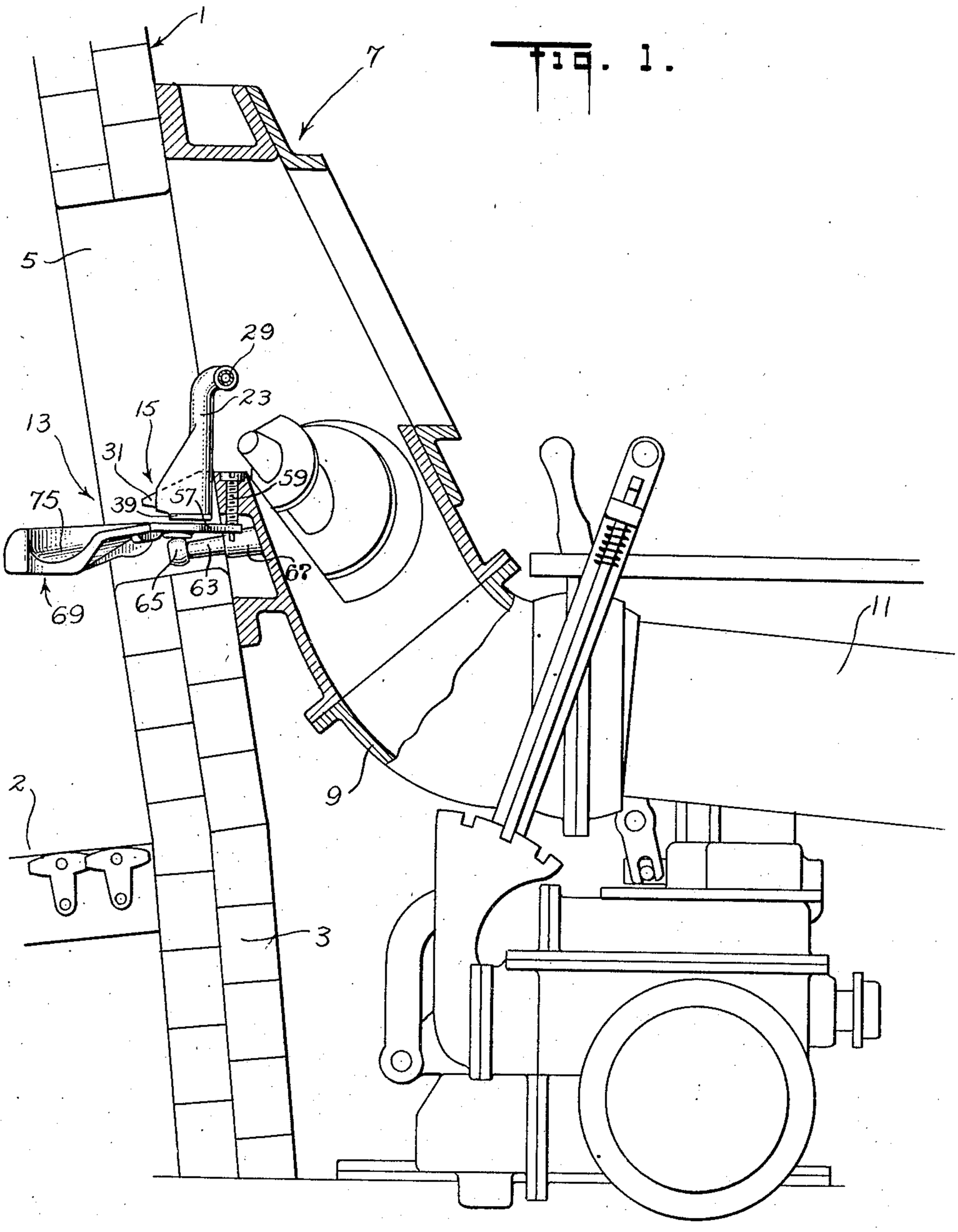
Aug. 2, 1938. W. T. HANNA 2,125,289

DISTRIBUTOR PLATE FOR STEAM BLAST STOKERS

Original Filed July 8, 1933 3 Sheets-Sheet 1

Fig. 1.



