No. 638,340. Patented Dec. 5, 1899.

J. J. KERMODE.

APPARATUS FOR BURNING LIQUID FUEL IN STEAM GENERATORS, &c.

(Application filed Dec. 5, 1898.)

(No Model.) 3 Sheets—Sheet 1.

FIG. I

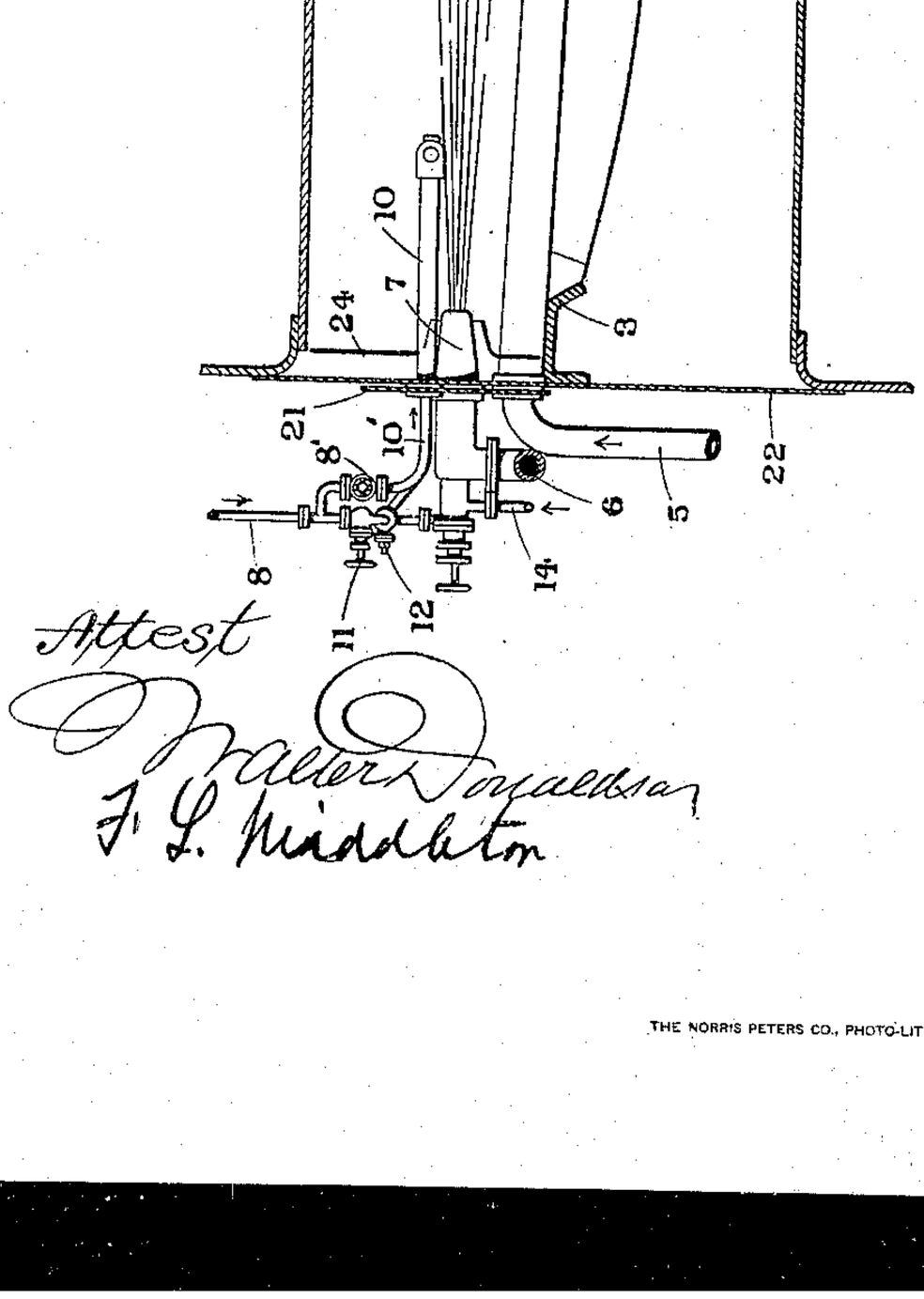


FIG. II

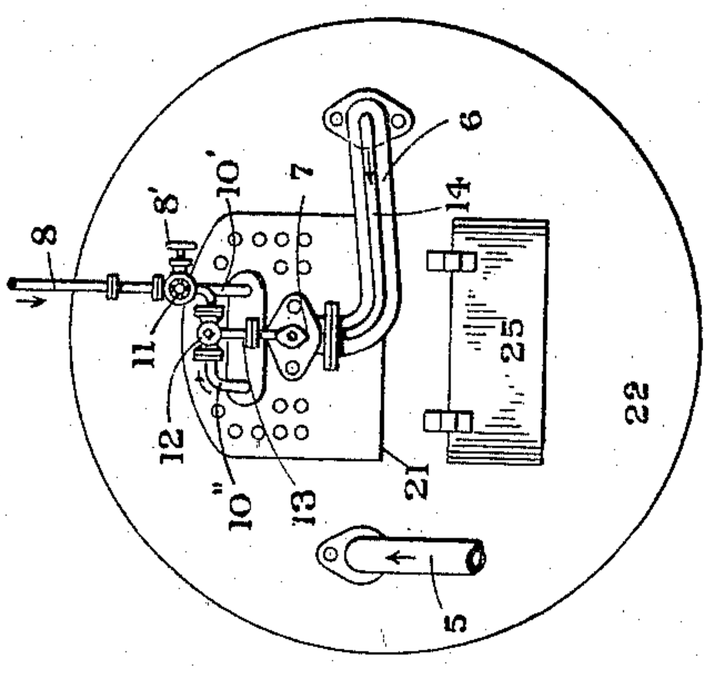


FIG. III

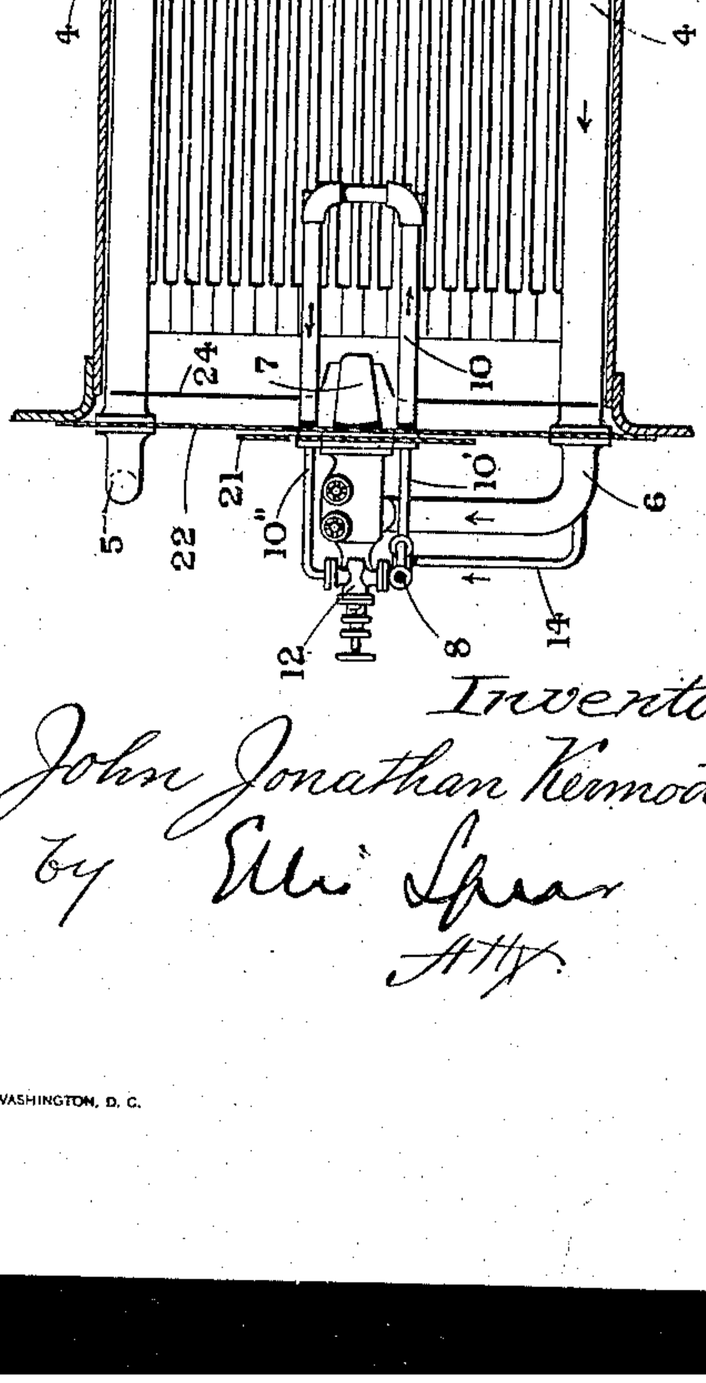
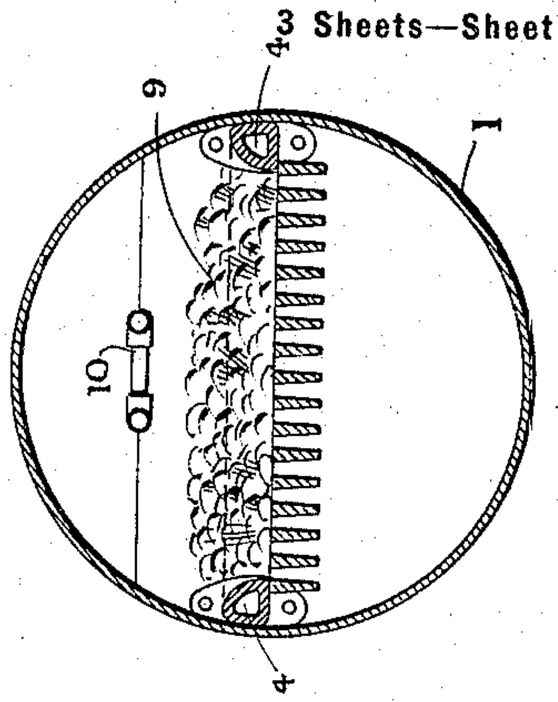


