May 7, 1935. M. M. DURKEE 2,000,277

PROCESS AND APPARATUS FOR HEATING STEAM

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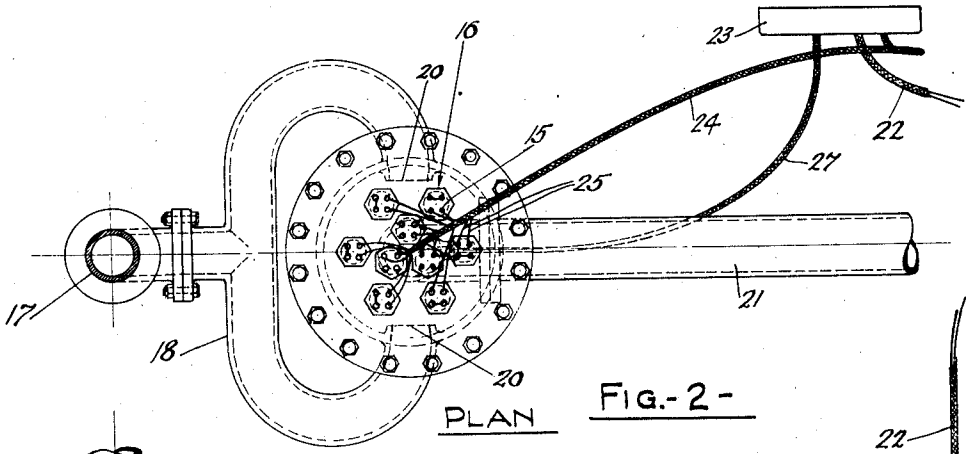

PLAN FIG.-2-

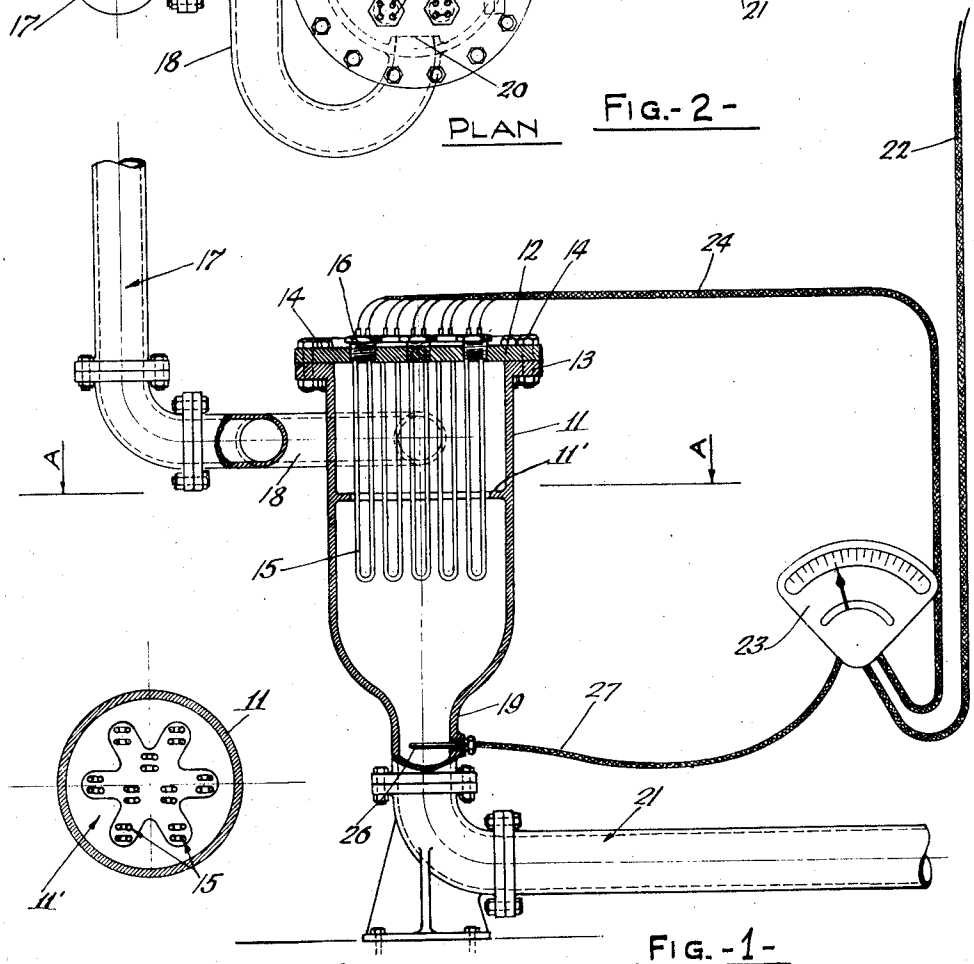

FIG.-1-

FIG.-3-

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PROCESS AND APPARATUS FOR HEATING STEAM

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4 Claims. (Cl. 219—39)

This invention relates in general to the heating of gases, and while the invention will hereinafter be described as embodied in a process and apparatus for the heating of steam for purifying oil, it will be readily manifest that it has other valuable applications and uses.

A principal object of the present invention is the provision of an improved process and apparatus for the superheating of steam to desired temperatures without corresponding increase of pressure.

An example of the intended use of this invention is the provision of steam heated to desired specified temperature for upward percolation through an oil to accomplish the distillation of objectionable odors and flavors, the oil being maintained under a vacuum. My invention contemplates in this regard the accurate maintenance of the desired temperature, for example, in the neighborhood of 400° F. independently of the degree of vacuum maintained.

