No. 797,975. PATENTED AUG. 22, 1905.

J. M. O'NEALL.

RESIDUE CRUDE OIL BURNER.

APPLICATION FILED FEB. 11, 1903.

Fig. 1

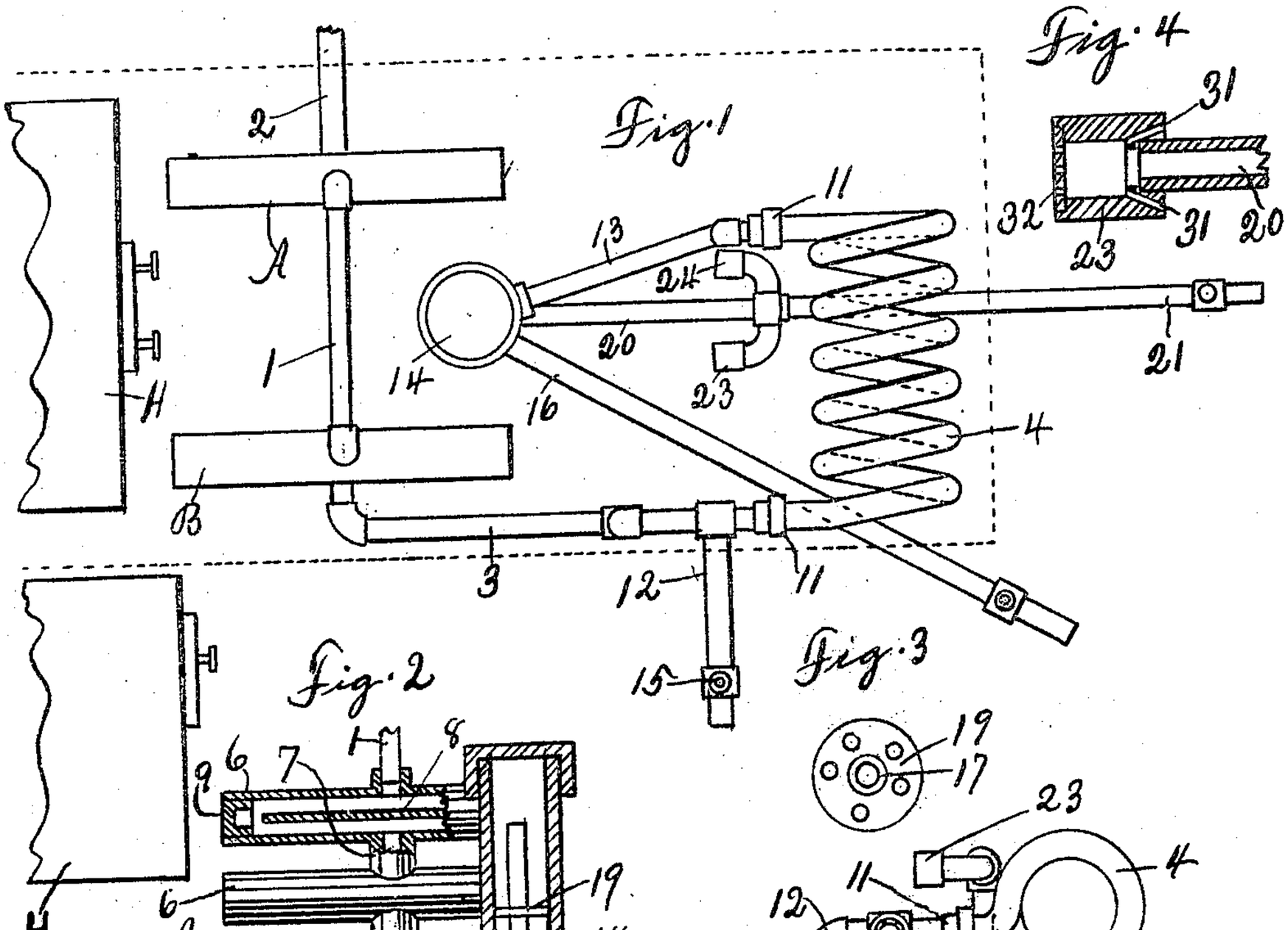


Fig. 4

Fig. 2

Fig. 3

Fig. 5

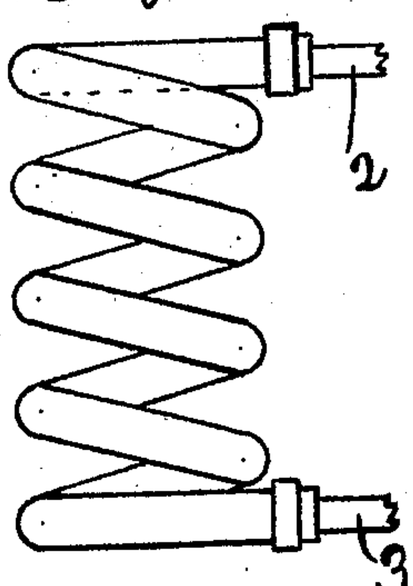
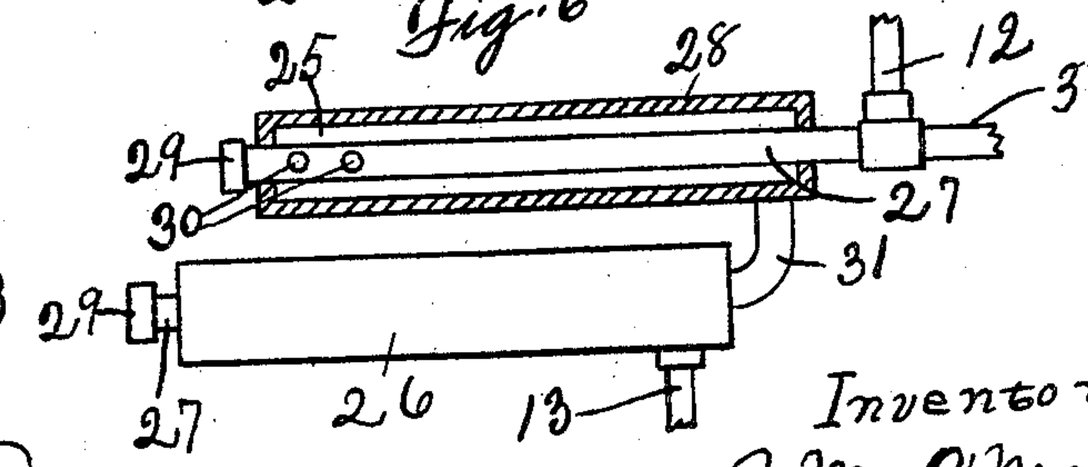


Fig. 6



Witnesses:-

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UNITED STATES PATENT OFFICE.

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RESIDUE-CRUDE-OIL BURNER.

No. 797,975. Specification of Letters Patent. Patented Aug. 22, 1905.

Application filed February 11, 1903. Serial No. 142,881.

To all whom it may concern:

Be it known that I, JAMES M. O'NEALL, a citizen of the United States, residing at Dallas, Texas, have invented a new and Improved Residue-Crude-Oil Burner, of which the following is a specification.

My invention relates to burners which consume gas manufactured from crude oil or petroleum and which are used principally for heating purposes; and the object is to produce a burner which will furnish the heat which is utilized in the manufacture of the gas to be consumed and by which the entire operation of manufacturing gas for heating and illuminating purposes is automatic and also automatic in separating the by-products or residue tar from the gas.

Much of the crude oil now on the market contains considerable matter that is for practical purposes incombustible and either chokes the burners or accumulates on the boilers or passes off as smoke when the oil is burned. This incombustible matter is a hindrance to obtaining the best results in burning oil for heating purposes, because this incombustible matter is present in the flame and destroys much of the heat by consuming the heat.

