Dec. 7, 1943. L. B. LUELLEN 2,336,269

MOUNTING AND SUPPORT MEANS FOR FURNACE BURNERS

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Fig. 2.

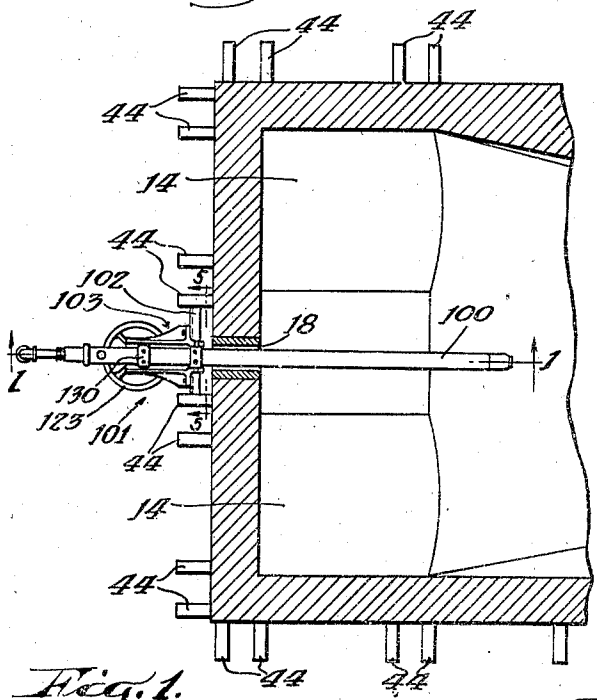


Fig. 1.

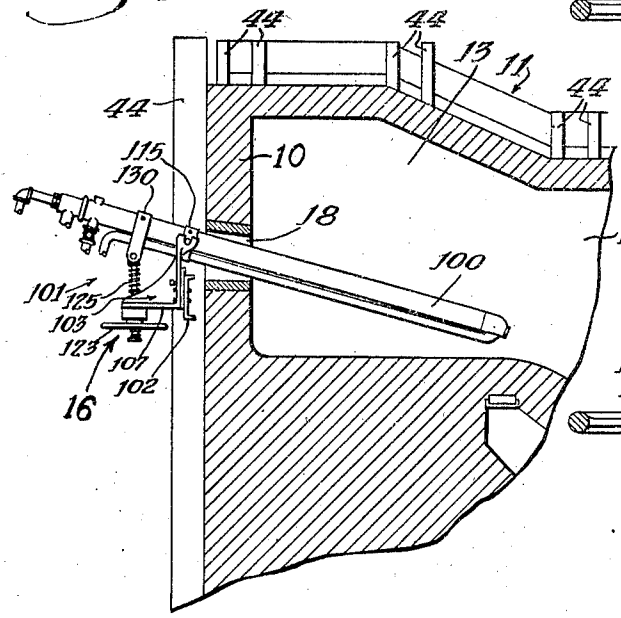


Fig. 9.

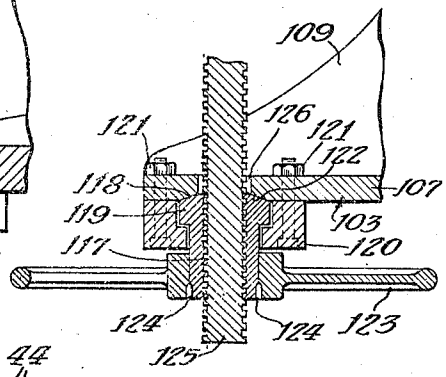
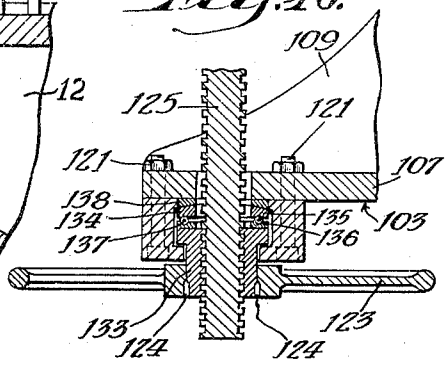


Fig. 10.



