

Sept. 1, 1925.

1,552,116

F. CORDES

FURNACE STRUCTURE AND METHOD OF PROTECTING THE SAME

Filed July 8, 1924

2 Sheets-Sheet 1

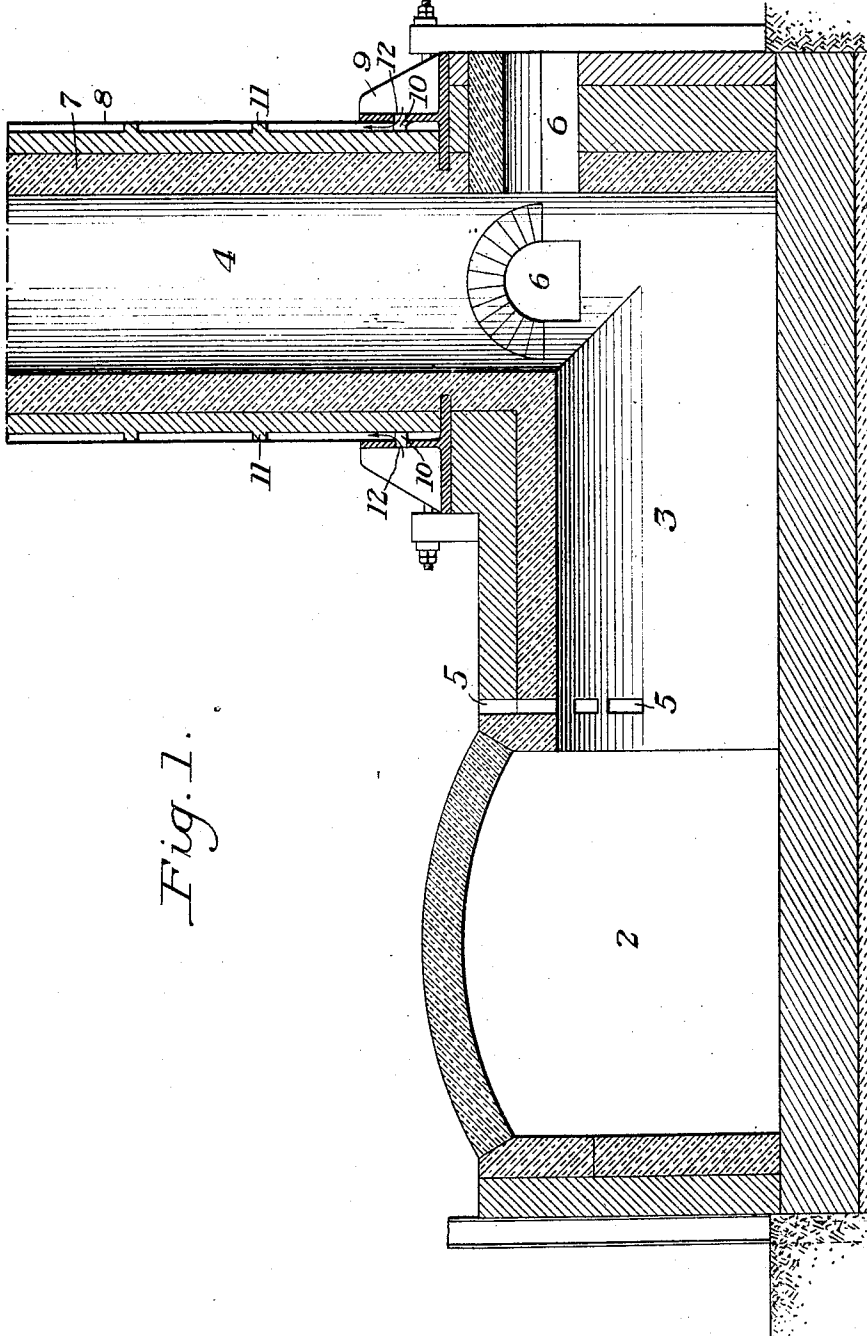


Fig. 1.

