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H. L. BROWN

OIL EDUCTION APPARATUS

Filed April 21, 1920 2 Sheets-Sheet 1

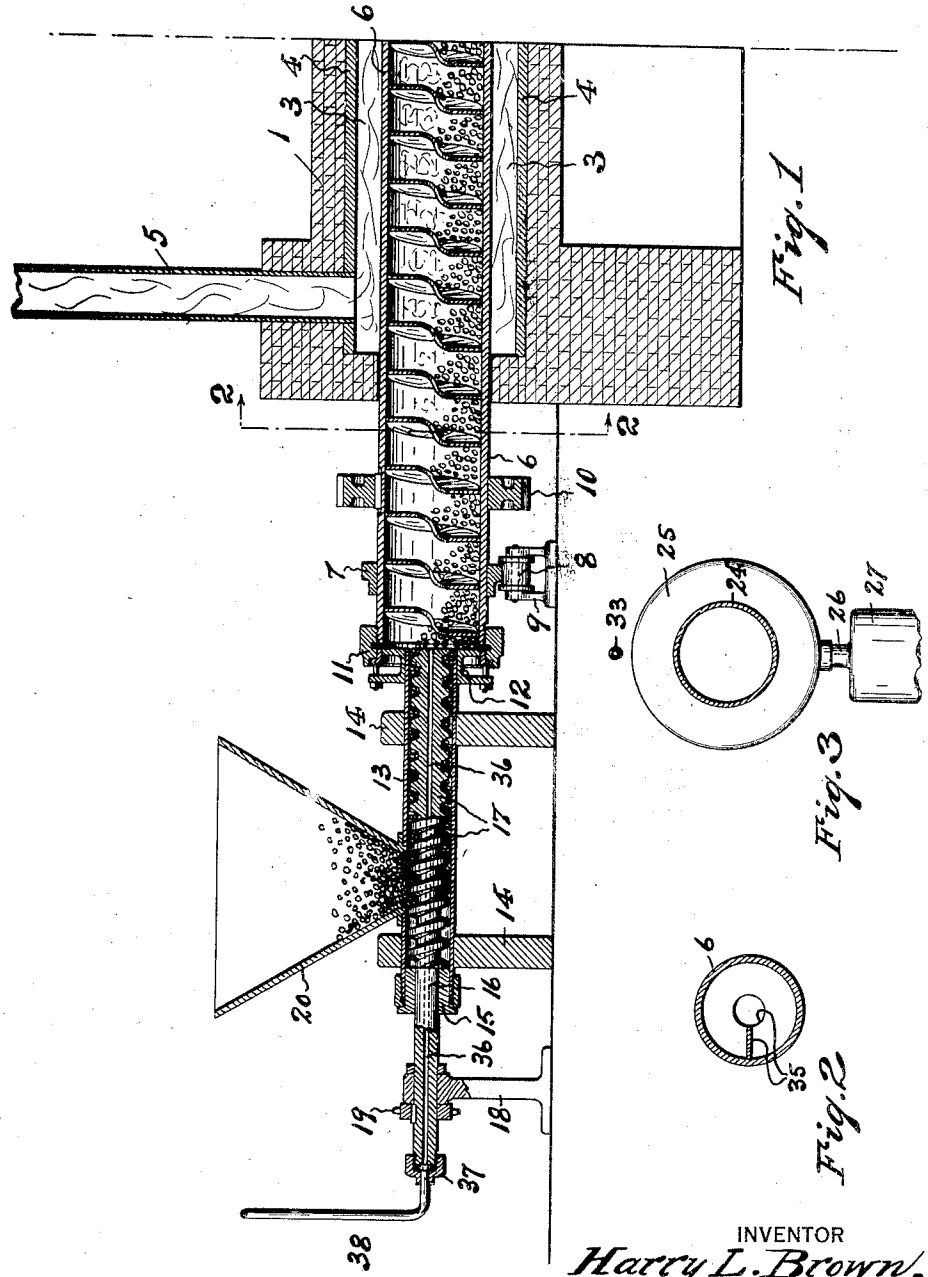


Fig. 1

Fig. 3

Fig. 2

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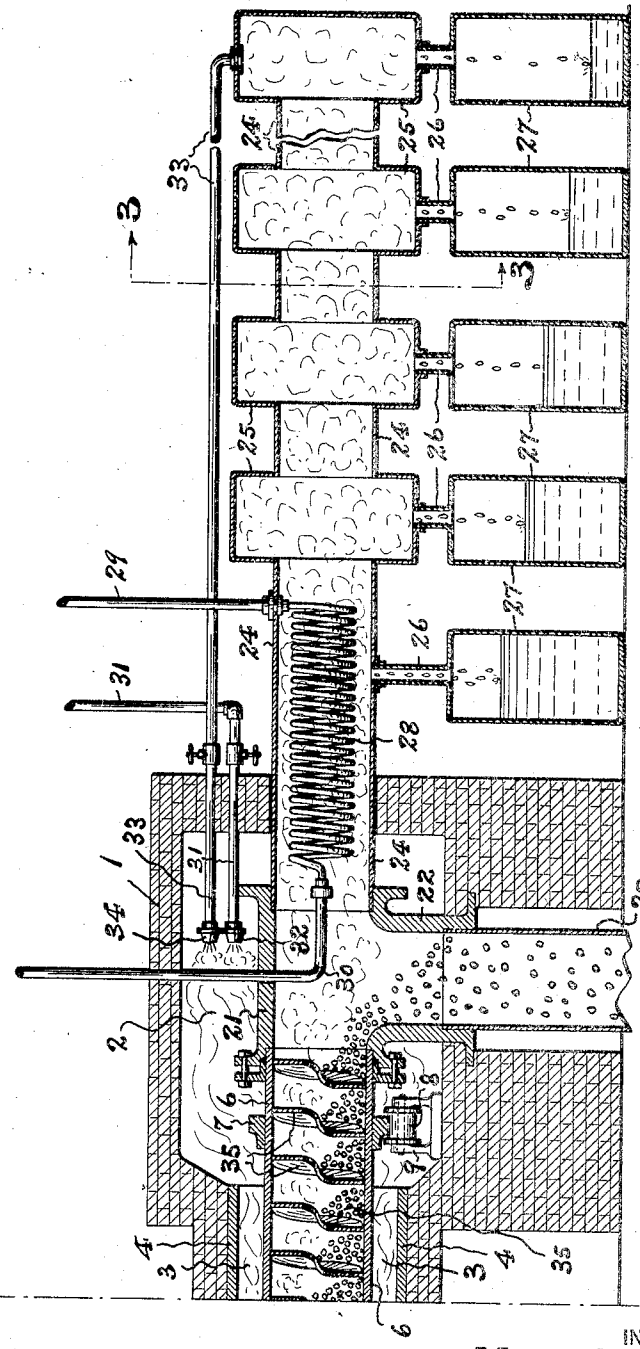


Fig. 1A

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UNITED STATES PATENT OFFICE.

HARRY L. BROWN, OF NEWARK, NEW JERSEY.

OIL-EDUCTION APPARATUS.

Application filed April 21, 1920. Serial No. 375,420.

To all whom it may concern:

Be it known that I, HARRY L. BROWN, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Oil-Eduction Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention has reference, generally, to improvements in oil eduction apparatus for the recovery of oil from shale rock, and for the reduction of ore and similar purposes; and the invention relates, more particularly, to a novel construction of eduction apparatus adapted to operate in a continuous manner.

The invention has for its principal object to provide a very simple and highly efficient apparatus primarily adapted for the treatment of shale rock so that the oil content thereof may be quickly educed in a continuous manner at a minimum cost.

Other objects of the present invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

With the various objects of the present invention in view, the same consists, primarily, in the novel construction of eduction apparatus hereinafter set forth; and, the invention consists, furthermore, in the novel arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, all of which will be hereinafter more fully described, and then finally embodied in the claims appended hereto.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figures 1 and 1A, taken together, represent a vertical longitudinal section of the novel construction of eduction apparatus made according to and embodying the principles of my present invention.

Figure 2 is a detail transverse section, taken on line 2—2 in said Figure 1; and Figure 3 is another detail transverse section, taken on line 3—3 in said Figure 1A.

Similar characters of reference are employed in all of the hereinabove described views, to indicate corresponding parts.

