

No. 832,461.

PATENTED OCT. 2, 1906.

E. W. DUNN.  
OIL BURNER.

APPLICATION FILED JAN. 24, 1903. RENEWED AUG. 22, 1906. 2 SHEETS—SHEET 1.

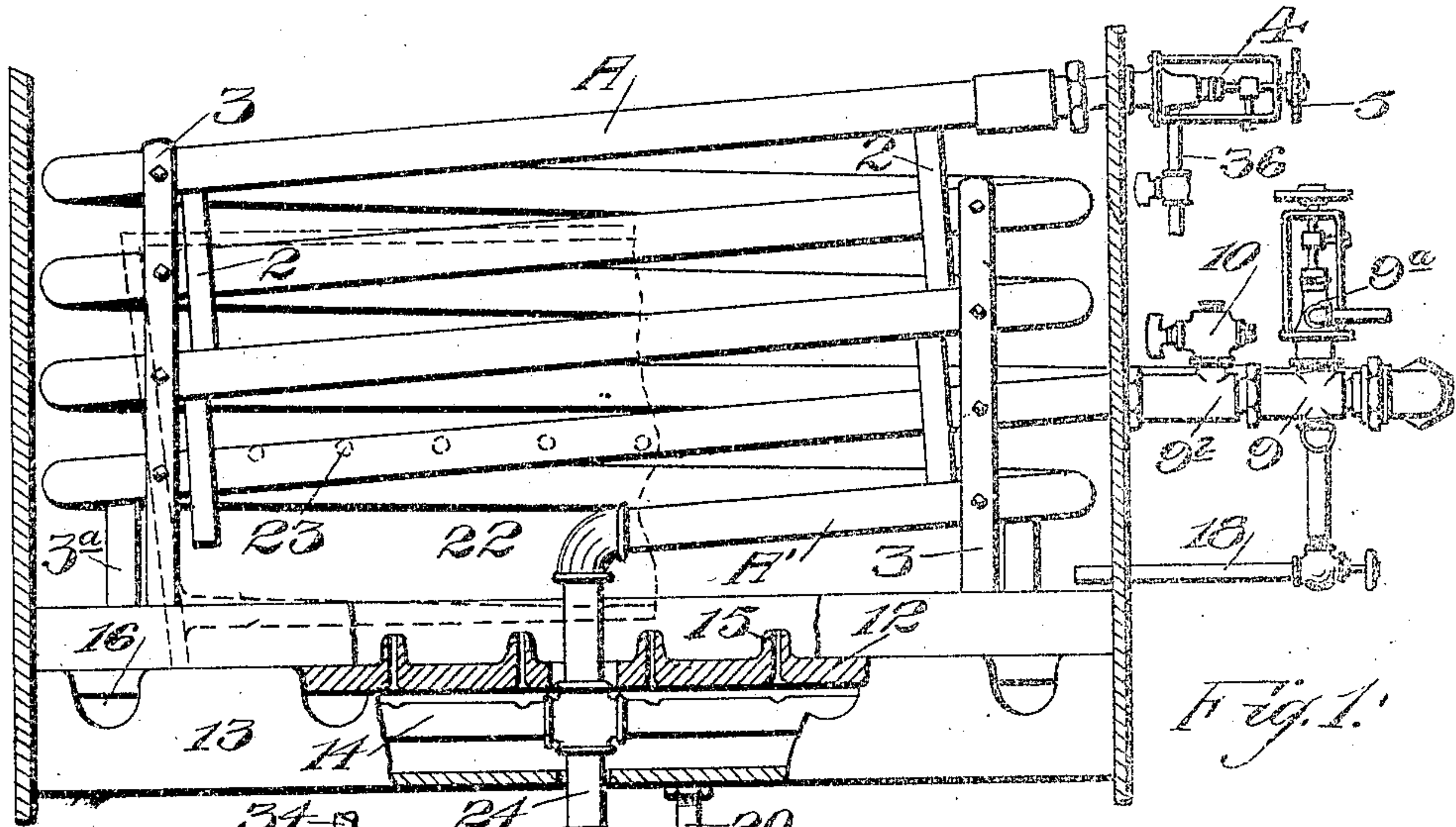


Fig. 1.

