Aug. 17, 1926. 1,596,147

L. G. BOSTEDO

OIL BURNER AND METHOD OF OPERATING THE SAME

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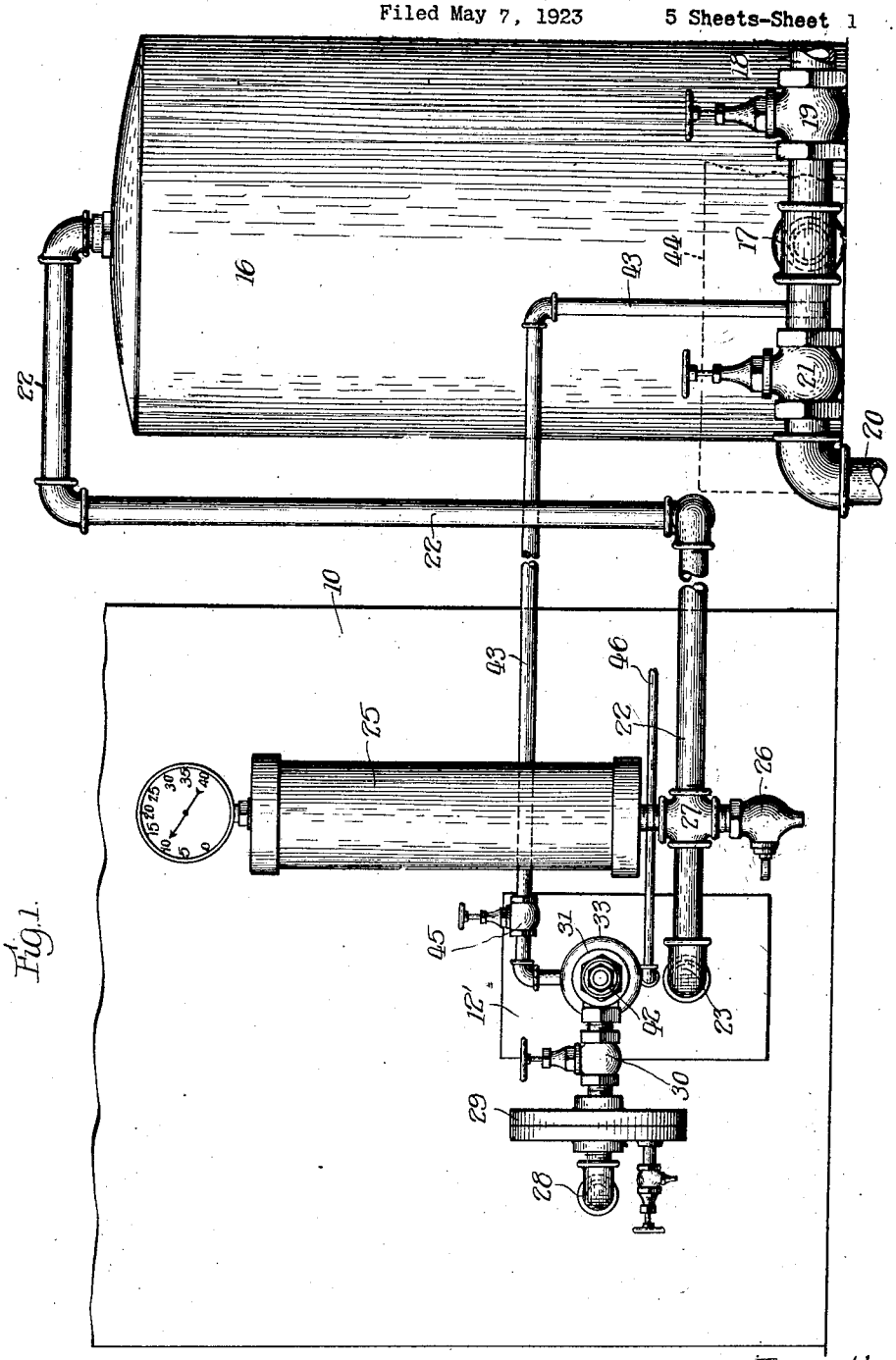


Fig. 1.

Witness:
A. J. Sauser.

Inventor:
Louis G. Bostedo,
By Samuel N. Ford, Atty.

