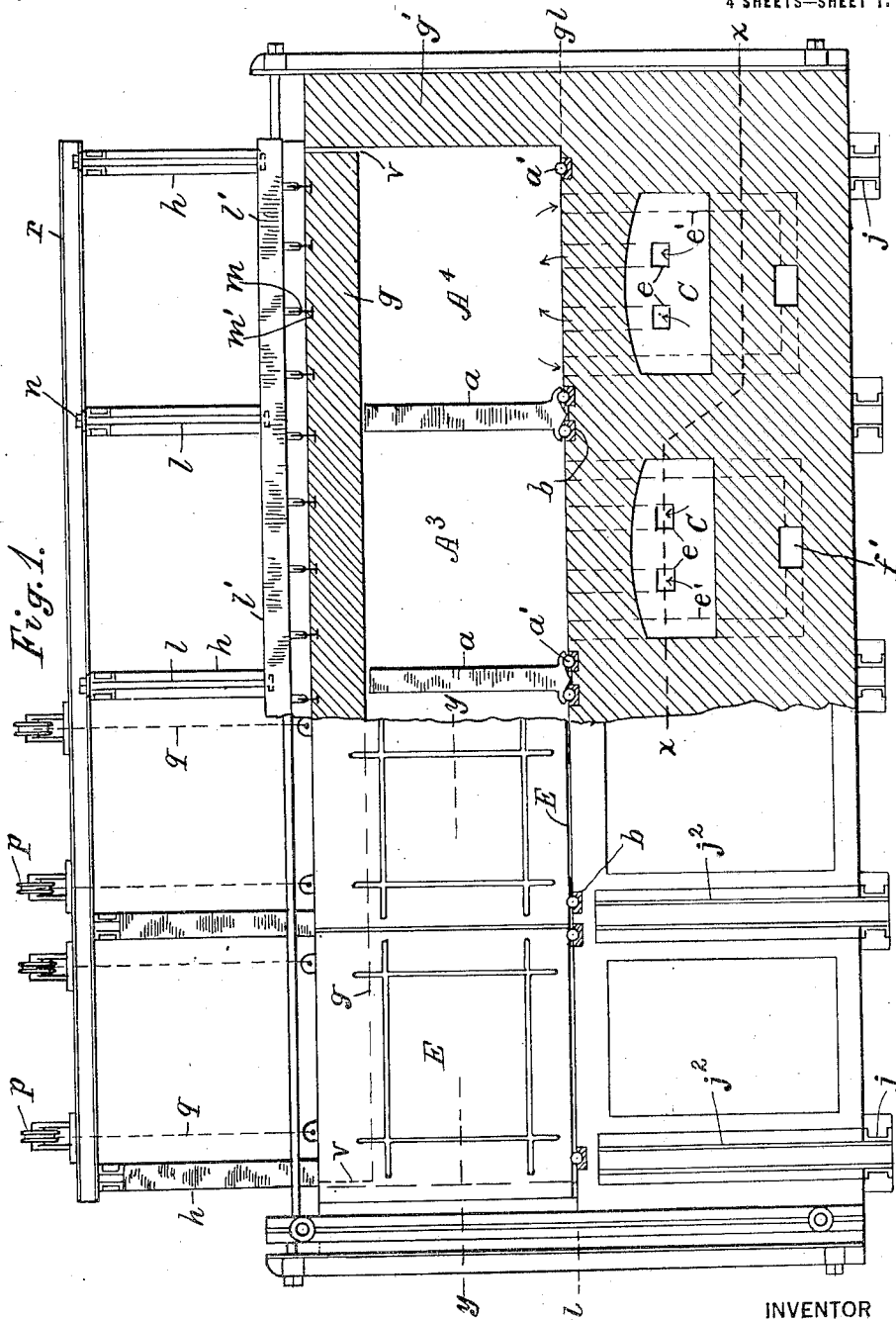


W. S. ROCKWELL.
OPEN SIDE FURNACE.
APPLICATION FILED NOV. 4, 1919.

1,359,532.