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DISTRIBUTOR PLATE FOR STEAM BLAST STOKERS

Original Filed July 8, 1933 3 Sheets-Sheet 2

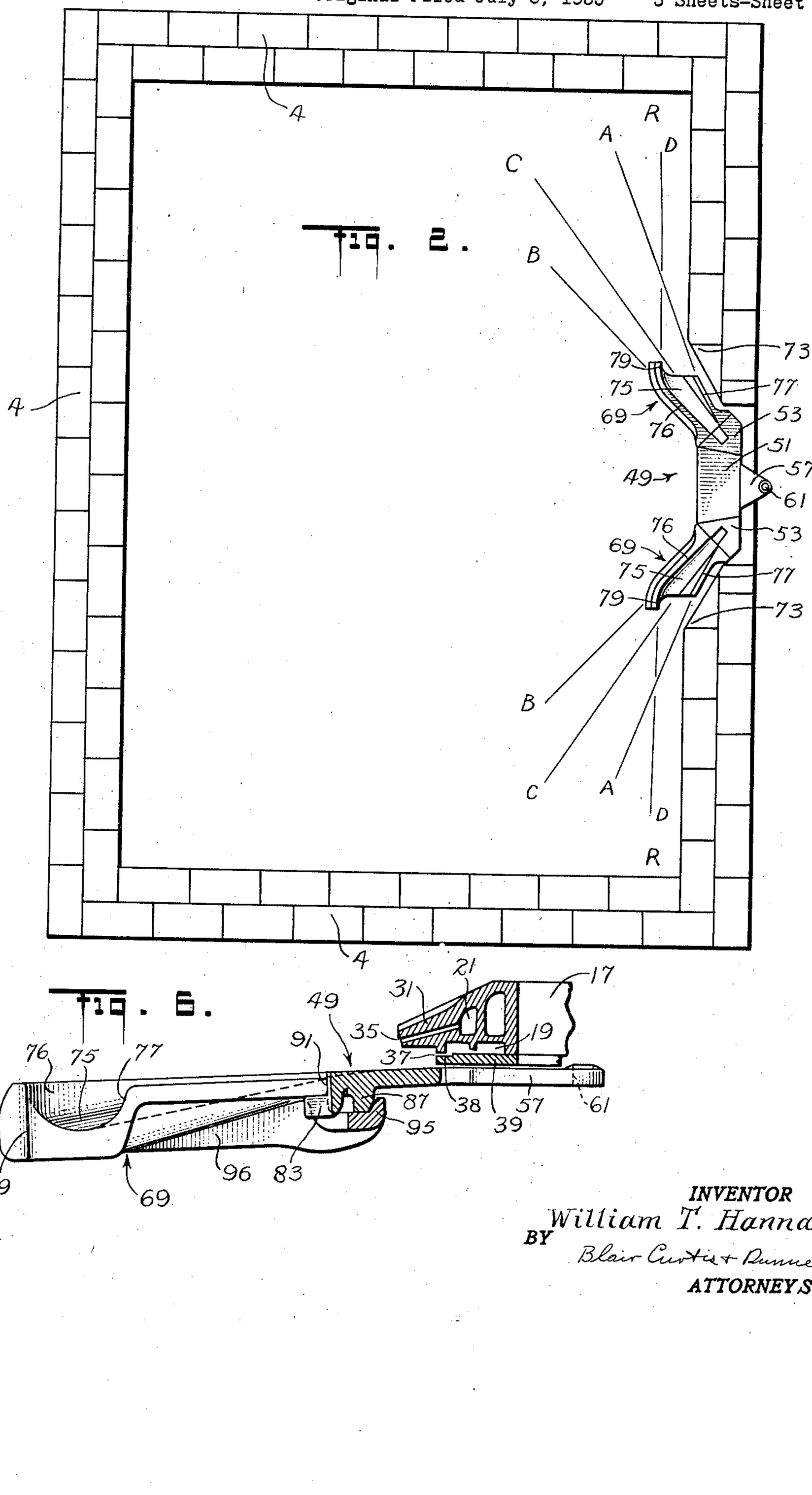

Fig. 2.

Fig. 6.

