L. D. LOVEKIN.

OIL BURNING PROVISION FOR BOILER FURNACES.

APPLICATION FILED FEB. 11, 1911.

1,039,768.

Patented Oct. 1, 1912.

2 SHEETS--SHEET 2

Fig. 3.

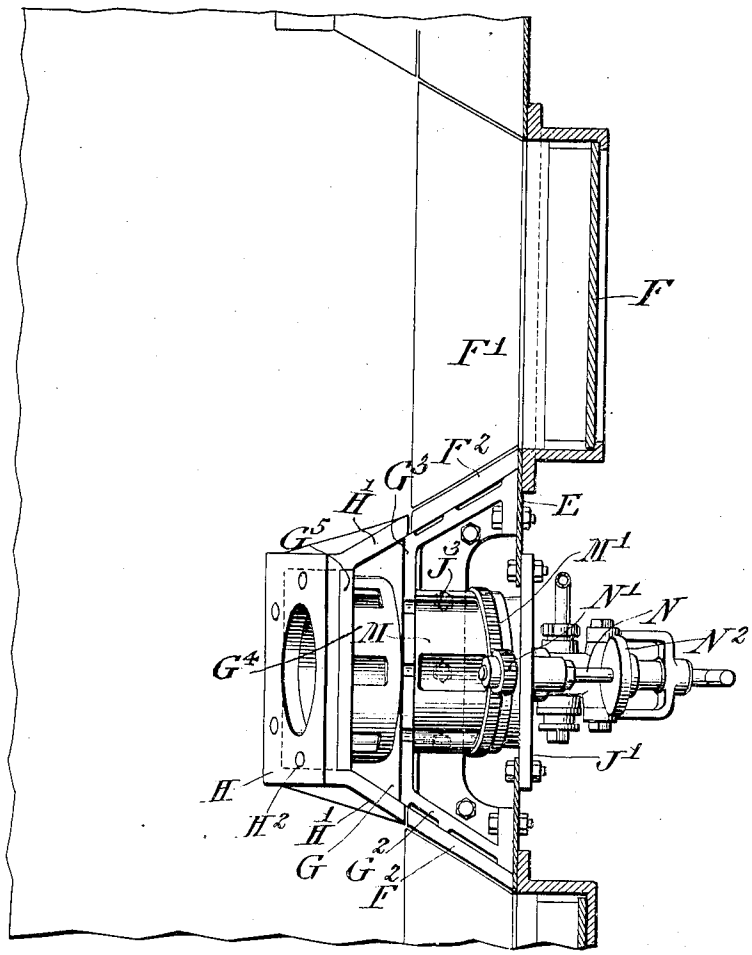
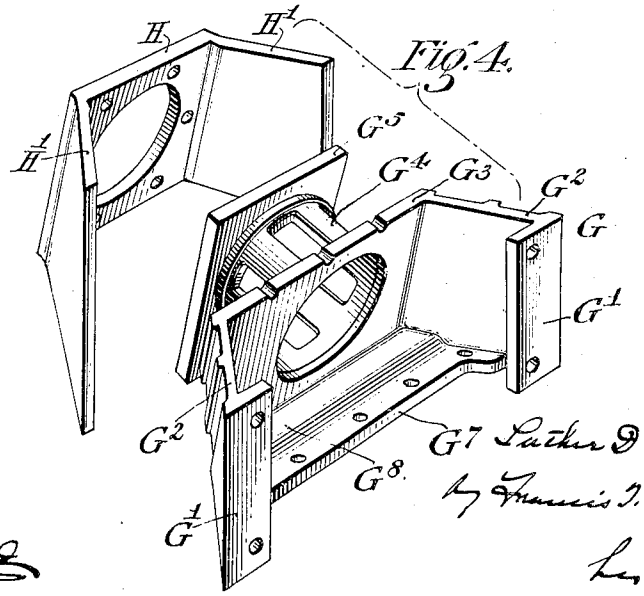


Fig. 4.



Witnesses

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2 SHEETS—SHEET 1.

Fig. 1.

