

F. C. ROBERTS & A. BRODEN.
FURNACE TOP.
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1,066,225.

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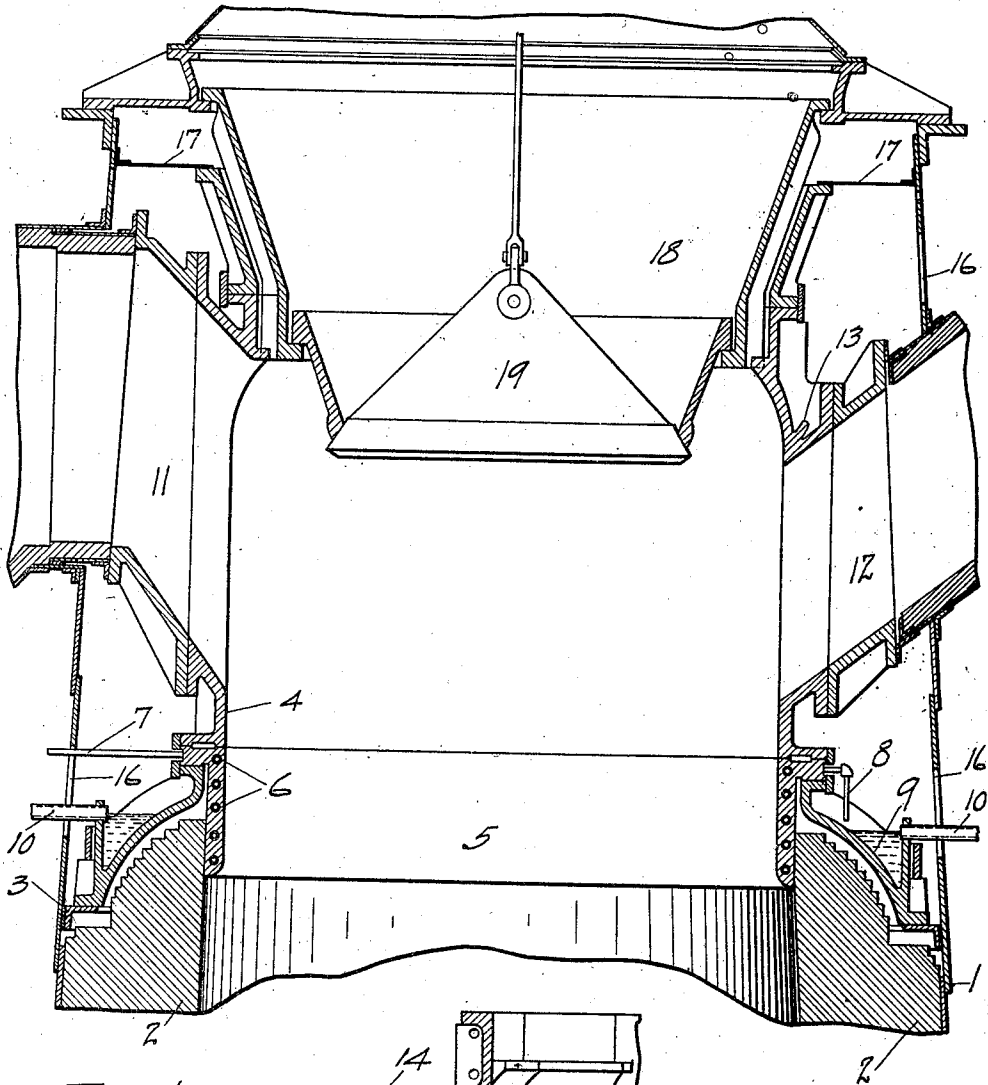


FIG. 1.

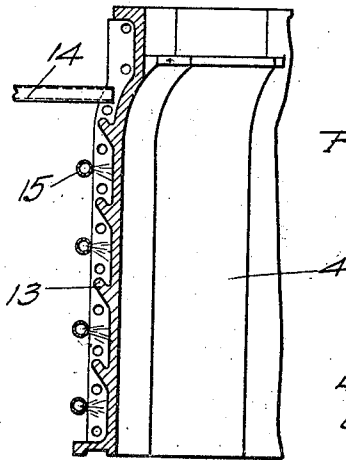


FIG. 2.

