Jan. 25, 1938. C. C. WEBB 2,106,583

APPARATUS FOR PRODUCING ASPHALT

Filed April 17, 1936

Fig. 1,

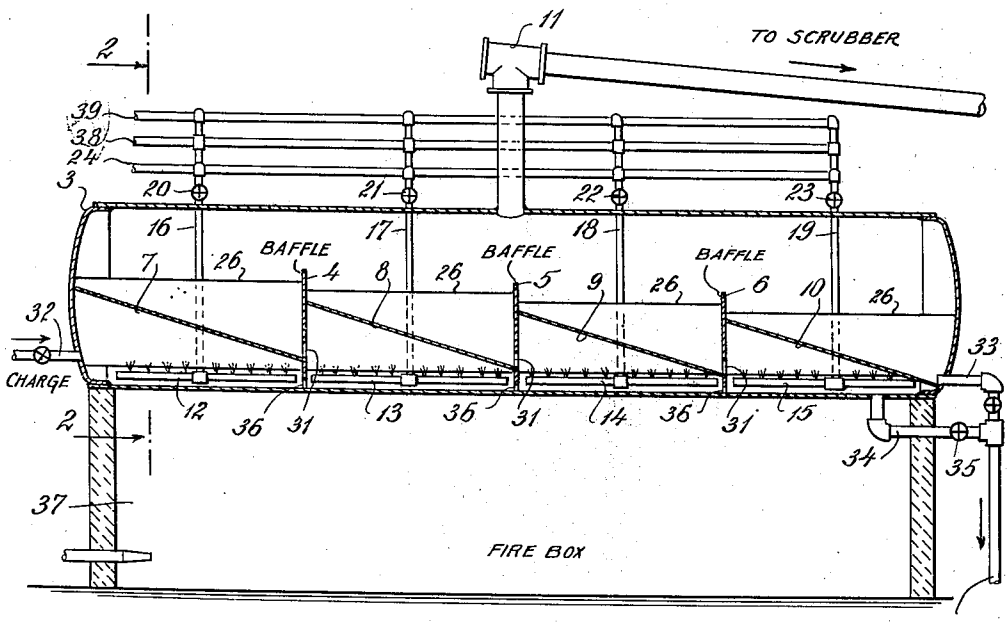
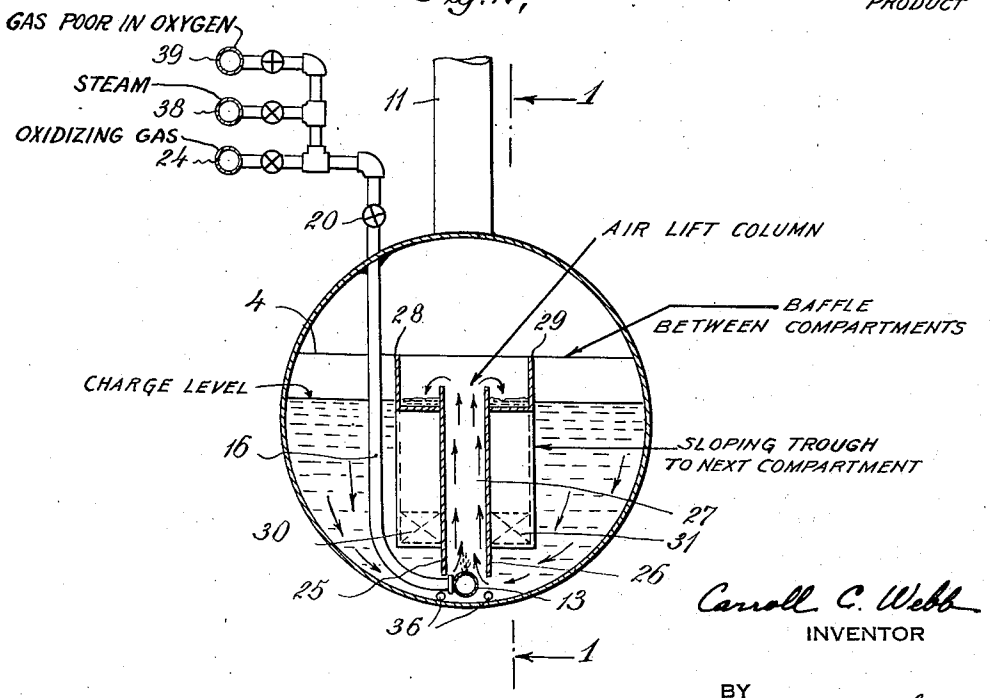


