W. N. BEST.

FURNACE FOR ANNEALING OR HEAT TREATING.

APPLICATION FILED JUNE 14, 1918.

1,281,489. Patented Oct. 15, 1918.

2 SHEETS—SHEET 1.

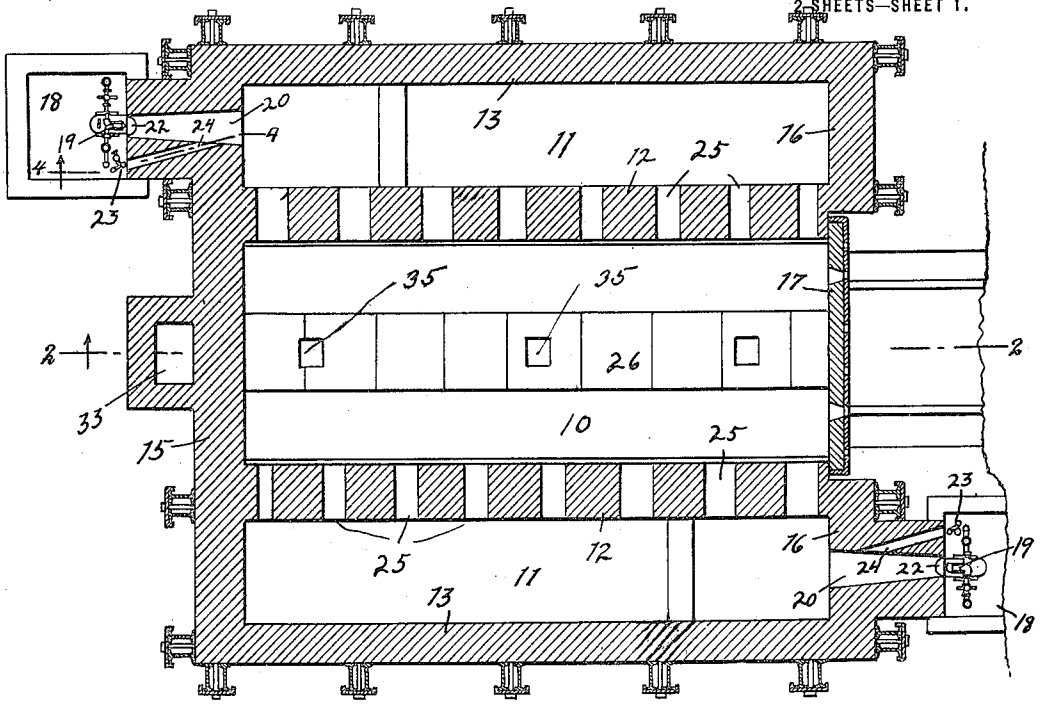



Fig. 1.

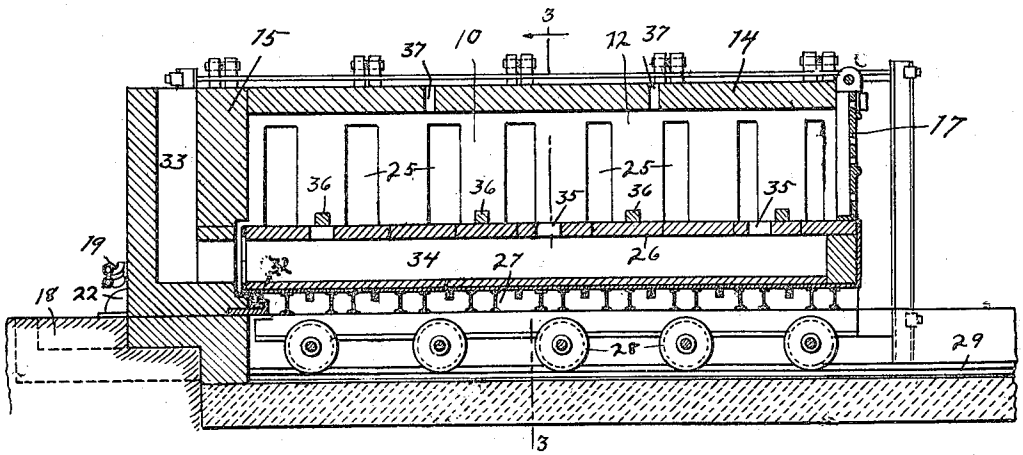



Fig. 2.

