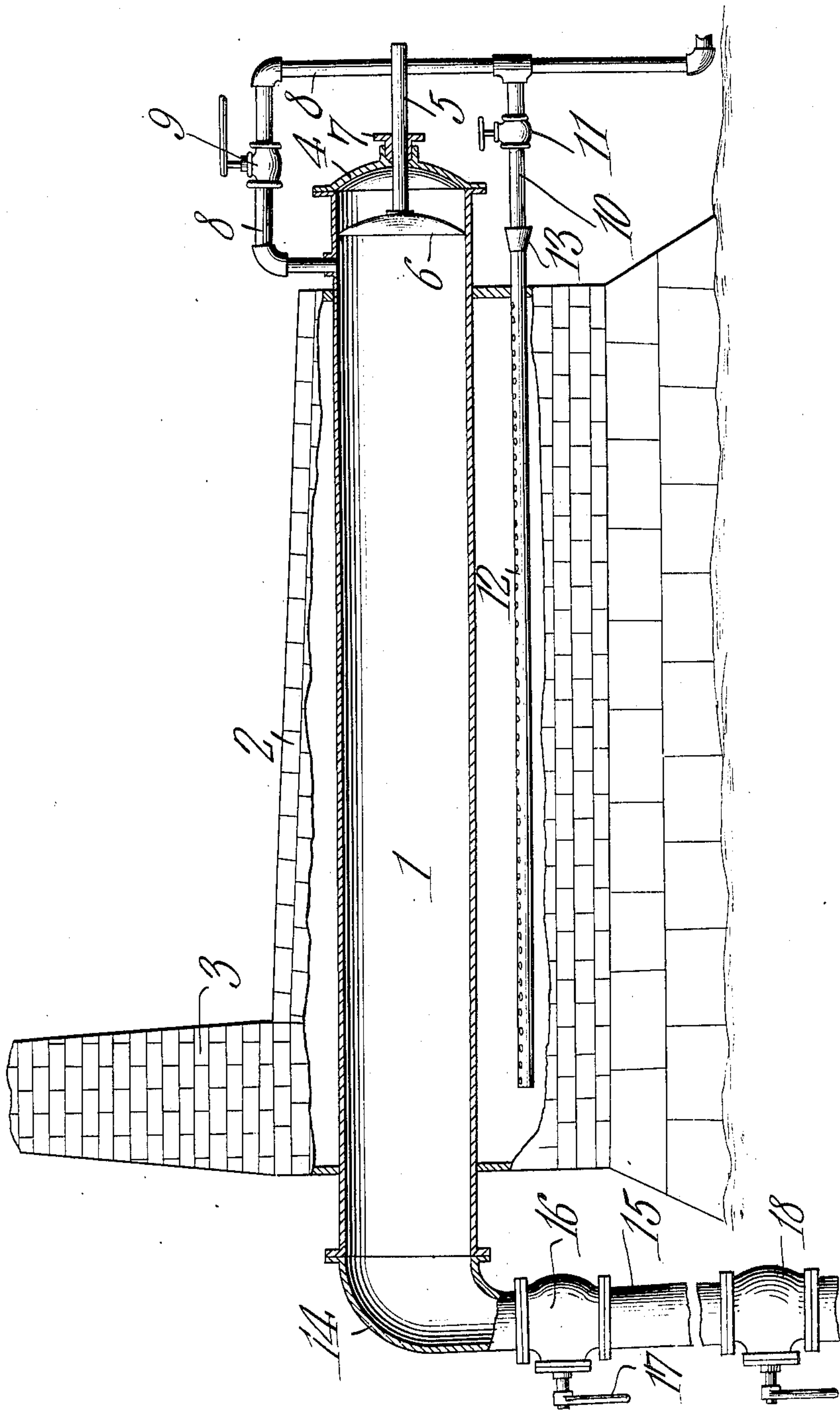


No. 877,596.

PATENTED JAN. 28, 1908.

A. D. PURTLE & I. E. ROWLAND.  
APPARATUS FOR PRODUCING CARBON BLACK.

APPLICATION FILED APR. 22, 1907.