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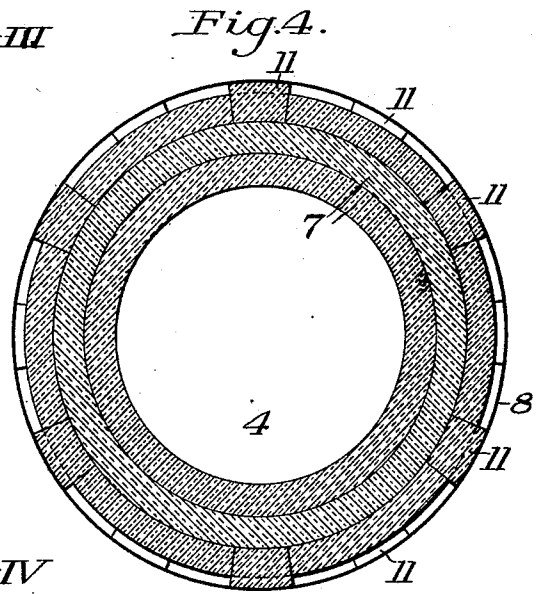
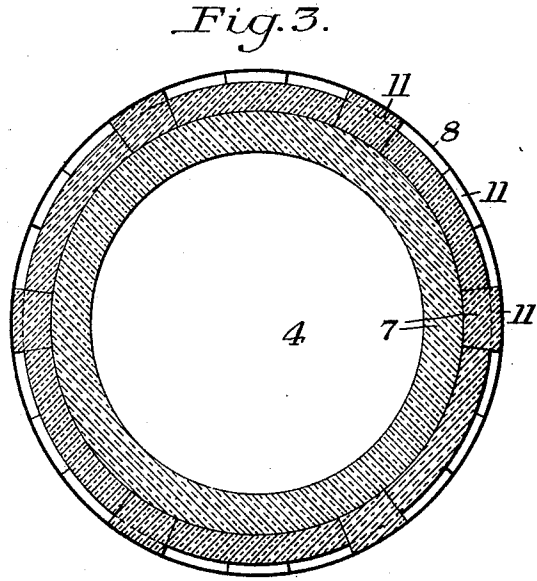
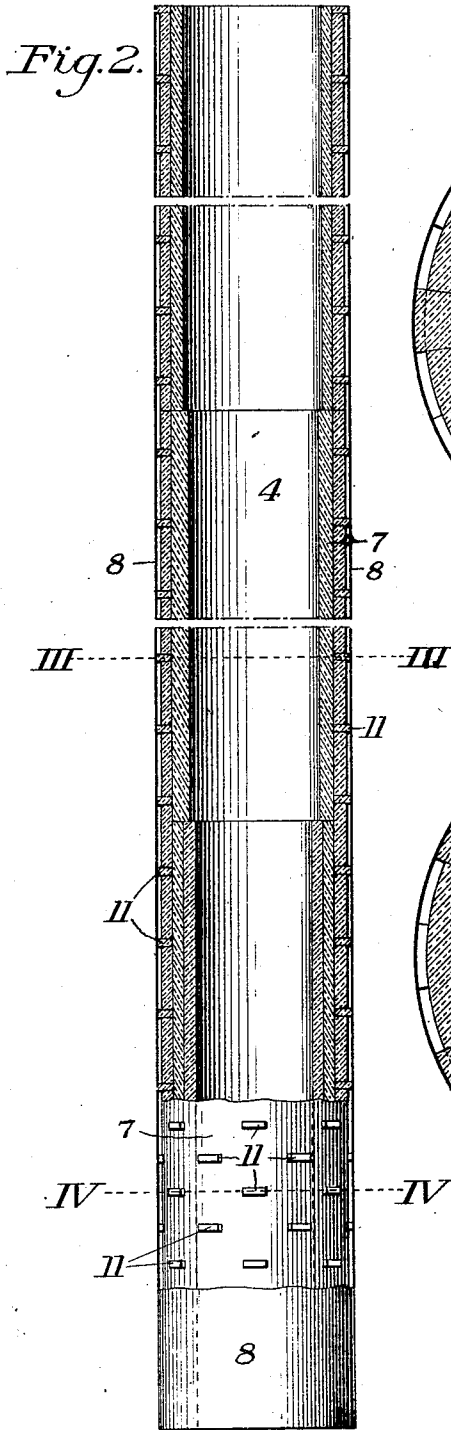
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FURNACE STRUCTURE AND METHOD OF PROTECTING THE SAME