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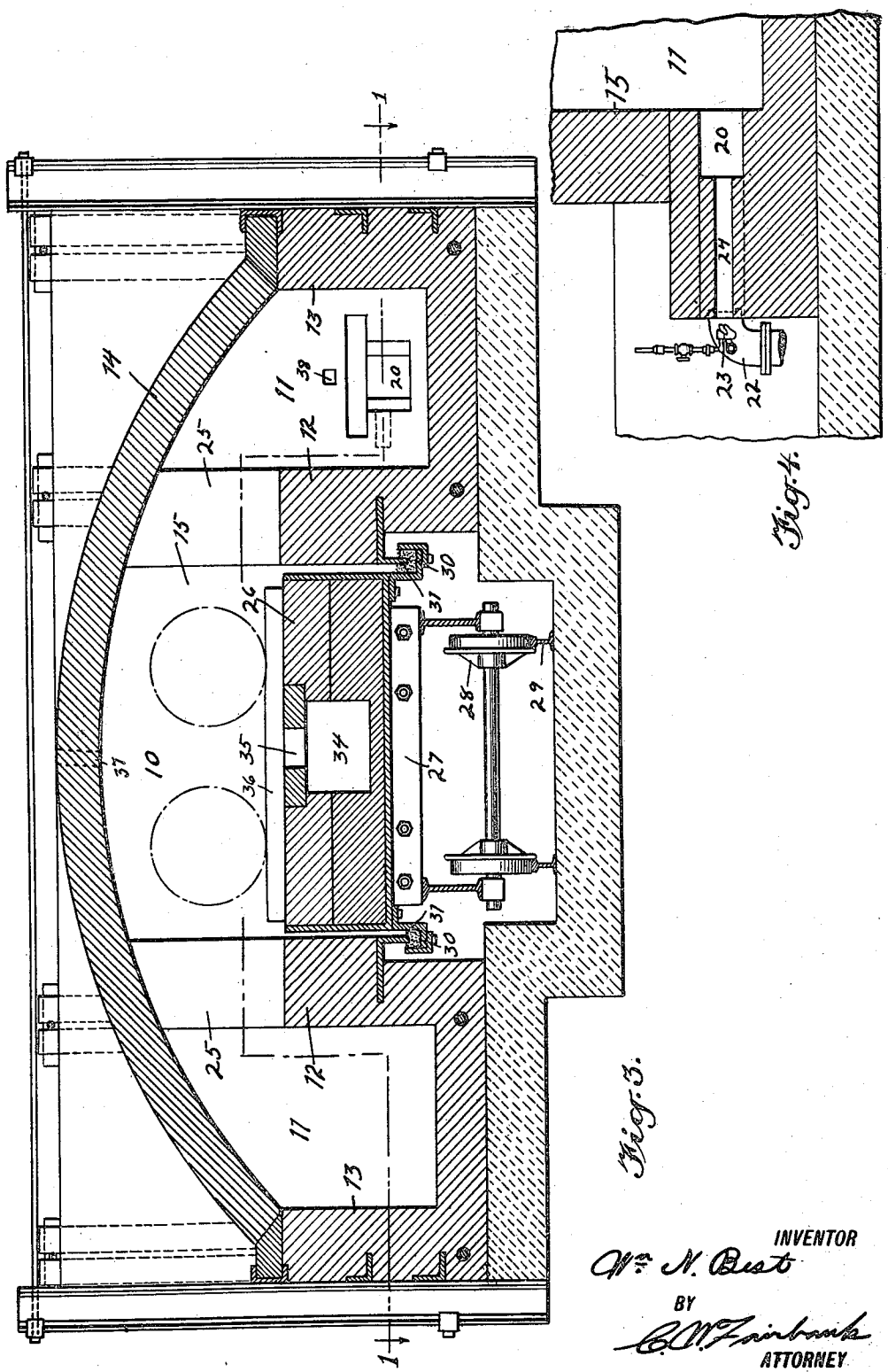



