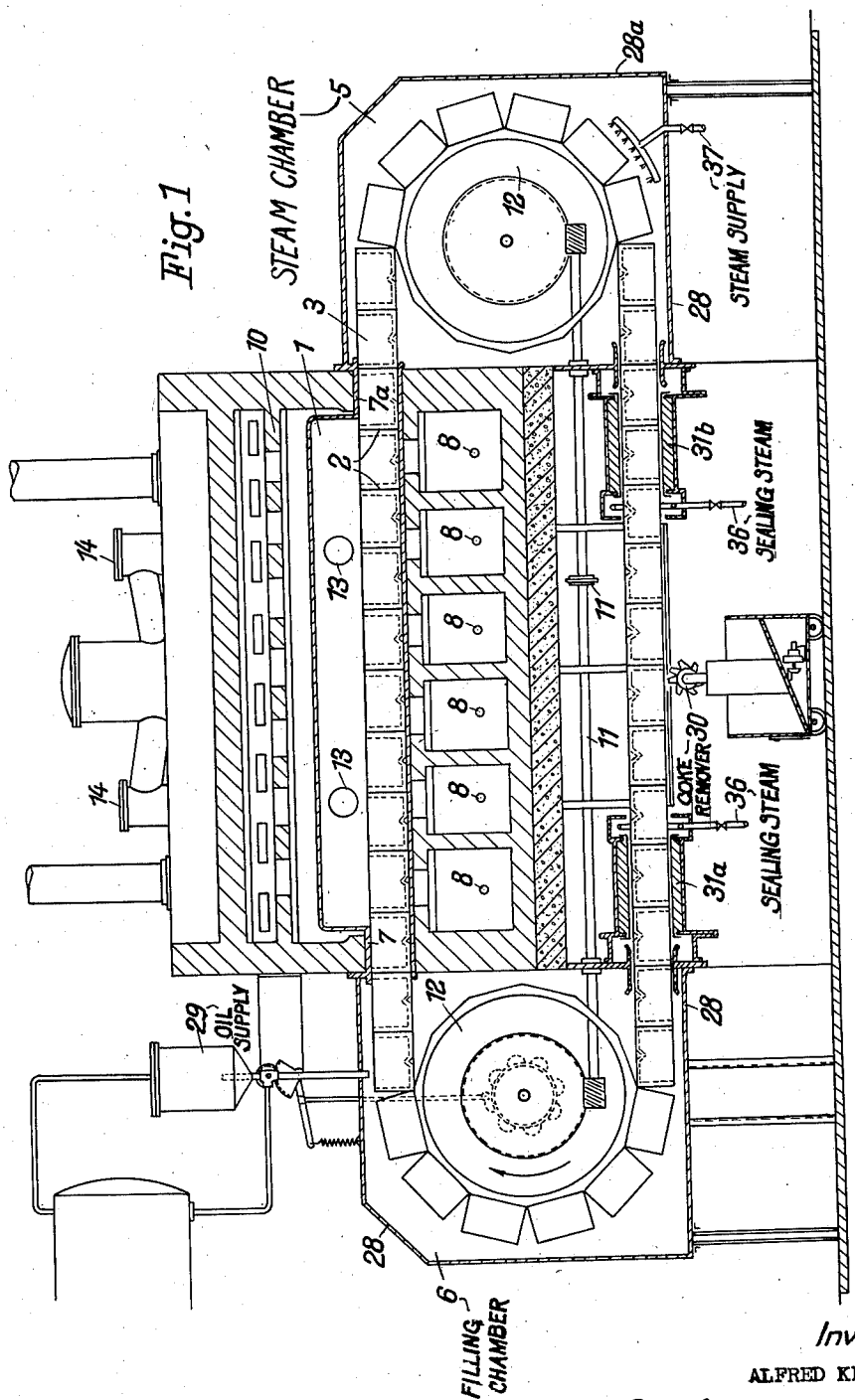
June 27, 1939. A. KNUDSEN 2,164,247

APPARATUS FOR THE CONTINUOUS DISTILLATION OF HIGH-BOILING HYDROCARBONS TO COKE

Filed Feb. 10, 1937 2 Sheets-Sheet 1

Fig. 1



Inventor:

ALFRED KNUDSEN

By Norris & Bateman

ATTORNEYS

June 27, 1939. A. KNUDSEN 2,164,247

APPARATUS FOR THE CONTINUOUS DISTILLATION OF HIGH-BOILING HYDROCARBONS TO COKE

Filed Feb. 10, 1937 2 Sheets-Sheet 2

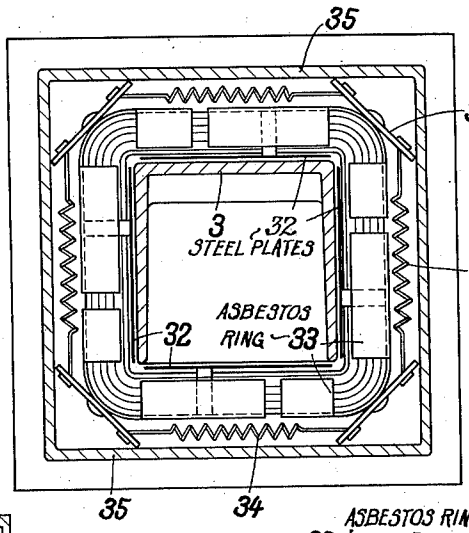


Fig.2

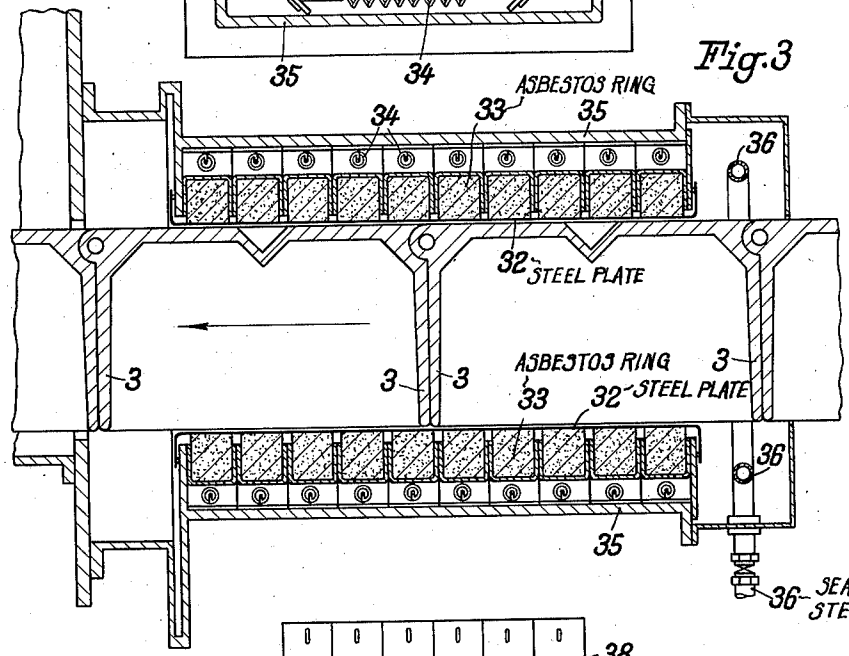


Fig.3

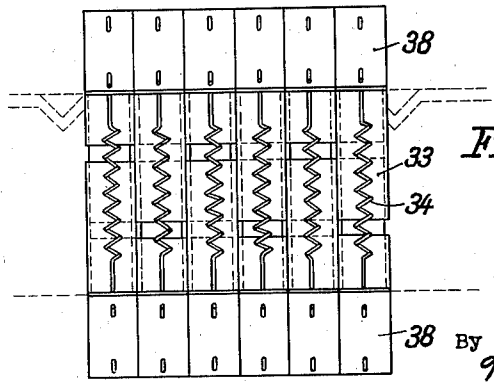


Fig.4

Inventor:
ALFRED KNUDSEN
By Morris & Bateman
ATTORNEYS

Patented June 27, 1939

2,164,247

UNITED STATES PATENT OFFICE

2,164,247

APPARATUS FOR THE CONTINUOUS DISTILLATION OF HIGH-BOILING HYDROCARBONS TO COKE

Alfred Knudsen, Astra (Chubut), Argentina, assignor to the firm "Astra" Compañia Argentina de Petróleo Sociedad Anónima, Buenos Aires, Argentina