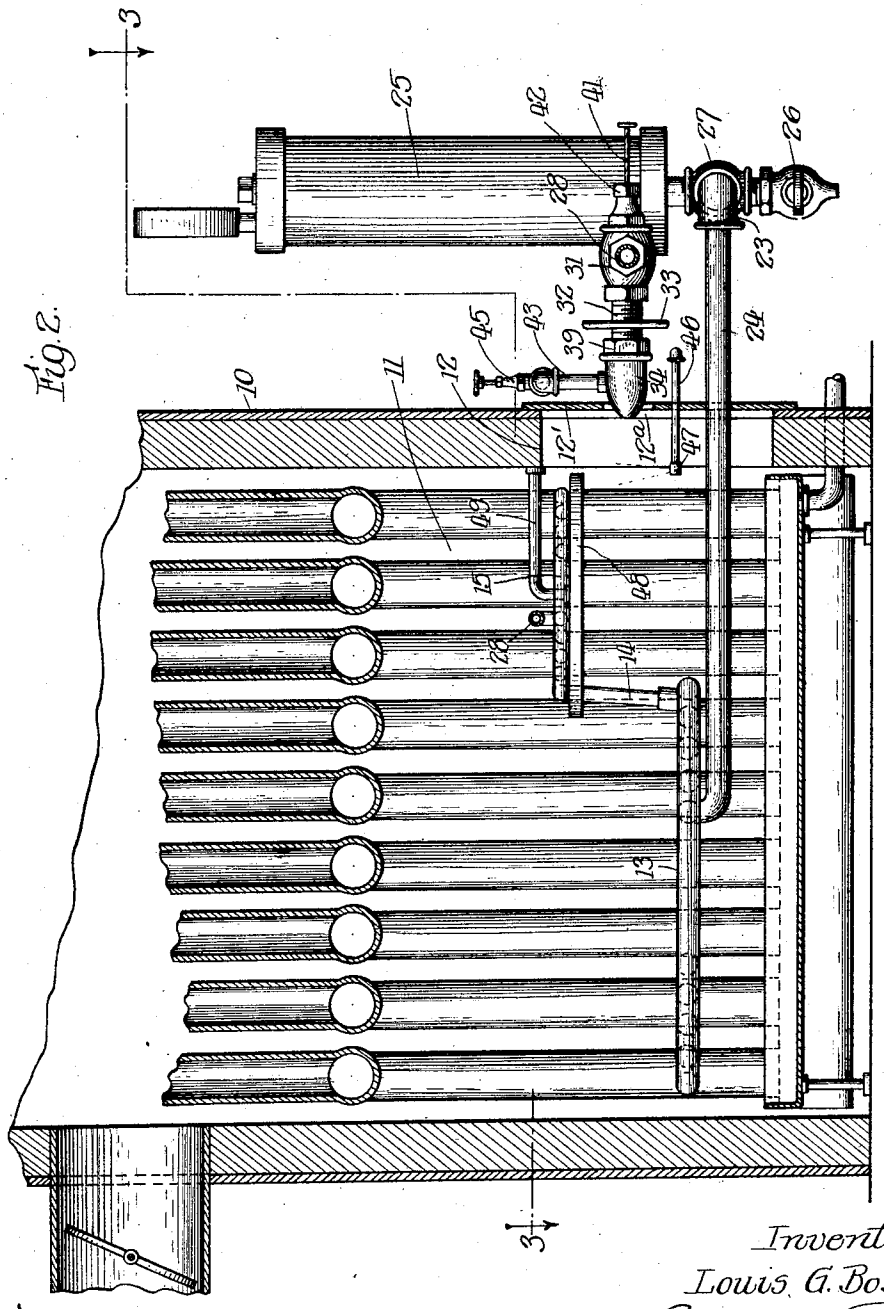
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OIL BURNER AND METHOD OF OPERATING THE SAME

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Fig. 2.