Fig. 4.

Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## FURNACE FOR ANNEALING OR HEAT TREATING.

1,281,489. Specification of Letters Patent. Patented Oct. 15, 1918.

Application filed June 14, 1918. Serial No. 239,962.

*To all whom it may concern:*

Be it known that I, WILLIAM N. BEST, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Furnaces for Annealing or Heat Treating, of which the following is a specification.

This invention is a furnace for annealing, hardening, tempering, or other heat treating of metallic or other articles or of crucibles or containers therefor. The main object of my invention is to secure a uniform heat distribution in the chamber adapted for the heat treatment of the articles and particularly comparatively large articles, such as shafts, axles, etc., which are most conveniently moved into and out of the chamber on a car, truck, or other movable platform and supported thereon during said heat treatment.

As one important feature of my construction for securing the uniform heat distribution, I utilize the platform or body of the car or other movable work support and carrier, as a part of the conduit or passage for the hot gases so that they are brought into more intimate contact with the work, parts, or articles to be heat treated. By forming the platform with a longitudinal passage having gas ports along its length and open at one end so as to register with the flue in the furnace wall when the platform with its load is in position, the articles along the platform are equally subjected to the heating action.

As another important feature of my improved construction, I provide two separate parallel flame or hot gas passages along opposite sides of the heating chamber and deliver the flame or hot gases in opposite directions lengthwise of these passages and admit it along the length of said sides so that all portions of the chamber along its length receive equal quantities of heat.

As another important feature, I establish communication between the heating chamber and the parallel flame or hot gas passage by a series of ports leading from the latter at an angle to the main direction of flame travel, the ports varying in size with the largest nearest to the burner where the velocity past the port is greatest. Thus the amount of flame or hot gases entering the chamber at all points may be substantially equal irrespective of the distance of said ports from the burner.

As a further important feature I provide a single arch roof over the heating chamber and flame passage or passages with its axis parallel to the latter and with the high part over the chamber and the downwardly inclined sides of the arch over the flame passages so that said inclined sides act to deflect the flame and gases and also radiate the heat laterally of the passages on to the articles to be heated.

In the accompanying drawings I have illustrated one embodiment of my invention designed for the accomplishing of the above mentioned object and including all of the features above referred to. It will of course be evident that various changes may be made in the details of construction and the arrangement of parts and that constructions embodying certain but not all of the important features thereof may be constructed within the scope of my invention as defined in the appended claims.

In these drawings to which reference is to be had:

Figure 1 is a horizontal section on line 1—1 of Fig. 3.

Fig. 2 is a central longitudinal vertical section on line 2—2 of Fig. 1.

Fig. 3 is a transverse vertical section on the line 3—3 of Fig. 2 on a larger scale, and

Fig. 4 is a sectional detail on line 4—4 of Fig. 1.

In the specific form illustrated the furnace has three main chambers including a heating chamber 10, and two oppositely disposed flame or hot gas chambers or passages 11, 11 separated therefrom by parallel partitions 12, 12. The outside wall of the furnace may be of fire-brick or any other suitable material and includes side walls 13, 13 parallel to said partitions and supporting an arch roof 14 covering the three chambers with the high part of the roof over the central or heating chamber 10. At one end there is provided an end wall 15 and at the opposite end are walls 16, 16 at the ends of the flame passages 11, 11 and a door 17 for closing the heating chamber.

