Dec. 8, 1925. 1,564,271

J. T. POPE

OIL SHALE RETORT

Original Filed Oct. 24, 1922 3 Sheets-Sheet 1

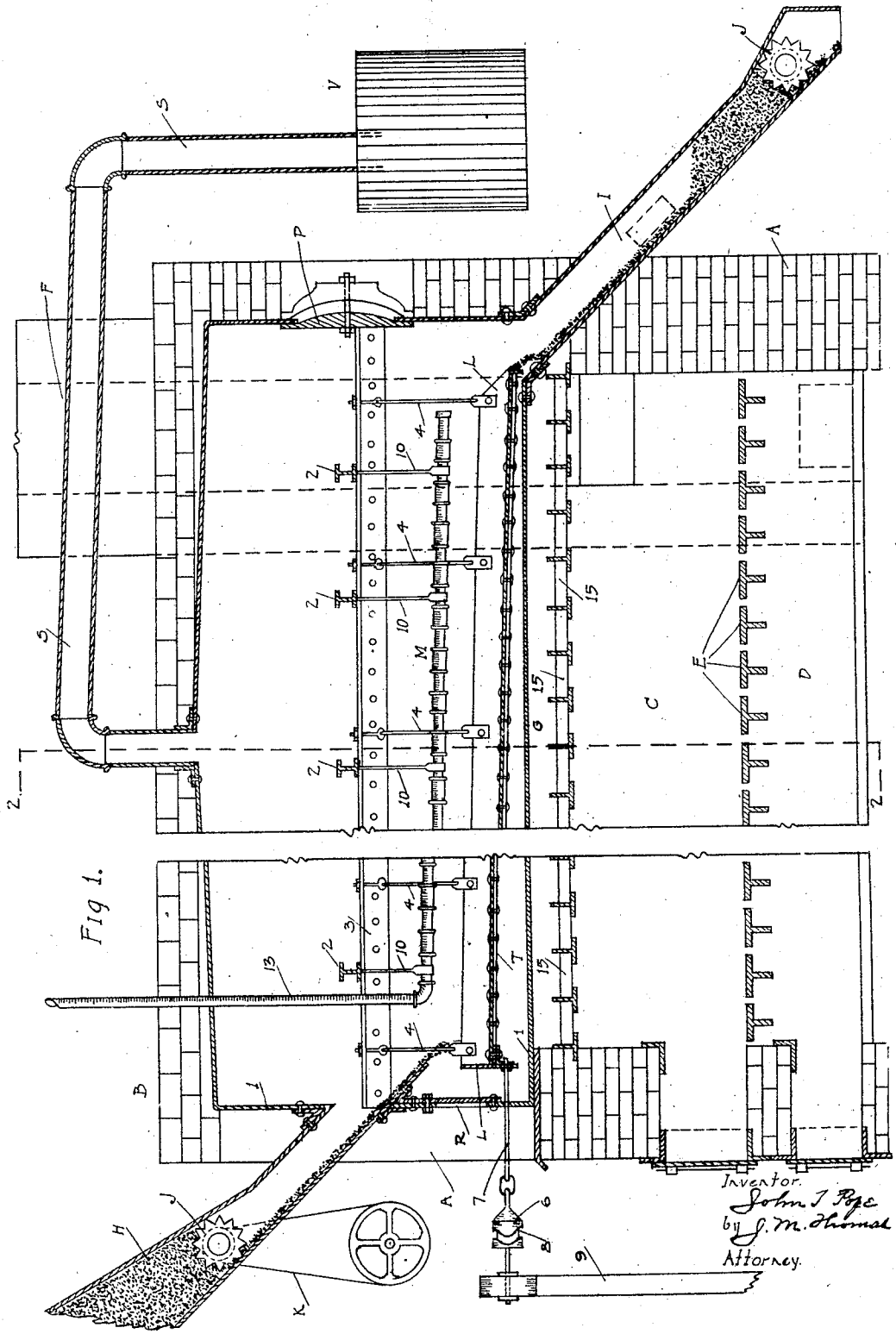


Fig 1.