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OIL BURNER AND METHOD OF OPERATING THE SAME

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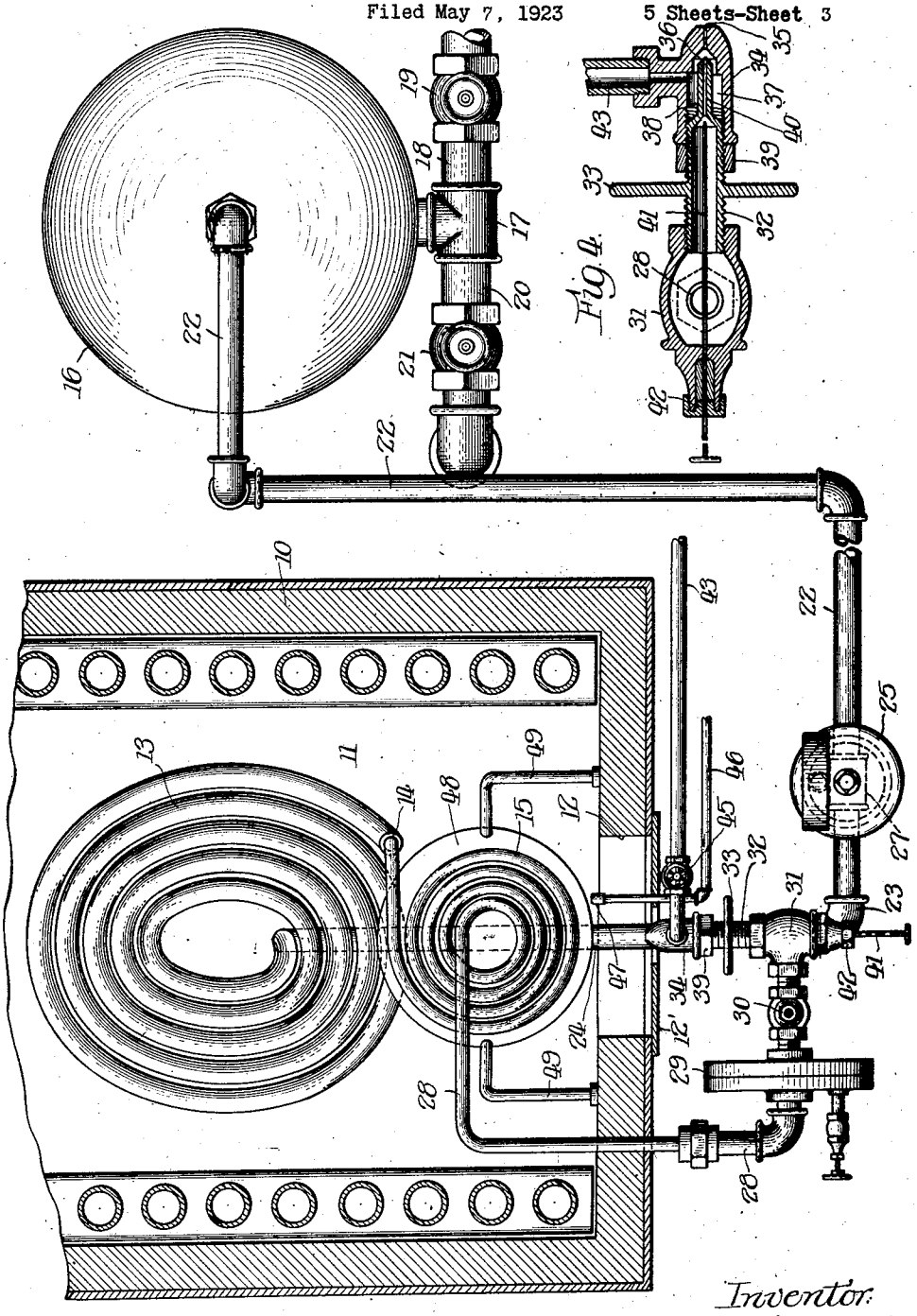


Fig. 3.

Fig. 4.