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Original Filed July 8, 1933 3 Sheets-Sheet 3

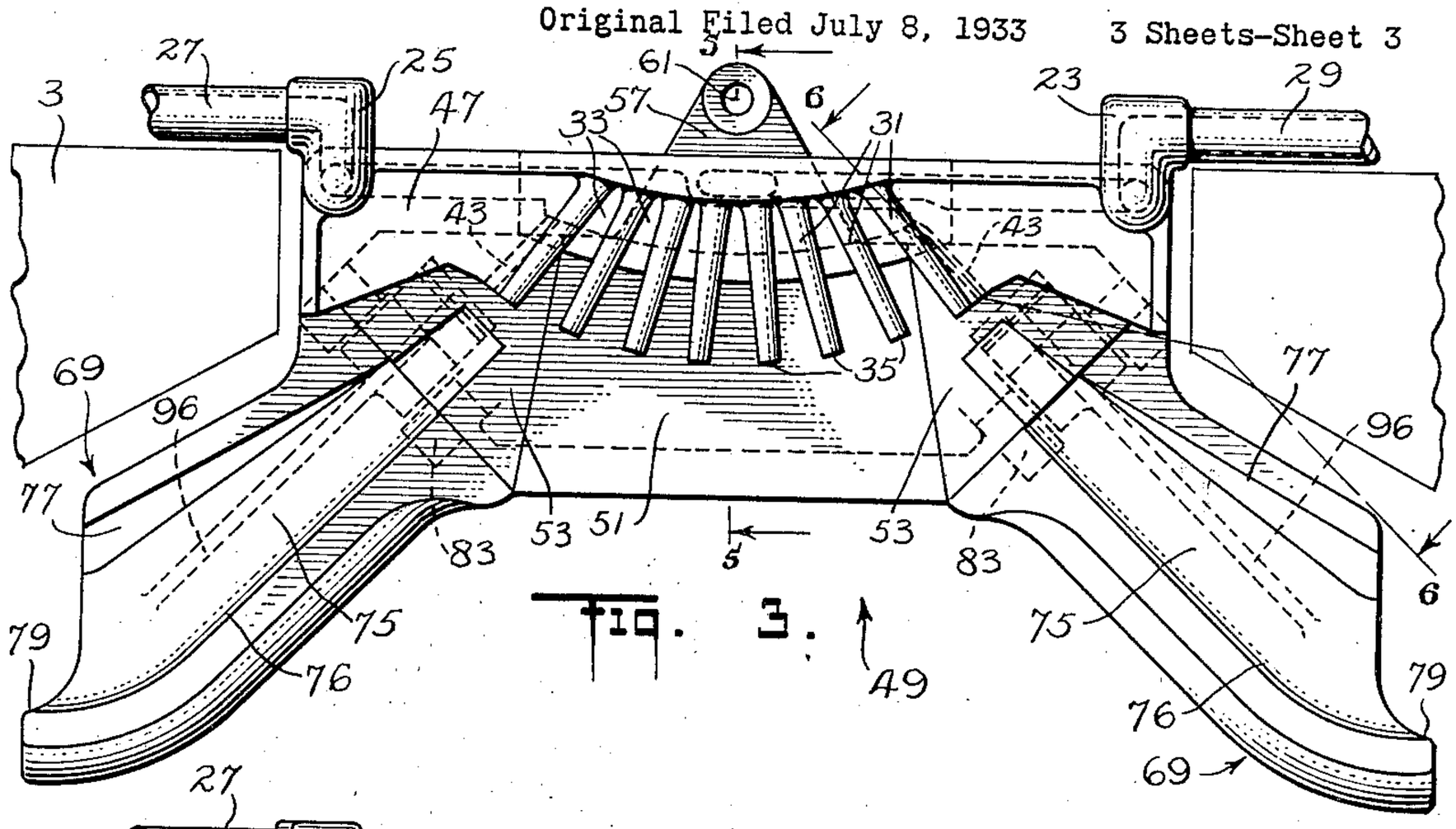

Fig. 3.