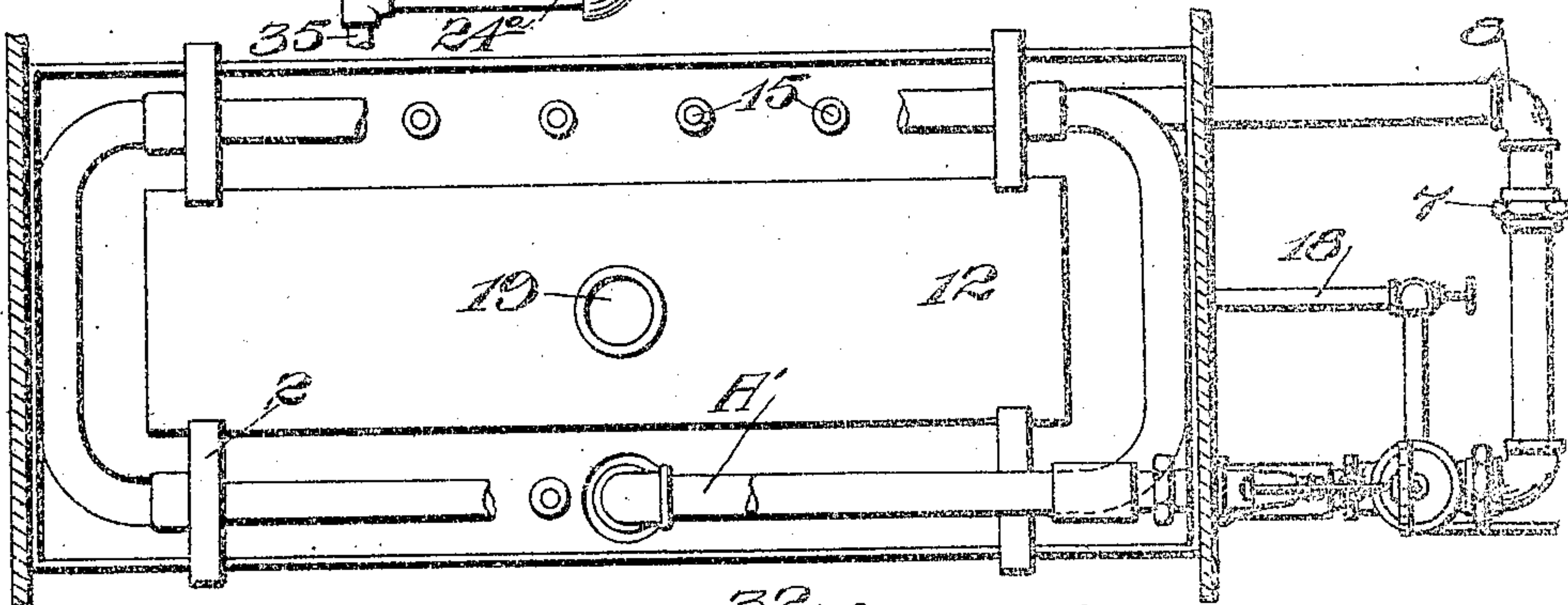


Fig. 2.