Filed July 8, 1924

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

FRANK CORDES, OF PITTSBURGH, PENNSYLVANIA.

FURNACE STRUCTURE AND METHOD OF PROTECTING THE SAME.

Application filed July 8, 1924. Serial No. 724,785.

To all whom it may concern:

Be it known that I, FRANK CORDES, a citizen of the United States, residing at Pittsburgh, Allegheny County, Pennsylvania, have invented a new and useful Improvement in Furnace Structures and Methods of Protecting the Same, of which the following is a full, clear, and exact description.

The present invention relates broadly to furnace construction, and more particularly to furnace stacks and a method of protecting the same.

At the present time, considerable difficulty is experienced with high temperature stacks, due to the burning-out of the refractory lining and the high temperature to which the metallic protecting shell is raised, whereby not only is it impossible to maintain paint thereon, but the temperature tends to destroy the metal. Both the painting and the repair either of the lining or of the shell are not only dangerous operations accompanied with considerable difficulty, but they are exceedingly expensive. Furthermore, the temperature conditions to which the shell is subjected result in expansion and contraction thereof to such an extent as to cause shearing of the rivets which hold the plates together.

The present invention has for one of its objects the construction of a stack which is less affected by the gases leaving the furnace and which has a materially greater length of life.

Another object of the present invention is to supply supplemental air to the gases leaving the furnace in such manner as to complete the combustion thereof and to both cool the stack and form a protective coating of carbon on the inner walls thereof.

In the accompanying drawings, there is shown for purposes of illustration only a preferred embodiment of the present invention, it being understood that the drawings do not define the limits of my invention, as changes may be made in the construction and operation disclosed therein, without departing from the spirit of the invention or the scope of my broader claims.

In the drawings:

Figure 1 is a vertical sectional view through a portion of a furnace illustrating a portion of the furnace hearth, the stack and the connecting flue;

Figure 2 is a vertical sectional view partly broken away and partly in elevation, il-

lustrating a preferred form of stack construction;

Figure 3 is a transverse sectional view on an enlarged scale on the line III—III of Figure 2; and

Figure 4 is a view similar to Figure 3, but taken on the line IV—IV of Figure 2.

The present invention is not restricted to use with a furnace of any particular construction, and it will be understood that the drawings merely illustrate more or less diagrammatically one type of furnace construction in combination with the improved stack. In Figure 1 of the drawings, there is illustrated a portion of the furnace 2 having a flue 3 for conducting the hot gases and products of combustion to the stack 4. It is not uncommon with furnaces of this general type to operate under such conditions that a solid flame, many feet in length, continuously issues at the top of the stack. It will be apparent that under such conditions the stack, which has a limited radiating surface, is subjected to such extreme temperatures that the objections heretofore pointed out are encountered.

In accordance with the present invention, there may be provided openings 5, permitting the passage of air into the flue 3, adjacent the furnace 2. This air, which is drawn through these openings, not only assists in the completion of combustion, but also is preferably admitted in such amounts as to have a decided cooling effect in the flue and form a protective film of cooling air between the hot gases and the lining of the arch. This materially reduces the destructive action of the hot gases on the lining and correspondingly increases the length of life thereof.