At one end of one flame passage and at the opposite end of the other flame passage are burner pits 18 receiving burners 19 which latter deliver through diverging passages 20 through the walls 16, 16 lengthwise

of the flame passages 11, 11. Although I may employ various different forms of burners in connection with my improved furnace, I preferably employ a type in which the liquid fuel, such as oil or tar, is delivered through an upwardly facing port across which a blast of compressed air, steam or other atomizing fluid is forced so as to deliver the atomized fuel in a substantially fan-shaped sheet. I have shown somewhat conventionally a burner 21 which may be constructed as shown in my prior Patents 708,453 issued September 2, 1910 or 752,195 issued February 16, 1904. Below this may be placed a nozzle 22 for delivering low pressure volume air to support the combustion of the vaporized fuel. Although the burners above referred to are relied upon to raise the heating chamber and the articles therein to the desired high temperature, it may be found desirable and economical to use smaller burners for holding the temperature at the desired point after this has been reached. I have shown small auxiliary burners 23 delivering through passages 24 adjacent to the burners 19 and their passages 20. The use of such auxiliary means may be substantially the same as disclosed and claimed in my prior Patent 1,166,807 issued January 4, 1916.

The arch roof 14 has its downwardly inclined side portions directly over these flame passages 11, 11 and tends to deflect or divert the flame and gases laterally and also to radiate laterally the absorbed heat. For aiding in securing the uniform distribution of the heat along the length of the heating chamber, the partitions 12, 12 each have a series of ports 25 therethrough, the ports varying in size from one end of the partition to the other. The largest port is disposed adjacent to the burner and of each flame passage where the flame is traveling at the highest velocity. As the rate of travel of the flame decreases toward the far end the ports are smaller in size. The smaller ports opposite the slow velocity gases take substantially the same amount as the larger ports opposite the high velocity gases, due to the fact that the gases are traveling in a direction at right angles to the direction of the ports. Each port extends from the upper edge of the partition closely adjacent to the arch roof down to a point determined upon by the level of the support for the articles or parts to be heated.

For supporting the articles to be heated, I employ a platform 26 of a width but slightly less than the distance between the two partitions 12, 12 and provide means whereby this platform may be moved bodily into or out of the furnace. As shown, it has a metal frame-work 27 supported by a series of wheels 28 movable along a track 29. The body of the platform above the frame is formed of fire-brick or other fire-resisting insulating material and the sides of the platform or truck have means for coöperating with the partitions to form a seal separating the heating chamber above the platform and the space beneath the platform within which is the supporting wheels and track. One means of forming such a seal includes the use of channels or troughs 30 on one each side of the platform into which extend depending flanges 31 on the partitions 12, 12. The troughs are filled with sand so that the truck may be freely moved endwise but the passage of gas beneath the flanges 31 is prevented by the sand. At the end of the truck opposite to the door the end wall 14 may have a trough 32 into which sand may be piled to such a level that the under surface of the platform will move into or on to the sand and thus form an effective seal.

The end wall 14 of the furnace has a flue 33 for the escape of the gases of combustion and this at its lower end turns laterally and registers with a flue or passage 34 in the body of the platform 26 and extending lengthwise of the latter. A series of ports 35 lead from this flue 34 to the upper surface of the platform so that the gases which are delivered laterally into the heating chamber through the ports 25 may pass over and around the articles to be heated and down through the ports 35 to the flue 34. By supporting the articles to be heated such for instance as large shafts or axles on rest-blocks 36, the gases may pass beneath as well as over the said shafts or axles from the ports 25 to the ports 35 and effectively and uniformly heat them from one end to the other. To aid in preventing the space beneath the platform from being too highly heated, the door 17 is preferably mounted to move vertically and when in lowered position rest directly upon the end of the platform so that the outside air may freely circulate beneath the platform and around the wheels and bearings of the truck.