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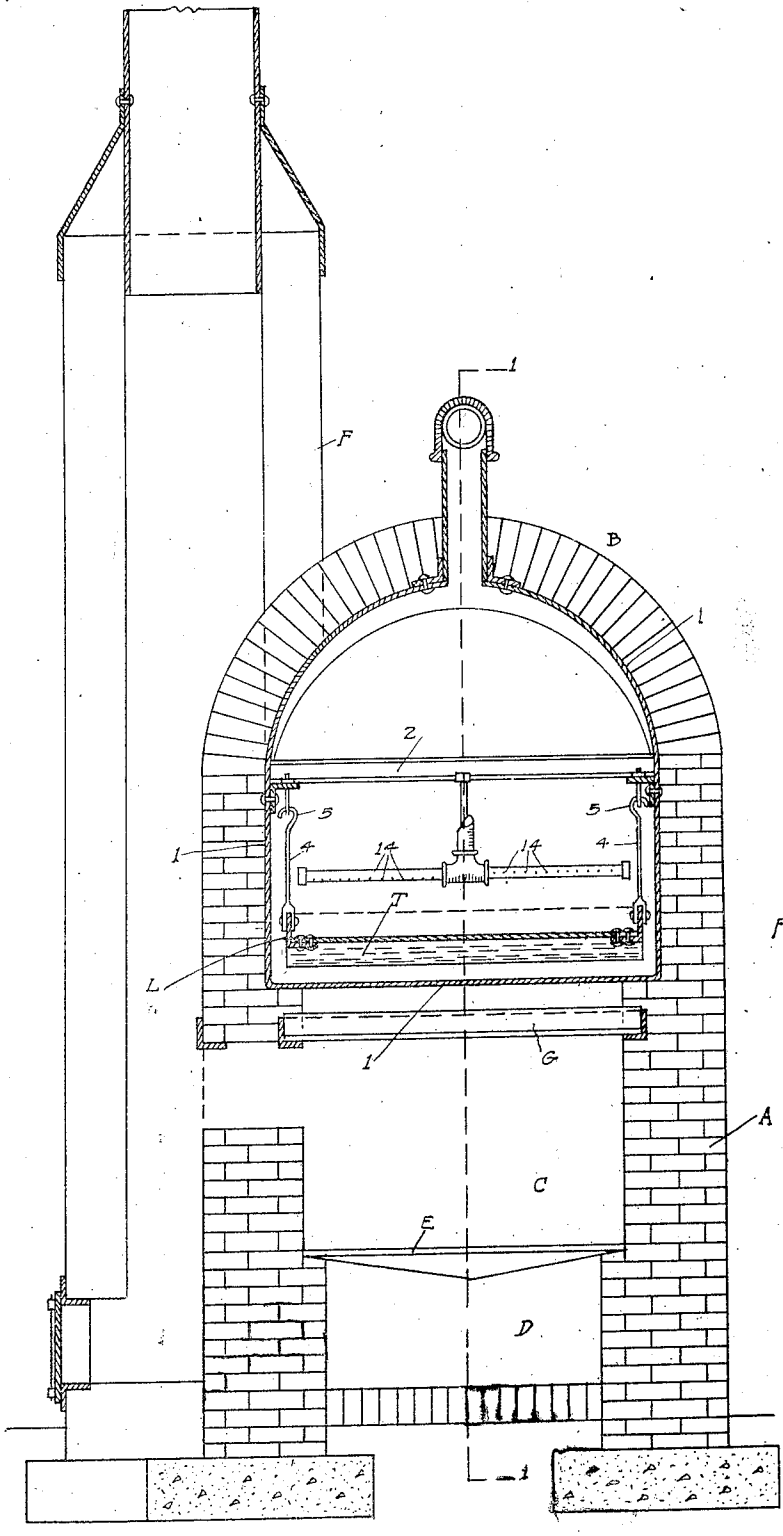


Fig. 2.