Application February 10, 1937, Serial No. 125,166
In Germany June 20, 1936

4 Claims. (Cl. 202—98)

This invention relates to improvements in apparatus for the continuous distillation of high-boiling hydrocarbons to coke. More particularly, this invention concerns modifications of the apparatus claimed in Patent No. 2,006,273.

The present invention has for one of its objects to permit of a more complete utilization of heat in a distillation plant of the above kind. The plant modified according to the present invention may be employed advantageously wherever it is desired to distil to coke the viscous residue of a previously treated oil. This plant has furthermore the advantage that, due to more compact construction, a saving of constructional material is secured and less space is required.

Other objects and features of the present invention will appear from the following description.

A constructional form of the apparatus according to the invention is shown by way of example in the accompanying drawings, wherein

Figure 1 shows a longitudinal section through the plant,

Figure 2 shows a cross section, and

Figure 3 shows a longitudinal section through a sealing element, while

Figure 4 shows an outer view of the annular elements of the seals.

Referring to Figure 1, **10** is the furnace with the distillation chamber **1**, through which travels an endless chain arrangement **2** of containers **3**. The container chain is moved continuously by toothed driving wheels **12** and enters the distillation chamber **1** through the opening **7**, leaving it again through the opening **7a**. The toothed wheels **12** are driven by a main shaft **11** by means of a suitable motor drive.

The distillation chamber **1** is heated on all sides by means of burners **8**. The oil vapours are led through the suction conduit **13** to the rectifying columns **14**.

In front of the distillation chamber **1** is a filling chamber **6** for filling the containers **3** with the oil supplied by the filling device **29**. The containers **3** are filled automatically as soon as they come into the horizontal position. Before entering the distillation chamber, the containers pass over a short rail, not shown, which serves as a filling bridge. The filling chamber **6** is closed from the outside air by a casing **28**.

Adjoining the furnace is a steam chamber **5** which serves for hardening the coke residue and into which steam can be introduced by means of a supply pipe **37**. The steam chamber **5** is closed from the outside air by a casing **28a**.

At the inlet of the container chain **2** into the filling chamber **6** and the outlet of the container chain from the steam chamber **5**, permanently built-in sealing elements **31a** and **31b**, respectively, are provided.

These sealing elements (Figure 2) comprise a casing **35** enclosing a plurality of adjacent asbestos rings **33** provided with iron reinforcements. The inner surface of the asbestos rings **33** is lined with four thin, smooth steel plates **32**. Externally, springs **34** connected to form a ring by connecting pieces **38** are provided on the asbestos rings **33** and act upon the annular elements in such a manner that the plates **32** are pressed against the container surfaces **3** moving past them and fit tightly against them. The length of the sealing elements amounts to about ¾ of the length of a container, so that two transverse walls of the containers are always situated within the length of the sealing elements. The closure between the containers and the sealing elements is hermetic and resilient. In order to prevent with certainty any entry of air at these inlet or outlet places, steam is also supplied through nozzles **36**.

The containers **3** are filled in the chamber **6** by the filling device **29**, then pass through the opening **7** into the distillation chamber **1**, where their contents are distilled, then the containers **3** travel in a continuous movement through the opening **7a** to the steam chamber **5** where the coke is hardened, and finally they pass out into the open through the sealing elements **31b**. There, the coke residue is removed from the containers by an automatic device **30**. The device **30** for removing the coke comprises a milling head, which is introduced into the container. The rotary movement of the milling cutter loosens the coke which falls out by gravity.