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MOUNTING AND SUPPORT MEANS FOR FURNACE BURNERS

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Fig. 3.

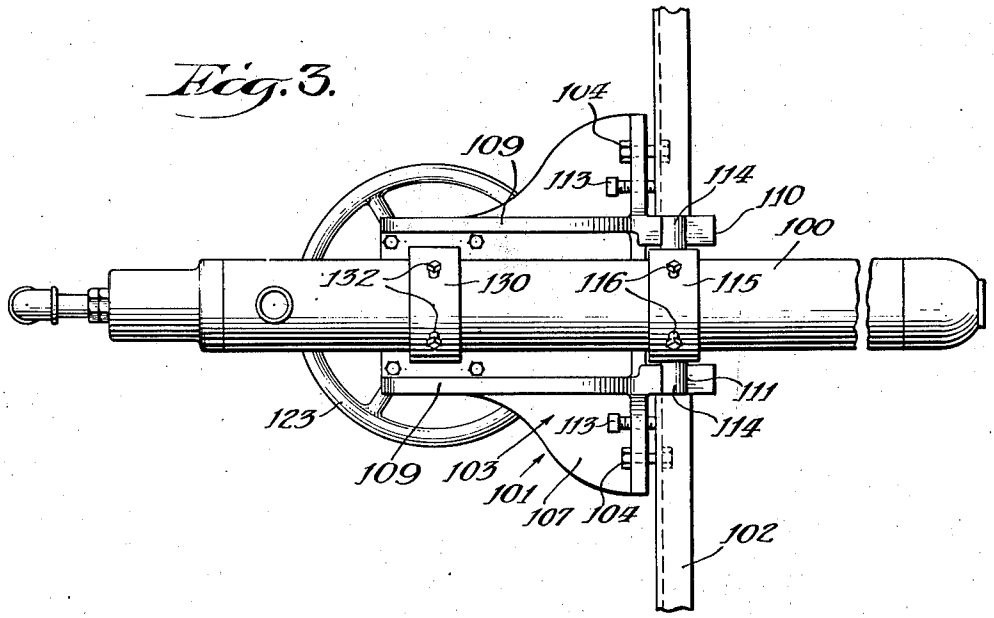
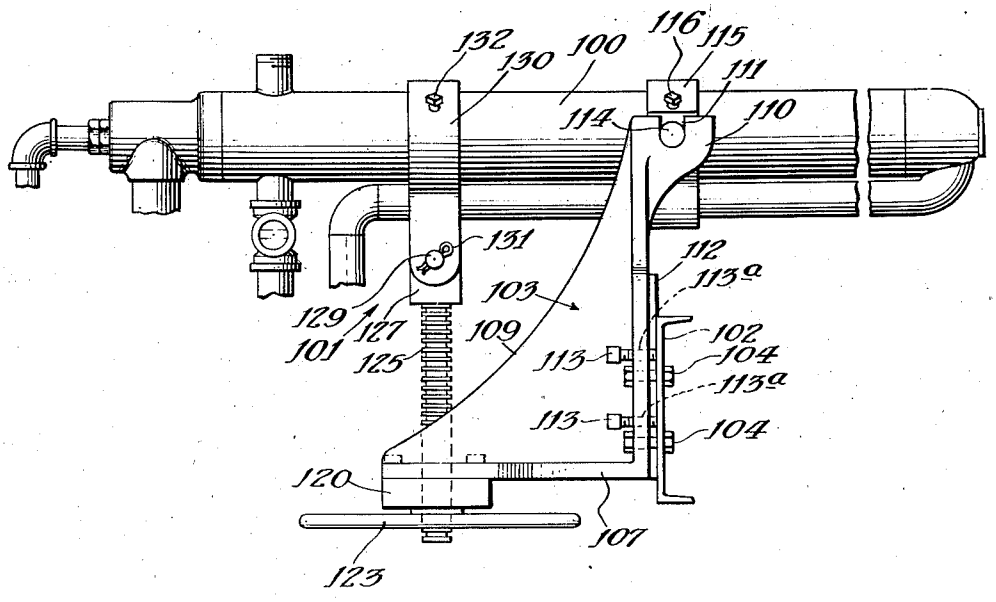


Fig. 4.