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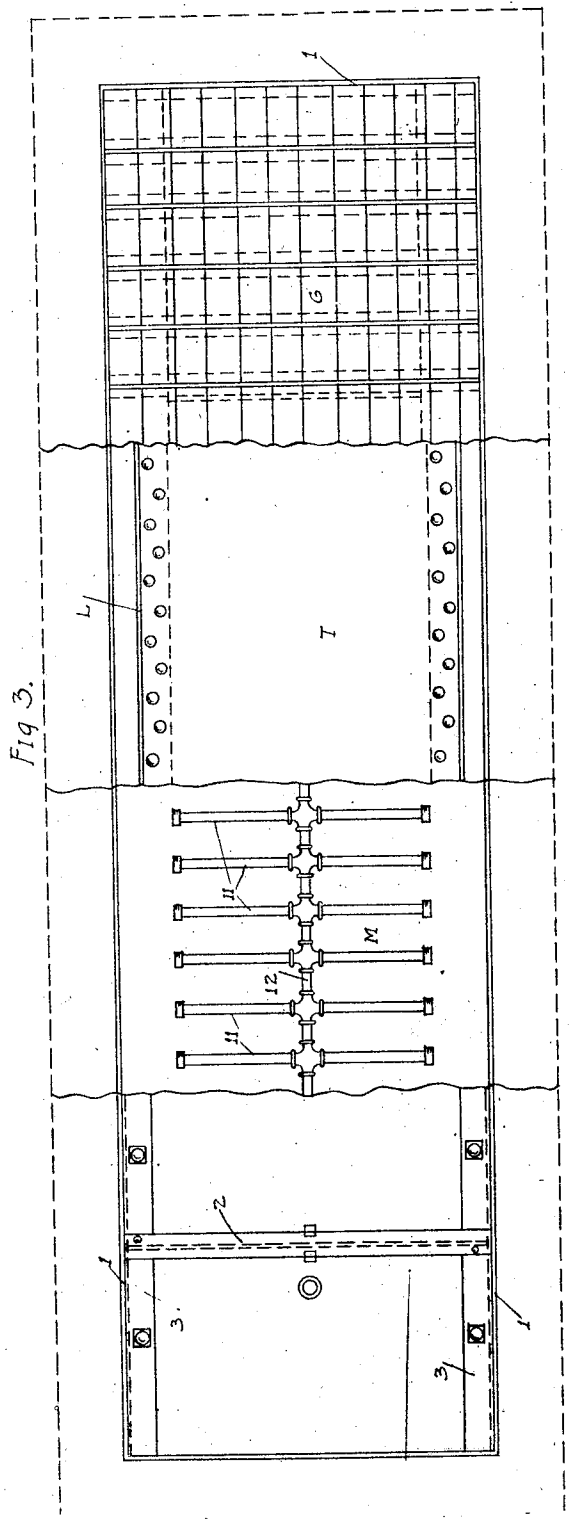


Fig 3.

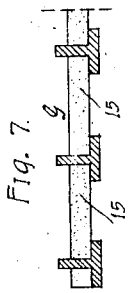


Fig. 7.

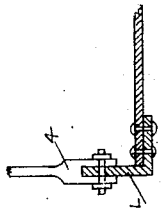


Fig. 6

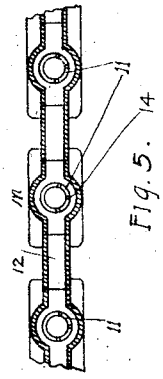


Fig. 5.

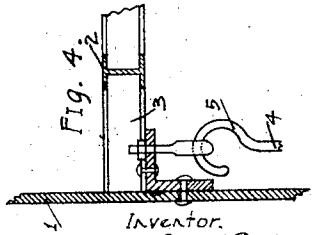


Fig. 4.

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BEST AVAILABLE COPY

Patented Dec. 8, 1925. 1,564,271

UNITED STATES PATENT OFFICE.

JOHN T. POPE, OF SALT LAKE CITY, UTAH.

OIL-SHALE RETORT.

Application filed October 24, 1922, Serial No. 596,562. Renewed June 29, 1925.

To all whom it may concern:

Be it known that I, JOHN T. POPE, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Oil-Shale Retorts, of which the following is a specification.

My invention relates to oil shale retorts, and has for its object to provide an economical and efficient retort of the horizontal type in which the oil content of shale may be volatilized and conducted to a condenser for recovering the hydrocarbon oils.

A further object is to provide a retort through which a large tonnage of crushed oil-bearing shale may be passed in a continuous operation, and by which the oil may be volatilized out of the shale by means of heat and superheated steam directed on the passing shale whereby a more rapid distillization may be carried out to produce an uncracked hydrocarbon oil, which oil may be subsequently treated.

These objects I accomplish with the apparatus illustrated in the accompanying drawings in which similar letters and numerals of reference indicate like parts throughout the several views and as described in the specification forming a part of this application and pointed out in the appended claims.

In the drawings in which I have shown a substantial embodiment of my invention, Figure 1 is a vertical longitudinal section on line 1—1 of Figure 2. Figure 2 is a transverse vertical section on line 2—2 of Figure 1. Figure 3 is a horizontal section with parts cut away to show the different elements in partial plan views. Figure 4 is an elevation of the suspension means for the table. Figure 5 is fragmentary section of the steam pipes. Figure 6 is an elevation of the table support. Figure 7 is a fragment of the furnace top. Figures 4, 5, 6 and 7 are somewhat enlarged from the other views.

