

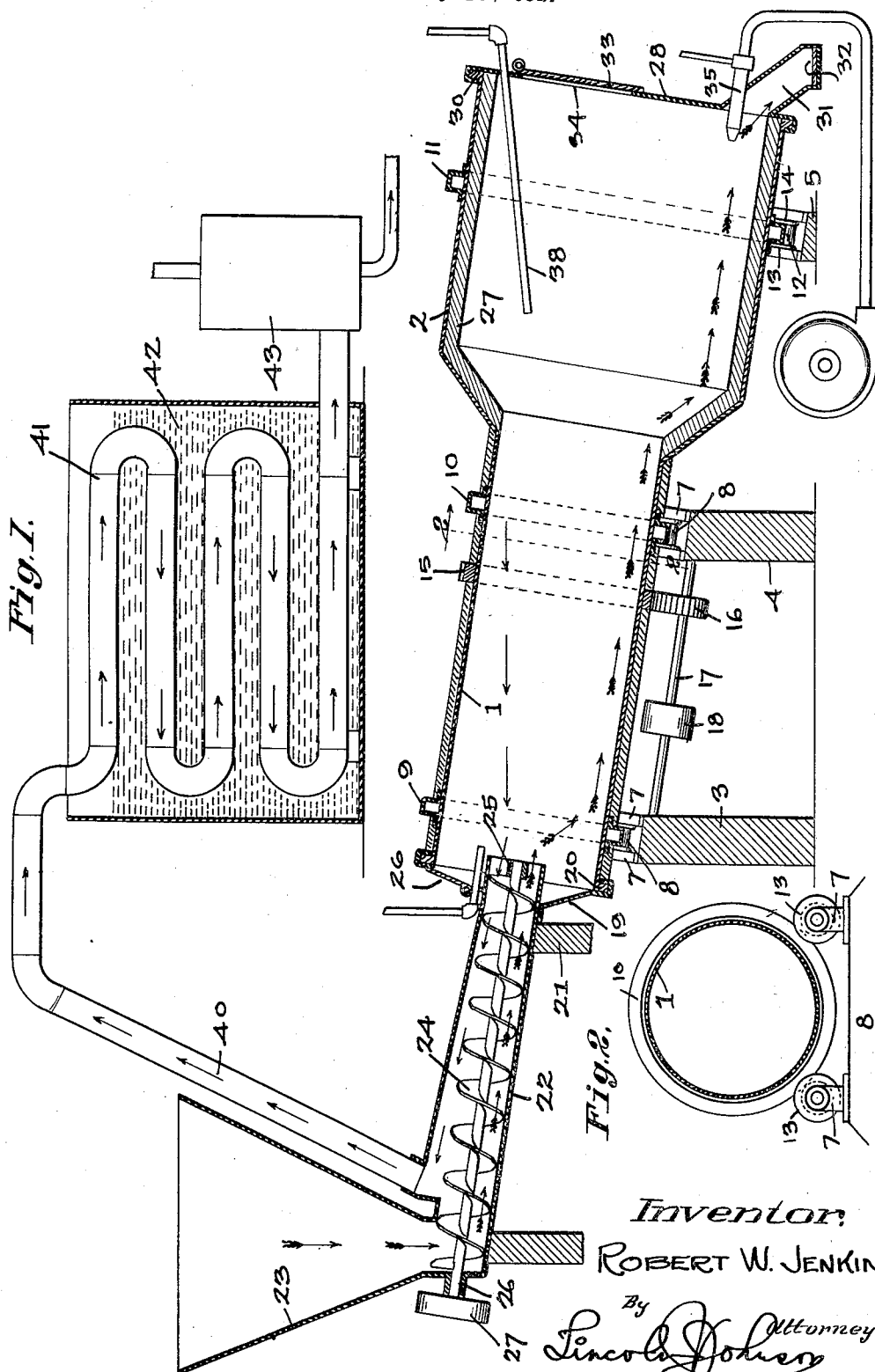
July 8, 1924.

R. W. JENKINS

1,500,323

OIL SHALE EXTRACTION PROCESS

Filed May 12, 1921



Inventor:

ROBERT W. JENKINS

By

Lincoln Jones Attorney.

Patented July 8, 1924.

1,500,323

UNITED STATES PATENT OFFICE.

ROBERT W. JENKINS, OF RICHMOND, CALIFORNIA.

OIL-SHALE EXTRACTION PROCESS.

Application filed May 12, 1921. Serial No. 468,844.

To all whom it may concern:

Be it known that I, ROBERT W. JENKINS, a citizen of the United States, and a resident of the city of Richmond, county of Contra Costa, State of California, have made a new and useful invention to wit, Improvements in an Oil-Shale Extraction Process; and I do hereby declare the following to be a full, clear, concise, and exact description of the same.

This invention relates particularly to the process of distilling or extracting oil from ore or shale of an oil bearing nature.