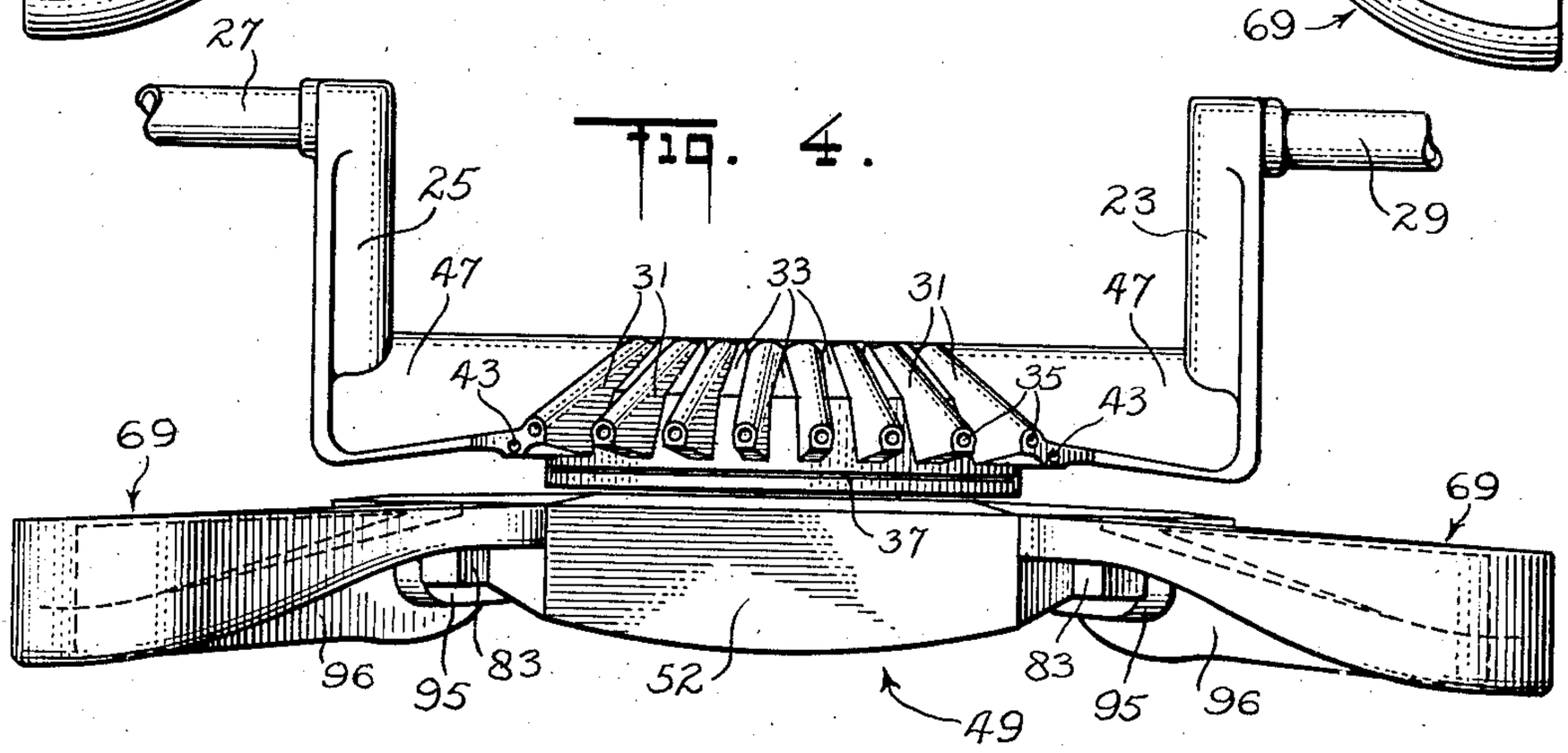

Fig. 4.