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# UNITED STATES PATENT OFFICE.

ALBERT D. PURTLE AND IRVEN E. ROWLAND, OF SALEM, WEST VIRGINIA.

## APPARATUS FOR PRODUCING CARBON-BLACK.

No. 877,596.

Specification of Letters Patent.

Patented Jan. 28, 1908.

Original application filed December 11, 1906, Serial No. 347,313. Divided and this application filed April 22, 1907. Serial No. 369,593.

*To all whom it may concern:*

Be it known that we, ALBERT D. PURTLE and IRVEN E. ROWLAND, citizens of the United States, residing at Salem, in the county of Harrison and State of West Virginia, have invented a new and useful Apparatus for Producing Carbon-Black, of which the following is a specification.

This invention has reference to improvements in apparatus for the production of carbon black, and is a division of our application Serial No. 347,313, filed December 11, 1906, for process of making carbon black.

The object of the present invention is to provide an apparatus wherein a hydrocarbon gas, such, for instance, as natural gas, may be heated in a closed retort to a sufficiently high degree by heat obtained from a source exterior to the retort so that the hydrocarbon gas is decomposed and the carbon is deposited on the walls of the retort in a flocculent state, after which the deposited carbon is removed before it has undergone any changes.

The invention comprises a tubular retort, or a bank of such retorts, means for supplying gas such as natural gas thereto under pressure, and with an exterior heater preferably supplied from the same source of gas supply for heating the retort to a sufficiently high degree to cause the deposition on the interior walls of the retort of the carbon of the gas. The retort is provided with a means whereby the deposited carbon may be removed from the retort without the necessity of cooling the latter and with practically no interference with the continuous operation of the device.

The invention will be fully understood from the following detailed description taken in connection with the accompanying drawing forming part of this specification, in which,—the figure is a longitudinal section, partly in elevation, of an apparatus for the production of carbon black constructed in accordance with our invention.

Referring to the drawing, there is shown a long tubular retort 1 which, however, need not of necessity be circular in cross section. This retort is supported in a suitable furnace structure 2 provided with a stack 3 and preferably constructed of refractory material. The furnace 2 may be of such capacity as to contain any suitable number of retorts 1. The retort 1 projects beyond each end of the furnace 2 and at the end shown at the right side of the figure this retort is closed by a

tight cap 4 having a central perforation for the introduction of a rod 5 carrying at its end a scraper head 6 conforming in size and shape to the interior of the retort 1. The cap 4 where the rod 5 passes through the same is provided with a packing gland 7.

Connected to the retort 1 at the end projecting beyond the furnace 2 at the right-hand end of the figure, and which may be called the feed end of the retort, there is a pipe 8 coming from any suitable source, not shown, of gas supply, and this pipe includes a valve 9 by means of which the introduction of the gas coming through the pipe 8 into the retort may be regulated or stopped at will. The pipe 8 enters the retort at a point between the scraper 6, when in its most retracted position, and the discharge end of the retort. Branching off from the supply pipe 8 there is another pipe 10 including a valve 11, and this pipe 10 has a perforated extension 12 arranged within the furnace beneath the retort 1, so that gas coming from the supply pipe 8 may be burned beneath the retort and supply the necessary heat. In order that an intense heat may be generated by the burner formed by this perforated pipe 12, it is provided exterior to the furnace with an air induction device 13 of the ordinary type, whereby the burner operates as an ordinary Bunsen burner. The other end of the retort, which will constitute the outlet end thereof, is provided with a hood 14 terminating in a downwardly-extending portion connected to a pipe or conduit 15 through the intermediary of a valve 16 of large size, this valve being under the control of a manually operated handle 17. Another valve 18 is also interposed in the pipe 15 beyond the valve 16. It will be understood that beneath the pipe or conduit 15 conveyers may be located to carry the carbon formed in the retorts to a suitable packing room.