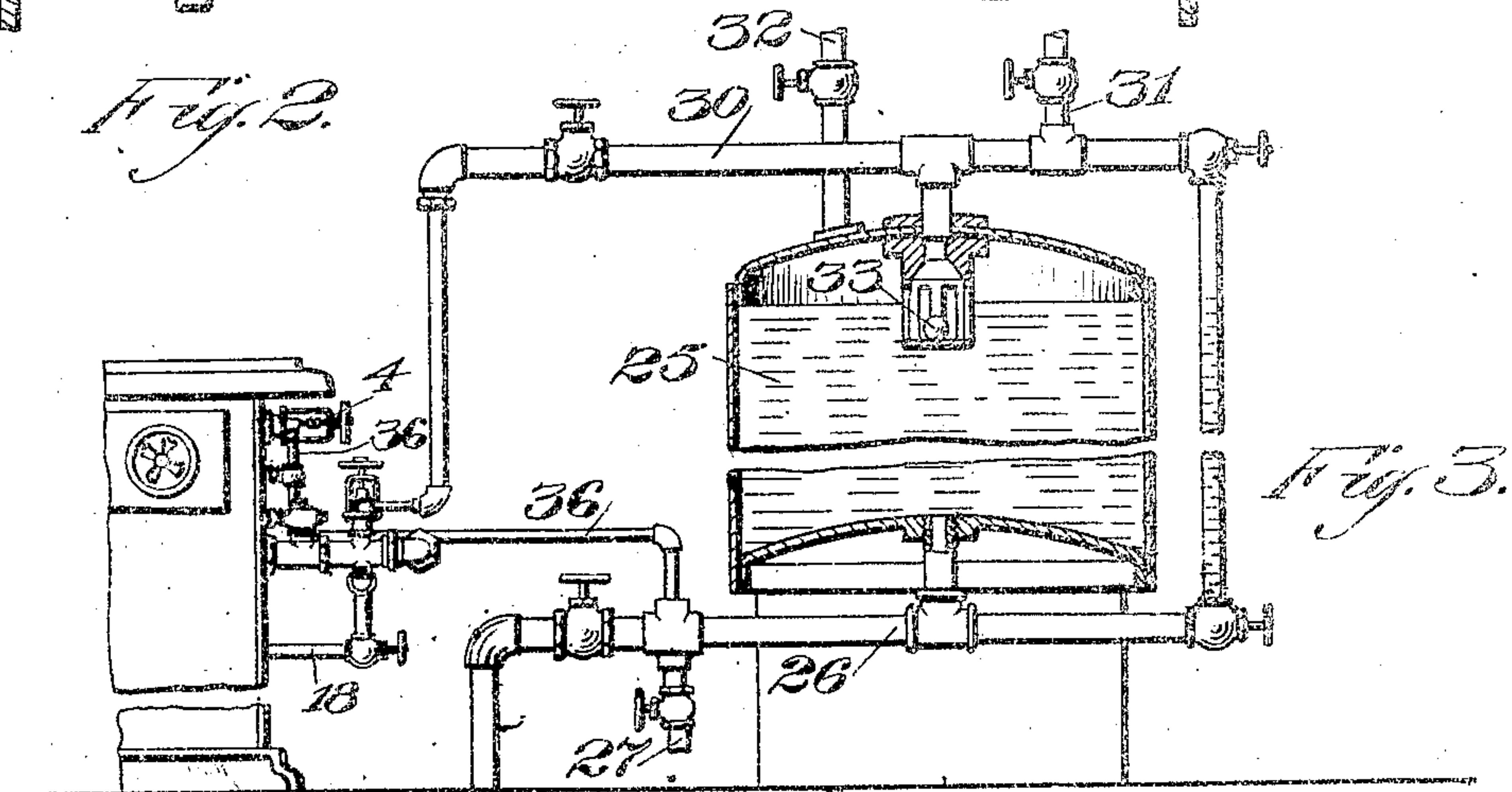


Fig. 3.