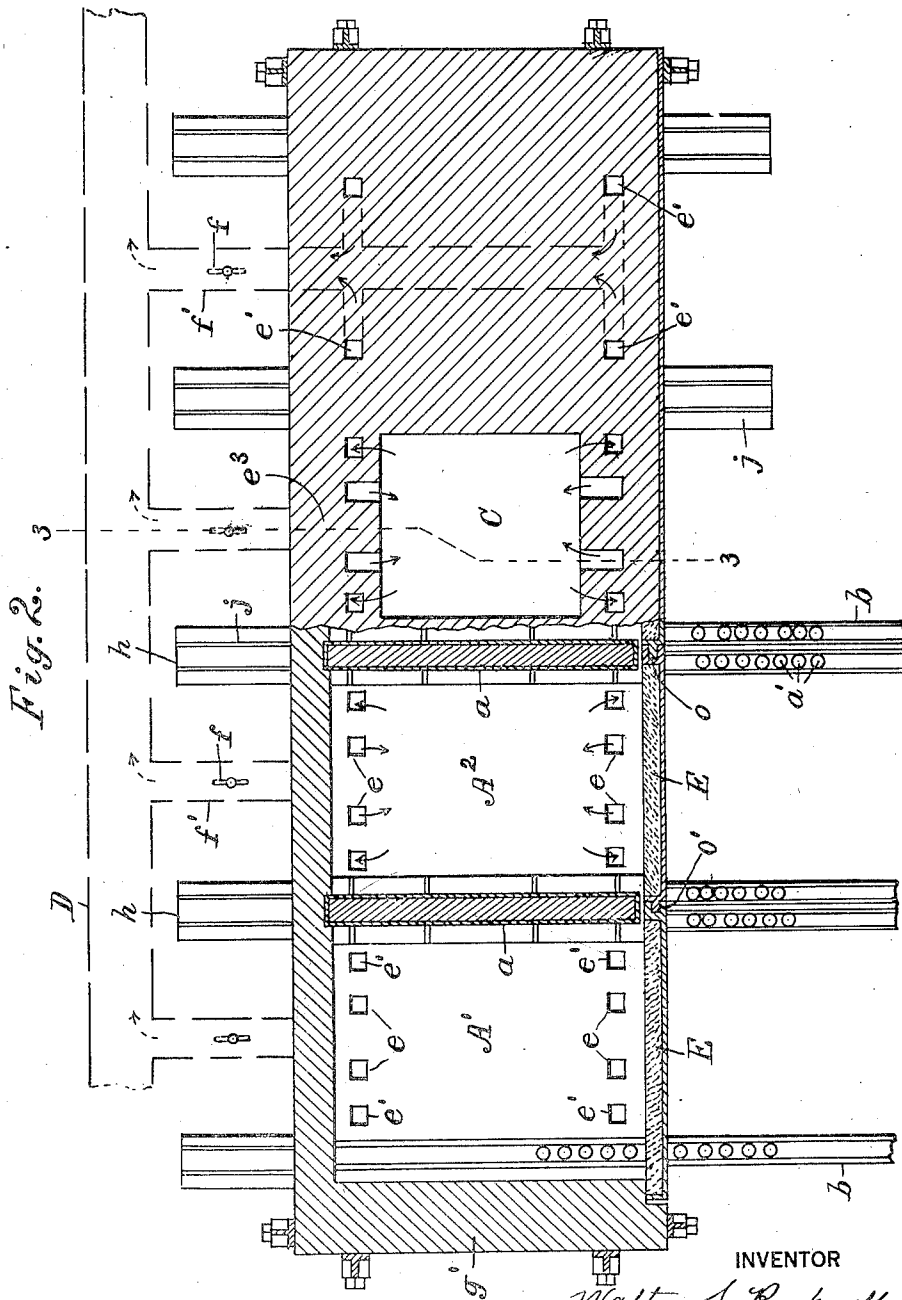
Patented Nov. 23, 1920.

4 SHEETS—SHEET 1.



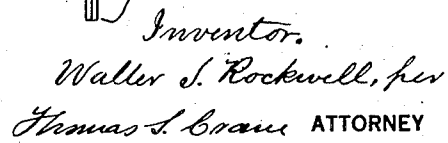
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1,859,532.