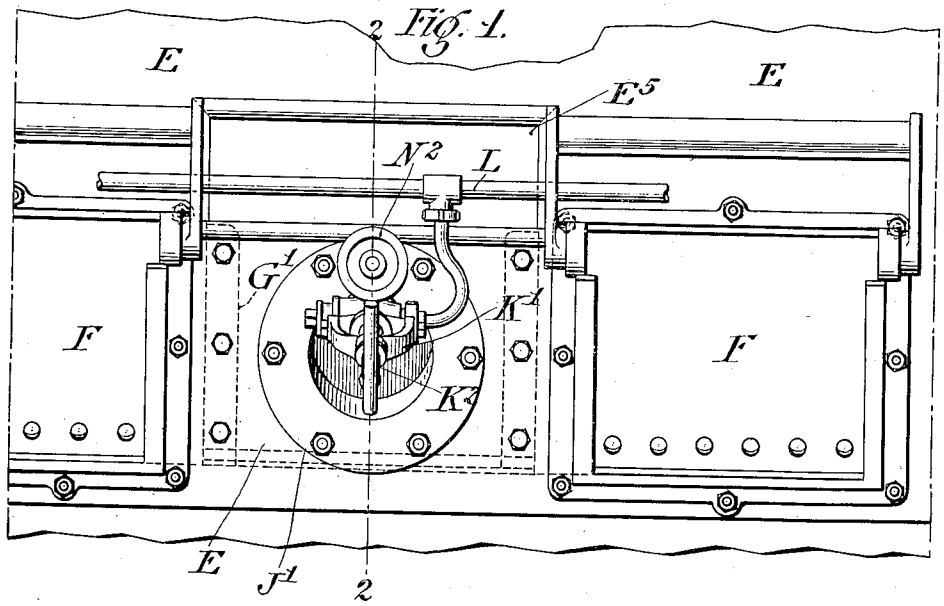
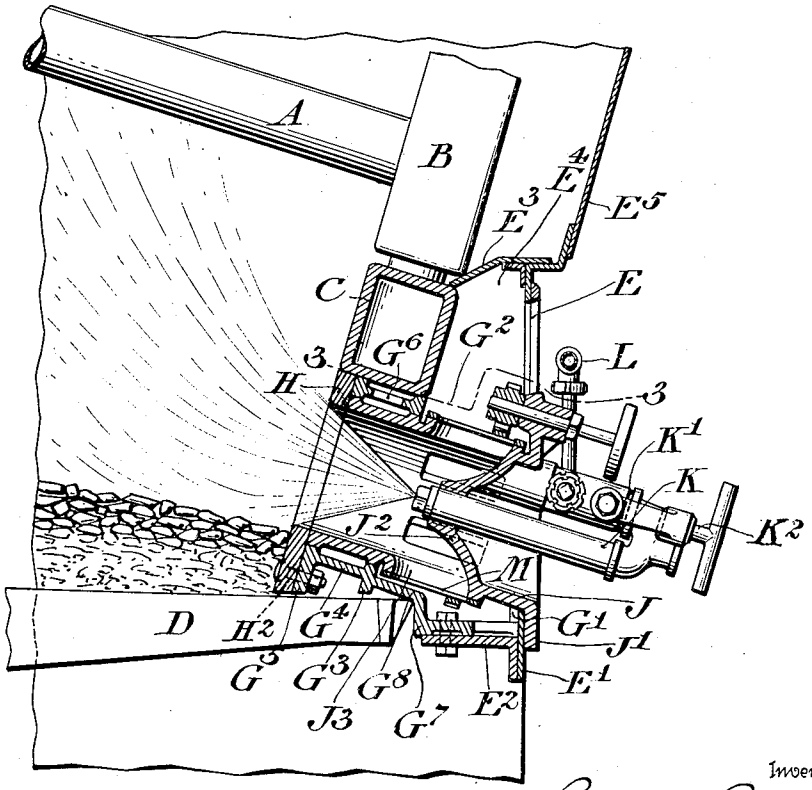


Fig. 2.



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UNITED STATES PATENT OFFICE.

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OIL-BURNING PROVISION FOR BOILER-FURNACES.

1,039,768. Specification of Letters Patent. Patented Oct. 1, 1912.

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To all whom it may concern:

Be it known that I, LUTHER D. LOVEKIN, a citizen of the United States of America, residing in the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Oil-Burning Provisions for Boiler-Furnaces, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

It has been found possible to obtain an increased economy of fuel and an increase in the capacity of coal fired boilers by injecting a limited amount of oil and air into the combustion space of the boiler furnace. The heat resulting from the combustion of the oil is added to the heat derived from the combustion of the coal, thus increasing the total heating effect, and moreover, air and oil properly injected into the furnace assist in obtaining a thorough combustion of the gases given off by the coal and in obtaining complete combustion of the latter.

