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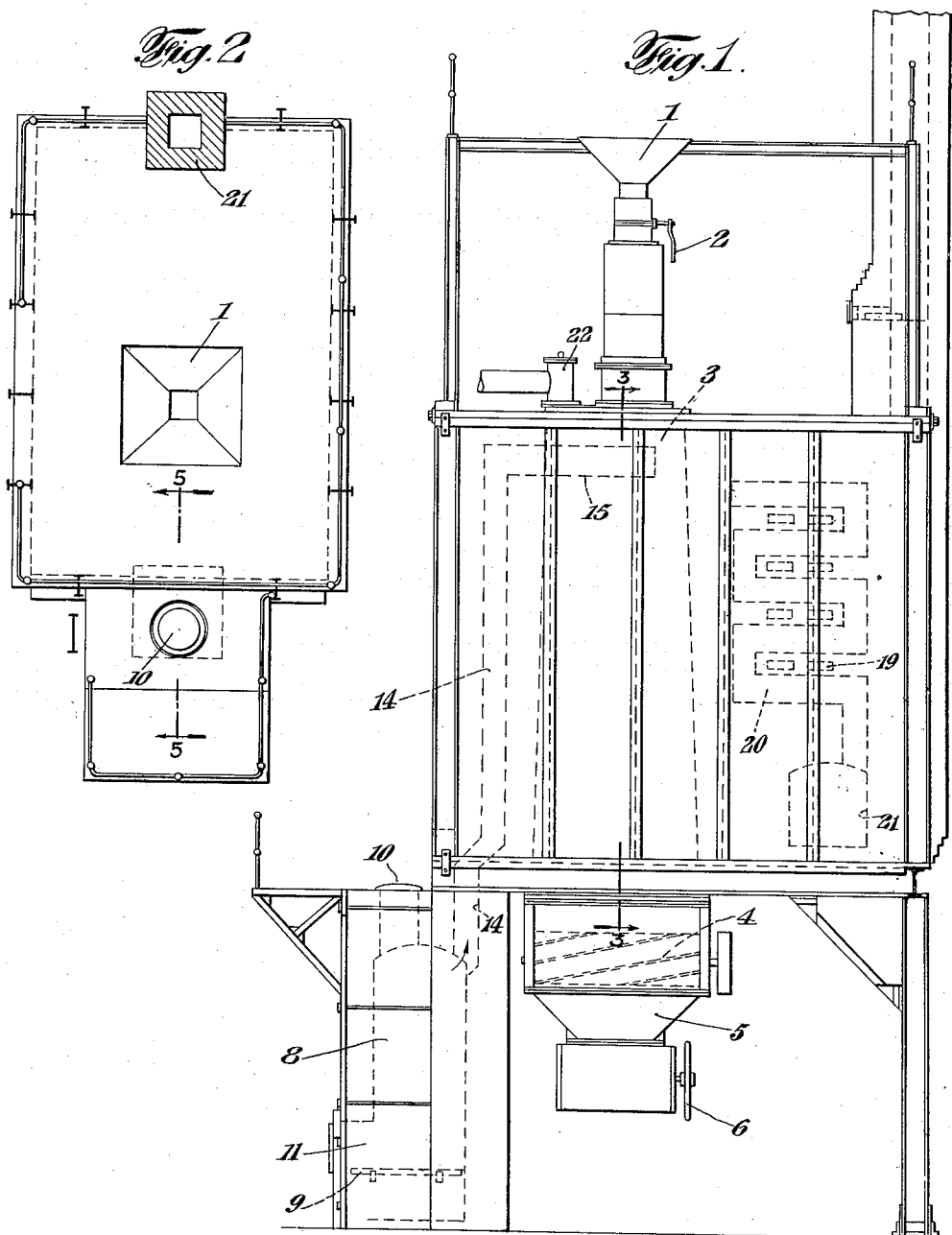
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M. C. WHITAKER

PROCESS OF CARBONIZATION

Filed July 11, 1919

5 Sheets-Sheet 1



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By his Attorneys
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Aug. 12, 1924.