Witnesses:  
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Inventor:  
Emmanuel V. Dunn  
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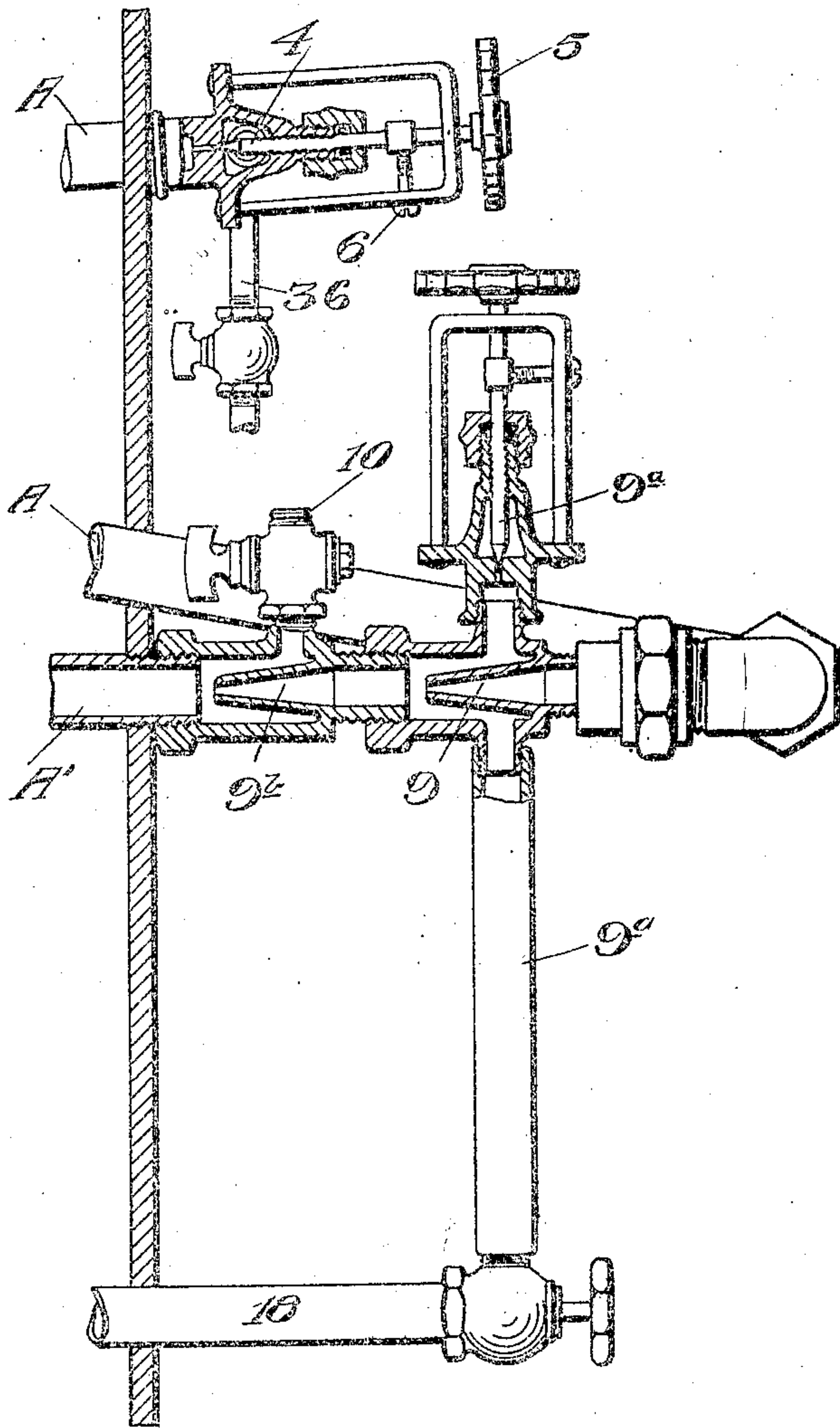


Fig. 4.

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# UNITED STATES PATENT OFFICE.

EMANUEL W. DUNN, OF SAN JOSE, CALIFORNIA.

## OIL-BURNER.

No. 832,461.

Specification of Letters Patent.

Patented Oct. 2, 1906.

Application filed January 24, 1903. Renewed August 22, 1906. Serial No. 331,624.

*To all whom it may concern:*

Be it known that I, EMANUEL W. DUNN, a citizen of the United States, residing at San Jose, county of Santa Clara, State of California, have invented an Improvement in Oil-Burners; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an apparatus for the preparation and burning of vapors and gases produced by the union of steam, oil, and air; and it consists in a mechanism the details of which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of my invention. Fig. 2 is a plane view of the same. Fig. 3 shows the oil-tank and pipe connections, the tank being shown in section. Fig. 4 is a section showing my valve arrangement and construction.

It is the object of my invention to provide an apparatus for the burning of gases generated from a mixture of oil, steam, and air, means for generating steam within the said apparatus, means for mixing steam when generated with oil and injecting the steam and oil vapor into the apparatus with an admixture of air for the combustion of the mixed vapors, and means for delivering and burning said vapor in proper relation with the heating-coils of the apparatus and the fire-box of the same.