Fig. 2,



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APPARATUS FOR PRODUCING ASPHALT

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2 Claims. (Cl. 196—111)

This invention is directed to apparatus for the production of asphalts from residual or other petroleum oils by oxidation, wherein the oils are blown with air or oxygen-containing gas while in a heated condition, thereby increasing the asphaltic nature of the oil and resulting in a product of desired characteristics as to melting point, hardness, and the like.

Present methods of blowing are uneconomical in their requirements of time for completion of the reaction and amount of air required for a given reduction. In general these methods are batch operations, in which the oil is placed in a shell still, heated, and blown by air introduced through a perforated pipe coil placed upon the bottom of the still. There is little control over the relative amounts of air and oil in contact at any one instant of time, the amount of air which may be used being limited by the difficulty of securing effective contact between it and the oil, and the process does not lend itself effectively to continuous methods of operation. Due to the slowness of the reaction, each unit of equipment is tied up for a considerable time, and since the method is batch, there are as many units of equipment tied up as there are batches of product in process at any one time. The present method is thus seen to be prodigal in its requirements of equipment and operating attention. It is likewise not capable of convenient and easy control, since each batch, as a separate operation, must be closely watched while coming to grade.

This invention has for its object the provision of an apparatus wherein the blowing of asphalts may be successfully operated as a continuous process, with accurate control over the amount of oxidizing gas to be contacted with the oil at various stages of the reaction and with convenient control over the quality of product. A further object is the provision of an apparatus wherein differing gaseous media may be used at different stages of the preparation of the product, and wherein products of different grade may be continuously withdrawn at different points from a continuously operating system. An important object is the provision of an apparatus whereby more intimate contact of oil and gas may be brought about to secure a more vigorous and speedier reaction while at the same time using a lesser amount of gas for the process as a whole.

This invention is based upon the discovery that closely controlled contact of small amounts of oil with comparatively large amounts of air, progressively repeated, leads to the attainment of the objects and advantages above outlined.

In order that this invention may be more readily understood, reference is now made to the drawing which is attached to this specification. Figure 1 of this drawing shows a longitudinal section of an apparatus for carrying out this invention, and Figure 2 shows a vertical section therethrough. In this drawing, in Figure 1, reference numeral 3 designates a shell still body, internally equipped with a plurality of baffles, 4, 5, and 6, dividing the portion of the shell occupied by liquid into a series of compartments 7, 8, 9, 10, having a common vapor space in the upper portion of the shell, which is not baffled. These baffles 4, 5, and 6, may be of progressively less height, as shown, or may be equal in height, and may, if desired, be extended upwardly any desired distance to prevent carryover of froth from one compartment to another, but should not be so far extended as to seriously impede the flow of vapors from the several compartments to the central vapor takeoff pipe 11, which leads to a scrubber or fractionation system which may be of any suitable type, the choice of which has no bearing on this invention, and which is not shown in the drawing. In each compartment 7, 8, 9, 10, there is placed centrally and longitudinally along the bottom, an ingress means for oxidizing gases, preferably in the form of a drilled pipe, but which may take the form of a series of jet nozzles, a longitudinally slotted pipe, or other convenient form. These gas pipes are indicated by numerals 12, 13, 14, and 15, and each is connected by a riser, as 16, 17, 18, and 19, controlled by a valve, as 20, 21, 22, and 23, to a main supplying oxidizing gas, designated by 24. The internal construction in each of chambers 7, 8, 9, and 10, will best be understood from Figure 2, showing a vertical cross-section through chamber 8, the other chambers being identical. In the center of the chamber, supported from the end walls or baffles defining the chamber, are two vertical plates 25 and 26, extending horizontally throughout the length of the chamber and extending vertically from a level a short distance above the bottom of the chamber to a level a short distance below the top of the chamber-defining baffles. These two plates, 25 and 26, are horizontally spaced apart to provide a vertical passage 27, which passage extends throughout the length of the chamber and is situated over the gas introducing means 13 in such a manner that the action of the gas will lift the oil through this vertical passage 27 in