In the practice of this and similar industrial processes it has usually been the custom to superheat the steam by passing it through pipes or flues in a furnace fired by coal, coke, oil, natural gas, or like fuel. These constructions are of course expensive and they operate at relatively low efficiency because of the circumstance that the steam in passing has required excessive temperatures in order that there be a sufficient absorption of heat by the steam.

This invention contemplates the utilization of the kinetic energy of the moving steam to temporarily increase the steam pressure at and about the heating element or elements to the end that the individual particles of steam may more readily absorb the heat from the heating elements and transfer it throughout the steam body.

Another important object of the invention is the provision for the heating of steam and other gases which will permit of the economic and practical use of readily controlled, electrical heating elements for the heating. An ancillary and important purpose of the invention is the provision of a process for the heating or superheating of steam wherein the heating may be accomplished by electrical resistance members, the steam being subjected to their action in such manner and fashion as to permit of their heating action without danger of overheating of the elements and their resultant deterioration.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawing, discloses a preferred embodiment thereof.

Figure 1 is a vertical, transverse sectional view through an apparatus embodying my present invention, parts being shown in elevation.

Fig. 2 is a top plan view thereof; and

Fig. 3 is a section taken substantially upon the line A—A of Fig. 1.

For the purpose of illustrating my present invention I have shown on the drawing an apparatus, comprising a heating chamber 11, generally of cylindrical form and closed at its top by a plate 12, the body of the chamber being provided with an outwardly extending flange 13 to which the top 12 is secured by bolt and nut assemblies 14. A plurality of electrical resistance members or elements 15 are arranged to extend down from the top 12, and these are or may be of hair-pin type. In the present instance the resistance members 15 are arranged in pairs and a plurality of plugs 16 are threaded into the top 12 and removably carry and support the resistance elements.

Steam is introduced into the heating chamber 11 from a supply pipe 17 and at opposing points in the circumference of the chamber 11, two branches being provided in the present instance and generally indicated by reference character 18. These branches communicate with the interior of the chamber 11 at opposed sides at 20 and direct the steam to the heating members 15. In flowing through the inlets 20 by reason of the kinetic energy of the steam, the pressure at and around the elements is temporarily increased, bringing the steam particles in their convection action into intimate contact with the presented surfaces of the resistance members. Expressed otherwise, the steam is injected into the area heated by the resistance members in oppositely directed jets which impinge each other and create a concentration and turbulence that thoroughly mixes and efficiently heats the steam.

A partition or constrictor means 11' is arranged below the inlets 20 and about the depending resistance hair-pin members, as may be seen in Fig. 3. The constrictor member 11' confines the steam in its downward movement through the heating chamber to close contact with the heating members 15, so that final heating is accomplished. The heating chamber 11 is restricted at its lower end at 19 for connection to an outlet delivery pipe 21, which conveys it or may convey it to the oil to be purified.

Reference character 22 indicates a cable leading from a source of electric power. This cable passes to a combined indicator and thermostatic

switch 23, from which a cable 24 leads to the upper ends of the resistance elements through which it completes the heating circuits. Parallel leads 25 extend from the cable 24 to each plug assembly of resistance elements. The resistance elements of each plug assembly are connected in series with each other and in parallel across the wires of the cable 24. A pyrometer 26 is arranged in the heating chamber 11 near its bottom, and in position for control by the temperature of the passing steam. The pyrometer 26 is connected by a cable 27 with the switch 23 and, as will be readily understood, controls the delivery of current to the heating elements in accordance with the temperature of the steam.

By reason of the conjoint delivery of the steam of the heating elements from a plurality of opposed outlets, the pressure of the steam in contact with the heating elements is increased and heat is absorbed from the heating elements at a rate producing high heating efficiency, and also preventing overheating of the elements and their consequent deterioration.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. The method of heating a gas which comprises injecting a plurality of jets of gas from different directions into a zone so that the jets impinge each other and create a turbulence in the zone, simultaneously heating the gas at a plurality of points in the zone, causing the gas to flow in a direction at right angles to the plane of the jets and further heating the gas during its flow.

2. The method of preheating steam to a high temperature at a low pressure which comprises injecting oppositely directed jets of steam into a zone offering a low resistance to the flow of steam so that the opposed jets impinge each other and create a turblence in the zone, simultaneously heating the steam at a plurality of points in the zone, causing the steam to flow in a direction at right angles to the plane of the jets and further heating the steam during its flow.

3. An apparatus for superheating steam comprising an open-ended chamber, a head for closing the chamber having a plurality of heating elements of small diameter depending therefrom and forming a labyrinth of heating elements in the chamber that offer a low resistance to the flow of the steam, a plurality of conduits connected with the chamber on opposite sides for introducing jets of steam into the labyrinth of heating elements and toward each other whereby the oppositely directed jets impinge each other and create a turbulence for mixing the steam and causing a more efficient heating.

4. An apparatus for superheating steam comprising a vertical chamber open at the top and having a constrictor means extending inwardly intermediate its ends, a head for the open end of the chamber having a plurality of heating wires depending therefrom and extending to a position below the constrictor means, a plurality of oppositely disposed conduits connected with the chamber above the constricture for introducing jets of steam into the area of heating wires and toward each other, and an outlet conduit at the bottom of the chamber whereby the oppositely directed jets impinge each other and create a turbulence that mixes and heats the steam before it passes outwardly through the constrictor means and in the direction of the heating wires toward the outlet conduit.

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