In the base of the stack 4, there are also preferably provided arch-like openings 6, which are adapted to be filled to a greater or lesser extent by placing bricks therein to control the amount of air supplied. This air further tends to complete the combustion of any unconsumed furnace gases and to assist in cooling the base of the stack. By completing the combustion of the gases before they enter the stack properly, the temperature in the stack is reduced thereby lessening the tendency to burn out the stack lining 7 or burn off the paint from the shell 8. Another advantage of supplying air through the openings in the base of the stack, particularly in connection with coal-

fired furnaces, is found in the tendency to produce a carbon coating on the lining at the base of the stack. The gases from the furnace carry over with them fine particles of carbon and the air entering through the openings projects these particles on to the inner surface of the stack lining before they are completely burned, thereby forming a protective coating for the portions of a stack lining subjected to the highest temperatures.

The stack itself is also preferably of special construction whereby the shell 8 is further protected. In accordance with one embodiment of the invention, the construction may comprise brackets 9, adjacent the base of the stack, the brackets having lugs 10 for supporting the lower end of the shell 8. This shell throughout the length of the stack is preferably maintained in spaced relation to the lining 7 by projections 11, from the lining. It will be understood by those skilled in the art that this lining may comprise any suitable refractory body or material, either in the form of bricks or blocks or of more or less solid construction formed in situ. Irrespective of the particular method of construction, there will be provided the projections 11, preferably at certain definite points, these projections in adjacent courses or rows being staggered, as clearly shown in Figure 2, to provide a tortuous flow path therebetween. The brackets 9 are formed with air admission openings 12, permitting the passage of air into the space between the shell and the lining. This air, circulating between and around the projections 11, forms a protective film not only tending to cool the outer surface of the lining and the inner surface of the shell, but also tending to prevent the effective transmission of heat from the lining to the shell.

In actual operation, it has been found that a stack constructed as disclosed herein will retain an effective coating of paint thereon due to the much lower temperatures encountered.

The advantages of the present invention arise not only from the method of supplying supplemental air for complete combustion of the hot gases, assisting in cooling and forming a protective coating, but also from the construction of the stack itself, whereby the shell is protected from the temperature conditions obtaining within the stack.

I claim:

1. A furnace comprising a stack and a flue connecting the furnace with the stack,

said flue having an air admission opening therein adjacent the furnace whereby to supply a film of cooling air between the hot furnace gases and the walls of the flue, substantially as described.

2. A furnace comprising a stack and a horizontal flue connecting the furnace with the stack, said flue having an air admission opening in the top wall thereof adjacent the furnace whereby to supply a film of cooling air between the hot furnace gases and said top wall, substantially as described.

3. A furnace comprising a stack and a flue connecting the furnace with the stack, said flue having an air admission opening therein adjacent the furnace and said stack having an air admission opening therein adjacent the base thereof, substantially as described.

4. A stack comprising a refractory lining having a plurality of spaced staggered projections, and a shell enclosing said lining and held in spaced relation thereto by said projections, there being openings for the admission of air to the space between said shell and lining, substantially as described.

5. A stack comprising a lining and a shell maintained in spaced relation thereto, said stack having openings adjacent the base thereof for the admission of air into the stack, substantially as described.

6. A stack comprising a lining and a shell maintained in spaced relation thereto, said stack having openings adjacent the base thereof for the admission of air into the stack, said openings being adjustable to vary the amount of air admitted to the stack, substantially as described.

7. A stack comprising a lining and a metal shell extending substantially the full height of the stack, and means for maintaining said shell in spaced relation to the lining, there being openings adjacent the lower end of the shell for the admission of air to the space between said shell and lining, substantially as described.

8. A stack comprising a lining and a shell held in spaced relation thereto, there being openings adjacent the lower end of said shell for the admission of air to the space between said shell and lining, the construction being such that the air is compelled to ascend the space between the lining and the shell in a tortuous path, substantially as described.

In testimony whereof I have hereunto set my hand.

FRANK CORDES.