WITNESSES:

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FURNACE-TOP.

1,066,225.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, FRANK C. ROBERTS, a citizen of the United States, residing at Wynnewood, county of Montgomery, and State of Pennsylvania, and ALBERT BRODEN, a citizen of the United States, residing at Reading, State of Pennsylvania, have invented certain new and useful Improvements in Furnace-Tops; of which the following is a specification.

The object of our invention is to provide a furnace top structure which will be durable, economical and efficient.

One source of trouble in blast furnaces has been the wearing away of the lining of the furnace above the stock line by the striking of the charge against the furnace lining as it comes from the bell of the hopper. The furnace lining above the stock line is open to the effects of the heat and the gases. More or less of the charge entering the furnace, after leaving the bell, strikes the lining with enough force to cause the lining to wear at this point and a result is that the furnace lining, instead of wearing uniformly throughout the height of the stack, is abraded and destroyed near the top. The present invention obviates this defect by discontinuing the masonry lining of the furnace at a point somewhat below the place where the wear normally comes from the incoming charge striking against the lining. Above the shortened masonry lining is provided a lining of a more durable material, preferably iron or steel. The upper metallic lining is supported independently of the masonry lining and the junction between the two linings is so arranged that provision is made for independent and separate contraction and expansion under varying conditions of temperature for the two linings. The upper lining may be cooled by piercing the outer shell of the furnace and passing a draft of air about the upper lining or water, in pipes, in troughs, or as a spray may be applied to cool the upper lining or two or more of these methods may be used. The weight of the hopper at the top of the furnace is not borne by the upper lining and it is possible for the upper lining to expand or contract with variance of temperature

without being influenced or restrained by the hopper.

It will be seen then that we have provided a furnace having a separate and independent lining at the upper portion where the mechanical wear comes, which is of durable material and which is capable of being cooled and preserved and which, because of its separate character, may be renewed or replaced without the expense or delay incident to a complete relining of the furnace.

In the accompanying drawing the invention is shown in one form it may take applied to a blast furnace as used for the reduction of iron or other ores.

Figure 1 is a transverse, vertical section of the upper part of a furnace; Fig. 2 is a section of a fragment of the metal lining taken at approximately right angles to Fig. 1.

We have shown the furnace provided with the usual metallic sheath 1 within which is the masonry lining 2. It does not extend to the top of the furnace and may be provided as shown with an irregularly formed top line. Above the masonry wall, in the present instance, is an annular bracket 3 riveted or otherwise attached to the furnace sheath on which rests an inwardly springing trough 9 which receives the flange of the lip 5 of the metallic lining 4. The metallic lining 4 is thus supported from the furnace sheath above the upper end of the masonry lining, and out of contact therewith, so that the masonry lining may expand and contract with variations of temperature in the furnace without being impeded by the metallic lining above it. The metallic lining shown in the drawing consists of two parts although this is not essential. The lower portion or lip 5 extends downwardly within the masonry lining 2 and forms a junction seal therewith. The lip 5 has embedded in it a series of pipes 6 through which water or other cooling medium may be passed from the pipe 7 exhausting through the pipe 8 into the trough 9 on the bracket 3 from which the overflow is carried out through the pipes 10. The upper portion of the metallic lining has an outlet 11 for the downcomer and an outlet 12 to the relief valve and about its surface is provided with ribs 13 which in

addition to strengthening the structure, form troughs to hold water or other cooling medium. The water may be let into the troughs through the pipe 14 and overflow from one trough to another or a series of pipes 15 may be provided which spray the cooling medium onto the surface of the metallic lining. Openings 16 may be provided in the outer shell of the furnace adjacent the metallic lining through which a current of air may be forced or drawn for cooling the lining. The particular means used for cooling the lining is not essential to the present invention and it is obvious that one or more of the specific means described might be omitted. The lining is connected at its top with the outer shell or sheath by a thin annular plate 17 which forms a gas seal between the lining and the shell and which is thin enough to allow by its deformation for independent expansion and contraction of the metallic lining.