To obtain a satisfactory simultaneous combustion of coal and oil with a reasonable approximation to the maximum efficiency theoretically possible it is essential to carefully regulate the relative amounts of air and oil supplied to the combustion chamber of the furnace and the manner of their introduction thereinto, not only in order to insure complete combustion but also to have the combustion take place to the desired extent in the different portions of the combustion space of the furnace and without injury to the boiler.

One main object of the present invention is to provide an oil burner attachment for coal fired boiler furnaces and particularly for certain types of boiler in common use wherein the space available for the oil burning provisions is restricted, which will insure satisfactory operation and make it possible to obtain desired high efficiency.

A more specific object of the invention is to make oil burning provisions which are simple and compact in construction and comparatively inexpensive to manufacture, and which may be readily installed in existing coal fired boilers not originally devised for supplemental oil burning, as well as in new boilers.

A further object of the invention is to make oil burning provisions in which the parts liable to comparatively rapid deterioration by their exposure to the flames and heat of the combustion chamber of the furnace may be cheaply and readily renewed when necessary.

The invention consists in various novel features of construction and arrangement pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention and the advantages possessed by it, however, reference may be had to the accompanying drawings and descriptive matter in which I have illustrated and described one of the forms in which my invention may be embodied.

Of the drawings, Figure 1 is a front end view of a portion of a coal and oil fired marine boiler furnace. Fig. 2 is a partial sectional elevation on the line 2—2 of Fig. 1. Fig. 3 is a sectional plan taken on the line 3—3 of Fig. 2. Fig. 4 is a perspective view of a portion of the oil burning provisions.

In the drawings, A, represents the lower row of water tubes of a type of water tube boiler in which the water tubes are inclined upwardly away from the front or firing end of the boiler. This type of boiler is one in common use for marine purposes. B represents one of the sectional headers to which the lower ends of the tubes are connected. C, represents the horizontally extending mud drum below the headers B. In the usual construction of boilers of this type the mud drum is, as shown, rectangular in cross section with its walls parallel to and perpendicular to the tubes A.

D, represents the grate bars at the bottom of the combustion chamber; E, an upper inclined portion of the front wall of the boiler; and E′ a vertical portion of the front wall of the boiler in which the coal firing and ash pit doorways are formed.

F, F, represent the doors for the coal firing doorways F, F′.

In the construction illustrated I arrange the oil burning provisions in the space between the coal firing doorways E, F'. The oil burning provisions comprise, a housing or body G, which as shown is a one-piece casting comprising vertical flanges G' adapted to bear against the inner side of, and to be bolted to, the boiler housing wall E', vertical plate-like portions G^2 which are inclined toward each other at their ends, and are united by a plate-like portion G^8 which extends transversely to the direction of the tubes A. From the inner side of the flange G^3 (the side facing away from the wall E) extends a tubular portion G^4 formed at its inner end with flange G^5 parallel to the flange or plate portion G^3. The flanges G^2 and G^3 are connected at their lower edges by a web G^7, G^8, the portion G^8 of which is horizontal and rests upon, and is bolted to a horizontal shelf or bracket E^2 secured to the housing wall portion E'. The member G is shielded from the flames and heat of the combustion chamber of the furnace by the cheek plate F^2, F^2, at the sides of the doorways F, F, and by a special plate structure H, H'. As shown, this special cheek plate structure comprises a plate-like body H which bears against the inner side of the flange G^5 to which it may be secured by bolts H^2. The body portion of the cheek plate structure is secured to wings H' which extend toward the front of the boiler, and in the form shown, in such manner that they overlap the flanges or sides G^2 of the casting G and form continuations of the cheek plates F^2, F^2, the outer end edges of the wings H' being vertical and abutting against the edges of the cheek plates F^2, F^2. The cheek plate member H, H', and the inner portion of the member G overhang the grate bars D, but preferably do not bear upon the grate bars so as to interfere with the removal or adjustment of the latter. The parts are preferably proportioned and arranged as shown, so that the inner face of the cheek plate body portion H is flush with the inner wall of the mud drum C, while the outer face of the flange G^3 of the casting G is flush with the outer face of the mud drum. The flange G^3 of the casting G and cheek plate portion H, H', form the sides of a box-like air chamber surrounding the tubular portion G^6 of the casting G. This chamber is open at its lower end immediately above the grate bars and through the spaces between the latter to the ashpit, but is almost or entirely closed at its upper end by the bottom wall of the mud drum. Preferably a passage or passages is provided between the flange G^3 and the under wall of the mud drum as by the notches G^{10}, so that a restricted flow of air may take place through the passage or passages thus provided, into or out of the upper end of the air chamber according to the air pressure conditions prevailing.