An object of this invention is to provide adequate means and methods of controlling the temperatures necessary to extract or distill the maximum possible quantity of the desired commodity from the crude material.

A further object of this invention is to provide an apparatus, for use with my process, that will require a smaller initial outlay, cost less to maintain than other apparatuses of a similar nature, that may be operated more efficiently and effectively, minimize labor costs and also successfully handle sufficient quantities of crude material to yield the desired hydrocarbon commodity in sufficient quantities.

A further object is to provide a retort in which the process of my invention may be carried on, having means therein for admitting the crude material, receiving the distilled product therefrom, carrying away the residue of the crude material and with escape ports for relieving excessive pressures. Other objects and advantages will appear as this description progresses.

In this specification and the annexed drawing, the invention is illustrated in the form considered to be the best, but it is to be understood that the invention is not limited to such form, because it may be embodied in other forms, and it is also to be understood that in and by the claims following the description, it is desired to cover the invention in whatsoever form it may be embodied.

In the accompanying one-sheet of drawings,

Figure 1 represents a diagrammatic side elevation of an apparatus adapted to be used in the operation with my improved extraction process.

Figure 2 represents a side view through Figure 1 on line 2—2.

Various apparatuses and processes have

been constructed for treating ore of the same character as is proposed to be utilized in the operation of my process. Such means and apparatuses have been at their best, inefficient in operation and not commercially valuable for distilling or producing the oil in paying quantities. Furthermore the older method of treating oil bearing ore or shale consisted in heating the product externally thus indirectly tending to cook the commodity and raise the temperature thereof sufficiently to drive off the desired commodity. This manner of treatment does not extract the highest percentage of the desired product from the crude material, nor is it possible to treat quantities of material in such a short period of time necessary for efficient operation. My invention consists in directly contacting the ore or crude material to be treated with the heat of a flame, used in conjunction with steam, whereby the crude material is heated much faster than where cooked by an external heat, also serving the purpose of permitting greater quantities of the crude material to be treated in much quicker time.

In detail the construction illustrated in the drawings comprises a cylindrical retort or furnace generally designated by the numeral 1, formed from metal or other desirable material adapted to reasonably resist the deleterious effects of heat. The retort 1 consists of a cylindrical body portion and of an enlarged cylindrical end portion 2 thereon concentric therewith. The axis of the retort is inclined so that the enlarged portion 2 thereof lies in close proximity to the ground or surface upon which rests the standards or frame work for supporting the said retort. The exterior of the retort is encased with heat resisting material such as magnesia covering, asbestos or the like, to prevent loss of heat by radiation. Supports 3 and 4 are mounted adjacent the cylindrical portion 1 of the retort, and a support 5 adjacent the enlarged end 2 thereof, although it would be clearly within the purview of this invention to rearrange the supporting means shown or to vary the method of supporting the retort. Each of the supports 3, 4 and 5 are provided with spaced, bearing members 7 thereon between which a roller or spool member 8 is rotatably mounted, and which is adapted to receive and support annular projections 9, 10 and 11 respectively, fixed on the retort. The rollers 8

have depressed center portions 12 and flanged ends 13 and 14. The outer faces of the annuluses 9, 10 and 11 contact with the inner portion of the roller 8 and the retort is guarded against lateral or longitudinal disalignment by the flanges 13 and 14 engaging the sides of the said annuluses 9, 10 and 11. A suitable gear 15 is mounted circumferentially about the retort 1 and meshes with a gear 16, fixed on a shaft 17, having the ends thereof in the bearings formed in the supports 3 and 4. The shaft 17 is provided with a pulley 18 thereon connected by a belt or other suitable media to a source of energy for rotating the same. The apparatus indicated for the purpose of revolving the retort is susceptible of various modifications within the scope of this invention and it is to be understood that suitable modification would be permissible.

The upper end of the retort 1 is closed by a fixed cover 19 secured to a standard 21 and has a circumferentially beaded edge therearound, engaging a peripheral flange 20 provided on the end of the retort 1. The cover 19 has a concentric opening therein through which a substantially cylindrical casing 22 is adapted to project, the opposite end of said casing communicating with a hopper 23 adapted to contain the crude material, oil bearing shale or ore. Casing 22 has a suitable screw feed shaft 24 rotatably mounted therein and supported in bearings 25 and 26 respectively at its opposite ends. A pulley 27 may be used for the purpose of imparting rotative movement to the screw feed and thus progressively conveying raw material or the oil bearing shale from the hopper 23 through the casing 22 and into the retort 1. The casing 22 is slightly enlarged throughout its length for the purpose to be hereinafter described in detail, and is also covered without with asbestos or other heat resisting material. The cover 19 is also provided with a door or fly-lid 26 pivotally mounted thereon and normally adapted to remain closed and effectively seal off the interior of the retort from the atmosphere.