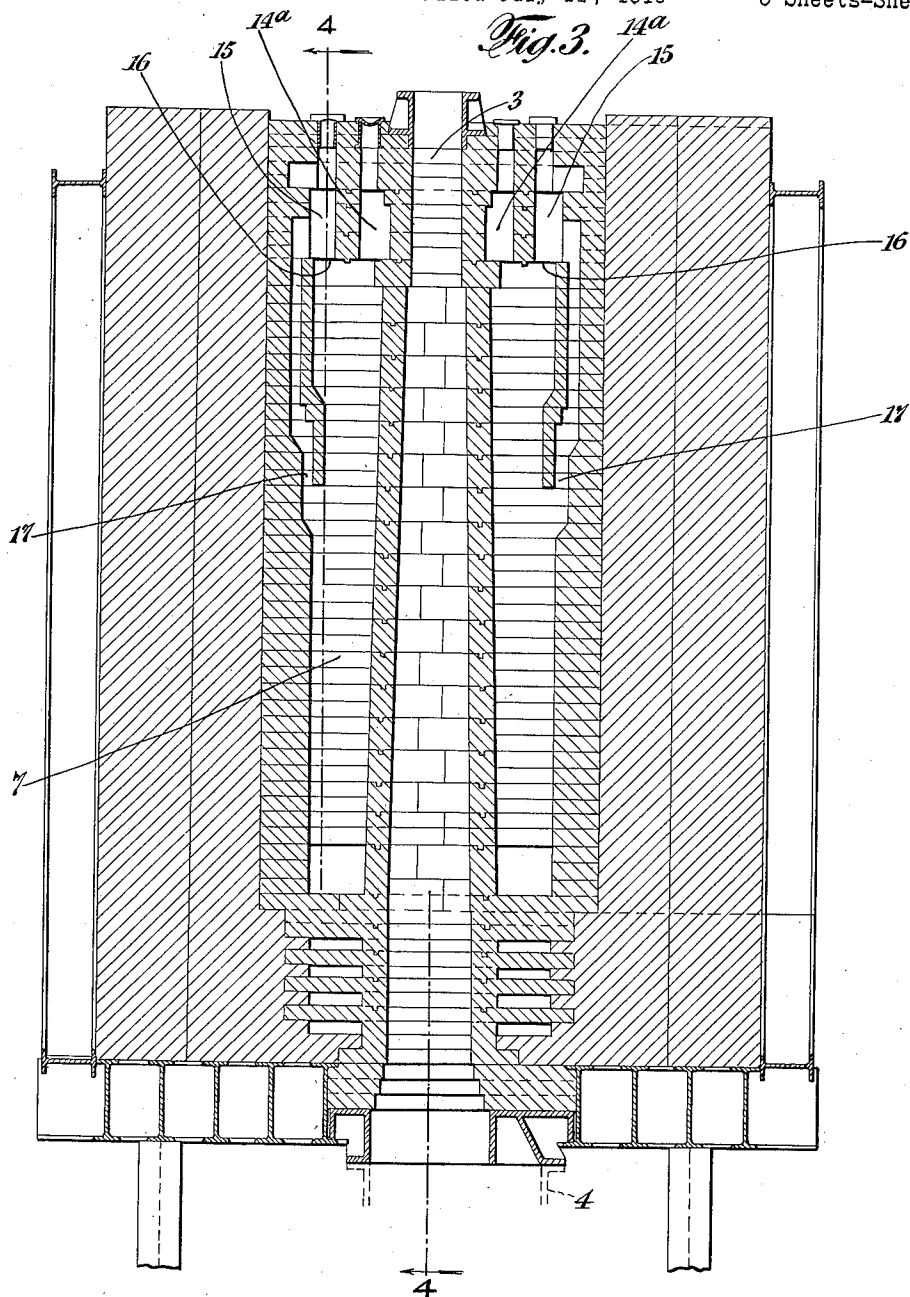
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5 Sheets-Sheet 2