With the arrangement described, the portion G^2, G^3, G^7 and G^8 of the member G in conjunction with the bracket E^2 form the sides of the rear end wall and bottom of an air box. The front wall of this box is formed by the boiler housing end wall E' and parts attached to it as hereinafter described. In the form shown this air box is open at its upper end to the air space inclosed by the front wall of the mud drum C and housing portions E^3 and E^4 and open at its front side through the window or port E^5. The air box casting portions G^2 and G^3, and the cheek plate H, are formed with apertures having a common axis which is parallel, or substantially so, to the direction of the water tubes. The apertures in the portions G^2 and G^3 are of less diameter than the bore of the tubular portion G^5 and form bearings for the inner end of a tubular burner body or air register J. The latter bears at its inner end against the body of the cheek member H at the margin of the aperture in the latter, which is of the same diameter as the bore of the member J. At this outer end the burner body J is formed with a flange J' parallel to, and bolted against the outer side of the wall member E, the latter being apertured to receive the body of the member J. A spider-like portion J^2 extends across the passage of the burner body J adjacent its outer end and is formed with a central passage receiving the inner end of the burner nozzle member K. The portion J^2 is conical and serves as a guide for the air which passes into the combustion chamber through the inner portion of the member J and the aperture in the cheek member body H. This air enters the interior of the member J through the port J^3 formed in it between the spider J^2 and the plane of the front side of the mud drum C. The amount of air thus admitted to the interior of the burner body may be regulated by means of a valve member or damper M in the form of a slotted cylinder which surrounds the burner body and may be circumferentially adjusted by means of the gear segment M' secured to the valve M and the spur gear N' carried by the spindle N journaled in a boss J^4 formed on the flange J' of the member J. Preferably, as shown, the portion of the member J in which the slots J^3 are formed is of somewhat greater external diameter than the portion of the member which enters the portion G^3 to permit the valve M to be slipped on to and off the inner end of the burner body in assembling and disassembling the apparatus. With respect to the nozzle K and means for supplying it with oil, it is sufficient to say that preferably the nozzle is removably secured to the member J as

by means of the yoke K′ and the clamping screw K^2, and, that with the oil burner illustrated the oil is supplied to the nozzle through the pipe L under such pressure and temperature conditions that it issues from the nozzle in the form of a spray as indicated in Fig. 2.

With the construction described, it will be apparent that the oil and air entering the combustion chamber through the air register or burner body J are so directed as to insure the desired admixture of air and oil, and air and combustible gases driven off from the coal as to insure the proper distribution and complete combustion desired in the combustion chamber. Furthermore, the flames of the burning oil do not directly impinge against any portion of the boiler proper at any point close to the burner nozzle. The oil burning provisions are thus obviously adapted to effectively utilize the available space for them. Moreover, the space occupied by the oil burning provisions, even in the very compact boiler construction illustrated, is practically waste space when the oil burning provisions are not employed. Because of this the oil burning provisions may be readily installed in existing boilers of the type disclosed without any material alteration in the boiler or boiler furnace proper, and after being installed the boiler furnace may be operated with coal fire alone as readily and effectively as if the oil burner provisions were not present. When the oil burning provisions are not used I consider it desirable usually to remove the burner nozzle K. This may be done with or without the removal of the air register J. If the burner nozzle K is removed and not the air register it is desirable to blank off the aperture in the spider J^2 in which the nozzle is normally inserted and to close the chamber M. If the air register J is removed, as it may well be, it is desirable to blank off the aperture in the cheek plate H.

It will be apparent that with the construction illustrated the inner end of the air chamber J has its durability greatly increased by the provision of the air chamber surrounding the tubular portion G^4 of the casting G. Preferably the tubular portion G^4 is ported at G^5 so that air may circulate through the space between the member J and the portion G^4 as well as around the latter. The principal function of the member G^4 and the flange G^5 is to support the cheek plate member H, H′. It will be apparent that the cheek plate member H, H′ is readily removable and renewable when necessary. While I prefer to make the member H, H′ as illustrated, in the form of a one-piece metal casting, it will be understood that it might be made in sections and of a somewhat more refractory material than metal. As constructed and arranged, however, it is free to expand and contract and is quite durable since the liability of its cracking is quite small.

While in accordance with the provisions of the statute I have illustrated and described the best form of my invention now, known to me, it will be apparent to those skilled in the art that changes can be made in the form of the apparatus disclosed and may be used without departing from the spirit of my invention. It will also be understood by those skilled in the art that under some conditions it may be of advantage to use certain features of the invention without a corresponding use of others.

