Sept. 13, 1932. J. H. ANDERSON 1,877,634

APPARATUS FOR CRACKING AND DISTILLING HYDROCARBONS

Filed Feb. 9, 1929

Fig. 1.

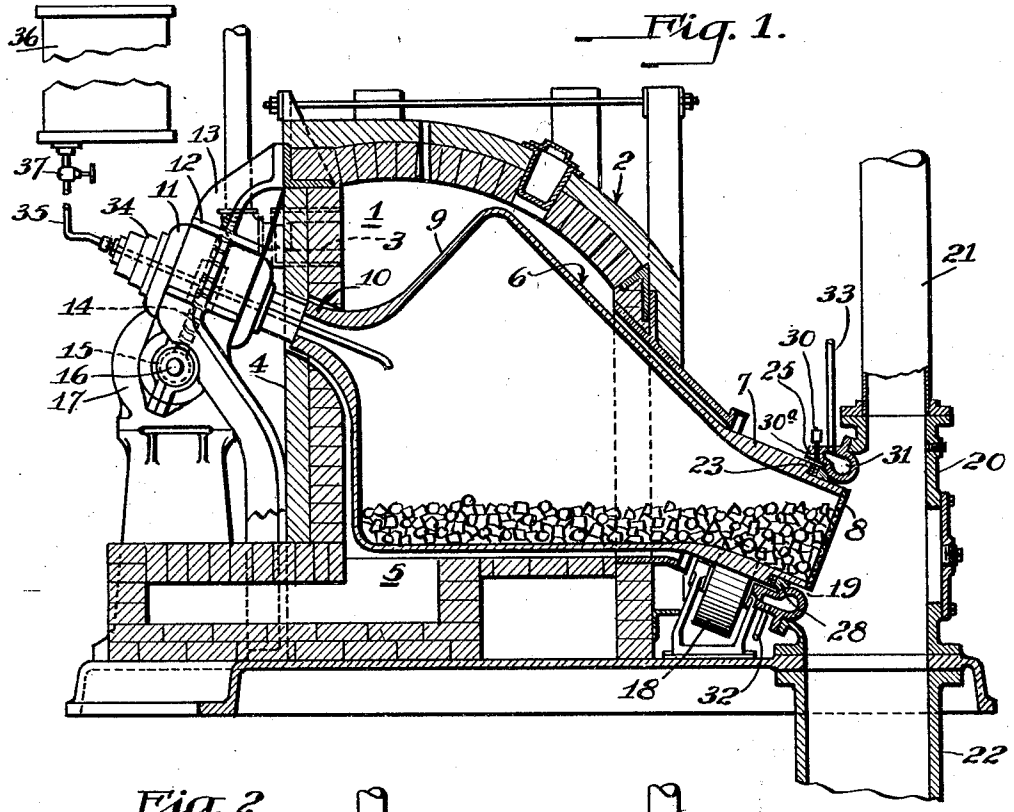


Fig. 2.

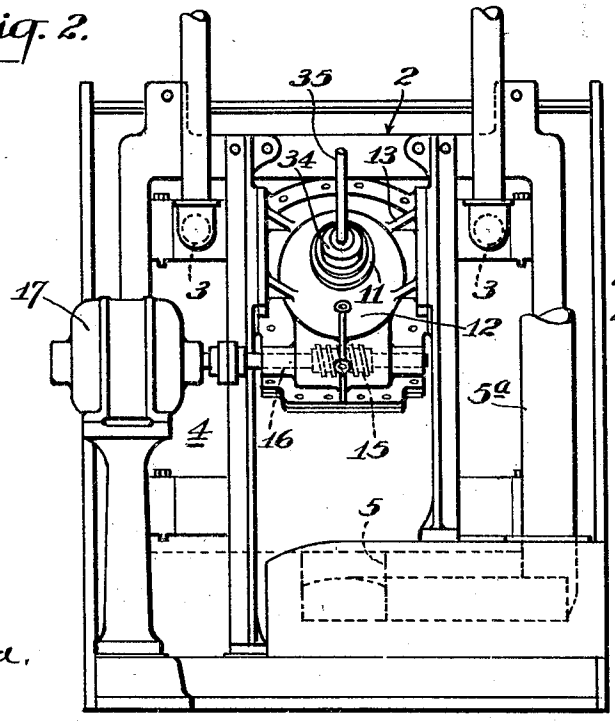
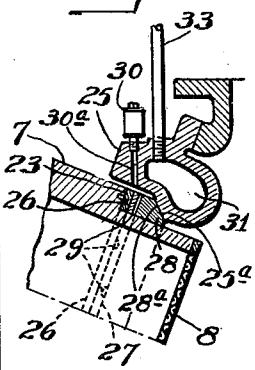