the form of a froth of intimately admixed oil and gas. On either side of this passage, there are provided troughs 28 and 29, into which the oil so lifted may overflow, and in which it may separate from the gas. These troughs 28 and 29 are provided with bottoms which slope toward the next compartment 9, and communicate therewith by openings 30 and 31 in baffle 5. The construction of the troughs is such that no material which has been contacted with gas may return to chamber 8, and no material which has not been so contacted can pass from chamber 8 to chamber 9. Returning now to Figure 1, the shell still 3 is provided with a charging pipe 32, leading to the first chamber, and a discharge line 33, leading from the last chamber, both properly valved. In order to completely drain the still when shut down, a drain line 34, with valve 35, is provided, and each baffle 4, 5, 6, is provided at its bottom with one or more small passages 36 (shown in Figure 2). In normal operation, pipe 34 is closed by valve 35, and the area of the holes 36 is small enough so that no substantial flow of oil therethrough occurs, the level of oil in adjoining compartments being the same or nearly the same. The whole still is mounted above a suitable firebox 37.

The method of operation with this apparatus enables me to contact oil with gas under controlled conditions, and the employment of the vertical passage compels a definite contact, wherein the relative proportions of gas and oil may be definitely adjusted. The division of the operation into stages permits me to contact with varying amounts of gases at different stages in a continuous process, and thereby to gain greater control over the degree of oxidation and degree of exothermic heating encountered. Also, by suitable division of the oxidizing gas supply main, or by provision of other mains, as 38 and 39, properly manifolded to the gas introduction risers 16, etc., I may blow with various gases in various compartments, as for example, with steam in chamber 7, with gas rich in oxygen in chambers 8 and 9, and with gas lean in oxygen in chamber 10. I also contemplate that if necessary, oxidized oil may be recirculated from the last chamber of a still to the first chamber thereof, and reintroduced in admixture with fresh oil. I particularly contemplate the use of a plurality of these units operated in series in a battery, wherefrom oils of various degrees of oxidation may be withdrawn at appropriate points in the series, thus accomplishing the continuous production of asphaltic materials of varying grades from a single charge stock in a single continuously operating process.

I claim

1. Apparatus for contacting oil with a gaseous medium comprising a series of chambers, in each chamber means defining a confined vertical passage, means to introduce a gaseous medium into each chamber to pass vertically through the said passage, means whereby the passage of said gas through said passage causes the passage of said oil through said passage in admixture with said gas, means to prevent oil so lifted from returning to the chamber from whence it came, and means to introduce oil so lifted into the succeeding chamber.

2. Apparatus for the production of asphalts by oxidation comprising a vessel, means for heating said vessel, in said vessel a series of liquid compartments, means in each compartment defining a confined vertical passage, means to admit a gaseous medium to each passage to entrain oil therein and lift oil therethrough, individual overflow means for catching oil from each of said passages, in which oil and gas may separate, a common vapor space communicating with all overflow means, means for removing vapors from said space, means whereby oil may pass from each overflow space to the next compartment, and is prevented from returning to that from which it was lifted, means to admit selected gaseous media to selected passages, a feed pipe discharging into the first liquid compartment, and an outlet pipe leading from the last overflow space.

CARROLL C. WEBB.