

(No Model.)

3 Sheets—Sheet 1.

F. N. CLINE & H. McFARLANE,
TIRE FURNACE.

No. 469,415.

Patented Feb. 23, 1892.

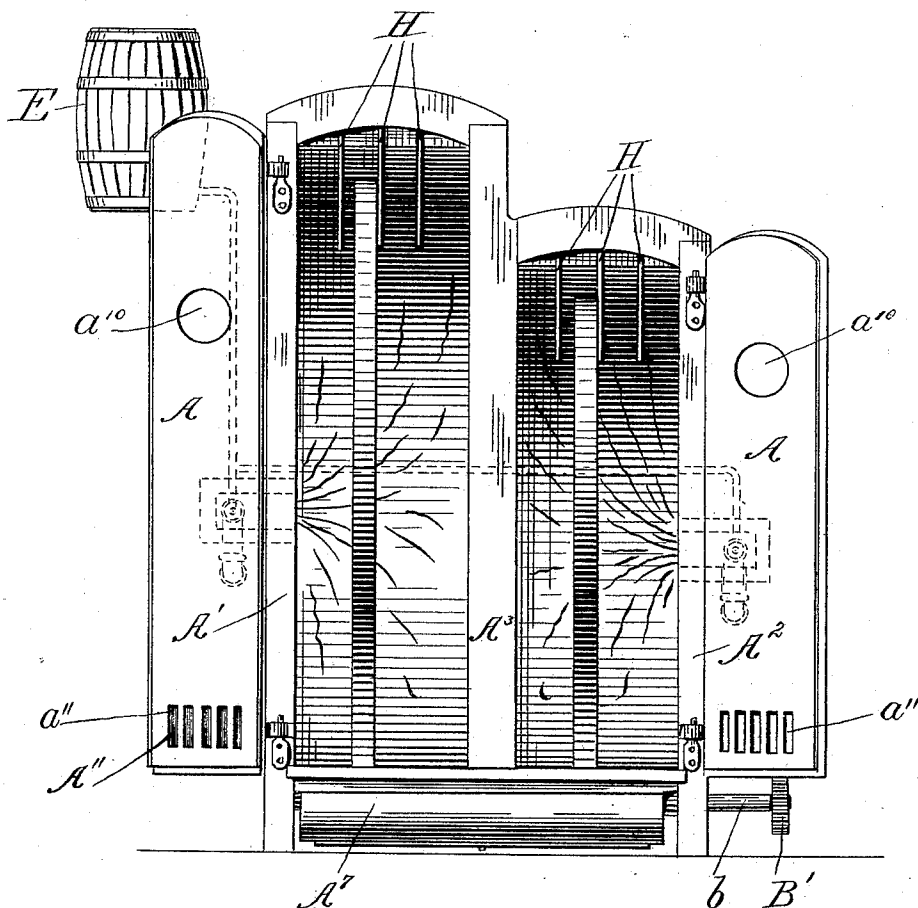


FIG 1

Witnesses:

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Jean Bellis

By *Attorneys*
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Inventors:

Fred. N. Cline
Hugh McFarlane

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FIG 3

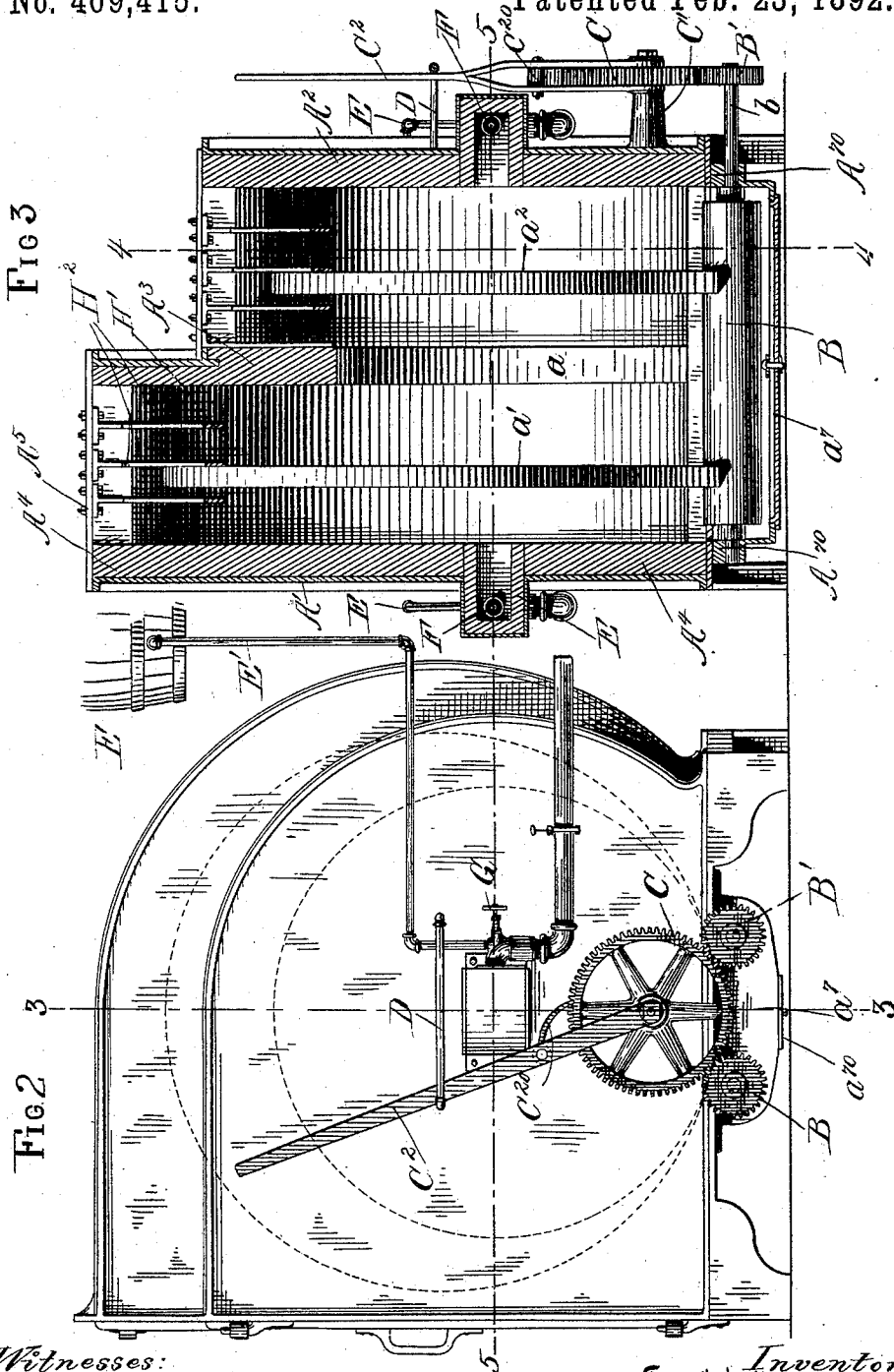


FIG 2

Witnesses:

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UNITED STATES PATENT OFFICE.

FREDERICK N. CLINE AND HUGH MCFARLANE, OF CHICAGO, ILLINOIS.

TIRE-FURNACE.

SPECIFICATION forming part of Letters Patent No. 469,415, dated February 23, 1892.

Application filed June 12, 1891. Serial No. 396,043. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK N. CLINE and HUGH MCFARLANE, citizens of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Tire-Furnaces, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved furnace in which to heat metal wheel-tires to expand them preparatory to applying them about their respective wheels in order to take advantage of the contraction of the metal during cooling to bind the framework of the wheel and cause the tire to be firmly held thereon. Heretofore, so far as we are aware, it has been customary to heat tires in horizontal position, and various devices or furnaces for such purposes adapted, respectively, to various kinds of fuel—solid, liquid, and gaseous—have been employed; but a difficulty encountered in such methods of heating tires is that they cannot easily be heated uniformly throughout their entire circumference on account of the difficulty of maintaining perfect uniformity in the heating-flame or bed of coals and the further difficulty that a large amount of heat must necessarily be wasted in attempting to maintain a uniform fire of such an extent. Our invention is designed to overcome these defects and to heat tires uniformly by means of the smallest fire which is sufficient to afford the necessary heat.