Witness:
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Aug. 17, 1926. 1,596,147

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OIL BURNER AND METHOD OF OPERATING THE SAME

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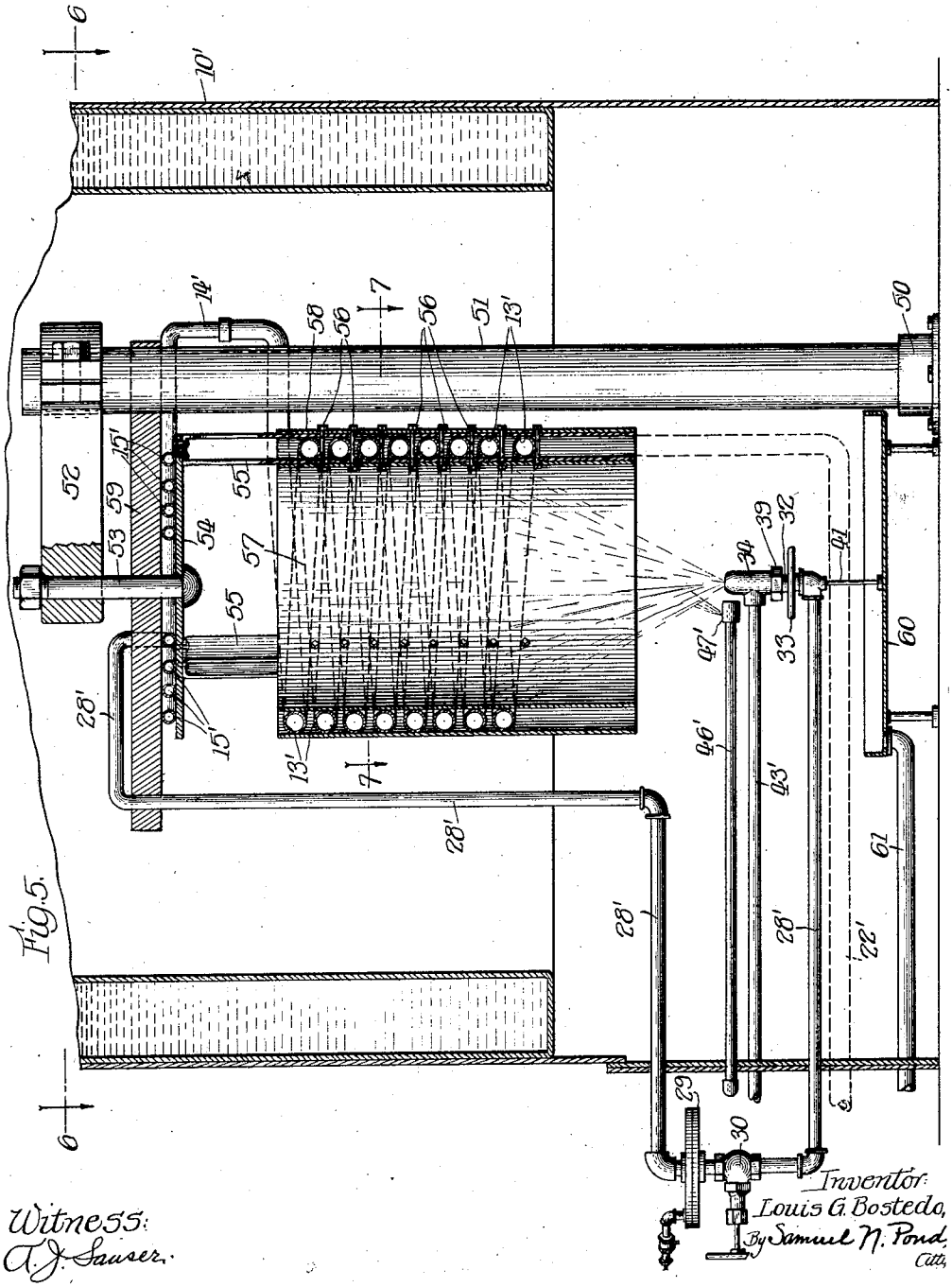


Fig. 5.

Witness:
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Inventor:
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Aug. 17, 1926. 1,596,147

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OIL BURNER AND METHOD OF OPERATING THE SAME

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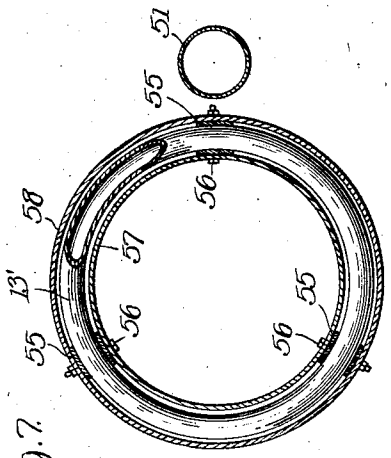


Fig. 7.