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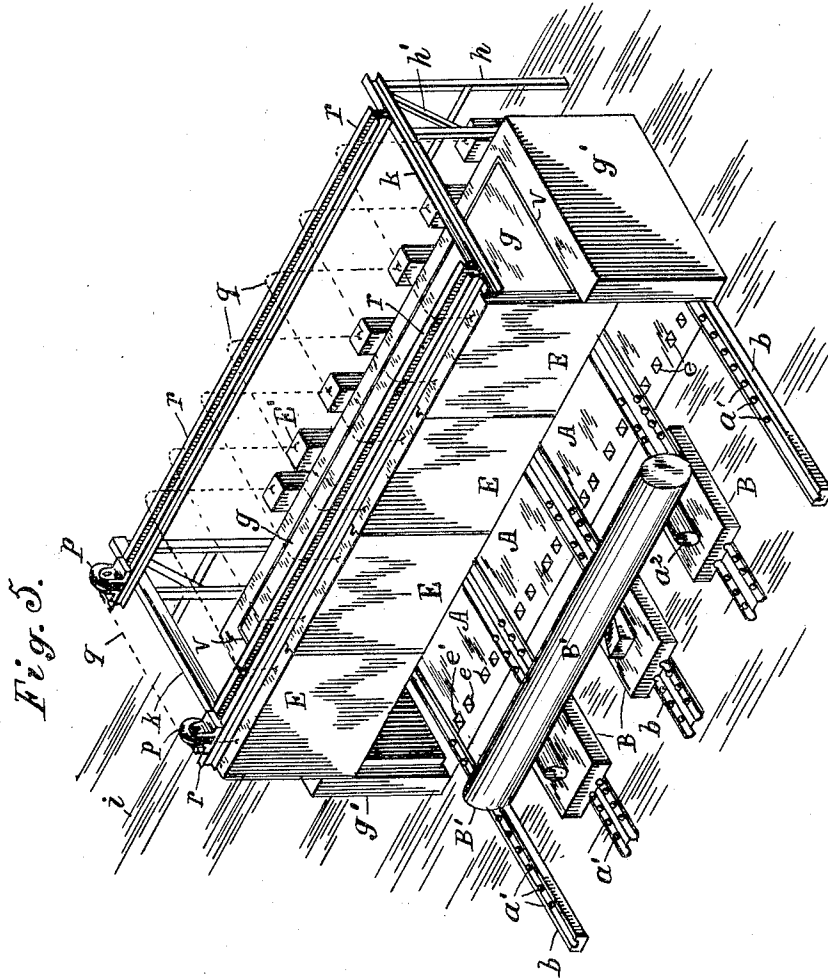
4 SHEETS—SHEET 3.



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OPEN-SIDE FURNACE.

1,359,532.

Specification of Letters Patent. Patented Nov. 23, 1920.

Application filed November 4, 1919. Serial No. 335,602.

To all whom it may concern:

Be it known that I, WALTER S. ROCKWELL, a citizen of the United States, residing at 300 West 106th street, New York, county of New York, and State of New York, have invented certain new and useful Improvements in Open-Side Furnaces, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to provide a heating-furnace with an oblong heating chamber and a series of contiguous doors covering the longer side of said chamber. When the doors are all raised, such heating-chamber is adapted to receive sidewise and heat long objects (like steamship propeller shafts), and this long chamber is also capable of division by partitions into a series (as two or more) of independent spaces for operating upon pieces much shorter than the entire initial chamber.

The partitions are movable into and out of the initial chamber which is made with flat roof to nearly touch the tops of the partitions, and the bottoms of the partitions are mounted upon balls or other anti-friction supports in runways arranged to guide them transversely of the chamber.

The roof of the chamber is not only flat to fit the tops of the partitions, but is necessarily overhung throughout its entire length, and its weight supported independent of the furnace-walls by a cantaliver structure of beams extended above the roof from trussed standards at the rear side of the furnace.

Independent means is provided for heating each of the divisional spaces separately, when the partitions are inserted, and the furnace can thus be economically used in heating relatively short pieces, while it is also adapted to receive long pieces transversely by removing the partitions.

The drawing shows an underfired furnace, and in such construction the combustion-chamber is necessarily located below the floor-level of the mill, so that the floor of the heating-chamber may be level with the

mill-floor to permit the charging of the furnace by a truck.

One embodiment of the invention is shown in the annexed drawing, in which Figure 1 is an elevation of the furnace, in section where hatched, on the center line of the furnace; Fig. 2 is a plan in section at the right-hand end upon the line $x-x$ in Fig. 1, and at the left-hand end upon the line $y-y$ in Fig. 1; Fig. 3 is a vertical cross section on line 3-3 in Fig. 2; Fig. 4 is a cross section of the heating-chamber with a modified arrangement of the spent-gas-flue; and Fig. 5 is a diagram, in perspective, of the body of the furnace with the doors raised and partitions removed to utilize the entire heating chamber at once.

Such chamber is designated A in Figs. 3 and 5, and the spaces A' , A^2 , A^3 and A^4 in the other figures are transverse divisions of such chamber formed by the movable partitions a , which are supported by balls a' in runways or floor-rails b , grooved to guide the balls. The spaces are closed by separate doors E.

When the partitions are removed, as shown in Fig. 5, one or more trucks B may be mounted on the balls a' to support a shaft or bar B' which requires the whole length of the furnace to heat it. Such shaft is thus moved transversely into the furnace, instead of lengthwise, as is usual with relatively short shafts or pieces. The partitions a and truck B are of refractory construction, as is necessary.