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MOUNTING AND SUPPORT MEANS FOR FURNACE BURNERS

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Fig. 5.

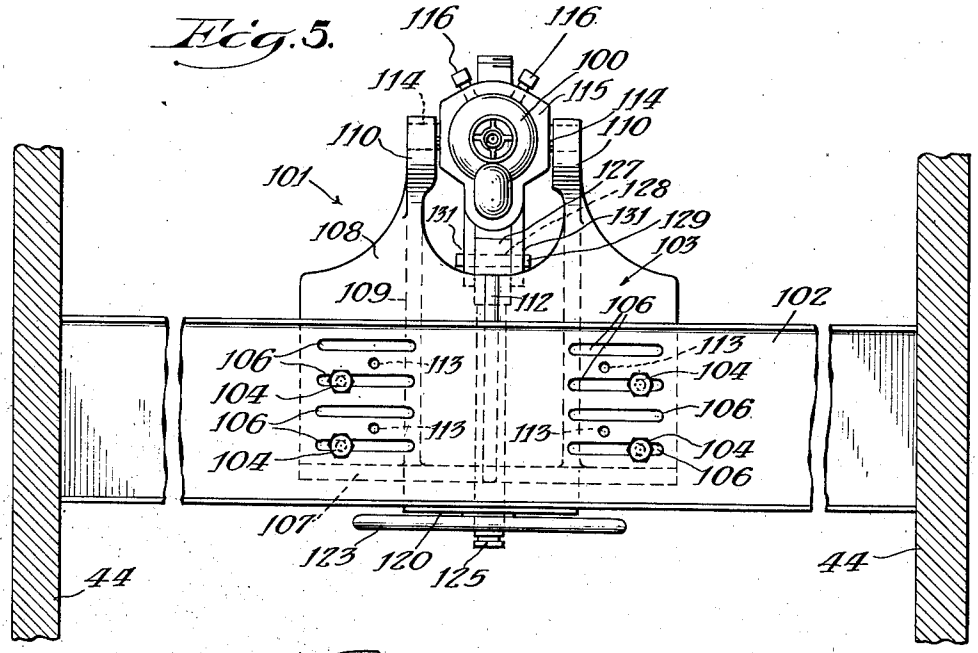


Fig. 6.

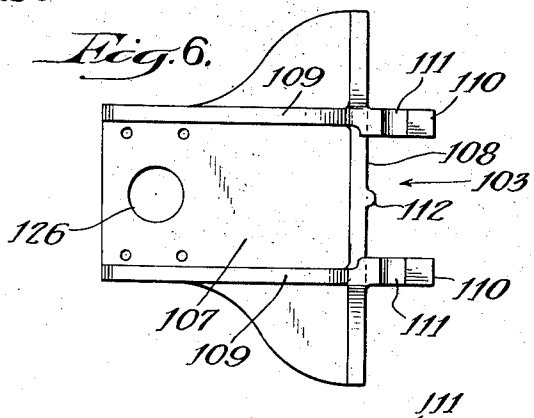


Fig. 8.

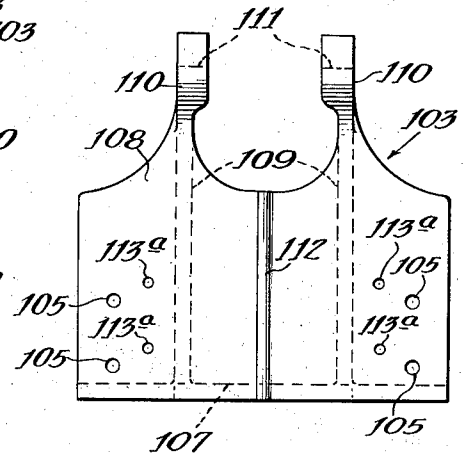
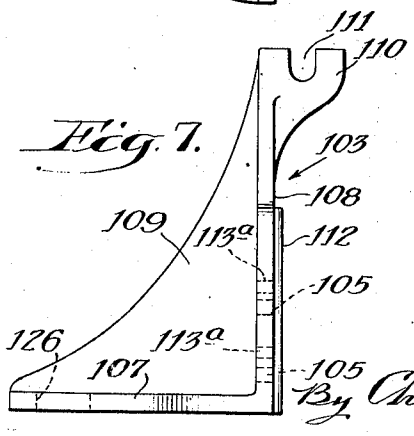


Fig. 7.