FIG. IV



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(No Model.) 3 Sheets—Sheet 2.

FIG. VIII

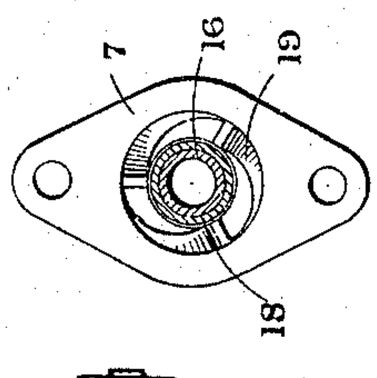


FIG. VII

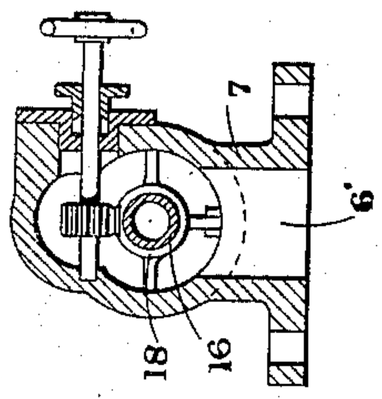


FIG. VI

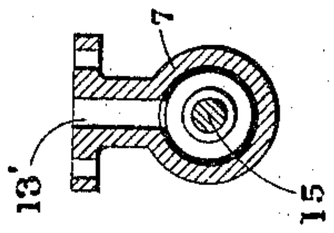


FIG. V

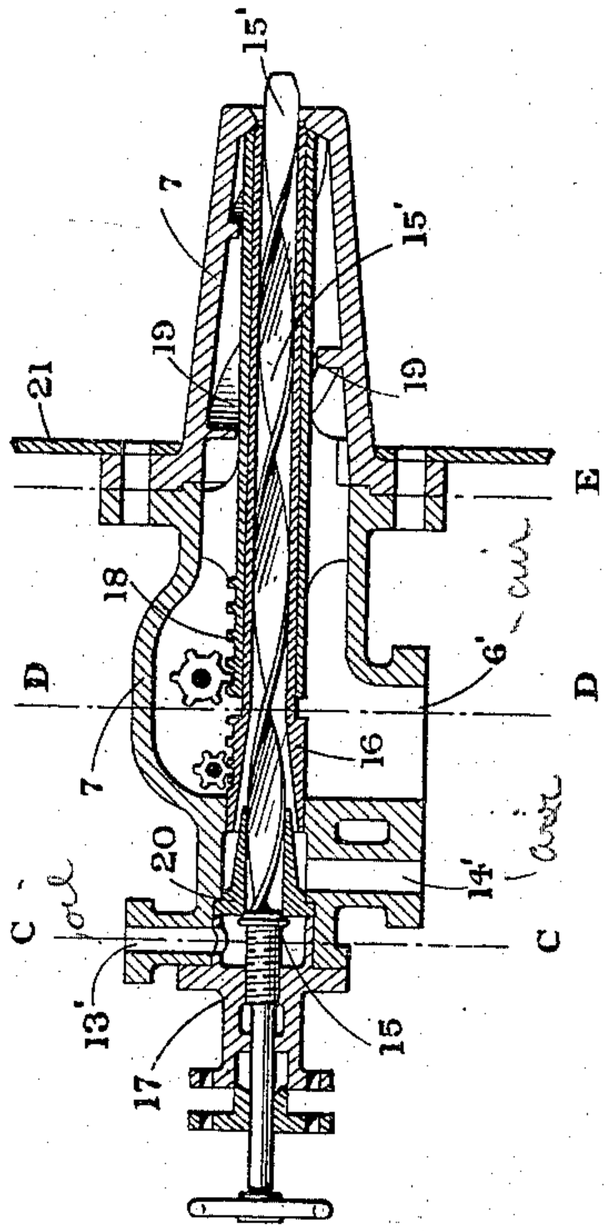
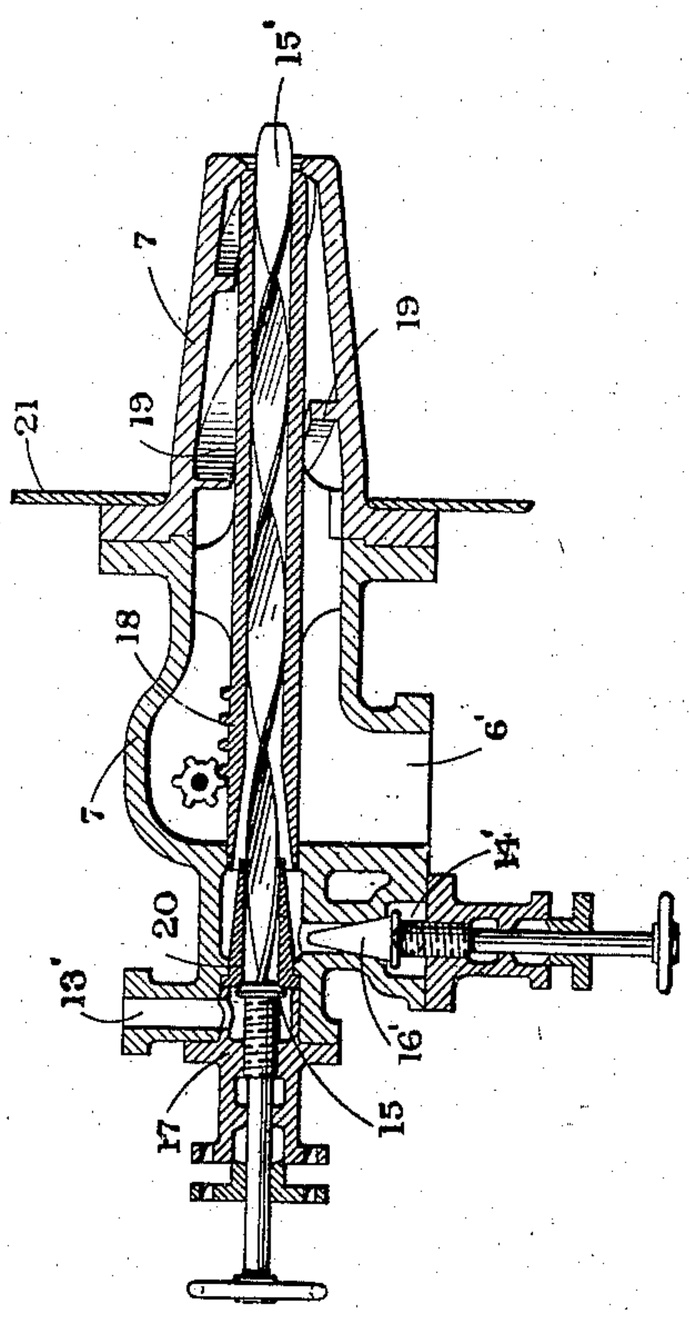


FIG. IX



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(No Model.) 3 Sheets—Sheet 3.