A combustion-chamber C is shown beneath each of the spaces A' to A^4 , and connected with said spaces by the hot gas flues e entering the floor of each space at its front and rear ends, as shown in Fig. 2.

Spent gas-flues e' and f' are shown extended from the floor of each divisional space separately to a common duct D which would be connected to a chimney. Burner-openings e^2 are shown, and any means of heating the combustion-chamber may be used.

Where it is not convenient to lead the spent gases downwardly, they may be car-

ried upwardly as shown in Fig. 4, by flues e^2 in the wall of the heating-chamber.

A preheater s for the air used in combustion, is shown in Fig. 4, through which the spent gases pass; heating the air-coil s' which is supplied through the inlet t and discharged through the outlet t^2 to the fuel-burners.

The construction described thus provides means to heat each divisional space A' to A^4 separately, such means also operating conjointly to heat the entire initial chamber when the partitions are removed, as in Fig. 5.

The disposition of the separate heating means at a series of points in the width of the heating-chamber, enables the operator to regulate the heat at different points, and thus utilize the fuel most efficiently.

It is common to arch the roof of furnace-chambers, but in the present invention the roof is entirely flat, and may be supported independently of the furnace-walls, and therefore needs no abutment for an arch.

The use of movable partitions makes a flat roof necessary, to permit the partitions to slide into the chamber, and stand close to the roof. Such a flat roof is not self-supporting like an arch, and means is therefore provided, independent of the furnace-walls, to support the roof g intermediate to its end walls g' and free or clear of the rear wall and doors.

Figs. 1 and 4 show a clearance v between the edge of the roof and the adjacent walls, and Fig. 3 shows the rear wall rabbeted at b^* to clear the roof and forming a bent passage to retain a refractory material (as asbestos) which would obstruct the escape of the hot gases.

The supporting means is preferably arranged at a distance above the furnace where it will not be injuriously affected by the heat of the roof, and may be connected adjustably to the roof; so that the tension of the supporting rods may be regulated to correspond with any expansion or distortion of the roof as an effect of heat.

The floor of the heating-chamber A is necessarily at the level i of the mill-floor, and the combustion-chambers are shown as in a pit of suitable depth, and standards h trussed by braces h' are shown anchored in the earth below the floor-level i , and further stiffened by foot-bars j joined to the bottoms of the standards h , and extended below the body of the combustion-chamber.

Each of the frames thus formed is provided at the top with a braced cantaliver beam k extended transversely above the roof g , and connected to the roof by hangers or suspension rods l which are secured detachably to transverse suspending bars m having each a flange m' embedded in the upper side

of the roof. The rods l have adjusting-nuts n fitted to the tops of the beams k to vary the tension of each rod until they support equal proportions of the entire load.

To equalize the strain, all the rods are connected jointly with all the suspending-bars m by means of joint-plates formed of two opposed channel-irons l' fitted to heads upon the rods l and upon clevises pivoted to the bars m , as shown in Fig. 3. The rods l may thus be tightened to distribute the load of the roof equally upon all the suspending-bars m .

Figs. 3 and 5 show bars r transversely connecting the beams k , and supporting pulleys p which carry the chains q that sustain the separate doors E and their counterbalance-weights E' .

The doors have a loose "tongue and groove" joint o, o' , at their adjacent edges, to guide each in a vertical path when raised independently of the others, as shown in Fig. 2.

Very heavy loads may be carried by the truck B into and out of the heating-chamber A , and it is evident that the runways b, b' , must, notwithstanding such loads, be permanently sustained at the same level as the floor of the furnace, so that the trucks may be readily moved into the chamber A , upon the runways.

To sustain the runways firmly, the frame formed of the bars h and j is extended upward to the level of the runways by bars and braces j^2 which serve additionally, as shown in Fig. 3, to brace or support the front side of the masonry about the combustion-chamber C .

The location of the beams k (which carry the roof weight) materially above the roof, preserves the supporting parts effectively from the heat of the furnace, and thus enables them to furnish a firm stationary support for the roof.

It is evident that with a horizontal heating chamber a very long shaft may be much more readily charged into the furnace, and withdrawn and quenched, than in a vertical furnace in which the shaft would be removed and quenched vertically.

It will be understood that the partitions are of such flat form that when they are not in use they may (by the aid of a crane) be grouped in a small pile where they will not interfere with the use of a truck, as B , upon the same runways that sustain the partitions. The runways thus perform a double function in the use of the furnace; in supporting both the partitions and the trucks independently.