A principal use of the new apparatus is for the distillation to coke of material immediately after the process producing such material, carried out in a preceding plant, the residue being then passed directly through the apparatus for continuous distillation. If for example a crude oil is vaporised in a tube furnace to an extent of 30–50%, the very viscous residue (70–50%) may be passed immediately, that is to say without any material loss of heat, into the apparatus for the distillation to coke and there converted to coke.

I claim:

1. Apparatus for the continuous distillation of high-boiling hydrocarbons to coke comprising, in combination, a furnace having an oil filling

chamber, a distillation chamber with two openings in the walls thereof, and a steam chamber, an endless chain of distillation containers having one of the stretches thereof arranged to pass continuously through said chambers and the other stretch thereof arranged to pass out of the steam chamber and into the filling chamber, all of said containers in the chain being adapted to receive oil, and sealing elements at the inlet for the container chain into the filling chamber and at its outlet from the steam chamber, said sealing elements cooperating with the containers of the chain and sealing the filling chamber and the steam chamber hermetically, the filling, distillation and steam chambers enclosing and hermetically sealing from the outer air, the entire extent of the container chain excepting the length of the stretch thereof between said sealing elements which is exposed to the outer air for the removal of the coke.

2. Apparatus for the continuous distillation to coke of high-boiling hydrocarbons comprising in combination, an endless chain of oil containers having oppositely disposed stretches, a furnace having a distillation chamber provided with two opposite openings through which travels continuously one of the stretches of the chain of containers, an oil filling chamber disposed in front of the distillation chamber and adapted to supply all of said containers with oil, a steam chamber disposed behind said distillation chamber, said filling and steam chambers enclosing the extremities of the chain and the steam chamber having an outlet and the filling chamber having an inlet for the other stretch of the chain, said outlet and inlet facing one another, and sealing elements at the inlet for the container chain into the oil filling chamber and at its outlet from the steam chamber, the said elements co-operating with the containers of the chain and sealing the filling and steam chambers hermetically, the filling, distillation and steam chambers enclosing and hermetically sealing from the outer air, the entire extent of the container chain excepting the length of the stretch thereof between said sealing elements which is exposed to the outer air for the removal of the coke.

3. Apparatus for the continuous distillation of high-boiling hydrocarbons to coke comprising, in combination, a furnace having an oil filling chamber, a distillation chamber with two openings in the walls thereof, and a steam chamber, an endless chain of distillation containers having an upper stretch arranged to pass said containers successively and continuously through said chambers, the filling chamber having an inlet through which the lower stretch of said chain enters and the steam chamber having an outlet through which the lower stretch of said chain passes out, said inlet and outlet being relatively close to and facing one another, all of said containers in the chain being adapted to receive oil, and sealing elements at the inlet for the lower stretch of the container chain into the filling chamber and at its outlet from the steam chamber and cooperating with the containers of the chain to seal the filling and steam chambers hermetically, the filling, distillation and steam chambers enclosing and hermetically sealing from the outer air, the entire extent of the container chain excepting a short length of the lower stretch thereof between said sealing elements which is exposed to the outer air for the removal of the coke.

4. In apparatus for the continuous distillation to coke of high-boiling hydrocarbons, the combination of a substantially air-tight furnace structure comprising an oil filling chamber, a distillation chamber and a steam chamber, an endless chain of distillation containers all adapted to receive oil, said chain having an upper stretch arranged to pass through said chambers, the filling chamber having an inlet for the entrance of the lower stretch of the chain and the steam chamber having an outlet through which the lower stretch of the chain passes therefrom, said inlet and outlet being located below the distillation chamber in close relation to and facing one another, and sealing elements at the inlet for the lower stretch of the container chain to said filling chamber and at the outlet for the lower stretch of the chain from said steam chamber, said sealing elements co-operating with the containers of the chain and sealing the structure hermetically, the filling, distillation and steam chambers enclosing and hermetically sealing from the outer air, the entire extent of the container chain excepting a short length of the lower stretch thereof between said sealing elements which is exposed to the outer air for the removal of the coke.

ALFRED KNUDSEN.