The enlarged end 2 of the retort is lined in the interior with fire-brick or other refractory heat resisting material, inasmuch as the destructive action occurring by directly contacting the oil bearing ore with the flame of the heating medium, takes place in the enlarged chamber 2, it becomes necessary to provide effective and lasting protection for the interior of the retort. The lower end of the retort 2 is closed by a cover member 28, fixed relative to said retort and also has a peripheral flanged edge thereon over-lapping an annular lip 30 on the retort to provide substantially an airtight joint therewith. The lower end of the cover 28 has a chute 31 extending therefrom into which ash or the debris remaining after the ore has been des-

troyed, may be discharged. A suitable endless conveyor 32 is provided within said chute to carry away the ash or otherwise dispose of it. The casing 2 is provided with a door 33 pivoted thereon closing an opening 34 in said casing. This door or fly-lid 33 is provided for the purpose of relieving any sudden increases of pressure occurring within the retort occasioned by a premature combustion of the hydrocarbon vapors or gases within the retort. The cover 28 is also provided with an opening therein through which the nozzle of an oil burner 35 projects, said oil burning apparatus being used for the purpose of heating the interior of the retort and applying the flame thereof in direct contact to the ore or crude material from which oil is to be distilled or extracted. A steam smother line 38 projects through the said cover into the interior of the retort for co-operating with the oil burner in increasing the temperature within the retort and thus aiding in heating the shale or crude material and hastening the distillation.

This invention operates as follows:

The crude material or oil bearing shale is placed within the hopper 23 and the screw feed 24 rotated sufficiently to advance predetermined quantities of the material into the upper end of the retort 1. Prior to advancing the crude material, the oil burner would be started and the gasified fuel delivered therefrom lighted to produce a flame. After the temperature within the retort has reached a desired degree, the pulley 18 would be rotated and through the inter-meshing gears 15 and 16, commence revolving the retort. The screw feed would then be continued in its rotation, advancing the crude material or oil bearing shale into the upper end of the retort. The degree of inclination of the revolving retort is such that the material would gradually work its way toward the lowest point and would be continually agitated and turned so as to permit all parts thereof to be thoroughly heated. As the ore passes into the enlarged end of the retort, it would come in direct contact with the flame of the oil burner, tending to thoroughly destroy the structure of the crude material and to drive off, distil or extract the desired commodity contained therein. In order to increase the efficiency of the retort it is desirable that steam be introduced with the flame of the oil burner, thereby tending to raise the temperature of the crude material to the desired point where the hydrocarbon vapors would be given off. The continued revolving of the retort would gradually pass the crude material to the lowermost edge thereof in the form of an ash or debris which would be removed from the retort by the ash conveyor 32 or otherwise disposed of.

The oil bearing shale or crude material when first introduced into the retort com-

mences to give off its hydrocarbon vapor properties, almost instantly upon being heated. As the temperature of the shale is gradually increased, more and more of the oil vapor is given off. That the vapor of distillation might be withdrawn from the retort and collected; a suitable condenser conduit 40 connects with the cylindrical casing 22 and communicates with a coil of pipes 41 mounted in a suitable cooling reservoir 42 forming a condenser. The end of the condenser pipe 40 is connected with a vacuum pump 43 used to exhaust the interior of the retort of its vapors of distillation and otherwise create a suction through the screw feed casing 22 and into the condenser. The vapors of distillation in passing from the retort is partially cooled by contact with the incoming crude material and with the walls of the casing 22, somewhat simplifying the work of the condenser. The vapor is cooled or otherwise collected in the condenser aforementioned after which it is conveyed to suitable receiving tanks or other ready means whereby it may be disposed of.

It often happens in the process of extraction that the vapors of distillation will come in contact with the flame of the oil burner causing a premature combustion which might be disruptive to the apparatus but which is counteracted by the fly-lids or explosion doors at the opposite ends of the retort; thus any sudden pressure increases or undue expansion of the air within the retort is relieved by the opening of said doors to the atmosphere. Where a prema-

ture explosion takes place and a burning of the shale follows, the smothering steam from the conduit 38 tends to make the same short-lived and thus effectively quench the fire to permit a resuming of the process of distillation.

Having thus described this invention, what I claim and desire to secure by Letters Patent is:

1. The herein described process of distilling oil from oil shale, comprising progressively passing predetermined quantities of shale into a heated retort; revolving said retort to advance said shale therethrough; subjecting said shale to direct contact with the flame of a heating medium for distillation purposes; collecting the heated oil vapors of said shale and relieving said retort of excess pressures.

2. The herein described process of distilling oil from oil shale, comprising progressively passing predetermined quantities of shale into a heated retort; revolving said retort to advance said shale therethrough; subjecting said shale to direct contact with the flame of a heating medium for distillation purposes; introducing steam into contact with said shale to aid in distillation; collecting the heated oil vapors of said shale and relieving said retort of excess pressures.

In testimony whereof, I have hereunto set my hand at San Francisco, California, this 14th day of April 1921.

ROBERT W. JENKINS.

In presence of

LINCOLN V. JOHNSON.