The object of this invention is to eliminate the incombustible matter and leave a highly-inflammable gas which will produce intense heat and burn without smoke and to separate and collect this incombustible matter as a residue tar which has a considerable value as a commercial product. By this process crude oil is used directly for heating boilers and various other objects, and at the same time a gas is produced which can be used for illuminating purposes and for heating other objects than heating the particular boiler in connection with which the gas is produced.

Other objects and advantages will be fully explained in the following description and the invention will be more particularly pointed out in the claims.

Reference is had to the accompanying drawings, which form a part of this application.

Figure 1 is a plan view of the invention, showing a broken portion of a boiler in conventional form and showing by dotted outline the position of the walls of a fire-box. Fig. 2 is a broken sectional view showing a vertical section of the residue-separator, grate-bars in section, a side elevation of one of the steam-superheaters partly broken, and a side elevation of the mixing-coil and the connecting-pipes. Fig. 3 is a plan view of a perforated disk shown in Fig. 2. Fig. 4 is a longitudinal section of the burner and its connection with a pipe. Fig. 5 illustrates a spiral tube which is a variation in the steam-superheater. Fig. 6 illustrates a variation of the mixing vessel or shutler to be used instead of the spiral tube shown in Fig. 1 and Fig. 2.

Similar characters of reference are used to indicate the same parts throughout the several views.

This invention consists of mechanism for superheating steam, of a separate receptacle for receiving the superheated steam and crude oil and mixing the same, of a receptacle for separating the gas and the residue tar, and a burner for directing the gas, and consequently the flame, toward said superheating and separating mechanism.