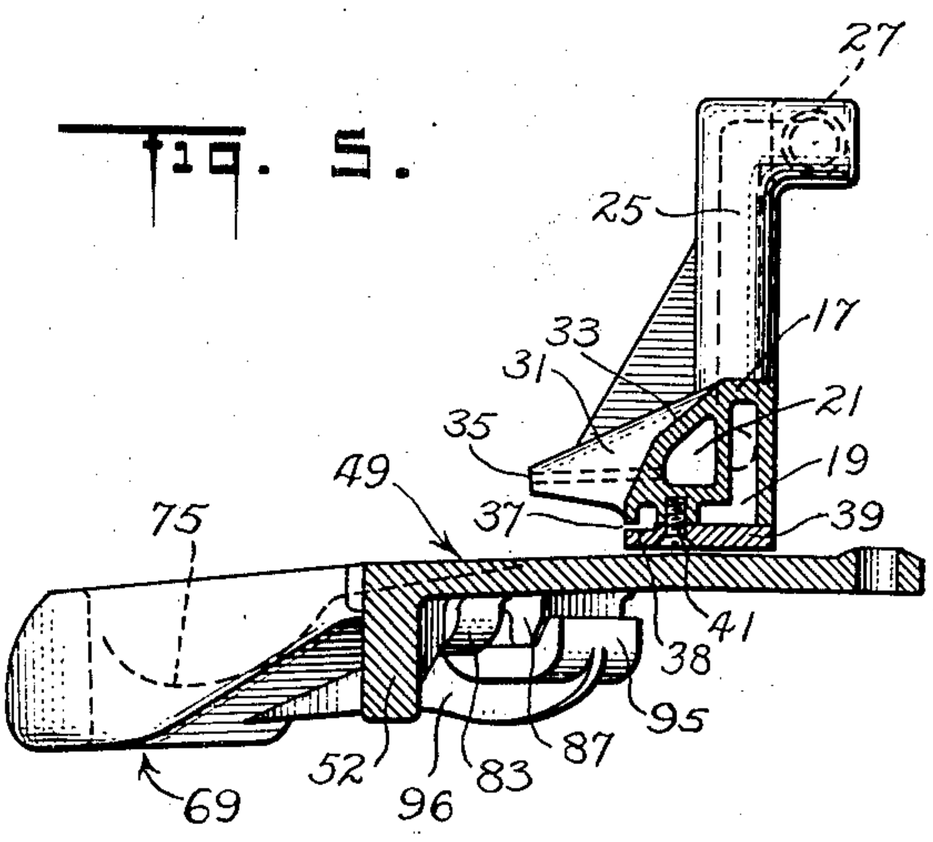

Fig. 5.

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UNITED STATES PATENT OFFICE

2,125,289

DISTRIBUTOR PLATE FOR STEAM BLAST STOKERS

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Application July 8, 1933, Serial No. 679,548
Renewed November 22, 1934

7 Claims. (Cl. 110—101)

This invention relates to stokers, and more particularly to stoker mechanism for distributing fuel over a fire bed of a fire box.

Among the several objects of the invention may be noted the provision of a distributor plate for satisfactorily distributing fuel over fire boxes of abnormal dimensions, and having fire boxes having rear walls of abnormal thicknesses.

Another object is to provide a distributor plate of the class described which is of the usual dimensions and which may be mounted in the usual firing opening.

Another object is to provide a distributor plate of the class described in which parts which are subject to deterioration are replaceable.

Another object is to provide distributor plates, of the class described, which may be adapted to fire boxes of different dimensions.

Another object is to provide such a distributor plate of the class described which is economical, efficient and easy to manufacture.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of which will be indicated in the following claims.

In the accompanying drawings, in which is shown one of the various possible embodiments illustrative of this invention,

Fig. 1 is a diagrammatic cross-section of a rear wall of a fire box showing a blast chamber and distributor plate mounted therein, and a fuel conveying system connected thereto;

Fig. 2 is a top plan view of a distributor plate embodying the invention, positioned in a firing opening of a fire box;

Fig. 3 is a top plan detail of the distributor plate of Figs. 1 and 2;

Fig. 4 is a detailed elevation of the distributor plate of Figs. 1 and 2 looking from the fire box out through the firing opening;

Fig. 5 is a vertical section taken on line 5—5 of Fig. 3; and,

Fig. 6 is a vertical section taken on line 6—6 of Fig. 3.

Corresponding reference characters refer to corresponnding parts throughout the several views of the drawings.

As conducive to a clearer understanding of the invention it is pointed out that in mechanical firing of fuel, such as coal, it is highly desirable for successful operation, to distribute the coal uniformly over the entire fire bed, including the four corners thereof. The present distributor plates, designed for use in connection with steam blasts of one type or another, and for long narrow fire boxes (such as locomotive fire boxes), have the disadvantage, when short, wide fire boxes are being fired, of delivering more fuel to the far corners and central portion of the fire box than is delivered to the nearer rearward corners. (By rearward corners is meant those corners adjacent the rear wall of a fire box, and the forward or far corners are those away from the rear wall.)

Also, if the back head is unusually thick, such as, for example, the rear wall of steamboat boilers, or stationary boilers (in contradistinction to locomotive boilers) this same disadvantage is prevalent. If, to correct this disadvantage, the distributor plate is pushed forward into the fire box in an effort to reach the rearward corners, a second disadvantage arises, namely, that the heat of the fire box causes a rapid deterioration of the entire distributor plate.

It is another object of this invention to overcome these disadvantages associated with the earlier distributor plates in an economical and practical manner.