It will be understood that the width of the furnace is the space occupied by the series of doors, and as the expansion of a roof 40 to 60 feet in width is very considerable when

highly heated, means is provided in this invention to permit such expansion without injury to the roof and the adjacent walls.

Such means consists of the clearance space v or v' , which is shown in the drawing at the ends and rear edge of the roof. Such a clearance space entirely relieves the end and rear walls of the furnace from the weight of the roof, and this feature distinguishes the invention from any construction in which the roof is supported wholly or substantially upon the walls of the furnace.

The construction prevents the expansion of the roof from straining or pushing the walls outwardly and thus preserves them from such unnecessary injury.

The clearance space between the roof and the side-walls thus performs the double function of permitting expansion, and relieving the side-walls from the weight of the roof, which is transferred wholly or substantially to the suspending means.

It is obvious that all the advantages of the independently supported roof may be realized by arranging the cantaliver beam z close to the roof, with shorter supporting connections between the two, if circumstances required such an arrangement.

A notched roll a^2 is shown supporting the shaft B' upon each of the end trucks B , to permit the expansion of the shaft when heated but is not claimed herein as it has been claimed separately by Richard C. Drinker in application No. 328,164 filed October 3, 1919. The shaft may be wedged up on the center truck, to divide the load with the end trucks. The subject-matter of the present application was disclosed in a prior application filed September 2, 1919, with Serial No. 321,126, which application has been abandoned.

Having thus set forth the nature of the invention what is claimed herein is:

1. A heating-furnace having a heating-chamber with a series of contiguous doors closing its longer side, a roof fitted between the walls of the chamber and the said doors with clearance to provide for expansion, and means projected above the furnace and connected to the roof for supporting the same.

2. A heating-furnace having an oblong heating-chamber with a series of contiguous doors closing its longer side, a roof fitted between the side-walls of the chamber with clearance to provide for expansion, and means projected above the furnace from the rear side thereof and connected to the roof for supporting the same in its operative position independently of the side-walls.

3. A heating-furnace having an oblong heating-chamber with a series of contiguous doors closing its longer side, runways extended transversely into the heating-cham-

ber, and one or more trucks movable upon such runways for carrying a long bar into the chamber transversely of its length.

4. A heating-furnace having a refractory roof, means provided in the roof for the attachment of suspension-rods, a frame with beams extended from the rear of the furnace over its roof, and suspension-rods connecting the said beams with the roof.

5. A heating-furnace constructed as in claim 4, and having trussed standards at the rear side of the furnace, and braced cantaliver beams projected from the standards above the furnace to sustain the suspension-rods.

6. A heating-furnace constructed as in claim 4, and having a joint connection between all the suspension-rods and the attachments to the roof to equalize the loads thereon.

7. A heating-furnace having a heating-chamber with an overhung roof, means provided in the roof for the attachment of suspension-rods, trussed standards in the rear of the furnace with beams projected over the roof and suspension-rods connecting the beams to the roof, and anchor beams attached to the standards and extended below the body of the heating-chamber.

8. A heating-furnace constructed as in claim 7 and having the anchor beams of the standards extended beneath the masonry of the combustion-chamber of the furnace.

9. A heating-furnace having an oblong heating-chamber and provided with a flat roof and one or more partitions movable into and out of the heating-chamber, to form independent heating-spaces.

10. A heating-furnace having a heating-chamber with a flat stationary roof, means above the roof with connections for supporting the same clear from the furnace walls, and one or more partitions movable into and out of the heating-chamber, to form independent heating-spaces.

11. A heating-furnace constructed according to claim 10 and having means for separately heating the said independent spaces.

12. A heating-furnace constructed according to claim 10, and having separate combustion-chambers beneath the spaces formed by the partitions, with means to supply such combustion-chambers independently with fuel for combustion.

13. A heating-furnace having a heating-chamber of much greater width than length, with an overhung roof, and means to suspend the same over such chamber independently of the furnace-walls, a series, as two or more, of refractory partitions movable into and out of said chamber to form independent heating-spaces, means for separately heating said independent spaces, and movable doors fitted to separately close each

of the said spaces, and to close the entire chamber when the partitions are not in use.

14. A heating-furnace having a heating-chamber with an overhung roof, transverse
5 runways extended into such chamber, trussed standards at the rear of the furnace with beams projected over the furnace roof, and suspension-rods or hangers connecting
10 the beams to the roof, anchor beams attached to the standards, and extended beneath the furnace and beyond the front side
of the same, and an upward extension of the frame at the front side of the furnace
beneath each of the runways, to hold the
same level with the floor of the heating- 15 chamber.

In testimony whereof I have hereunto set my hand.

WALTER S. ROCKWELL.