In the drawings are shown superheaters A and B, connected by means of a pipe 1. A pipe 2 for delivering steam to the superheaters is connected with the superheater A. A pipe 3 conducts the superheated steam to the mixing-coil 4. The pipe 2 is connected to the lower part of the superheater A, and the pipe 3 is connected to the lower part of superheater B in the same manner as pipe 1 is connected to the upper parts of these superheaters. The superheaters are placed above the grate-bars of the furnace and in position of the greatest heat zone. The steam enters from any suitable supply source through the pipe 2 and leaves the superheater A through pipe 1 and enters superheater B. The two superheaters are similar in construction, and each consists of a plurality of pipes 6, connected at their central parts one with another in succession by tubular connections 7, and each pipe is provided with a horizontal partition 8, which extends close to each end of the pipe, but not close enough to prevent the passage of the steam. The object of this partition is to cause the steam to travel for a considerable time while subjected to the greatest heat. Each end of each pipe 6 is closed by a thimble-plug 9. The object in having a cavity made in this plug is to let the steam enter a part of the plug, so that a part of the threaded part of the plug will be expanded proportionately as the pipe 6 is expanded by the heat. If there was no cavity in the plug 9, the pipe 6 would expand more rapidly than the plug and the plug would be blown out by the steam. This danger is prevented by constructing the plug so that a portion of the threaded part may expand as the pipe expands. The pipe 3 may

extend below the grate-bars 10 and toward the front of the fire-box and then upward to be connected with the mixing-coil 4. The pipe 3 is provided with a union 11. Oil is injected into the steam by means of a pipe 12, which connects with the steam-pipe 3 before the pipe 3 is connected with the mixing-coil 4. The pipe 12 leads from a suitable supply source of oil. The oil is converted into gas and residue tar in the mixing-coil 4 and escapes by a pipe 13 to the separating vessel 14. The amount of oil to be injected into the pipe 3 may be controlled by any suitable cock 15. It will be noticed that the mixing-coil is placed in the zone of the least heat. The object of this arrangement is to prevent baking or charring or carbonizing the oil in the mixing-coil. The coil-pipe is preferred as the best mixing vessel, because there are no corners or edges of material to obstruct the passage of the mixture and for the further reason that, while the passage is unobstructed, the passage is changing its direction at every particle of the distance, and thus causes the oil and steam to be constantly agitated. One object must be carefully observed and that is there must be no horizontal surface in the zone of the intense heat. Such a surface would accumulate charred or baked or carbonized matter. The residue tar must be separated from the gas just as quick as may be practical, and this must be done out of the zone of the intense heat, because the residue tar would be quickly carbonized by the intense heat. The mixed gas and tar must be placed in a vessel in which the motion will be slower than the motion of the mixture was in the mixing-coil. For this reason the separating vessel 14 must be larger in diameter than the induction-pipe by which the mixture reached this vessel, and the separating must be done in a zone of less heat than that in which the superheating of steam and gas is accomplished. For this reason the separation of the gas is accomplished in the lower part of the separator below the grate-bars of the fire-box. This separator is placed vertically, so that when the mixture of gas and the residue assumes a slower motion the heavier particles or residue tar will fall by gravity to the bottom part of the separator, where it can be drawn off through the pipe 16, and the gas will ascend to the upper part of the separator, the gas being lighter than the residue tar. It has been found that the residue tar would tend to ascend the pipe 17, which is the pipe for conveying away gas after it has been superheated. To prevent this, a small disk-like collar 18 is mounted on the pipe 17, and a perforated disk 19 is mounted farther up on the pipe 17 to prevent any particles of the residue from passing to the upper part of the separator.

The lower part of the separating vessel 14 is slanting on the interior toward the mouth of the pipe 16. The object of this is to have no flat surface on which the residue might collect and carbonize. The upper part of the separator is in the zone of intense heat, so that the vapors, which are by the time they reach this part of the separator gas, are more thoroughly gasified. The gas is taken from the separator by pipes 17 and 20. Pipe 20 may be tapped by a pipe 21 for conveying away gas for heating or lighting purposes. Pipe 20 may be provided with a union 22. Any suitable number of burners may be attached to the pipe 20. I show two burners 23 and 24, attached to the pipe 20 and arranged to direct the gas and flame on the upper part of the separator and on the superheaters A and B and thence under the boiler H. Each burner may be provided with apertures 31 for the admission of air to a mixing-chamber 32.