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2,336,269

UNITED STATES PATENT OFFICE

2,336,269

MOUNTING AND SUPPORT MEANS FOR FURNACE BURNERS

Leland B. Luellen, Highland, Ind., assignor to Inland Steel Company, Chicago, Ill., a corporation of Delaware

Application April 29, 1941, Serial No. 390,984

5 Claims. (Cl. 158—2)

This invention relates to certain new and certain improved means for mounting and supporting furnace burners. It is intended to apply particularly to open hearth and other furnaces where the burner installations are relatively heavy and are substantially extended into the furnace system, although it may be advantageously applied under other conditions as well.

In the operation of an open hearth furnace certain adjustments to burner direction are necessary or desirable during the various stages of each heat. There are other adjustments as to burner position and directional characteristics which are desirable at intervals during the furnace producing campaign to compensate for the progressive changes in the contour of the interior surfaces of the furnace. Finally, there are adjustments as to burner positioning which are frequently necessary after the periodic furnace relining or rebuilding. This latter need exists because there are always some small variations in furnace dimensions and levels from rebuilding to rebuilding due to various circumstances such as steel-work warpages, brick tolerances, joint thicknesses, etc.

Many and varied means for mounting and supporting burners have heretofore been devised. In some cases the devices now available may be fully adequate to the needs of the particular application for which they were designed, as for instance steam boilers, billet and slab furnaces, reheating units, etc. On the other hand, all of these existing devices are either unsuited to those applications requiring the several characteristics specifically referred to above or else they fail to provide adequate and sufficient means by which these ends may be practically attained.

It is one of my objects to provide a burner mounting and support means which shall embody, in a self-contained form, sufficient and wholly practical facilities by which a burner position or direction may be changed in one or all of five different planes or elevations, and furthermore, to secure such adjustments by directly positive means that provide, both exactness, so that repeated duplication of the adjustments may be accomplished, and likewise, stability and strength, so that a burner's weight, vibration and other operating stresses will not cause displacement of the burner.

Another object is to provide a construction in which the various agencies for making adjustments as required are independent of one another and in which any of the adjustments can be made without necessitating the re-alignment of any of the other previously established adjustments.

An additional object is to provide a burner mounting and support means which is independent of all brickwork construction and therefore not subject to displacement due to the melting or cutting away of such brickwork which is a natural and inevitable result of open hearth furnace operation, and additionally, is unaffected by the entire dismantling of adjacent furnace walls which takes place periodically when furnaces are being rebuilt.

A further object is to provide a burner mounting and support means in which no part rests or depends upon fuel, atomizing agent or water lines, and furthermore, in which any repair, alterations, or other work upon such lines has no influence upon nor relation to any of the mounting, supporting or adjusting features of said construction.

A still further object is to provide a construction of exceptionally compact nature which can be conveniently mounted upon the furnace binding in such a way that no working floor space is occupied and the passageway between adjacent furnaces is unimpeded.

Other objects will be manifest from the following description:

This application is a continuation in part of my co-pending application for United States Letters Patent Ser. No. 347,736, filed July 26, 1940.

Referring to the accompanying drawings:

Figure 1 is a view in longitudinal sectional elevation of one of the two similar end portions of an open hearth regenerative furnace for producing steel, the general features of which are of well known construction, showing incorporated therein a burner construction supported and mounted by means embodying my invention, the section being taken at the line 1 on Fig. 2 and viewed in the direction of the arrow.

Figure 2 is a plan view, partly sectional, of the structure shown in Fig. 1.