FIG. XI

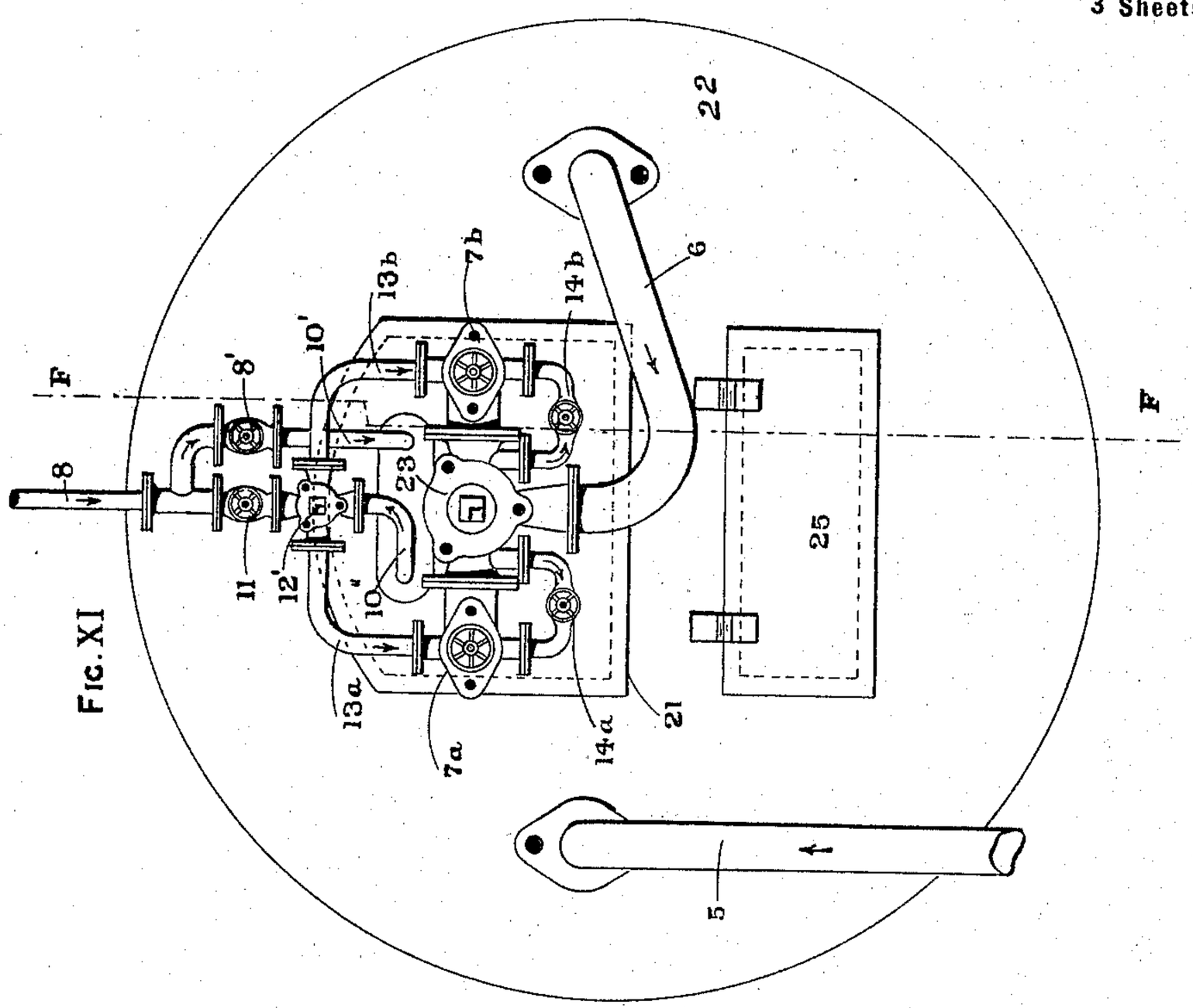


FIG. X

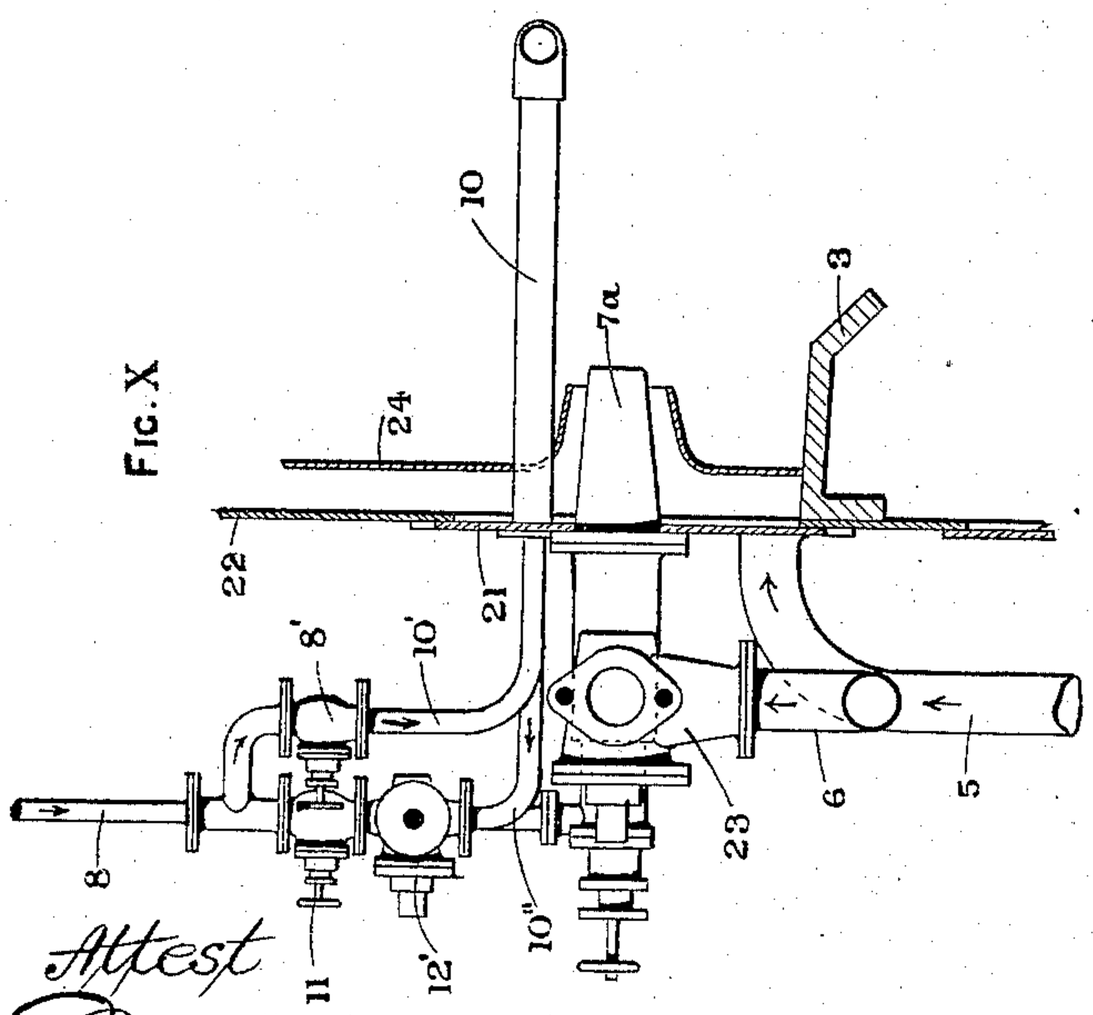
