I have discovered that furnace temperature can be controlled by providing on the insides of the furnace walls varying proportions of slightly cooled and highly cooled areas. The ratio of the highly cooled surfaces to the slightly cooled surfaces is sufficient to give the desired degree of cooling within the furnace. I have also discovered that a wall so constructed has another valuable property, namely, that of providing a surface whereon ash and slag will adhere only in limited quantities.

Where the entire furnace wall is of rough refractory material it has been found that ash and slag in appreciable quantities will be deposited upon the walls by the flame and the combustion gases. The deposit covering the walls is not mechanically stable and has been known to break away in slabs and fall upon the furnace floor. Where the walls of the furnace are of the usual construction these slabs are frequently too heavy and too large for safe and proper operation of the furnace.

According to the present invention, the area of the furnace wall is broken up so that the ash or slag coming upon the wall will not deposit continuously over the wall, but will be limited in extent to small slabs. When these small slabs break away from the walls of the furnace and fall into its bottom they will cause a minimum disturbance because of their limited size, and will not interfere with safe operation of the furnace.

In order to accomplish the above result the character of the wall surface inside of the furnace is altered at intervals, the ratio of slightly cooled and highly cooled areas being such as to give the desired temperature within the furnace in each case.

In the drawings there is shown a furnace wall of the usual type which comprises water cooling tubes 10 and blocks 11 preferably of refractory material covering the tubes on the inside of the furnace. Thus, the blocks are cooled by the water cooled tubes to which they are attached and their life is prolonged in well known manner.

The refractory blocks 11 form the major part of the interior face of the wall. Other elements having a different surface from that of the refractory blocks interrupt the vertical extent of the blocks 11 in the wall and may interrupt the extent of these blocks in all directions. These elements may be

means for accelerating heat absorption by the tubes, having a higher rate of heat conductivity than the blocks 11. Thus, in addition to the refractory material carried by the tubes, there is a second class of material which is of greater heat conducting capacity than the first, and this second class of material may be present in various forms including metal blocks or fins on the tubes, the latter being illustrated in Figs. 3 and 4.

In Figs. 1 and 2 the other elements to which reference is made above, are blocks 12 which interrupt the extent of the refractory blocks 11 forming the major part of the interior face of the wall. These blocks 12 have a different surface from that of the refractory blocks 11, which surface may be that of a different type of refactory or may be a metal surface, the entire block 12 being constructed of metal. The blocks 12 may be carried by the tubes as are the refractory blocks 11. In any case the areas provided by the blocks 12 are highly cooled and tend to cool the inside of the furnace.

Where the above construction is employed, the ash is deposited on the rough refractory surface of the wall, that is to say—on the refractory blocks 11, and large areas of deposited ash are prevented from falling to the furnace floor through the provision at intervals of a surface having a different character. The blocks 12, shown in Figs. 1 and 2, and corresponding elements shown in Figs. 3, 4 and 5, present such surfaces of different character, to which the ash or slag will not adhere and over which the ash or slag will not bridge in a strong enough section to make a continuous slab which may fall to the furnace floor. As a result of this construction only small quantities of ash or slag will fall from the furnace walls at any time.

In Figs. 3 and 4 the interrupting surfaces are provided by tubes 14 having longitudinal fins thereon and the major part of the wall is formed by causing refractory 15 to adhere to spiral fin tubes 13. Obviously, other means might also be employed for this purpose.

Attention is called to the fact that it is not necessary to employ the particular design shown in Figure 1, but many variations of this design may be employed with satisfactory effect. As an example—there is illustrated in Fig. 5 a wall wherein horizontal lines of cleavage only are provided.

The particular description here given and the forms illustrated in the drawings are merely presented by way of example. Other constructions varying in detail but not in principle from the invention, will naturally suggest themselves to those dealing with this problem.

I claim—

1. In a furnace for burning slag-forming fuel, a wall comprising water tubes, refractory material carried by portions of said tubes, and other portions of said tubes arranged to absorb heat more directly than the first mentioned portions, said portions being arranged alternately throughout substantially the entire wall surface to provide slightly cooled and highly cooled areas to regulate furnace temperature and prevent accumulation of large masses of slag.

2. In a furnace for burning slag-forming fuel, a wall comprising water tubes, refractory materials carried by portions of said tubes, and other portions of said tubes arranged to absorb heat more directly than the first mentioned portions, said portions being arranged alternately throughout substantially the entire wall surface in both vertical and horizontal directions to provide slightly cooled and highly cooled areas to regulate furnace temperature and prevent accumulation of large masses of slag.

3. In a furnace for burning slag-forming fuel, a wall comprising water tubes, refractory blocks carried by portions of said tubes, and other portions of said tubes arranged to absorb heat more directly than the first mentioned portions, said portions being arranged alternately throughout substantially the entire wall surface to provide slightly cooled and highly cooled areas to regulate furnace temperature and prevent accumulation of large masses of slag, the faces of said refractory blocks constituting the major portion of the wall surface.

4. In a furnace for burning slag-forming fuel, a wall comprising water tubes, a series of blocks each having a refractory surface carried on some portions of said tubes, and a series of means on other portions of said tubes for more directly absorbing heat, said blocks and said means being disposed and arranged to provide a series of alternate slightly cooled and highly cooled areas throughout substantially the entire wall surface to regulate furnace temperature and prevent accumulation of large masses of fuel residues such as slag or ash.

5. In a furnace for burning slag-forming fuel, a wall comprising water tubes, refractory material carried by portions of some of said tubes, and a second class of material carried by other tubes and tube portions, said second class of material being of greater heat conducting capacity than said refractory material, and said materials being arranged alternately throughout substantially the entire wall surface to provide slightly cooled and highly cooled areas to regulate furnace temperature and prevent accumulation of large masses of fuel residues such as slag or ash.

6. In a furnace for burning slag-forming fuel, a wall comprising water tubes, refractory material carried by portions of some of said tubes, and a second class of material carried by other tubes and tube portions, said

second class of material being of greater heat conducting capacity than said refractory material, said materials being arranged alternately throughout substantially the entire wall surface in both vertical and horizontal directions to provide slightly cooled and highly cooled areas to regulate furnace temperature and prevent accumulation of large masses of fuel residues such as slag or ash.

7. In a furnace for burning slag-forming fuel, a wall comprising water tubes, refractory material carried by portions of some of said tubes, and bare metal on other tubes and tube portions, said refractory material and said bare metal being arranged alternately throughout substantially the entire wall surface to provide slightly cooled and highly cooled areas to regulate furnace temperature and prevent accumulation of large areas of fuel residues such as slag or ash.

8. In a furnace for burning slag-forming fuel, a wall comprising water tubes, refractory material carried by portions of some of said tubes, and bare metal on other tubes and tube portions, said refractory material and said bare metal being arranged alternately throughout substantially the entire wall surface in both vertical and horizontal directions to provide slightly cooled and highly cooled areas to regulate furnace temperature and prevent accumulation of large areas of fuel residues such as slag or ash.

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