Referring now to Figures 1 and 2, there is generally indicated at 1 a fire box having the usual walls 4 and a rear wall 3 provided with a firing opening 5, embraced by a fuel supply housing 7, which is part of a mechanical stoker mechanism such as is described in my Patent No. 2,044,001, issued June 16, 1936. Fuel is raised to the housing 7 by an elevating conduit 9 receiving fuel from a fuel transfer conduit 11 which conveys fuel forwardly from a fuel supply, not shown. Mounted in the firing opening 5 is a fuel distributing mechanism, generally indicated at 13, for distributing fuel received from the housing 7 over the bed 2 of the fire box 1. The distributing mechanism includes as one part a blast chamber, generally indicated at 15.

The blast chamber comprises a body portion 17 having channels 19 and 21 connected respectively with upwardly extending hollow side arms 23 and 25. Preferably pivotally connected to the hollow side arms are pipes 27 and 29 (Figs. 3 and 4) which extend outwardly through the housing 7 and form a pivoted support for the blast chamber. The pipes 27 and 29 are preferably respectively supplied with low and high pressure steam.

To grade or screen the fuel passing over the blast chamber, the body portion 17 is preferably provided with a plurality of fingers 31, the top

portions of which slope downwardly and forwardly into the fire box. The fingers as a unit form a grating, the top surfaces forming the ridges, and openings 33 therebetween forming the openings between the ridges. With this arrangement, fuel flowing over the grating is screened, the larger particles riding over the tops of the fingers, and the smaller pieces falling through the elongated openings.

The arrangement of the fingers in the fan-like formation not only serves, as will be hereinafter described, to direct the fuel uniformly over a larger area of the fuel bed, but also provides the openings with gradually increasing widths, thereby eliminating any tendency for lumps of fuel to become wedged between the fingers.

The fingers 31 are provided with nozzles 35 connected with the channel 21 in the base 17, so that high pressure steam is supplied to the nozzles 35. Thus, lumps of coal rolling off over the fingers 31 are caught in the steam jet emitted therefrom, and carried to the various areas of said fire box reached by said jets.

For handling the coal falling between the fingers 31, the base 17 of the blast chamber 15 is provided with a slot 37 (located beneath the fingers 31) connected with the low pressure channel or chamber 19, as shown in Figure 5. The chamber 19 is formed by a plate 39 secured to the lower surfaces of the base 17 as by screws 41 or the like, and the slot 37 is formed by a cut 38 running the length of the plate. The slot 37 thus forms an outlet for the low pressure steam (in the chamber 19) in the form of a sheet jet emitted beneath the high pressure jets from the nozzles 35, and serves to propel the coal falling through the openings 33 over those portions of the fire box reached by said sheet jet.

For reaching the rearward corners R—R (Fig. 2) of the fire box, the blast chamber 15 is preferably provided at either side thereof with jets 43—43 connected with the high pressure chamber 21; and also (as shown in Figures 2, 3 and 4) is provided, at each side of the set of fingers, with a sloping surface 47—47.

The distributor mechanism 13 also includes a distributor plate, generally indicated at 49, located beneath the blast chamber 15, and forming a support therefor. As shown in Figures 1 and 2, this plate may comprise a main central portion 51, side portions 53—53, and a rearwardly extending triangular portion 57 serving as one of the mediums for mounting the distributor plate in the firing opening 5.

The plate is preferably secured therein by an upper support comprising a screw stud 59 threaded in the housing 7 (Figure 1), the end of the screw in the form of a stud having a limited entrance in a hole 61 provided in the triangular portion 57. The other (a lower) support may preferably comprise a stud 63, having a rounded tip 65, secured in an extension 67 of the housing 7. By adjusting the position of the screw stud 59, the angle of the plate with respect to a horizontal plane may be changed. By reference to Figures 1 and 2, it is evident that with this mounting of the plate 49, it is so located in the firing opening 5 as to be protected from the high temperature existing in the fire box.

The plate is further protected from damaging effect of the heat of the fire box by an apron 52 (Figs. 4 and 5) extending downwardly from the front edge of the plate. This apron is preferably thicker than the horizontal portion of the plate, and reenforces the forward edge thereof against warping due to the heat received from the fire box.