Referring now to said drawings, the improved construction of eduction apparatus embodying the principles of my present invention, comprises a suitable furnace housing 1, usually built of brick, and providing a fire box 2 which communicates with one end of a longitudinally extending cylindrical combustion chamber 3 provided with a suitable lining 4. The opposite end of said combustion chamber communicates with a suitable flue or stack 5 for carrying off the spent products and gases of combustion.

Mounted to extend longitudinally through said combustion chamber 3 is a cylindrical or tubular rotary retort member 6, having its receiving end projecting externally of and beyond said housing 1, while its discharge end terminates within the fire-box 2. Fixed on said retort member, adjacent to each end thereof are annular external tracker flanges 7 which are supported by and rotate upon bed rollers 8 journaled in suitably supported bearing brackets 9. Also fixed upon the forward exterior end of said retort member is an annular drive gear 10, which connects with suitable transmission mechanism (not shown) for rotating said retort member.

The outer or receiving end of said retort member is closed by means of a suitable head device 11 provided with a central bearing portion 12 which receives and rotates on the stationary tubular housing 13 of a feeding conveyor mechanism. Said tubular housing 13 is supported by conveniently disposed standards 14 in longitudinal alinement with said retort member 6, so that its discharge end, which enters said bearing portion 12, communicates with the interior of said retort member. The outer end of said tubular housing 13 is provided with a bearing block 15 in which is journaled the shaft 16 of a conveyor screw 17, the latter being arranged to extend through and rotate in said tubular housing 13. The outer end of said shaft 16 is journaled in a bearing standard 18, and is provided with a drive sprocket 19, or other suitable means, which connects with suitable transmission mechanism (not shown) for rotating said conveyor screw 17. Mounted in connection

with said tubular housing 13, so as to communicate with the interior thereof, is a feed hopper 20.

The inner or discharge end of said retort member communicates with one side of a fixed T-member 21 mounted within said fire-box 2. Said T-member 21 has a downwardly extending or vertical arm 22 which communicates with a drop well 23 into which the spent shale rock is discharged from said retort member 6 to be conveyed away to some suitable place of deposit. Connected with the opposite side of said T-member 21 is a vapor and gas conduit 24, which projects outwardly beyond the housing 1 for any required distance. The outer portion of said vapor and gas conduit 24 is provided, at suitable intervals throughout its length, with a series of annularly enlarged condensing chambers 25. The bottom portion of each condensing chamber is connected, by a suitable neck portion 26 with a collecting tank or reservoir 27. Arranged within the inner portion of said gas conduit 24 is a condenser pipe coil 28, one end of which is secured in connection with a water supply pipe 29, and the opposite end of which is secured in connection with a suitably disposed water discharge pipe 30. That section of said vapor and gas conduit 24 in which said condenser pipe coil 28 is located is also connected by a communicating neck 26 with a similar collecting tank or reservoir 27.

Mounted in connection with said housing 1, so as to enter said fire-box 2 thereof, is a fuel oil or gas supply pipe 31 which leads from any suitable source of fuel supply. Said supply pipe 31 is provided, within said fire-box 2, with a suitable burner nozzle 32. Connected with one or more condensing chambers 25, preferably the last or outermost of the series, is a gas return pipe 33, which runs back to enter said fire-box 2 of the housing 1. Said gas return pipe 33 is provided within said fire-box 2, with a suitable burner nozzle 34.

The interior of said retort member 6 is provided with an internal helical fin or conveyor flange 35 which extends from end to end thereof.

It is sometimes desirable in the practice of the eduction process by the aid of the above described apparatus to introduce into the receiving end of said retort member 6 with the entering shale rock a certain amount of steam, and for this purpose the said conveyor screw 17 and its shaft 16 is provided with a centrally disposed longitudinal passage providing a steam injection conduit 36. The outer end of said shaft 16 is provided with a desirable form of coupling device 37 for connecting with said steam injection conduit 36 a steam supply pipe 38.

The operation of the apparatus in carrying out the oil eduction process relative to shale rock is as follows:—

The fuel supply being turned on the burner nozzle 32 is lit, so that the combustion of the fuel is initiated within the fire-box 2, the hot gases or products of combustion passing through the combustion chamber 3, and surrounding the retort member 6.