The various walls of the furnace may be reinforced, supported or held in place in any suitable manner and suitable pyrometer openings 37 may be provided in the arch roof as well as peepholes 38 in the end walls adjacent to the burners, whereby the operation may be observed and controlled. So far as the actual heating operation and the uniform distribution of heat is concerned it will of course be evident that the bottom or work supporting platform may be stationary and the articles placed thereon upon opening the door 17 or through any other suitable openings. The forming of the bottom of the heating chamber as a car platform is not an essential to my invention, although it is

preferably employed where the parts to be heated are heavy or moved with difficulty when in heated condition.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A furnace, having a heating chamber, separate flame passages extending lengthwise thereof along opposite sides and communicating therewith through said sides, means for delivering flame lengthwise of one of said passages from one end thereof, and means for delivering flame lengthwise of the other passage from the opposite end thereof.

2. A furnace, having an arch roof, substantially vertical partitions extending lengthwise thereof therebeneath, and forming a heating chamber beneath the high portion of the arch, and flame passages beneath the downwardly inclined side portions of the arch, and means for delivering flame lengthwise of said passages, said partitions having portions of their upper edges spaced from said roof to permit the upward flow of gas along said roof from said passages to said heating chamber.

3. A furnace, having an arch roof, recticulated substantially vertical partitions extending lengthwise thereof therebeneath, and forming a heating chamber beneath the high portion of the arch, and flame passages beneath the downwardly inclined side portions of the arch, and means for delivering flame lengthwise of said passages in one direction in one passage and in the opposite direction in the other passage.

4. A furnace, having a heating chamber, separate flame passages extending lengthwise thereof upon opposite sides and separated therefrom by partitions, said partitions having ports therethrough along the length thereof and larger at one end than at the other, and means for delivering flame lengthwise of each passage from the end thereof adjacent to the largest ports in said partitions.

5. A furnace, having a heating chamber, a flame passage extending along one side thereof from one end to the other and separated therefrom by a substantially vertical partition, and means for delivering flame to one end of said passage lengthwise thereof, the top wall of said passage being inclined downwardly away from said heating chamber, and said partition having passages therethrough closely adjacent to said top wall whereby the flame and hot gases are deflected laterally toward said heating chamber.

6. A furnace, having a heating chamber, a flame passage extending lengthwise thereof along one side, a partition separating said chamber and said passage and having a series of ports therethrough of varying sizes, the largest being at one end and the smallest at the other, and a burner at the end of said passage adjacent to the largest ports delivering lengthwise thereof toward the end having the smallest ports.

7. A furnace, having a heating chamber, flame passages extending lengthwise thereof along opposite sides and separated therefrom by reticulated partitions, means for delivering flame lengthwise of said passages and through said partitions, and an outlet passage extending lengthwise within the floor of said heating chamber and communicating with the latter through spaced ports along the length of said floor.

8. A furnace, having a heating chamber, the work supporting floor or platform thereof having a passage extending lengthwise thereof and communicating therewith through a series of spaced vents, side walls for said heating chamber having a series of ports therethrough, and means for delivering flame and hot gases along the outer surfaces of said side walls in one direction on one side and in the opposite direction on the other side.

9. A furnace, having a heating chamber, provided with spaced inlets along opposite sides thereof for delivering the flame or hot gases transversely thereof and a longitudinal movable platform or work support provided with a passage extending lengthwise thereof, and spaced ports leading from said passage to the upper surface thereof along the length of said platform, and an escape flue adapted to register with said passage when said platform is in position.

10. A furnace, including a work support platform, an arch roof extending over the same, means for delivering flame lengthwise beneath the side portions of said arch in opposite directions upon opposite sides of said platform, and a vent flue extending lengthwise through said platform.

Signed at Brooklyn in the county of Kings and State of New York this 7th day of June A. D. 1918.

WILLIAM N. BEST.