The central portion 51 of plate 49 has an upper surface sloping forwardly and downwardly toward the fire box and co-acts with the low pressure steam jet issuing from the slot 37 in guiding the fuel falling between said fingers over the central rear and entire forward portions of said fire box (not the rear corners). The portion 51 also cooperates to a limited extent with the high pressure jet 35 in the distribution of the coal.

As is evident from Figure 2, the fire box shown is relatively short and wide, and the rear wall 3 is relatively thick. For this reason, fuel flowing over the fingers and fuel falling therebetween does not reach the rear corners of the fire box designated by R from this central section.

In order to insure the distribution of the fuel to the rearward corners R of the fire box, the plate 49 is preferably provided with extending arms, generally indicated at 69—69. (Inasmuch as the two sides of the plate and the arms 69—69 are similar, the following description is directed to one side only, and corresponding reference numerals are used for both sides.) These arms form a part of the distributor plate and are effective to extend it out into the fire box and around corners 73—73 of the rear wall 3. Each extending arm forms a continuation of the surface of its respective side portion 53 of the plate 49, this surface sloping downwardly, forwardly and sidewardly toward the fire box. Each arm also is provided with a channel 75 formed by an inner wall 76 and an outer wall 77. The channel increases in depth and width toward the end of the arm, and at the end of the channel the inner wall 76 is provided with a curved lip 79. For purposes to be described hereinafter, the inner walls 76 are preferably elevated slightly above the outer walls 77 (Figs. 5 and 6). The provision of the channel aids in the proper spreading and distribution of the fuel to the near and far parts of the fire box fed by the arms and allows the unimpeded crossing of the fuel paths. Each channel is aligned with a corresponding channel beginning in its respective side portion 53.

These extension arms co-act with the hereinbefore described jets 43—43 and with the jet 37 to distribute fuel over the corner sections R of the fire box. Such a distribution may take place in the following manner: Coal in coming to the firing opening from the conduit 9 flows over the end portions 47 of the blast chamber 15, and between or over the end fingers 31 onto the surfaces 53—53 where it is picked up by the extreme ends of the jet 37 and by the jets 43—43, and is impelled by these jets—part into the channels 75—75, part along the tops of the inner walls 76 (to follow lines B—B), and part over the walls 77 (to follow lines A—A, Fig. 2). Of that fuel which falls into the channel, part may be forced in a straight line, as shown by lines C—C in Figure 2, into the portions C of the fire bed; and other portions may strike the lips 79—79 and thereby be forced over into the extreme corners R—R following lines D—D. Another part may merely fall over the ends of the arms 69—69 to cover that portion of the fire bed nearer the arms. In this way the rearward corners and rearward portions of the fire bed are reached and uniformly covered with fuel.

But the arms 69—69 thus extending into the fire box are subjected to excessive heating, and thereby to more deterioration than the main portion of the distributing plate 49. For this rea-

son, and others, it is preferable to have the arms 69—69 removably attached to the plate 49, as shown in Figures 5 and 6. To this end the under side of each portion 53 of the plate 49 is provided with spaced hinge portions or lips 83—83 extending forwardly, and to the rear of the lips with a stop or projection 87—87.

Likewise the inner end of each arm 69 (Figs. 5 and 6) is provided with an abutting surface 91—91 for pivoting on and abutting the hinges 83 of the plate 49; and on the underside with a hook 95—95 for engaging and hooking over the stop 87—87. The hooks 95 and stop 87 are provided with cooperating slanting faces, so that, as the arm is hooked to its side section, the slanting faces draw the abutting surface 91 against the forward edge of the portion 53. From the preceding description it is clear that an arm may be hooked to a side portion by resting the abutting surface 91 of the arm (while it is in a vertical position) on the hinge extensions 83—83, and lowering the arm to a horizontal position by pivoting it about the hinges until the hook 95 and stop 87 contact to secure the connection.

The underside of each arm is provided with a re-enforcing rib 96 for re-enforcing the hooks 95 and the entire length of the arm.

The detachability of the arms from the main portion of the distributor 49 has an advantage that, as an arm becomes damaged as by the high temperature of the fire box, it may be readily, quickly and conveniently replaced with a new arm without necessitating the removal or renewal of the main section of the distributor plate which, as hereinbefore described, is protected from the heat.