As shown in the accompanying drawings, the apparatus is designed for use in the fire-box of a stove, range, or furnace, and such a fire-box is here shown as substantially rectangular in shape. Within this fire-box is a coil composed of pipe A, having its direction changed so that it extends around the sides within the space which is occupied by the coil, a sufficient number of turns being made for the purpose of generating steam from water which is admitted into the upper end of the coil. The lower end of the coil is carried outside of the fire-box and is again bent to return into the fire-box, forming another series of coils below the first named. Suitable connections are made with this exterior portion, so that the jet of steam returning will act as an injector and will draw oil through a connecting pipe or passage, and also air, if required, and the vapors thus returned into the lower coil are more highly heated and discharge into the lower part of the fire-box.

The supply of water and oil is derived from the source under a substantially equal pressure, so that the injection of the water and oil will be balanced at all times.

The coils are made symmetrical with a downward inclination sufficient to promote the flow of water before it is converted into steam. The coils are kept separate from each other by means of rings or other suitable devices, as at 2, and are clamped and held firmly together by standards 3 with clamping-bolts, by which they are secured. The water is delivered into the upper end of the coil A by means of a needle or other suitable valve, as shown at 4, the opening of said valve being controlled by a hand-wheel, as shown at 5. This hand-wheel may have its periphery subdivided and marked so that the number of turns can be easily regulated, and a suitable stop, as at 6, may serve to regulate the amount of opening of the valve. This having been determined upon trial, only so much water is admitted into the upper end of the pipe as can be converted into steam while it is flowing down to the point where the pipe temporarily leaves the fire-box.

In order to start the apparatus when cold, I have shown a pipe 18 opening into the lower part of the fire-box, the floor of which may be covered with asbestos or other suitable material, so that oil may be first admitted through the pipe 18, and being ignited within the fire-box a sufficient heat will be produced to heat up the pipes to the point where the water admitted into the coil A will be converted into steam, and this oil after being ignited will soon raise the temperature to a sufficient degree and bring all parts of the apparatus into its normal operative condition.

As many coils of the pipe A may be made within the furnace as will be sufficient to convert the water into steam. The pipe then passes outside of the furnace, as shown, making a turn by means of couplings and elbows, as at 7 and 8, and the pipe then returns again into the fire-box and below the coils of the pipe A. This lower portion of the coil may be designated as A'. The steam thus carried outside of the fire-box is returned through a nozzle or injector, (shown at 9.) The oil-supply arriving through a valve 9<sup>a</sup> is delivered around the steam-nozzle 9, and by the heat and injection action of the steam through this nozzle the oil is converted into a spray and vapor and is injected through a



nozzle 9<sup>b</sup> into the lower portion A' of the coil within the stove. Air may also be admitted to unite with the oil and steam thus injected through a controlling-cock, as shown at 10.

5 Below the coil A' is a shallow box or chamber 13, and within this is a final coil of pipe 14, with which the lower end of the coil A' may be connected. The top or cover plate 12 of the chamber 13 has a series of up-  
10 wardly-projecting cones or nozzles 15 around its inner periphery and beneath the coils, and the pipe 14 has openings made in the top registering with these cones, so that the mixed gases reaching these openings may be dis-  
15 charged up through the cones and into contact with the coils A' above. A certain amount of draft is created by this blast of gases through the nozzle, and this draws in a fresh supply of air through openings 16,  
20 which are made in the sides of the chamber 13, as shown. By this process of mixing the steam, oil, and air and superheating them they are discharged into the fire-box, and the combustion is so perfect and intense that no  
25 smoke, soot, or odor is perceptible, and all parts of the stove, range, furnace, or boiler to which it is applied are heated to any desired degree. The combustion is so perfect that meats may be broiled without any odor or  
30 taint appearing.

In some cases it may be desirable to employ an interior metal box or casting 22, which forms an inclosure for the space occupied by the fire-box and within the coil.  
35 When this box is employed, holes 23 may be made around its sides for the escape of the heat and gases into the space around the box and within which the coils are located. When this box is employed, it will not be necessary  
40 to connect the mixer A' with the coil 14 in the lower box, and the lower end of this pipe may terminate so as to discharge the mixed gases directly into the fire-box either with or without the box 22.