Fig. 3.



WITNESS

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UNITED STATES PATENT OFFICE

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APPARATUS FOR CRACKING AND DISTILLING HYDROCARBONS

Application filed February 9, 1929. Serial No. 338,739.

In the accompanying drawing Figure 1 is a central sectional elevation of apparatus embodying the invention, certain parts being shown in full elevation. Figure 2 is a front end elevation omitting the supply tank. Figure 3 is a detail view upon a somewhat larger scale.

In general the apparatus herein shown is the same as apparatus already described by me in Letters Patent No. 1,800,672 the invention to be herein described residing in improvements upon such apparatus.

The necessary heat is generated in the combustion chamber 1 of the furnace 2 by means of two burners 3 projecting through the front wall 4 near the top of the furnace chamber. In the furnace described in my said former application the products of combustion passed out of the combustion chamber through a stack located at the rear of the furnace. But according to the present invention I provide a flue 5 for the products of combustion, which opens out of the floor of the combustion chamber at the front, namely, at the same end of the furnace that the burners are located, and below the burners. I have found in practice that this arrangement is peculiarly effective in the form of furnace shown, and gives more uniform heating of the retort and its contents. The products of combustion pass through the flue 5 to the stack 5*a*, shown in Figure 2.

Rotatably supported in the combustion chamber by means to be described presently is the hollow retort 6, which is a metallic shell of the contour of a truncated cone, having at its smaller rear end a coaxial tubular throat 7, which projects out through the rear wall of the combustion chamber, and the open end of which is closed by a perforate screen or lattice 8. The conical retort 6 is tilted over on its side and is supported within the combustion chamber with the lower longitudinal line of its side wall in horizontal position, or substantially so, as shown in Figure 1, and consequently with its axis downwardly inclined from front to rear. In the front wall 9 of the larger end of the retort 6, which is adjacent to the front wall 4 of the combustion chamber there is formed an axial tubular throat 10, which projects outwardly through an opening in said front wall and to which is connected the tubular hub 11 rotatably mounted in bearings 12 formed or mounted in the heavy metal frame 13 in front of the furnace. Formed upon or secured to the hub 11 is the worm wheel 14, which meshes with the worm 15 on the shaft 16 of the motor 17. Outside the rear wall of the furnace the downwardly inclined tubular extension 7 of the retort rests upon correspondingly inclined bearing rollers 18, and its outer screened open end projects through the inclined lateral opening 19 in the T 20, which also has the upwardly projecting delivery pipe 21 for the gaseous products coming from the retort, and the downwardly projecting discharge pipe 22 for the residue which is discharged from the retort through the screen or lattice 8.