This detachability has another advantage in that a standard size distributor plate 49 may be mounted in firing openings of fire boxes not of a standard size. It is readily evident that in firing fire boxes of non-standard sizes and unusual dimensions, different problems and requirements are encountered in each instance. These varying requirements may be satisfactorily met by attaching to a standard size distributor plate arms of the proper dimensions and design. Thus, a wider fire box may require longer arms, whereas narrower boxes may require shorter arms; the particular dimensions and design in each instance being determined by the conditions encountered.

Thus, this detachability generally increases the efficiency of the distributor plate in many ways; such as, for example, by increasing its life; by reducing the ultimate cost of upkeep; and by increasing its operating efficiency.

I claim:

1. In combination with a fire box having a firing opening, a stoker mechanism including a steam jet blast chamber having steam jets directed into said fire box; a distributor plate located adjacent said blast chamber below said steam jets, and said distributor plate including a base portion for co-acting with certain jets of said blast chamber for distributing fuel supplied thereto over the central and back portions of said fire box, and a removable extension mounted on each side of said base portion for co-acting with the remainder of said steam jets for distributing fuel to the side and rearward corners of said fire box, said removable extensions extending appreciably into said fire box.

2. In combination with a fire box having a firing opening, a stoker mechanism including a steam jet blast chamber having steam jets directed into said fire box; a distributor plate located adjacent said blast chamber and below said steam jets, said distributor plate including a central portion having a surface slanting slightly forwardly and downwardly, said central portion co-acting with the central steam jets for distributing fuel over certain parts of said fire box; a side portion having a surface, sloping forwardly, laterally and downwardly, located on each side of said central portion, and removable arms mounted on said side portions for co-acting with said side surfaces and said blast chamber for delivering fuel to the rearward corners of said fire box, said removable arms extending appreciably into said fire box.

3. In combination with a fire box having a firing opening, a stoker mechanism including a blast chamber located in said firing opening and having high and low pressure steam jets; a distributor plate located beneath said blast chamber, said distributor plate including a central portion having a surface slanting forwardly and downwardly, said central portion co-acting with the central steam jets for distributing fuel over the central rear and entire forward portions of said fire box; a side portion having a surface, sloping forwardly, laterally and downwardly, located on each side of said central portion; and removable extensions mounted on said side portions and having surfaces for coacting with the surfaces of said side portions and said blast chamber for delivering fuel to the rearward corners of said fire box, each extension having a channel curved at the end for directing the fuel to the rearward corners of said fire box.

4. In combination with a fire box having a firing opening, a stoker mechanism including a steam jet blast chamber having steam jets directed into said fire box; a distributor plate located adjacent said blast chamber and below said steam jets, said distributor plate including a portion for co-acting with certain jets of said blast chamber for distributing fuel supplied thereto over the central and back portion of said fire box, and a removable side arm mounted on each side of said portion for co-acting with the remainder of said steam jets for distributing fuel to the side and rearward corners of said fire box, said side arms being removably hooked to said distributor plate and extending appreciably into said fire box.

5. In apparatus of the class described for a fire box having a fuel entrance, in combination, a distributor plate having a central fuel directing surface and a side fuel directing surface on each side of said central fuel directing surface, and a side arm extension removably secured to said distributor plate adjacent each side fuel directing surface and each side arm extension having a surface forming a continuation of its respective side fuel directing surface, said extension arms also having channels gradually increasing in depth and width for directing fuel supplied thereto to rearward portions of said fire box.

6. As an article of manufacture, a section for a distributor plate assembly for a locomotive stoker for aiding in distributing coal over the fire bed of a locomotive, said section comprising a body portion having in its operative position a central flat coal guiding surface sloping forwardly and downwardly for distributing coal over the central rear, middle and forward portions of the fire box and having a side coal guiding surface extending from each side of said central surface, said side surfaces sloping forwardly, downwardly and laterally and having grooves

formed therein, and engaging supporting means provided in said body portion below said coal guiding surfaces to receive coal guiding extensions.

7. As an article of manufacture an elongated coal-guiding arm for use as a side extension for a distributor plate of a locomotive stoker distributing fuel over a locomotive firebox, said arm being adapted to deliver fuel to the rear corner of the firebox and having means for securing the arm to the distributing plate, and a coal-guiding channel increasing in depth and width toward the delivery end thereof and one wall of said channel having an extension extending appreciably beyond the opposite wall of the channel at the delivery end thereof and the extension curving toward where the opposite wall would have been had it been extended.

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