45 If the surplus of the gas is greater than is necessary for heating the coils and supplying the required flame within the fire-box, this surplus may be conveyed away through a pipe, as at 24. This pipe is connected, by  
50 means of a pipe 24<sup>a</sup>, with a T, having a pipe 35, through which any residual unvaporizing substances within the pipes may be discharged, and by means of a connection, as at 34, the surplus gases may be delivered to any  
55 point for use or storage. An opening is made in the bottom of the chamber 13, and from this a discharge-pipe 20 leads, so that any unvaporized surplus will be discharged through this pipe. By means of the central  
60 opening 19 in the plate 12, which covers the chamber 13, any gases not otherwise escaping from the coil or chamber 13 may be delivered up into the fire-box.

The oil for the supply of the apparatus is  
65 contained in a tank 25. The bottom of this

tank is connected with a pipe 26, through which water is supplied to the tank and from which also the supply to the coil A through the valve 4 is derived. The oil is introduced through any suitable filling pipe, 70 as at 32. A float 33, guided by rods, is movable in line beneath the oil-discharge pipe. This float is sufficiently buoyant to rise and fall with the water, but will sink in the oil. The upper part of the float serves to close the 75 oil-outlet, so that when the water has reached a point where the oil is nearly exhausted the opening will be closed to prevent any water passing out through the oil-pipe 30. 31 is a vent-pipe through which air and gases may 80 escape. The connection of this tank with the water and oil supply insures a balanced pressure in the feeding of the two to the apparatus, and the pressure from below causes the water to follow the oil as fast as the latter 85 is withdrawn, and thus prevent accumulation of dangerous gases in the tank.

Having thus described my invention, what I claim, and desire to secure by Letters Pat-  
ent, is— 90

1. An oil-burning apparatus comprising a fire-box, a vertically-disposed spiral tube passing therethrough, a water-inlet at substantially the highest point of the tube whereby the water may be converted into 95 steam as it passes through the tube, said tube having an intermediate portion extended to one side, and oil and air inlets in said extension for supplying oil and air at points intermediate between the highest and lowest 100 parts of said tube.

2. An oil-burning apparatus comprising the combination with a fire-box, of a vertically-disposed coil fitting within the fire-box, a valve-controlled water-inlet connecting 105 with substantially the highest point of the coil whereby the water is converted into steam as it passes through the coil, a second coil with which the lower end of the first-named coil connects, said second coil having 110 openings through which the contained gases are delivered to a series of burners; said first-named coil having an extension of an intermediate portion carried outside the fire-box, and valve-controlled oil and air inlets in the 115 extension, and injectors in said extension through which the oil and air are admitted to mingle with the steam in said first-named coil and to be finally conveyed through the second coil to the point of delivery. 120

3. An oil-burning apparatus comprising the combination with a fire-box or furnace, of a vertically-disposed coil located in the fire-box or furnace, a valve-controlled water-inlet connecting with substantially the highest 125 point of the coil whereby the water is converted into steam as it flows through the coil, said coil having an extension of the middle portion to a point outside the furnace, said extension provided with valve-controlled oil 130



and air inlets and injectors for discharging the oil and air into the path of the steam generated in the coil; said commingled steam, oil and air passing through the lower part of the coil and again subjected to the heat of the fire-box or furnace; a plate or diaphragm below the coil and forming the top of an underlying chamber; and a coil within said chamber and connecting with the lower portion of the first-named coil, said plate or diaphragm provided with upwardly-projecting hollow cones and the second-named coil-openings adapted to discharge into the cones and to create an updraft therethrough.

4. In an apparatus of the character described the combination with a fire-box or furnace, of vertically-disposed coils fitting within the fire-box or furnace having a portion intermediate between the top and bottom extended to pass outside of the fire-box and again returned therein, a valve-controlled water-supply connecting with the upper end of the coil, successive valve-controlled oil and air inlets connecting with the intermediate exterior portion of the pipe by means of injectors, a diaphragm, or burner-plate forming the bottom of the fire-box having hollow cones projecting upwardly from its surface, a chamber formed beneath said diaphragm, said chamber being provided with air-inlet openings.