My retort is preferably built of fire brick and steel, and may be constructed with any number of units, but in the drawings I have shown but one unit. The invention consists of rectangularly shaped walls A with a semi-cylindrically shaped top B, with the interior having a furnace C and ash pit D. Between the furnace and ash pit are the commonly used grate bars E. A flue F is shown connected with said furnace, and a grid G is provided between the furnace and the bottom of the table T to allow heat radiation upwardly and around the table T. The said grid consists of spaced apart inverted T-irons, between which irons and carried thereon are slabs of fire brick 15. An inlet chute H is secured to one end of said casing 1 and has an inclined discharge from the hopper (not shown) to the said table T. The said table has its discharge end lower than the receiving end to aid in the travel of the shale through the retort, and from said discharge end another chute I is provided to carry off the spent shale. Both of said chutes are sealed by the shale as controlled by the rotating corrugated roller gate in each, shown at J, and each is rotated on its axis by the power-driven belt K. The speed at which said gates are operated controls the amount of shale fed into and discharged from the retort. The retort is lined with a sheet metal casing 1 with which said chutes H and I are connected, and from girders 2 and stringers 3 fastened in said casing is suspended the said table T and steam pipes or sprays. The said girders 2 and stringers 3 are made of angle iron and are fastened together at the ends of the girders and at right angles to each other, forming a frame-work on which is suspended the said table and pipes. The table consists of a rectangular box L having sides and one end about six inches high. The table is suspended from the stringers 3 by the connecting links 4 on one end of each of which is a hook 5 to facilitate removal for repairs if needed and the other end of each is pivoted to the sides of the table. To the higher end of said table is connected a cam roller 6 by a rod 7. On the roller face is cut a cam race 8 by which the said table is reciprocated when said roller is rotated by a power-driven belt 9. The pipe rack M is suspended from the said girders 2 by the hangers 10 and consists of spaced apart spray pipes 11 which are all connected with a steam pipe 13 by the lead pipe 12. In the lower side of all of the said spray pipes perforations 14 are provided to allow steam to exit as a spray, and said pipe rack M is spaced above said table T in order that the steam spray will strike the shale which is passing over said table. Openings P and R with suitable detachable covers therefor are provided in the ends of said casing 1 for

repairs required on the pipe rack and table. A gas pipe S is connected with the interior of said casing by which the volatilized oil as a gas is drawn off and conducted to the condenser V for condensation, or other treatment.

The operation of my retort is as follows:— Crushed shale is fed by gravity through the intake chute H, and as controlled by the gate roller J, into the casing where it falls on the table T. The table is set at a slight incline toward the discharge end and as reciprocated the shale will pass over the table as a continuous sheet of moving shale particles. The heat from the furnace will be radiated directly on the bottom of the table and also all around the shale. Additional heat from superheated steam will be directed by the steam pipe rack M on and around the passing shale. The purpose of the steam heat thus supplied directly on the shale is to prevent any cracking of the oil while in the retort casing and to keep a regular heat supply as desired; that so far found most advantageous is about 650 degrees F. The steam also has a tendency to drive the volatilized oil out of the casing through the pipe line S. I thus provide an economically constructed and efficient retort in which a continuous flow of crushed shale may be treated, to volatilize and drive off the oil content of the shale, without cracking and destructive distillation, leaving that to be carried out through condensation as desired. The shale which is carried in the chutes H and I above the roller gates J act as seals to prevent escapement of the volatilized oil from the retort.

Having thus described by invention and its operation I desire to secure by Letters Patent and claim:—

1. In an oil shale retort the combination of a sheet metal casing having a furnace thereunder; an angle iron frame secured to the sides of said casing; a grid composed of inverted T-irons and fire brick slabs placed between the furnace and said sheet metal casing; an inclined metal table suspended from said frame; means to reciprocate said table longitudinally; a perforated steam rack spaced above said table; means to conduct superheated steam to said steam rack; chutes to conduct crushed shale to and from said table; rotatable roller gates to control the passage of crushed shale through said retort; and a pipe line to conduct gas from said casing.

2. An oil shale retort consisting of an enclosed metal casing; a furnace thereunder; a reciprocating table suspended in said casing; a plurality of perforated pipes spaced above said table to direct steam onto said table for volatilizing the oil content of oil shale; sealed chutes to control the passage of shale over said table; and a pipe connected with the upper portion of said casing to convey volatilized oil from its interior.

3. An oil shale retort consisting of an enclosed metal casing; a reciprocation table suspended in said casing; a plurality of perforated pipes spaced above said table to direct superheated steam onto said table for volatilizing the oil content of shale; ingress and egress chutes connected with said table; roller gates to control the flow of shale over said table and a pipe connected with the upper interior of said casing to convey oil vapor from its interior.

In testimony whereof I have affixed my signature

JOHN T. POPE.