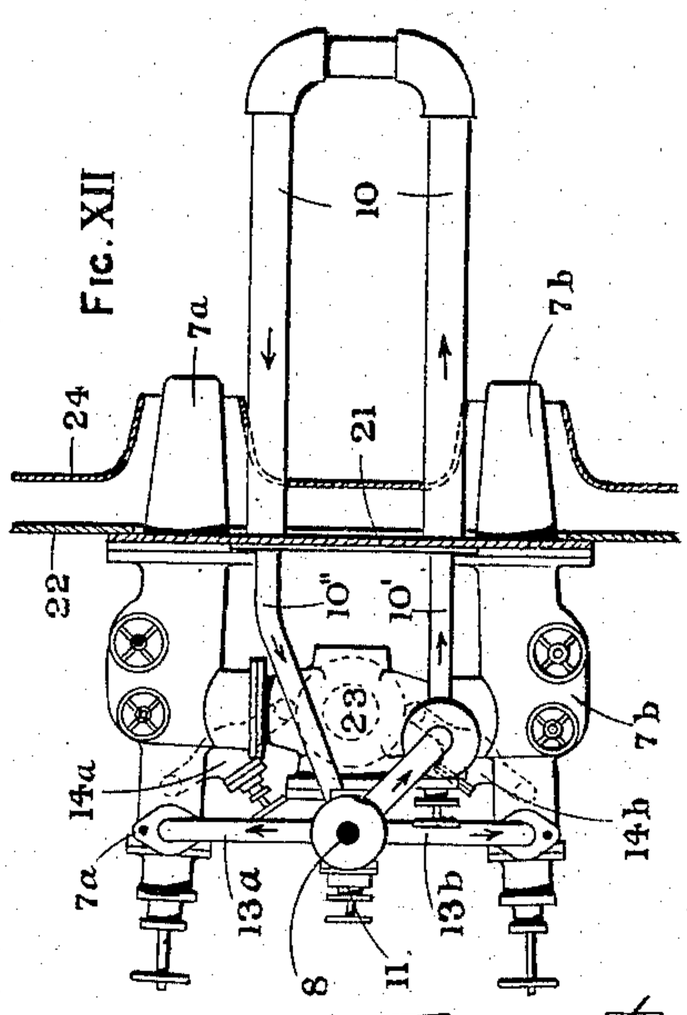


FIG. XII



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UNITED STATES PATENT OFFICE.