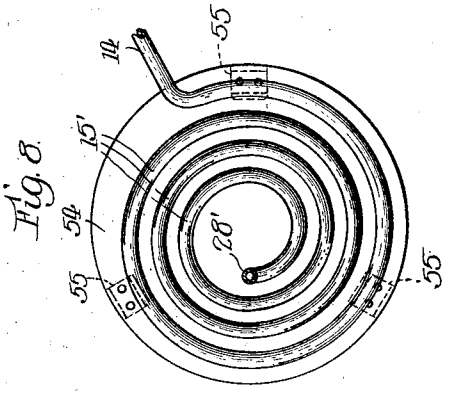


Fig. 8.

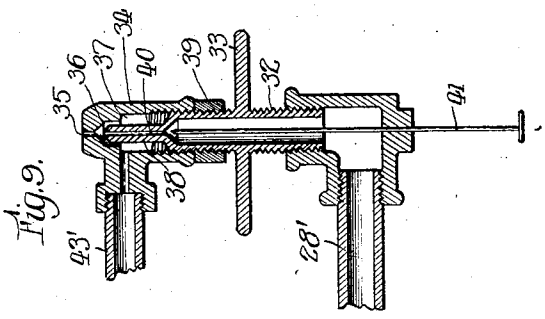


Fig. 9.

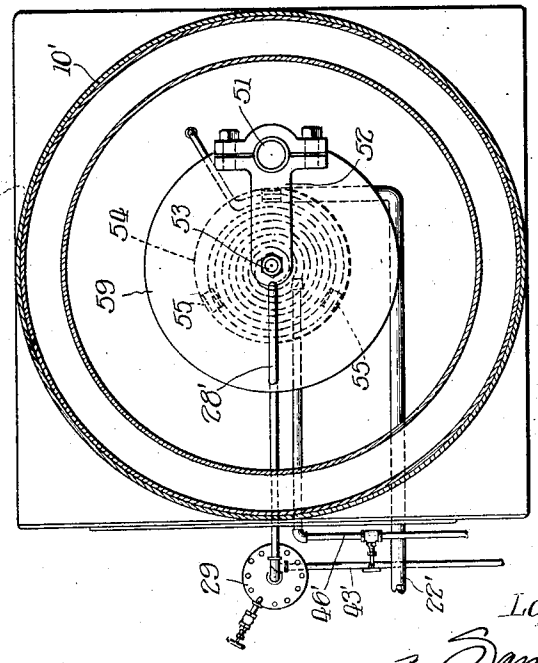


Fig. 6.

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Patented Aug. 17, 1926. 1,596,147

UNITED STATES PATENT OFFICE.

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OIL BURNER AND METHOD OF OPERATING THE SAME.

Application filed May 7, 1923. Serial No. 637,183.

This invention relates to oil burners designed to supply and burn liquid fuel in furnaces, steam and hot water boilers, etc; and has reference more particularly to that type of burners wherein the oil is induced and sprayed through the agency of a steam jet at the burner nozzle, and in the preferred form of the invention, wherein the steam is itself generated by the burner torch within the fire chamber.

One object of the invention is to provide an improved method of and means for starting the burner in operation through the agency of compressed air which shall not require any mechanical air pump or blower, nor any preliminary heating of the steam generator by gas or other extraneous source of heat before the burner torch is ignited.

Another object of the invention is to provide an improved device preferably located within the fire chamber of the furnace or boiler for generating and superheating the steam from and by the torch itself.

Other objects and attendant advantages of the invention will be readily understood by persons skilled in the art from the following description, taken in connection with the accompanying drawings in which I have illustrated two practical embodiments of the principle of the invention, one of which is best adapted for furnaces and boilers having relatively low fire boxes or chambers, while the other is adapted to furnaces and boilers wherein the fire chamber has greater height.