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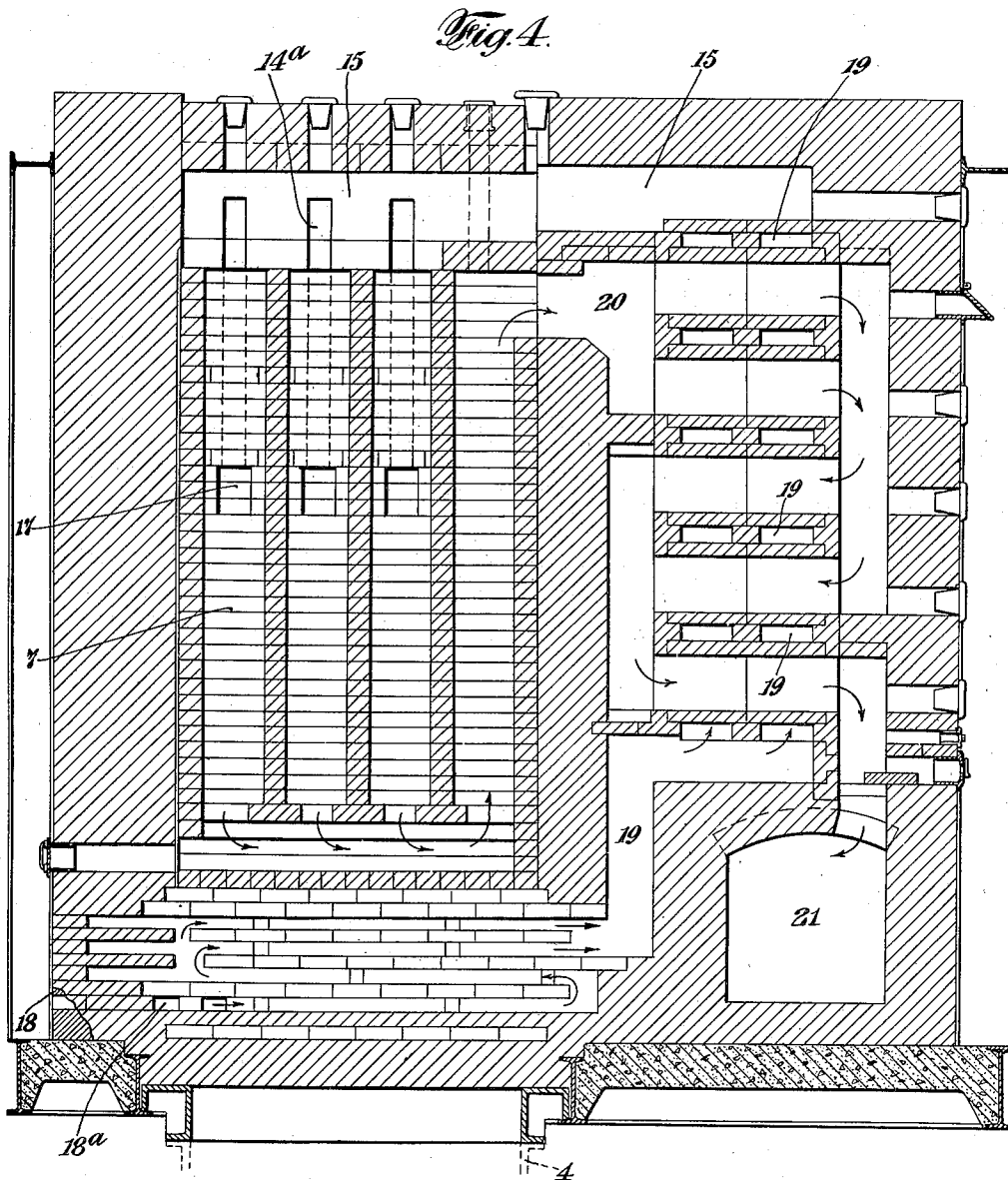
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PROCESS OF CARBONIZATION

Filed July 11, 1919

5 Sheets-Sheet 3



By *his* ^{Inventor} *Milton C. Whitaker,*
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Aug. 12, 1924.