JOHN JONATHAN KERMODE, OF LIVERPOOL, ENGLAND.

APPARATUS FOR BURNING LIQUID FUEL IN STEAM-GENERATORS, &c.

SPECIFICATION forming part of Letters Patent No. 638,340, dated December 5, 1899.

Application filed December 5, 1898. Serial No. 698,313. (No model.)

To all whom it may concern:

Be it known that I, JOHN JONATHAN KERMODE, a subject of the Queen of Great Britain, residing in Liverpool, in the county of Lancaster, England, have invented certain new and useful Improvements in and Relating to Apparatus for Burning Liquid Fuel in Steam-Generators and the Like, of which the following is a specification.

This invention relates to apparatus for burning liquid fuel in steam-generators and the like, and I have illustrated its application to the furnace of a marine boiler in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view of the furnace. Fig. 2 is an end view thereof. Fig. 3 is a longitudinal section of the furnace in plan view. Fig. 4 is a cross-section of the furnace, showing the position of the refractory material. Fig. 5 is an enlarged longitudinal sectional view of the burner. Fig. 6 is a cross-sectional view on the line C C of Fig. 5. Fig. 7 is a cross-sectional view on the line D D of Fig. 5, parts being omitted. Fig. 8 is a cross-section on the line E E of Fig. 5. Fig. 9 is a longitudinal sectional view of a modified form of burner. Fig. 10 is an elevation of a modification, parts being omitted, in which the connections are arranged to fit the burners in duplicate. Fig. 11 is an end view of the modified form, and Fig. 12 is a plan view thereof.

Throughout the drawings the same and similar parts are indicated by the same numerals of reference.

Referring first to Figs. 1 to 4, the furnace 1 is provided with the usual bridge 2 and dead-plate 3 to carry the fire-bars and is further provided with an air-heating trunk 4, carried around three sides of the furnace, as shown in Fig. 3. Air is forced under pressure into the trunk 4 by the pipe 5, and after having been heated in its passage around the furnace is led by the pipe 6 to the burner 7, where it mixes with and vaporizes the oil supplied to the burner by the pipe 8, and the resulting flame is directed onto a mass of refractory material 9, such as asbestos, which is thereby heated to incandescence.

The oil may be vaporized before it is supplied to the burner by being passed through a vaporizing-pipe 10 placed within the furnace, in which case the valve 8′ is opened to connect the pipe 8 to the pipe 10′, the valve 11 is closed, and the right-angled two-way cock 12 is turned so as to connect the pipe 10″ to the pipe 13, which leads to the burner 7, or the oil may pass direct to the burner 7, in which case the valve 8′ is closed, the valve 11 is opened, and the cock 12 is turned to connect the pipe 8 to the pipe 13 and so to the burner. Heated air is also supplied to the burner by a pipe 14, which branches, as shown, from the main air-pipe 6.

Referring now to Figs. 5, 6, 7, and 8, which are detail views of the burner to a larger scale, 13′ is the oil-inlet, which is connected to the pipe 13. 6′ is the main air-inlet, which is connected to the pipe 6, and 14′ is the branch air-inlet, which is connected to the pipe 14. The valve 15 controls the oil-passage in the burner, and as it requires a fine adjustment I operate it by means of worm-gear; but to avoid complexity in the drawings I have simply shown a hand-wheel for this purpose. The valve is provided with a spiral prolongation 15′ in the form of a twisted strip, which serves to give the oil a whirling motion as it passes to the nozzle along the inner axially-sliding tube 16. The spiral prolongation 15′ also serves as a scraper to clean the passage-way of this tube 16 and the valve-seating 20, and the gland 17 is made easily removable, so as to facilitate the operation of cleaning. The main supply of hot air which passes the nozzle is regulated by the axially-sliding tube 18, the end of which is adapted to adjust the amount of the annular opening for air at the nozzle, and the air is given a whirling motion in the opposite direction to that of the oil by the spiral wings 19. The hot air which enters by the passage 14′ from the branch pipe 14 passes through the annular passage between the sliding tube 16 and the fixed seating 20 of the valve 15 and then mixes with the oil, insuring its vaporization and driving it with vigor into the furnace. The sliding tubes 16 and 18 are independently operated in the usual manner by the racks, pinions, and hand-wheels shown. The burner is carried, as shown in Fig. 5, by flanges connected to a plate 21, which is secured to the furnace front plate 22 and which also carries the oil-vaporizing pipe and its connections.