Referring to the drawings—

Fig. 1 is a front elevation of the outfit as applied to a hot water boiler having a relatively low fire chamber;

Fig. 2 is a side elevation of the same, partly in central vertical section through the hot water boiler;

Fig. 3 is a top plan, in horizontal section through the boiler;

Fig. 4 is a longitudinal axial section through the oil sprayer and burner;

Fig. 5 is a vertical section showing another form of steam generator and superheater with a vertically disposed oil sprayer and burner adapted for use in furnaces and boilers having fire chambers of sufficient height;

Fig. 6 is a horizontal section, looking downwardly, on the line 6—6 of Fig. 5;

Fig. 7 is a horizontal section looking downwardly on the line 7—7 of Fig. 5;

Fig. 8 is a top plan view of the steam superheater coil; and

Fig. 9 is a vertical axial section of the burner or torch shown in Fig. 5.

Referring first to the form of the invention illustrated in Figs. 1 to 4 inclusive, 10 indicates conventionally a hot water heater or steam boiler having a relatively low fire box or chamber 11 formed with a front opening 12, closed by a cover plate 12′ formed with an opening 12ª. Within the fire box 11 and disposed for the most part within the rear half thereof is a flat horizontal steam generator coil 13, preferably of the oval form illustrated in Fig. 3. From the end of the outer turn of the coil 13 there extends upwardly a vertical pipe 14 which connects with the outer turn of a flat steam superheater coil 15 that is located in the front portion of the fire box just inwardly of the opening 12.

16 designates a sizable tank, which serves as a hydraulic air compressor and in practice may be one of the so-called hot water tanks commonly used in the kitchens or basements of residences for heating water by a coil in the fire box of the range or furnace. Into the lower end of the tank 16 is connected a T-coupling 17, into one branch of which is connected a pipe 18 leading from the city main and provided with a cut-off cock 19, and into the other branch of which is connected a drain pipe 20 equipped with a cock 21. From the top of the tank 16 there extends a pipe 22, which leads thence to a point in front of the lower portion of the boiler where it connects through an elbow 23 with a pipe 24 that in turn is connected into the innermost turn of the steam generator coil 13. The water supply pipe 22 is preferably equipped with the usual air cushion 25 and drain cock 26; these parts being connected into the pipe 22 by a four-way coupling 27.

From the innermost turn of the superheater coil 15 there extends outwardly through the wall of the boiler a steam pipe 28 which, through a suitable built-up connection, including a strainer indicated at 29 and a cut-off cock 30, leads into the outer portion of the oil sprayer and burner. This latter is shown in detail in Fig. 4 and is preferably made up of a hollow casting 31, into one side of which the steam pipe 28 is connected, an externally threaded tube section 32 equipped with a hand wheel 33 for

turning the same, and a burner tip or nozzle 34 that projects into the opening 12ª and is formed with a jet orifice 35 at its forward end. The inner end of the jet orifice 35 communicates with a tapered narrow passage 36, this latter in turn communicating with a wider passage or chamber 37, and disposed centrally within the chambers 36 and 37 is a reduced steam nozzle 38 on the forward end of the pipe section 32, which functions as a needle valve for the oil, the pipe section 32 having screw-threaded engagement with the members 31 and 34, whereby, by turning the hand wheel 33, the oil passage 36 can be more or less restricted; the adjustment being fixed by a lock nut 39 on the member 32. The steam nozzle or needle valve 38 has an axial bore 40 in line with the jet orifice 35, and these fine passages may be cleaned out when required by means of a needle 41 slidably mounted in a gland 42 on the outer end of the member 31 and of a size to snugly fit the bores 40 and 35.

43 designates an oil supply pipe leading from an oil tank indicated at 44 in Fig. 1, said oil pipe entering the upper side of the burner tip or nozzle 34 and communicating with the chamber 37 of the latter, and equipped with a shut-off cock 45. The maximum height of the oil in the tank 44 is maintained at a level below that of the burner nozzle so as to avoid any danger of flooding the latter when the torch is extinguished.

46 designates a gas pipe extending through the opening 12 of the boiler alongside the burner nozzle and terminating in a burner tip 47 which affords a constantly burning pilot flame for the ignition of the torch.

Beneath the superheater coil 15 is a plate 48 of asbestos, fire clay, or other fire-resisting material supported from the front wall of the boiler by bracket arms 49. This plate serves both as a support for the superheater coil and a guard or protector therefor to prevent its early destruction by the intense heat of the torch flame.