Figure 3 is an enlarged plan view of the burner and its mounting and support means.

Figure 4 is a view in side elevation of the burner and its mounting and support means.

Figure 5 is an end view of the burner and its mounting and support means, viewing the structure from the line 5, 5 on Fig. 2 and in the direction of the arrows, this view showing the adjacent brick-stays of the furnace in section.

Figures 6, 7 and 8 are plan, side and front views, respectively, of a mounting bracket forming a part of the mounting and support means.

Figure 9 is a view in sectional elevation of that portion of the mechanism by which the burner proper may be tiltably adjusted in a vertical plane; and

Figure 10, a similar view of a modification of the construction shown in Fig. 9.

Referring to the drawings, an open hearth furnace of well known construction as to its general features is represented at 11 and comprises, generally stated, a furnace combustion zone 12, into which the materials to be melted for making steel are charged in accordance with common practice, a zone, or passage, at each end of the combustion zone and in communication therewith, these zones or passages being similar, the one at the furnace-end shown being indicated at 13; pairs of up-take passages at opposite ends of the furnace opening upwardly into the zones 13, respectively, the up-takes at opposite ends of the furnace opening downwardly into cross passages, respectively, (not shown) at opposite ends of the furnace, the pair of up-takes at the furnace end shown being represented at 14; the above referred to cross passages 15 at opposite ends of the furnace communicating with ends of two checker chambers (not shown), respectively.

The furnace shown is fired, in accordance with common practice, from its opposite ends alternately by burners, the hot products of combustion, when one of the burners is operating, discharging through one of the checker chambers and when the other burner is operating, through the other checker chamber, to heat these chambers to high temperature, and hot combustion supporting air is supplied to the operating burner through the adjacent up-takes 14 from the checker chamber heated as stated in the operation of the burner.

The burner construction at the furnace end shown is represented at 16, it being understood that the burner construction at the opposite end of the furnace would be of the same construction.

The burner construction 16 comprises two major mechanical sections, one of which is the burner proper 100 which is of relatively long generally cylindrical form and in the applied position for use extends at its discharge end into the zone 13 through an opening 18 in an end wall 10 of the furnace, and the other of which is the supporting and mounting mechanism 101 for the burner proper and is located exteriorly of the furnace.

The mounting mechanism 101 for the burner proper 100 comprises a substantially horizontal channel 102 located in the space between those of the metal vertical buck stays shown at 44 and forming the exterior binding and framework portion of the furnace construction in accordance with common practice which are disposed immediately adjacent to, and at opposite sides of, the burner-receiving opening 18 in the furnace end wall, the channel 102 being secured to these buck stays, as for example by welding its ends to these buck stays. The main support channel 102 supports a bracket 103, forming a part of the means 101, through the medium of bolts 104 which extend through openings 105 in the ends of the bracket 103 and into vertical series of horizontally elongated equidistantly spaced lots 106 in the channel 102 to adapt the bracket to be secured in place at different elevations as desired and to allow variations in dimensional relationship between the longitudinal centers of the hearth and burner, respectively.

The mounting bracket 103 is shown as formed as a one piece structure presenting a bottom plate portion 107, a front upright plate portion 108, upright spaced apart webs 109, forming brace portions and located in the interior angle between the plate portions 107 and 108 and blocks 110 on the front face of the front portion 108 having upwardly opening trunnion-grooves 111.

Mounted in the trunnion-receiving grooves 111 are trunnions 114 provided on the burner proper 100. The trunnions 114 are provided on a trunnion collar 115 which surrounds the burner proper 100 and in which the burner proper is longitudinally slidably adjustable, the burner proper being clamped to the collar 115 by set screws 116.

The mounting mechanism also comprises means for adjusting the burner proper 100 on its trunnions 114 into different angular positions in a vertical plane and holding it in any position to which it may be adjusted; these means comprising the mounting bracket 103, a cylindrical nut 117 the upper surface of which is of substantially spherical form as represented at 118 and having an annularly flanged portion 119, the nut 117 being journaled in a retainer plate 120 secured, as by bolts 121, to the underside of the mounting bracket 103 and thus being held against lengthwise movement, on the bracket, the underside of the bracket 103 opposed by the nut 117 being of spherical form as represented at 122 to conformingly fit the top surface of the nut 117; a hand wheel 123 secured to the nut 117, as by a screw-pin 124; and a threaded rod 125 extending through an opening 126 in the bottom portion of the bracket 103 and engaging the thread of the nut 117.