Above the metallic lining and independently supported, either from the sheath or from the usual superstructure, is a charging device shown in the present instance as a hopper 18 provided with a bell 19.

It will be seen that the charge on entering the furnace will strike against the sides of the metallic lining as it leaves the bell and that the wearing due to this impact will be entirely on the metallic lining. The masonry lining ending below this point of impact is protected from the wear. The furnace is so constructed that the masonry lining is free to contract and expand independently. This construction affords at the various points in the furnace the most durable devices for the needs of the furnace at each point. It is possible without interfering with the masonry lining to remove and replace the metallic lining should it be destroyed where it receives the greatest wear.

We claim as our invention:

1. In a furnace, a sheath, a masonry lining extending part way up the sheath, a metal lining supported by the sheath above the masonry and extending therebelow, means for cooling the metal lining, an independently supported hopper above the metal lining, a junction seal between the linings, and a gas seal between the metal lining and the sheath.

2. In a furnace, a sheath, a masonry lining extending part way up the sheath, a metal lining supported by the sheath above the masonry lining and not in contact therewith, means for passing a current of air through the chamber between the sheath and metal lining, a water cooling device for the metal lining, a gas seal between the sheath and the metal lining, a lip attached to the metal lining and extending into the masonry lining and forming a junction seal therewith, a water cooling device for the lip, and

an independently supported hopper above the metal lining.

3. In a furnace, a masonry lining, a charging device, a metal lining between the masonry lining and the charging device supported independently of them, and means for cooling the metal lining.

4. In a furnace, a sheath, a masonry lining extending part way up the sheath, a metal lining supported by the sheath above the masonry and extending therebelow, means for cooling the metal lining, and an independently supported hopper above the metal lining.

5. In a furnace, a sheath, a masonry lining extending part way up the sheath, a metal lining supported by the sheath above the masonry, means for cooling the metal lining, an independently supported hopper above the metal lining, a junction seal between the linings, and a gas seal between the metal lining and the sheath.

6. In a furnace, a masonry lining, a charging device, a metal lining between the masonry lining and the charging device supported independently of them, and means for allowing independent expansion and contraction of the masonry and metal linings.

7. In a furnace, a masonry lining, an independently supported metal lining thereabove, a junction seal between the linings, and an independently supported charging device above the metal lining.

8. In a furnace, a sheath, a masonry lining extending part way up the sheath, a metal lining supported by the sheath above the masonry lining and not in contact therewith, a water cooling device for the metal lining, a gas seal between the sheath and the metal lining, a lip attached to the metal lining and extending into the masonry lining and forming a junction seal therewith, and an independently supported hopper above the metal lining.

9. In a furnace, a masonry lining, an independently supported metal lining thereabove, and an independently supported charging device above the linings.

10. In a furnace, a masonry lining, a charging device, and a metal lining between the masonry lining and the charging device supported independently of them.

11. In a furnace, a masonry lining, an independently supported metal lining thereabove, an independently supported charging device above the linings, gas seals between the various elements, means for cooling the metal lining, and means for allowing independent expansion of the linings.

12. In a furnace, a sheath, a masonry lining extending part way up the sheath, a metal lining supported by the sheath above the masonry lining and not in contact therewith, means for passing a current of air

through the chamber between the sheath and
metal lining, a gas seal between the sheath
and the metal lining, a lip attached to the
metal lining and extending into the masonry
5 lining and forming a junction seal there-
with, and an independently supported hop-
per above the metal lining.

Signed at Philadelphia this 29th day of
January, 1913.

FRANK C. ROBERTS.
ALBERT BRODEN

Witnesses:

J. DONALDSON BAXTON,
CLARENCE S. BUTLER.