In the modified form of burner shown in Fig. 9 the connections and construction are similar to those already described, with the exception that a valve 16′ is substituted for the inner sliding tube 16, which is its equivalent in Fig. 5.

In order that my invention should be more readily understood, I have in the first instance described an arrangement with but the one burner fitted to the furnace. I have found, however, that it is desirable for many reasons to fit the burners in duplicate and to so arrange the connections that the burners can be used alternately, so that the one may be cleaned or repaired while the other is in operation. An arrangement of this kind, which is the preferred form of the apparatus, is illustrated in Figs. 10, 11, and 12, which are drawn to a somewhat larger scale than Figs. 1, 2, and 3. As before, air is led through the pipe 5 to the heating-trunk 4 in the furnace and from the latter by a pipe 6 to a right-angled two-way cock 23, by means of which the air can be directed to either of the burners 7^a or 7^b. The branch air-pipes 14^a and 14^b, each controlled by a valve, supply air to the branch opening 14′ in the burner 7^a or 7^b, as the case may be. The oil-supply pipe 8 may be connected to the lower branch of the four-branch cock 12′ through the vaporizing-pipe 10 by closing the valve 11 and opening the valve 8′, which connects the pipes 8 and 10, or the oil may be led directly to the upper branch of the cock 12′ by closing the valve 8′ and opening the valve 11, and in either case it can be led from the cock 12′ by suitably turning the plug thereof (which has two ports at right angles) either to the burner 7^a by the pipe 13^a or to the burner 7^b by the pipe 13^b, as the case may be. The front plate 22 of the furnace is protected from the intense heat by an air-screen formed by the plate 24, and air may be supplied if necessary below the fire-bars through the ash-pit door 25.

The action of the apparatus is as follows: Oil is supplied to the oil-pipe 8, and assuming that the vaporizing-pipe 10 is used it passes through the said pipe on its way to the burner, being thus vaporized more or less completely before reaching the burner. As it passes through the burner complete vaporization is insured by the admixture with the oil of hot air, which enters, as described, by the branch inlet 14′, and the further supply of hot air necessary for combustion enters the burner by the hot-air inlet 6′, the relative proportions of the several supplies being adjusted by the controlling devices described. The issuing flame from the nozzle of the burner is directed onto a mass of refractory material, which is adapted to be heated to incandescence thereby and which therefore acts as an equalizer and radiator.

In some cases steam may be substituted for or supplied in conjunction with one or other, or both, of the hot-air supplies, and the smaller air-supply which enters the burner by the inlet 14′ may, instead of being branched from the main supply-pipe 6, be supplied from an independent source, so as to be capable of independent regulation as to temperature and pressure.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with a furnace, of a burner comprising an outer casing secured in the wall thereof, having a nozzle projecting into the furnace, an inner tube forming a mixing-passage having its forward end extending to the mouth of said nozzle, an oil and an air inlet leading through said casing back of the rear end of the mixing-tube, and an enlarged air-inlet leading through said casing in advance of the rear end of said tube communicating with the chamber surrounding said mixing-tube, the contracted mouth of said nozzle forming the discharge from said chamber, substantially as described.

2. The combination with a furnace, of a burner comprising an outer casing secured in the wall thereof, having a nozzle projecting into the furnace, an inner tube forming a mixing-passage having its forward end extending to the mouth of said nozzle, an oil and an air inlet leading through said casing back of the rear end of the mixing-tube and an enlarged air-inlet leading through said casing in advance of the rear end of said tube communicating with the chamber surrounding said mixing-tube, the mouth of said nozzle forming the discharge from said chamber, valves controlling the inlet of air and gas to the mixing-tube and a valve controlling the discharge from said chamber located directly at the nozzle-mouth, substantially as described.

3. In a burner for burning liquid fuel, in combination, a casing having an oil-inlet, and branch and main air-inlets therein, a central tube forming a mixing-passage and an annular chamber surrounding the same, an oil-valve controlling the oil-supply to the central passage, an inner sliding tube controlling the branch air-supply thereto, and an outer sliding tube controlling the discharge from the surrounding chamber at the nozzle of the burner; substantially as described and illustrated.

4. In a burner for burning liquid fuel and having a central tube forming an oil-passage; in combination with the said tube, a helical prolongation of the valve controlling the said passage, adapted to scrape the said tube and forming a deflector therein; substantially as described and illustrated.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN JONATHAN KERMODE.

Witnesses:

B. LLOYD BARNES,

JOSEPH E. HIRST.