The upper end of the rod 125 has a head 127 with a hole 128 through which a pin 129 mounted in the ends of a strap hanger 130, and held in place by cotter pins 131, extends. The strap hanger 130 surrounds the burner proper 100 in which the latter is longitudinally slidably adjustable; set screws 132 on the hanger 130 adapting the hanger to be clamped to the burner proper in the various positions of adjustment of the burner proper in the hanger.

According to the modification of the means shown in Fig. 10 for adjusting the burner proper into different angular positions in a vertical plane, the nut, herein shown at 133 and corresponding to the nut 117, has interposed between it and the bracket 103, a thrust bearing represented at 134 shown as comprising upper and lower ball-race members 135 and 136, respectively, with an interposed circular series of balls 137, and a self-aligning washer 138 between the bracket 103 and the upper ball-race member 135, the upper surface of the ball-race member 135 and the under surface of the washer 138 being conformingly spherically contoured as shown.

From the above description it will be manifest that the burner proper 17, may be adjusted up and down bodily through the adjustable connection of the bracket 103 with the channel 102 fixed to the buck stays 44, and tilted to any desirable angle at its trunnion support on the bracket 103, these adjustments being especially desirable as it adapts the burner proper for adjustment to such position as will insure the impingement of the flame against the charge in the furnace at the desired angle under all operating conditions and permits of the desired flame clearance at all times, even in the event of the building up of accumulations at the furnace-end which, if provision for such adjustments were not afforded, would interfere with the proper operation of the furnace.

Furthermore, provision is made for the positioning of the pivotal supporting means and, therefore, the swinging adjustment of the burner proper, in a horizontal plane, viz., about a fixed line to different angular positions in a horizontal plane. In the arrangement shown this is accomplished by the provision of a vertical rib 112 on the front face of the bracket 103 midway between its lateral edges which bears against the main support channel 102 and serves as a pivot point about which the bracket 103 may be adjusted. In making this adjustment the setscrews 113 which screw in holes 113a in the plate portion 108 of the bracket 103 are loosened and then opposite pairs of the bolts 104 are alternately loosened and tightened until the desired tilting adjustment of the bracket is attained after which the setscrews 113 are set against the channel 102. Thus it will be manifest that the burner proper 17 may be adjusted to various angular positions in a substantially horizontal plane by virtue of the rotational adjustment of the bracket 103 in a substantially horizontal plane.

The burner proper 100 may be installed for application by sliding the collar 115 and strap hanger 130 onto the burner proper 100, setting the burner proper into the burner opening 18 in the furnace end wall 10, seating the oppositely disposed trunnions 114 into the trunnion-receiving grooves 111, positioning the burner proper into the furnace in such a manner that the discharge end of the burner proper is at the desired point within the combustion zone 13, tightening the trunnion collar 115 and the strap hanger 130 about the burner proper 100 by means of the set screws 116 and 132, respectively, and staying the hanger 130 to the threaded bar head 127 by means of the pin 129 inserted through the ends of the hanger 130 and the hole in the head 127. The vertical angular adjustment of the burner is then attained by rotating the handwheel 123 to raise or lower the hanger 130 as desired, thereby providing means for positioning the burner proper 17 about its trunnions 114.

Further positioning of the burner proper is provided for by the provision of the holes 105 in the bracket 103 and the parallel equidistantly spaced slots 106 in the channel 102, in which holes and slots the bolts 104 may be selectively inserted. By such structure, provision is made for the raising and lowering of the bracket 103 vertically, and also the moving of this bracket to different positions laterally (in which positions of adjustment the bracket may be secured by the bolts 104), thereby varying the dimensional differentials between the center line of the burner proper and the longitudinal center line of the furnace. Thus the positioning of the bracket 103 relative to the channel 102 provides means for positioning the positive pivotal (trunnion) support for the burner proper, in lateral and vertical planes.