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

1. In a combined coal and oil burning furnace, the combination with the boiler housing, grate, water tubes, and mud drum adjacent one end wall of the housing and below the water tubes and above the grate, of an air box on the inner side of said end wall with a tubular extension lying between the mud drum and the grate, a cheek plate structure uniting with said mud drum and the inner wall of the air box proper to provide an air chamber surrounding said extension, and a nozzle for injecting oil into the furnace through said extension.

2. In a combined coal and oil buring water tube furnace, the combination with the boiler housing, grate and water tubes upwardly inclined from one end wall of the housing, and a mud drum located adjacent said end wall and below the water tubes and above the grate, an air box on the inner side of said end wall with a tubular extension lying between the mud drum and the grate and having its axis parallel to the water tubes, a cheek plate structure uniting with said mud drum and the inner wall of the air box to provide an air chamber surrounding said extension, and a nozzle for injecting oil into the furnace through said extension.

3. In a combined coal and oil burning water tube furnace, the combination with the boiler housing, having coal firing doorways formed in one end wall, grate, and water tubes, an air box on the inner side of said end wall between an adjacent pair of doorways and formed with a tubular extension at its inner side, above the grate and below the tubes, provisions for injecting oil through said tubular portion and provisions for regulating the flow of air through said air box into the furnace.

4. In a combined coal and oil burning water tube furnace, the combination with the boiler housing having coal firing doorways formed in one end wall, grate, and water tubes, an air box on the inner side of said end wall between an adjacent pair of

doorways and formed with a tubular extension at its inner side, above the grate and below the tubes, provisions for regulating the flow of air through said air box into the furnace, provisions for forming an air chamber surrounding said tubular extension.

5. In a combined coal and oil burning water tube boiler furnace, the combination with the boiler housing having doorways for coal firing formed in one end wall, grate, and water tubes, of an air box secured to said end wall on its inner side between an adjacent pair of doorways, a tubular air register extending through the inner wall of said air box and open at its inner end to the combustion chamber of the furnace, said air box and projecting portion of the air register overhanging the grate, and oil ejecting nozzle mounted in said air register, and means for regulating the flow of air from said air box through said air register into the combustion spaces of the furnace.

6. In a combined coal and oil burning water tube boiler furnace, the combination with the grate, water tubes and boiler housing having doorways for coal firing formed in one end wall, of a casting secured to the inner side of said end wall between an adjacent pair of said doorways and uniting with said end wall to form an air box overhanging said grate, a tubular air register or oil burner body passing through the inner and outer walls of said air box and provided with a flange abutting against the outer side of said end wall and formed with parts through which air may pass from the air box into the interior of said burner body, means for regulating the flow of air through said ports, and an oil ejecting nozzle supported in said burner body, said air box being in communication with an opening formed through said end wall.

7. In a combined coal and oil burning water tube boiler furnace, the combination with the grate, water tubes, and boiler housing having doorways for coal firing formed in one end wall, of a casting secured to the inner side of said end wall between an adjacent pair of said doorways and uniting with said end wall to form an air box overhanging said grate, a tubular air register or oil burner body passing through the inner and outer walls of said air box and provided with a flange abutting against the outer side of said end wall and formed with parts through which air may pass from the air box into the interior of said burner body, means for regulating the flow of air through said ports and an oil ejecting nozzle supported in said burner body, said air box being in communication with an opening formed through said end wall, and provisions for forming an air chamber surrounding a portion of said air register on the inner side of said air box.

8. An oil burning attachment for a boiler furnace, comprising an air box casting adapted to be secured to the inner side of the furnace housing and formed in its inner wall with an aperture, an air register or oil burner body, comprising a tubular body adapted to pass through said aperture and through an alined aperture in the end wall of the boiler furnace, and formed at its outer end with a flange adapted to bear against and be secured to said end wall, said tubular body having ports formed in the portion of it lying between said apertures, an oil ejecting nozzle mounted in said burner body.

9. In a combined coal and oil burning furnace, the combination with the boiler housing, grate, water tubes, and mud drum located adjacent one end wall of the housing and below the water tubes and above the grate, of an air box on the inner side of one said wall with a tubular extension from the inner wall of the air box proper lying beneath the mud drum and above the grate, a cheek plate structure comprising a body portion extending transversely to said extension and wings extending outward to the body of said air box, said structure uniting with said mud drum and said inner wall to provide an air chamber surrounding said air register, and a nozzle for injecting oil into the furnace through said air register.

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