In the drawings, Figure 1 is a front elevation of our improved furnace with the doors open, showing the interior of the furnace and tires therein. Fig. 2 is a side elevation of the same. Fig. 3 is a section at the line 3 3 on Fig. 2, except as to certain operating-gear shown in full elevation. Fig. 4 is a section at the line 4 4 on Fig. 3. Fig. 5 is a horizontal section at the line 5 5 on Figs. 2 and 3.

In the drawings we have illustrated a furnace having two compartments, in order to accommodate at the same time wheels of various sizes without making a compartment wide enough for such number of wheels and high enough to accommodate the largest size, which would be necessary if one compart-

ment only were provided and which would cause the furnace to have larger capacity than necessary, and so require more heat than necessary for its purpose.

A' A² are the opposite side walls of the furnace, and A³ the partition-wall between the two compartments a' and a², respectively. This partition is not continuous—that is, it does not completely close communication between the two compartments—but extends from the top downward and from the front and rear inward, having the circular opening a through it, which, however, is less in diameter than the smallest tire for which the furnace is designed to be used, so that said partition will confine the flame and heat about such smallest tire notwithstanding there is free communication between the two compartments through the center within the tire, such communication being no disadvantage, because there is at the center no metal to be heated and no necessity for confining the heat or heating-flame; and it is a positive advantage in this respect that the heat of the two compartments is substantially or approximately equalized by reason of the fact that their respective burners, hereinafter described, are located at opposite sides of this central opening a, so that each tends to contribute flame to some extent to the opposite compartment.

B B are horizontal rollers journaled in suitable bearings provided in the lower portion of the exterior walls. The particular location and arrangement of these bearings with respect to the furnace frame-work is hereinafter described. These two rollers are located a short distance apart in the same horizontal plane substantially at equal distances from a transverse vertical plane through the center of the chambers. They are far enough apart so that a tire standing upon them is stable as respects any tendency to roll; but somewhat more than this is necessary in view of the action hereinafter described, and in practice I have located these rollers with their axes distant from each other as much as one-half the radius of the largest size tires. Upon the shafts b b of these rollers, which extend beyond the furnace at one side, there are secured the gear-pinions B' B', respectively, and upon a stud-axle C', jutting hori-

zontally from the frame of the furnace vertically above a line midway between the axes of the rollers, there is journaled the gear-wheel C, which meshes with both the pinions B'. Upon the stud C' there is fulcrumed the forked lever C², said lever striding the gear-wheel C and having pivoted to it above the gear-wheel the pawl C²⁰, adapted to engage the cogs of the gear-wheel to rotate said wheel in one direction and free to ride over them when the lever is rocked in the other direction.

D is a guard for the lever C², consisting of a horizontal rod connecting horizontal feet at right angles to it, said feet being secured to the side wall of the furnace and constituting the stops which arrest the rocking movement of the lever at its opposite limits, the said rod D being outside the lever and preventing the accidental bending of the lever away from the plane of its rocking movement.

This furnace is designed to be used with liquid fuel, as gasoline or other oil capable of being vaporized. E represents a tank which may contain such fuel.

F F represent vapor-burners in the outside walls, respectively, of the two compartments of the furnace.

E' E' represent pipes which conduct the liquid fuel from the tank E to the burners, respectively. G G are controlling-valves in said fuel-supply pipes, by means of which the quantity of fuel furnished may be regulated as necessity requires. The location of these burners is preferably substantially as illustrated—that is, well up from the bottom of the furnace and preferably not far from the center of the tires. We find this location to result in the best distribution of heat, though some variation may be permitted without very materially affecting the result.

The doors A A are provided with draft-apertures a¹⁰ a¹⁰ toward the upper part, said apertures serving also the purpose of inspection-holes, and apertures a¹¹ a¹¹ at the lower part, these latter being preferably controlled by dampers A¹¹ A¹¹. The products of combustion are permitted to escape through apertures A¹² A¹² in the top of the compartments, respectively.