The capability of the bracket 103 for tilting adjustment as above described, provides means for rotating the burner proper 100, while pivotally supported at its trunnions 114, to different positions in a substantially horizontal plane.

The burner proper may be removed from the mounting and support means 101 by removing the pin 129 and lifting the trunnions 114 out of the trunnion-receiving grooves 111 and then lifting the burner proper out of the furnace opening 18 by any suitable means. Another burner may then be fitted with the hanger 130 and the trunnion collar 115 and put into place by seating the trunnions 114 into the trunnion-receiving grooves 111 and fastening the hanger 130 to the head 127 by means of the pin 129.

None of the positioning adjustments are thus changed when a burner proper is removed and the same or another burner proper is placed upon the mounting means, except in the latter case the longitudinal sliding adjustment of the burner proper through the trunnion collar 115 and the hanger 130, and this may be made constant by placing the trunnion collar 115 and the hanger 130 at the same relative positions on the burner proper which is installed as said members are found on the burner which is removed.

As will be understood the burner mounting and support means afford five different adjustments of the burner proper: Bodily lateral adjustment of the burner proper is afforded by the elongated slots 106 in the channel 102; vertical bodily adjustment is afforded by the provision of the vertical series of the slots 106; swinging adjustment of the burner proper into different angular positions in a substantially horizontal plane is afforded by the adaptability of the adjustment of the bracket 103 at its rib 112 as a pivot point; angular adjustment of the burner proper in a vertical plane is afforded by the trunnion support for the burner proper and the adjusting means comprising the nut 117 or the nut 133, as the case may be, and the threaded rod 125; and lengthwise adjustment of the burner proper relative to the mounting means by its adaptability for lengthwise movement in the hanger 130 and collar 115.

While I have illustrated and described certain particular constructions embodying my inventon I do not wish to be understood as intending to limit it thereto as the same may be variously modified and altered and the invention embodied in other forms of structure without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent, is:

1. In combination with a furnace structure having a burner receiving opening, a burner construction having a burner proper extending into the interior of the furnace through said opening and mounting means for said burner proper comprising a member supported on the furnace structure, a rib on said member at which said member is fulcrumed on the furnace structure for rocking adjustment in a horizontal plane, and means for holding said member in adjusted position.

2. In combination with a furnace structure having a burner receiving opening, a burner construction having a burner proper extending into the interior of the furnace through said opening and mounting means for said burner proper comprising a member supported on the furnace structure, a rib on said member contacting a portion of said structure at which said member is fulcrumed for rocking adjustment in a horizontal plane, and means engaging said member at opposite sides of said rib for holding said member rigidly in adjusted position.

3. In combination with a furnace structure having a burner receiving opening, a burner construction having a burner proper extending into the interior of the furnace through said opening and mounting means for said burner proper comprising a supporting member secured to the furnace structure, a second member having a rib at which said second member is fulcrumed on said supporting member for rocking adjustment in a horizontal plane, and means for holding said second member in adjusted position.

4. In combination with a furnace structure, a burner construction comprising a burner proper and mounting means therefor on said furnace structure comprising a supporting member adjustable laterally on said furnace structure into different set positions, adjustable vertically on said furnace structure into different set positions and adjustable horizontally into different angular positions relative to the center line of the furnace structure, means pivotally supporting said burner proper on said member for adjustment into different positions in a vertical plane, and means engaging said burner proper and said member for holding said burner proper in adjusted position on said member.

5. In combination with a furnace structure, a burner construction comprising a burner proper and mounting means therefor on said furnace structure comprising a supporting member adjustable into different set positions laterally on said furnace structure, vertically on said furnace structure and horizontally into different angular positions relative to the center line of the furnace structure, means pivotally supporting said burner proper on said member for adjustment into different positions in a vertical plane, and means engaging said burner proper and said member for holding said burner proper in adjusted position on said member, said burner proper also being lengthwise adjustable relative to said member.

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