Describing now the manner of starting the apparatus in operation, assuming that the tank 16 is empty, and the drain valve 21 closed, the water supply valve 19 is opened, and the water at city main pressure, which in most municipalities is from thirty-five to forty pounds, flows into the bottom of the tank 16, gradually rising in the latter and compressing and forcing the air in the tank ahead of it out through the pipe 22, elbow 23 and pipe 24 into and through the lower generator coil 13, thence upwardly through the connecting pipe 14 into and through the superheater coil 15, whence it flows through the pipe 28 past the open valve 30 into and through the burner. As the air rushes in a fine stream through the needle valve nozzle 38 and the jet orifice 35, it induces a flow of oil through the oil supply pipe 43, mixing with, spraying and partly vaporizing the oil, which latter is instantly ignited by the constantly burning gas flame on the pilot torch 47. For several minutes the torch is maintained at practically its full size and capacity by the compressed air inducing and spraying the oil as described, during which time both the steam generator coil 13 and steam superheater coil 15 become highly heated; so that by the time the volume of air in the tank 16 is exhausted, and the water following the same through the pipes 22, 23 and 24 reaches the generator coil 13, the water is almost instantaneously flashed into steam at an initial pressure somewhat below that of the water main; which steam, rising through the connection 14, flows through and becomes superheated and dried by the coil 15, which, being above and somewhat closer to the torch, receives greater heat from the latter than does the generator coil 13. From the coil 15 the superheated steam follows the heated compressed air into and through the burner nozzle, whereby the induction and spraying of the oil are maintained without interruption. I have observed in tests of the apparatus that at the instant the steam supersedes the compressed air as the inductive and spraying agent for the oil, there occurs a momentary drop in the size and intensity of the torch, but not sufficient to extinguish the latter, this drop being immediately followed by a revival of the torch to its full size and intensity. The operation of the burner then continues in an entirely automatic manner, the torch generating its own steam supply within the fire box of the furnace or boiler, so that no heat is lost, and no extraneous devices such as pumps, blowers and the like are required to maintain the burner in operation.

The size and intensity of the torch flame is capable of nice regulation by simply turning the hand wheel 33 of the burner to move the needle valve 38 toward or from the tip orifice 35, whereby the oil supply is decreased or increased. In case the steam pressure becomes undesirably high, it is easily throttled down to the desired extent by manipulation of the valve 30. When the fire is shut down, the apparatus is primed for its next service period by shutting the water supply valve 19, and opening the drain valve 21; thus emptying the tank 16 and refilling the same with air, which operation may be expedited by opening the drain cock 26.

Referring now to the embodiment of the invention shown in Figs. 5 to 9 inclusive, it may here be remarked that this embodiment is identical in principle, and very largely in structural detail, with that already de-

scribed; but is better adapted to installations where the fire box or chamber is relatively high and narrow. In Figs. 5 and 6, 10′ indicates a conventional round hot air furnace, from which the grate has been removed to permit installation of the liquid fuel heating apparatus. Secured to the floor on which the furnace rests, as by means of a flanged collar 50 is a vertical post 51 on the upper end of which is adjustably clamped a horizontal arm 52, in the free end of which is secured a depending bolt 53, this latter being substantially coaxial with the fire chamber of the furnace. The lower end of the bolt 53 centrally supports a plate 54, from the under side of which are suspended at uniformly spaced intervals narrow loop-shaped metal hangers 55, herein shown as three in number spaced 120° apart. Extending between the opposite sides of each loop are uniformly spaced bolts 56 which serve the double function of supporting the coils of a spiral tube steam generator 13′, and also supporting and clamping against the inner and outer sides of the generator cylindrical sheathings 57 and 58, the inner sheathing 57 being preferably of galvanized iron and the outer sheathing 58 of asbestos. The topmost turn of the steam generator spiral 13′ is connected by a laterally offset and upwardly extending pipe 14′ with the outermost turn of a flat superheater coil 15′ that rests upon the plate 54. Above the superheater coil 15′ is preferably placed a circular cover-plate 59 suitably apertured for the passage therethrough of the post 51 and bolt 53 and serving both as a heat retaining cover for the superheater coil 15′ and a spreader for the flames and gaseous products of combustion rising through the lower generator coil 13′. From the innermost turn of the superheater coil 15′ a pipe 28′ leads upwardly through the cover-plate 59 radially above the latter, thence downwardly alongside the generator coil, thence outwardly through the wall of the furnace where it is supplied with the strainer 29 and throttle valve 30, as in the other form of the invention above described, and thence back through the furnace wall and inwardly of the ash pit where it enters the lower end of the vertically disposed burner. The internal structure and arrangement of the burner is illustrated in the sectional view Fig. 9, and is substantially identical with the burner already described and shown in detail in Fig. 4, differing from the latter only in its vertical disposition and in having the openings for the steam and oil pipes on the same side of the burner and in the same vertical plane. 43′ designates the oil supply pipe connected laterally into the burner nozzle and leading from an oil tank similar to that indicated at 44 wherein the oil level is maintained at a level below that of the burner nozzle. 46′ designates the gas pipe leading alongside the oil pipe 43′ and terminating in a burner tip 47′.