In order to prevent the tires falling over sidewise while they are in the furnace and thereby becoming entangled and in consequence incapable of prompt manipulation to insure proper uniform heating and easy removal, we provide the dependent guards H H H, &c., which are secured to the top of the furnace in the compartments, respectively, projecting downward therefrom in planes transverse to the axes of the rollers B B and at suitable distance apart to admit between each two consecutive guards a single tire, the outermost guards being also at such distance from the proximate walls of the compartment as to admit a tire between them, respectively, and such walls. These guards are designed

to serve the further purpose of preventing the tire from swinging around on the rollers and so becoming lodged between them, as they might do even though the width of the furnace were not sufficient (as in the drawings it is not shown to be) to permit even the smallest tire to drop entirely between the rollers. The guards are adapted to prevent this displacement of the tires by being extended horizontally in planes parallel to the proper position of the tires, so that they contact the tires which stand between them or adjacent to them at least two points on opposite sides of the vertical line through the axis of the tire—that is, on opposite sides of a vertical plane parallel to the axes of the rollers and midway between them. A convenient form of these guards is that shown in the drawings and shown most clearly in Fig. 4, wherein the horizontal extension referred to is the curved portion H', the guard having two arms H² H² diverging from the upper end, where it is fastened to the frame of the furnace and joining said curved portion H'. This form is particularly adapted to the purpose, because by the curvature of the portion H² it is made to extend lower at the middle part, and thereby reaches smaller tires and contacts them, as desired, at two points at opposite sides of their middle vertical line without necessitating such length as would be necessary to reach and similarly contact such small tires and at the same time serve the same purpose in respect to larger tires if the horizontal extension were made straight instead of thus curved.

We will now describe the detail construction of this furnace in the form in which it is illustrated, this detail construction being merely preferred, not essential. We make the outer surface of the furnace of iron-plate suitably flanged or beaded at the edges for stiffness and convenience of joining the parts. The outer frame thus provided is lined with suitable fire-proof material, as fire brick or clay, at the sides, rear, top, and bottom. The doors A at the front are made with inner and outer plates and intervening air-space to prevent heating through, and the rear is curved so that the furnace does not occupy unnecessary space, and the fire-proof lining extends from the top down along the curved rear side. The bottom plate comprises suitable legs to support the furnace and is cut away from side to side at the middle part, leaving an opening, in which the rollers B stand, a shield being provided inclosing said rollers and making substantially a continuation of the bottom and side walls around them, but without the fire-proof lining at such portion. In the ends of this shield are provided journal-bearings for the rollers B B.

A⁴ represents the fire-proof lining wherever it is employed in side walls, partition-walls, bottom, top, and rear.

A⁵ represents the metal top and rear plates

of the two compartments, said plates being each made in one piece, being bent from the top down around the rear.

A⁶ represents the bottom plate, integral with which the legs A⁶⁰ A⁶⁰ may be formed.

A⁷ represents the shield, connected to the bottom and inclosing on the under side and ends the rollers B B. A draft-aperture a⁷ and damper a⁷⁰ therein may be formed in the bottom of the shield A⁷ between the rollers to assist in equalizing the temperature by properly directing the circulation in the chambers.

A⁷⁰ A⁷⁰ represent journal-bearings for the shafts b b of the rollers B B.

A⁸ represents the inner plate or lining of the doors.

The operation of this furnace may be understood from the foregoing description of its structure to be as follows: The fuel being admitted to the burners and the furnace brought to suitable temperature, with the doors closed, the doors may be opened and tires set in edgewise between the guards H H and upon the rollers in the manner illustrated in the drawings. The doors being then closed, the lever C² being rocked backward and forward will rotate the gear C continuously in one direction and thereby rotate the rollers, causing them to feed the tires which stand upon them slowly round and round in their respective vertical planes, thus bringing all portions of the tires successively into the hottest as well as the coolest and all intermediately-heated portions of the furnace, so that if the heat is not entirely equalized throughout the furnace-chamber the tire nevertheless by being so exposed successively to all the different degrees of heat which exist in the chamber will be uniformly heated throughout its entire circumference, and may then be withdrawn from the door in the same manner in which it was inserted and applied to the wheel, insuring uniform strength and tension in its grasp upon the wheel throughout.

This furnace is not limited to the employment of liquid fuel, although we prefer such fuel; but in view of the devices for rotating the tires in their respective vertical planes to bring them successively into all parts of the furnace substantially uniform heating of the tires may be attained even though the character of the fuel and the position of the fire should be such as to prevent uniform heating of the furnace-chambers.