5. In an oil-burner apparatus the combination with a fire-box or furnace, of a vertically-disposed coil fitting within the fire-box or furnace; a valve-controlled water-inlet connecting with substantially the highest point of the coil, said coil having its middle portion carried outside the fire-box or furnace; valve-controlled oil and air inlets and means in said extension for injecting the oil and air into the path of the steam whereby the commingled products gases are conducted through the lower portion of the coil and reheated; a plate or diaphragm below the coil and forming the top of an underlying chambered box; a second coil, located in said chamber of the box and connecting with the lower portion of the first-named coil, said box having air-admission openings and said plate or diaphragm having upwardly-extending hollow cones, and said second-named coil having opening discharging in line with said cones whereby the products are discharged through the cones and ignited within the fire-box; a pipe leading from the second-named coil to a point outside the fire-box or furnace, and provided with a draw-off for the residue collected from the coils; a connection to withdraw gases at the highest point for immediate use or for storage; and a connection with the bottom of the box to carry off any residue collected therein.

6. In an apparatus of the character described the combination with a fire-box or furnace, of a primary coil fitting the fire-

box or furnace, said fire-box or furnace having main and secondary chambers and a partition between said chambers, a coil within the secondary chamber said main coil having an intermediate portion extended horizontally to one side of the fire-box or furnace, and said secondary coil having discharge-openings, means for admitting water and oil and air into the primary coil, burner-cones in line with the openings of the secondary coil, and means for providing a pilot-fire consisting of an incombustible absorbent coating for the bottom of the fire-box, and a controlled oil-supply jet connected to the extended portion of the primary coil and adapted to discharge upon said coating.

7. In an oil-burning apparatus, the combination of a fire-box primary and secondary coils connected one with the other said primary coil connecting with a water-supply and having a middle portion extended outwardly to one side of the main portion thereof, said extended portion provided with valve-controlled oil and air inlets and injector devices whereby the admixture of the oil and air with the steam generated in the coil occurs at a point intermediate of the ends of the primary coil and the commingled products are reheated in passing through the lower part of said coil; a supplemental receiver for the mixed gases, and means for discharging the inflammable mixture for ignition.

8. An apparatus for the manufacture and combustion of hydrocarbon gas, consisting of a hollow vertically-disposed coil, means for admitting and regulating a supply of water at the highest point to be converted into steam, means including a lateral extension of a middle portion of the coil and valve-controlled oil and air inlets and injector devices therein for admitting oil and air into the coil to meet the previously-formed steam, whereby the subsequent heating of the mixture converts it into a fixed gas, and means for discharging and burning said gas.

9. In an apparatus for the manufacture and combustion of hydrocarbon gas, a fire-box, hollow vertically-disposed coils superposed therein, having their contiguous ends connected exterior to the fire-box, a source of water-supply connected with substantially the highest point of the upper coil, a source of oil-supply and connection with substantially the highest point of the lower coil and a connection between the source of water-supply and the source of oil-supply whereby the oil and water feed are subjected to a substantially equal pressure.

10. In an oil-burning apparatus a vertically-disposed coil, a fire-box or furnace within which it is located, controlled means for introducing a combustible fluid and air into the coil, a second coil located in the fire-box above the first-named coil and connected



exteriorly with the inlet end of the first coil having a controlled water-inlet passage at the upper end, a combustible fluid-containing tank, a pipe connecting its upper part  
5 with the inlet of the first coil, a pipe through which water passes, and independent connections between said pipe and the bottom of the tank, and with the inlet of the upper coil.

10 11. An oil-burning apparatus comprising vertically-disposed superposed spiral tubes, a water-inlet at substantially the highest point of the upper tube, a fire-box within which the tubes are contained, extensions of

the contiguous ends of the tubes and a con- 15  
nection exterior to the fire-box, a jet through which steam from the first tube is discharged into the second tube, a tank from which oil is delivered to the second tube, a water-  
supply pipe, and independent connections 20  
therefrom to the oil-tank and to the water-inlet of the upper tube.

In witness whereof I have hereunto set my hand.

EMANUEL W. DUNN.

Witnesses:

S. H. NOURSE,  
JESSIE C. BRODIE.