22′ designates the air and water supply line leading from the upper end of a hydraulic air compressor tank, such as 16 in Fig. 1, to the lowermost turn of the steam generator coil 13′.

In both embodiments of the invention illustrated I have shown, in the bottom of the fire chamber, a pan 60 and drain pipe 61 designed to catch and carry off any oil or oil and water that might pass through the burner nozzle owing to starting or continuing the apparatus in operation when the pilot flame had been accidentally extinguished.

The operation of starting this burner in action by first inducing and spraying the oil by an air blast created by a hydraulic air compressor, such as 16, thus bringing the steam generator and superheater coils into condition to convert the water following the air into steam, and then automatically switching the work of inducing and vaporizing the oil onto the steam blast is identical with that previously described. The lower generator coil 13′ is bathed internally by the flames from the torch, being sealed from a destructive heat by the inner lining or sheathing 57 and protected from undue cooling by the outer lining or sheathing 58; while the superheater coil 15′ is subjected to the high heat of the flames, when the burner is in full operation, but protected against a destructive heat by the guard plate 54. The water flowing in through the pipe 22′ is turned into steam during its passage through the generator coil 13′ and then superheated and dried during its flow through the upper coil 15′, whence it flows under a pressure slightly below that of the water to the burner nozzle.

The specific form of burner nozzle herein shown and described is not of the essence of the invention, but has been found in practice to yield satisfactory results; it being possible to regulate the intensity of the fire by adjustment of the needle valve 38, and any clogging of the bore of the needle valve or of the aperture in the nozzle tip by carbon is quickly remedied by the reaming effect of the clean-out needle 41.

While I have herein shown and described two practical embodiments of the principle of my invention adapted to somewhat different heating equipments, it is manifest that the principle of the invention, and especially the automatic starting by an air jet or blast created by a hydraulic compressor interposed in the line from the city main to the steam generator and burner nozzle may be embodied in other and specifically different forms from those herein shown and described. Hence I do not limit the invention to the details of structure and

arrangement herein disclosed for purposes of illustration, but reserve all such variations and modifications as fall within the spirit and purview of the appended claims.

I claim—

1. The herein described method of automatically starting and maintaining in operation an oil burner which consists in compressing a limited body of air by water under the pressure of a water main, conducting the compressed air through a steam generator and thence to the burner for the induction and spraying of oil thereby, igniting the oil spray at the burner nozzle and heating said steam generator thereby, conducting the water in the path of and immediately behind said compressed air to and through said generator whereby it is converted to steam and thence to the burner, and then continuing the induction and spraying of the oil by said steam in immediate succession to said compressed air.

2. In an automatic oil burner apparatus, the combination of an oil sprayer and burner, means for supplying oil thereto, a hydraulic air compressor, means for conducting the compressed air furnished by said air compressor to said oil sprayer and burner to start the latter in operation, means for converting the water employed to compress said air into steam, and means for conducting said steam to said oil sprayer and burner in immediate succession to said compressed air.

3. In an automatic oil burner apparatus, the combination of a vertically disposed oil sprayer and burner, an oil supply pipe communicating therewith, a steam generating coil of spiral form mounted above and in axial alinement with said burner, an internal sheathing for said coil protecting the latter from direct impact of the burner flames, a flat steam superheating coil mounted directly above and connected to said steam generating coil, a guard plate on the under side of said superheating coil protecting the latter from direct impact of the burner flames, a water supply pipe connected to the lower end of said generating coil, and a steam conduit pipe connecting said superheating coil with said sprayer and burner.

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