In using this apparatus for the production of carbon black a hydrocarbon gas is introduced through the pipe 8 under a considerable pressure, which may be varied within quite wide limits, and the higher the pressure the greater the amount of carbon deposited within a certain time. We have used pressures as high as one hundred and seventy-five pounds to the square inch and as low as one pound to the square inch, and have found that under the same degree of heat continued for the same length of time



the higher pressures gave the greater deposit of carbon. However, since the walls of the tubular retorts are weakened by the heat employed so that they are unable to resist so great a pressure as when cold, we find that a pressure of ten pounds to the square inch will be safe and efficient.

The temperature we use is sufficient to bring the retorts to a bright cherry red in color, which means that they are heated to about 800 degrees centigrade, but we are not confined to such a degree of heat since this may also be varied and we merely give it as an example of what we have found in practice to give satisfactory results. Now, when the retort has been filled with gas under pressure to the exclusion of air and the heat is applied thereto, the gas is decomposed into its constituents and the carbon is deposited on the interior walls of the retort in a flocculent form. If the carbon remained under the action of the heat for any considerable time it would be changed and would no longer possess the characteristics of the carbon which is produced in accordance with our invention, which carbon black, as we produce it, is of a flocculent nature and intensely bluish-black in color. Now, while the heat is maintained and while the gas is still in the retort under pressure and while the deposition of carbon is progressing, the scraper 6 is operated so as to scrape the deposited carbon away from the walls of the retort and push it toward the discharge end of the retort, when the valve 16 may be opened and the carbon will fall through the conduit 15 until stopped by the other valve 18. On closing the valve 16 the valve 18 may be opened, and, the carbon will fall either into a suitable receptacle or on to a suitable conveyer as before mentioned, and be carried to a packing room. The scraper 6 may be made to fit the retort fairly well and the scraping action may be performed rapidly. The two valves 16 and 18 prevent any material amount of air to enter into the interior of the retort so that there is no danger of producing explosive mixtures.

The process is to all intents and purposes a continuous process and may be carried on with practically no interruption, or if there be interruption it is but momentary during the opening of the valve 16 for the escape of the carbon, and such interruption occupies but a very small fraction of the time employed in the operation of the apparatus.

By the improved apparatus the carbon black may be removed at such frequent intervals as to preclude any possibility of injury by a too long continued subjection of the deposited carbon to the heat of the fur-

nace, and there is no necessity of reducing the heat or allowing the furnace to cool off.

It will be understood, of course, that the scrapers may be operated by mechanical connections to a suitable source of power, but such connections have not been shown in the drawings since they form no part of the present invention. It will also be understood that we may use natural gas directly from the wells when the pressure is sufficient, but when the natural pressure is too low we may use suitable compressing means to produce the requisite pressure.

We claim:—

1. An apparatus for the production of carbon black, comprising a closed retort of approximately the same diameter throughout, means for introducing hydrocarbon gas therein under pressure, means within the retort for removing the carbon deposited on the interior walls thereof and conveying it to one end of the retort, a valve at the discharge end of the retort, and a conduit and valve connected to the first-named valve for permitting the escape of deposited carbon without admitting air to the retort.

2. An apparatus for the production of carbon black from a hydrocarbon gas, comprising a tubular retort, a gas feeding pipe connected thereto near one end thereof, a hood covering the other end of the retort, a valve connected to said hood, a conduit leading from said valve, a valve interposed in said conduit, and a scraper of a diameter approximately the same as the interior diameter of the retort and movable longitudinally in said retort from a point on the side of the feed pipe remote from the discharge end of the retort to said discharge end.

3. An apparatus for the production of carbon black comprising a tubular retort, a furnace inclosing the same except at the ends, a gas burner within the furnace and in operative relation to the walls of the retort, a scraper within the retort and movable longitudinally with reference to the same, a gas supply pipe connected to one end of the retort exterior to the furnace and also connected to the burner, and a hood connected to the other end of the retort exterior to the furnace and provided with a downwardly-directed delivery end and a valved conduit leading from said delivery end of the hood.

In testimony that we claim the foregoing as our own, we have hereto affixed our signatures in the presence of two witnesses.

ALBERT D. PURTLE.  
IRVEN E. ROWLAND.

Witnesses:

R. T. REEP,  
F. S. LANE.