The retort member 6 is slowly rotated, and likewise the conveyor screw 17 is also rotated. The oil bearing shale rock, having first been crushed to suitable size, is deposited within the feed hopper 20. The shale rock, as it enters the tubular housing 13, is forced rearward by the rotating conveyor screw 17, and thus continuously fed into the receiving end of the retort member 6. As the retort member 6 slowly rotates its helical fin 35 forces the shale rock onward through the interior of the said retort member, and at the same time causes the same to cascade or tumble over the free edges of the said helical fin so as to constantly keep the same in movement to form a more or less open mass, to all parts of which the heat, communicated to the retort member, may have ready access. By reason of the heat generated within the combustion chamber 3 around said retort member, the temperature within the latter is raised to a high degree, so that all particles of the shale rock tumbling therethrough are subjected to such heat, with the result that the oil residual in the said shale rock is educed therefrom in the form of a vapor and gas. As the shale rock reaches the discharge end of the retort member it tumbles out of the same, and falls into the drop well 23, whence it is conveyed to a suitable place of deposit. The retort member is of such length, and its speed of rotation is so timed, that by the time the shale rock traveling therethrough has reached the discharge end it has been subjected to the action of the heat long enough to liberate, with substantial completeness, all the oil content thereof. The educed oil vapor and gas passes onward out of the discharge end of said retort member, and thence through said T-member 21 into said vapor and gas conduit 24. Cold water or other cold medium is circulated through said condenser pipe coil 28, so that the temperature of said oil vapor and gas is immediately reduced and condensation thereof begun. As the vapor and gas continues to flow on through the conduit 24 it successively passes into the annular enlargements or condensing chambers 25, the walls of which provide an increased surface area, cooled by the outer atmosphere and adapted to readily radiate heat, so that as the oil vapors and gases strike the wall surfaces of said condensing chambers further condensation takes place, diminishing in quantity production as progress is made toward the last or outermost of said con-

densing chambers. It is entirely possible to operate my apparatus with the condensing chambers alone, that is with the condenser pipe coil 28 omitted from the conduit 24, thus rendering the apparatus very practical for use in localities wherein water is scarce. The condensation of the oil vapor and gas, as it progresses through the conduit 24 and condensing chambers 25, results in the precipitation of liquid oil which drains off into and is collected by the several collecting tanks or reservoirs 27.

Since in practice certain non-condensable combustible gases are given off in the retort member 6, I seek to employ the same as an auxiliary to the main fuel supply, and to this end such gases after traveling through the conduit 24 are vented and returned through the gas return pipe 33 to the fire-box 2 wherein the same are ignited at the burner nozzle 34, thus serving to generate heat within the combustion chamber 3, and permitting the reduction and conservation of extraneous fuel supplies.

It will be understood from the above description that the novel eduction apparatus operates very efficiently upon the shale rock in a continuous manner, thus saving considerable time and labor in the performance of the eduction process, and rendering the handling of the shale rock extremely easy and cheap, eliminating all loss of time required in loading and unloading stationary retorts as heretofore used.

While I have particularly described my invention as utilized for oil eduction from shale rock, it will be understood that the same may be employed for other purposes, such for example as ore reduction, etc.

I am aware that some changes may be made in the construction of the novel eduction apparatus above described, both with respect to the general arrangements and combinations of the parts, as well as with respect to the details of the construction thereof, without departing from the scope and general principles of my invention as described in the foregoing specification and as defined in the following claim. Hence, I do not limit my invention to the exact arrangements and construction of parts as described in said specification, nor do I confine myself to the exact details of the construction of the various parts as illustrated in the accompanying drawings.

I claim:—

In an oil eduction apparatus, the combination with a furnace having a fire-box and a longitudinal combustion chamber communicating therewith, of a rotatable cylindrical retort extending through the combustion chamber provided with means for causing travel of material therethrough from its receiving end to its discharge end, a tubular housing having a feed hopper, said housing communicating with the receiving end of said retort, a rotatable conveyor screw in said housing operative to move material from said hopper into the receiving end of said retort, said screw having a central longitudinal steam injection conduit therethrough and a vertical drop well at the discharge end of said retort into which spent material is delivered after passing through the latter.

In testimony that I claim the invention set forth above I have hereunto set my hand this 13th day of April, 1920.

HARRY L. BROWN.

Witnesses:

GEORGE D. RICHARDS,

FREDK. C. FRAENTZEL.