Various changes may be made in the construction and arrangement of the different parts without departing from my invention. One or more superheaters may be used. For some purposes, as on a locomotive-engine, a coiled pipe may be preferable as a steam-superheater, such as is shown in Fig. 5. In some instances it may be desirable to use a different form of a mixing vessel. Fig. 6 shows shutlers for mixing the oil and superheated steam—two shutlers, 25 and 26. The pipe 3 is provided with an extension 27, which extends within a closed tube 28 and which is provided with a cap 29 and has perforations 30 for the mixture to escape in the tube 28. The mixture would have to pass back to the other end of the tube 28 and then pass through a pipe 31 to shutler 26, which is similar in all respects to shutler 25. The mixture would then pass through pipe 13, as above described.

The steam is heated to a very high degree. The oil is not subjected to severe heat before it comes in contact with the superheated steam. Gas is immediately generated from the crude oil or that part of the crude oil which is exposed to the superheated steam, and all of the oil is exposed to the heated steam before it passes from the mixer. It will be seen that the generated gas furnishes the heat while being burned for superheating more steam for generating more gas, thus making the process automatic in operation. The gas thus manufactured seems to be almost free from all impurities and burns with practically no flame and produces no smoke. The steam used to produce the gas may be said to be incandescent steam. Gas is produced directly from the crude oil without heating the oil to any great extent before it comes in contact with the superheated steam.

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

1. A burner provided with means for converting crude oil into gas and a residue tar comprising steam-superheaters arranged in the zone of greatest heat, a coiled pipe for mix-

ing superheated steam and crude oil, a pipe connecting said steam-superheaters with said coiled pipe, means for injecting crude oil into the superheated steam before entering said coiled pipe, and means for separating the gas from the residue tar, said coiled pipe being placed out of the zone of intense heat.

2. A burner provided with means for converting crude oil into gas and a residue tar comprising a steam-superheater, a coiled pipe for mixing superheated steam and crude oil, a pipe connecting said steam-superheater with said coiled pipe, means for injecting crude oil into said superheated steam before it enters said coiled pipe, a separator, and a pipe for delivering the mixed gas and residue tar from said coiled pipe to said separator, said separator having lower part thereof below the grate-bars of a fire-box and having the upper part arranged in the zone of greatest heat.

3. A burner provided with means for converting crude oil into gas and a residue tar comprising a steam-superheater, a vessel for mixing superheated steam and crude oil, and a separating and heating vessel connected to said mixing vessel arranged vertically with the heating part thereof in the zone of greatest heat and the separating part below the zone of greatest heat.

4. A burner provided with means for converting crude oil into gas and a residue tar comprising a steam-superheater, a coiled mixing-pipe connected to said steam-superheater, and a separating vessel connected to said coiled pipe, said steam-superheater being placed in the zone of greatest heat and said coiled pipe placed in a less-heated zone.

5. A burner provided with means for converting crude oil into gas and a residue tar comprising a steam-superheater, a coiled mixing-pipe connected to said superheater, a separating and heating vessel having the heating part thereof arranged vertically above the separating part thereof, a pipe connecting said coiled pipe and said separating vessel, and suitable pipes for conveying the gas and the residue tar.

6. A burner provided with means for converting crude oil into gas and a residue tar comprising a steam-superheater, a coiled mixing-pipe connected to said superheater, a gas-heater and residue-separator arranged vertically, an induction-pipe connecting said coiled pipe and said separator, and suitable pipes for conveying the gas and residue tar, the cross-sectional arc of said separator being of greater diameter than said induction-pipe whereby the mixed gas and residue tar has a retarded motion in said separator.

7. A burner provided with means for converting crude oil into gas and a residue tar comprising steam-superheaters, means for mixing superheated steam and crude oil connected to said superheaters, and means for separating the gas and the residue tar, said superheaters each consisting of a plurality of tubes or pipes connected by central tubular connections and having partitions horizontally disposed in said tubes with a passage at the end of each partition and each end of each tube closed by a thimble-plug.

8. A burner provided with means for converting crude oil into gas and a residue tar comprising a steam-superheater, a mixer connected to said steam-superheater, and a separator provided with an induction-pipe connected to said mixer and having suitable pipes for drawing off the residue and for delivering gas, said separator being arranged vertically and having the cross-sectional area larger than that of the induction and eduction pipes whereby the mixed gas and residue tar have a retarded motion and having the interior wall of the lower part thereof sloping to the mouth of the pipe for drawing off the residue tar.

9. A burner provided with means for converting crude oil into gas and a residue tar having a steam-superheater, a mixer connected to said superheater, and a separator, said superheater and the upper part of said separator being arranged in the zone of greatest heat and the lower part of said separator and said mixer being arranged or placed in the zone of the least heat for the purpose set forth.

In testimony whereof I set my hand, in the presence of two witnesses, this 23d day of January, 1903.

JAMES M. O'NEALL.

Witnesses:

A. L. JACKSON,

W. H. WRIGHT.