It is a matter of great importance that the joint between the tubular extension 7 of the retort and the T 20 shall be tight. If the operation within the retort is being conducted under superatmospheric pressure, passage of the gases out through this joint may easily create a very dangerous environment, while if the operation is being conducted under a small vacuum the consequences of drawing air inwardly into the flowing gaseous stream may well be equally harmful. An important factor in the maintenance of a tight joint is the relatively small diameter of the outlet end of the retort and of the extension 7 as compared with that of the body of the retort, whereby the thrusting stress of the retort upon this joint at the discharge end is greatly augmented. In order to form a bearing particularly suitable for this purpose, I provide a water-cooled bearing ring 25 which is secured in the opening 19, having within it the hollow water channel 31, having a water inlet pipe 32 and an outlet pipe 33. The outer face of this bearing ring 25 is provided with an inclined shoulder 25*a*, to cooperate with the reversely inclined surface 28*a* of the annular band or ring 28 which loosely surrounds the extension 7. An external annular shoulder 23 is formed on the extension 7 and between this shoulder and the ring 28 are

two other thin rings or annular disks 26 and 27. The ring 27 has oil pockets 29 formed in its opposite faces and lubricating oil is supplied to the bearing from the oil cup 30, passing through the channel 30*a* in the outer portion of the bearing ring 25. This not only makes a very effective thrust bearing, but by reason of the cooperating inclined faces of the loose ring 28 and the bearing ring 25, the tubular extension 7 of the retort may always be accurately centered in its bearing, and with a minimum of effort.

It will be understood that the specific arrangement of the members of the thrust bearing may be varied, and the cooperating inclined faces be formed in other members thereof, without departure from the invention.

At the opposite end of the apparatus the outer end of the tubular hub 11 is tightly closed by a stuffing box 34, through which passes the oil supply pipe 35 which leads from the oil tank 36 through the hub 11, and opens into the front of the retort 6. A cock 37 is provided in the pipe 35 for controlling the flow of the oil therethrough.

The retort contains a mass of loose metal bodies, which while the retort is at rest will be of a depth corresponding about to the height of the upper edge of the screen 8 above the level of the floor of the retort. These bodies may be of iron or steel; or, if desired, they, or some of them, may be of metal having a catalytic effect, such as nickel. In tumbling about within the retort while the latter is being rotated, the metal bodies continually agitate, stir and break up the tarry matter and other residue as it forms, until under combined heating and attrition the residue may ultimately become nearly or quite dry. The openings through the screen or lattice 8 are of such size that the metal bodies will be retained in the retort, while the granular residue will flow out freely and automatically into and through the discharge pipe or other outlet 22. The metal bodies keep one another clean, and they also keep the inner surface of the retort clean and free from any accumulation of residue, so that the heat will be conducted freely and uniformly through the wall of the retort.

I claim as my invention:

1. Apparatus for cracking and distilling hydrocarbons comprising, in combination, a heating-chamber and means for supplying heat thereto, a conical retort rotatably supported within the heating-chamber with its axis inclined downwardly from its larger to its smaller end, hollow inclined axial trunnions opening out of the retort at its opposite ends and projecting through the opposite end walls of the heating-chamber, means connected to the trunnion at the larger end for rotating the retort, means for supplying the substances to be treated at the larger end of the retort, a receiver for the products of the operation having an opening for the other of said trunnions, bearing shoulders formed respectively upon said trunnion and upon said receiver surrounding said opening, and a ring arranged between said shoulders and having an inclined face contacting with a cooperating inclined face upon one of said shoulders.

2. Apparatus for cracking and distilling hydrocarbons comprising, in combination, a heating-chamber and means for supplying heat thereto, a conical retort rotatably supported within the heating chamber with its axis inclined downwardly from its larger to its smaller end, hollow inclined axial trunnions opening out of the retort at its opposite ends and projecting through the opposite end walls of the heating chamber, means connected to the trunnion at the larger end for rotating the retort, means for supplying the substances to be treated at the larger end of the retort, a receiver for the products of the operation having an opening for the other of the said trunnions, a bearing shoulder formed upon said last named trunnion, and inclined bearing shoulder formed upon said receiver surrounding said opening, and a ring loosely mounted upon said last named trunnion between said shoulders and having an inclined face contacting with the inclined face on the shoulder surrounding said receiver opening.

In testimony whereof I have hereunto set my hand.

JOHN H. ANDERSON.