One great advantage of our furnace over those furnaces in which the tires are heated in horizontal position is that all the tires in our furnace at the same time are equally exposed to the heat of the furnace, which cannot be the case when the construction of the furnace is such that the several tires are assembled horizontally one above another over the fire or flame. We can therefore operate our furnace continuously after it is once heated, taking out the tires successively and replacing each as it is removed for setting by

a cold tire, which will become heated by the time it is reached in its turn. The flame or other fire can be regulated according to the rapidity with which the tires are being set, so that the time consumed in setting the whole number of tires which the furnace can accommodate shall be just sufficient for properly heating each tire. The construction of this form, which permits and includes the location of the two fluid-burners in opposite side walls and adapted to discharge toward each other, tends very materially to insure perfect combustion and thereby economical heating of the furnace, because the two jets of vapor or gas intermixed with air which is drawn in by them after the familiar operation by such burners meeting within the furnace mutually arrest each other as they impinge, and thereby cause the complete commingling of the air and vapor which is necessary to perfect combustion. When the furnace is made with two compartments, as shown and as desirable for the reasons already indicated, the central aperture a through their partition-wall has a function in that it permits the impact of the two jets, as described. This function, it will be observed, is in addition to the one already mentioned—that the heat of the two chambers is approximately equalized by the free interchange which can occur through said opening.

We claim—

1. A tire-furnace having its compartments arranged to receive the tires in a vertical position, combined with vertical guards therein to hold the tires vertical while they are being heated, substantially as set forth.

2. In a tire-furnace, in combination with the chamber adapted to receive the tires in vertical position, two horizontal rollers at the bottom of such chamber having their axes transverse to the vertical planes of the tires, and suitable means for rotating such rollers while the tires rest thereon, substantially as and for the purpose set forth.

3. In a tire-furnace, in combination with the chambers adapted to receive the tires in vertical position, the depending guards H H, projecting from the top of such chambers and extended in planes parallel to the tires to laterally contact the tires placed adjacent to them at two points on opposite sides of a vertical axial plane through the tires, substantially as set forth.

4. In a tire-furnace, in combination with the chambers, the guards H H, depending from the top of the furnace and extended in planes parallel to the tires, the lower edge of such extension being a curve symmetrical about a vertical plane through the axes of the tires, substantially as set forth.

5. In a tire-furnace, in combination with the chambers adapted to receive the tires in vertical position, a vapor-burner discharging at the side of such chambers within the circle of the tires therein, substantially as set forth.

6. In a tire-furnace, in combination with

the chambers adapted to receive the tires in vertical position, the horizontal rollers transverse to the chambers at the bottom thereof, the shafts of such rollers being extended beyond the vertical plane of one side, gear-pinions on such shafts, and the motorgear-wheel C, meshing with such pinions, and suitable means for rotating such wheel, substantially as set forth.

7. In a tire-furnace, in combination with the chambers adapted to receive the tires in vertical position, the vertical guards in such chambers to hold the tires vertical while they are being heated, and the horizontal rollers at the bottom of the chamber and extending transversely therethrough, and means for rotating the rollers to rotate the tires about their axes, substantially as set forth.

8. In a tire-furnace, a chamber in which the tire may be held in vertical position, combined with a burner in the side wall of such chamber discharging with respect to the vertical plane of the standing tire and within the circumference thereof, substantially as set forth.

9. In a tire-furnace adapted to receive the

tire in vertical position, the combination of fluid-burners in the opposite side walls of such furnace discharging toward each other within the circumference of the standing tires, whereby their jets respectively arrest each other and cause commingling of their constituent gases, substantially as set forth.

10. In a tire-furnace having two chambers side by side adapted to receive the tires in vertical position, the partition-wall between said chambers, apertured opposite the middle portion of the standing tires, combined with fluid-burners in the remote or outside walls of the chambers, respectively discharging toward each other and toward such aperture in the partition-wall, substantially as and for the purpose set forth.

In testimony whereof we have hereunto set our hands, at Chicago, Illinois, in the presence of two witnesses, this 3d day of June, 1891.

FRED. N. CLINE.
H. McFARLANE.

Witnesses:

D. PHILLIPS,
LE ROY PENNOYER.