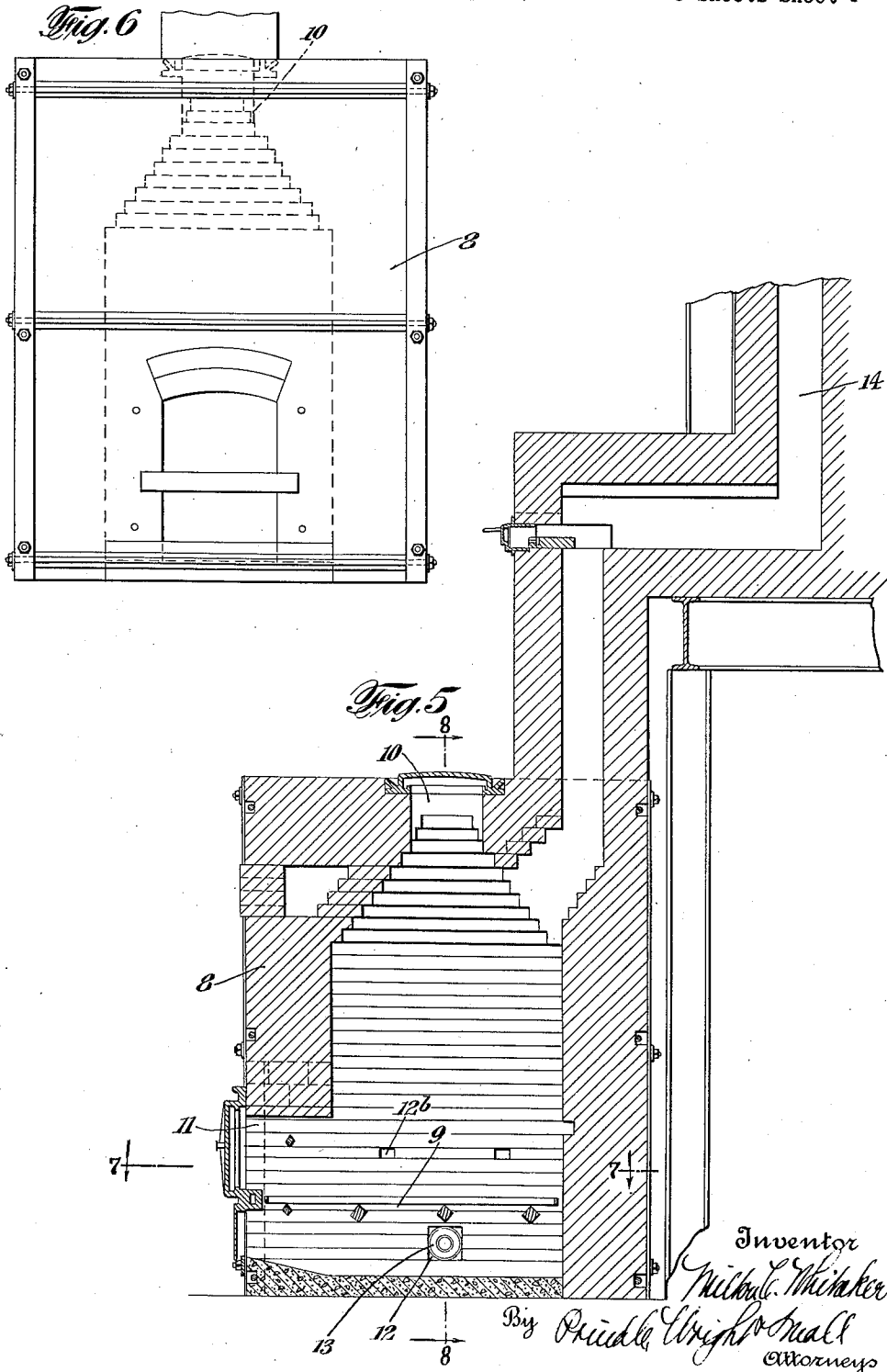
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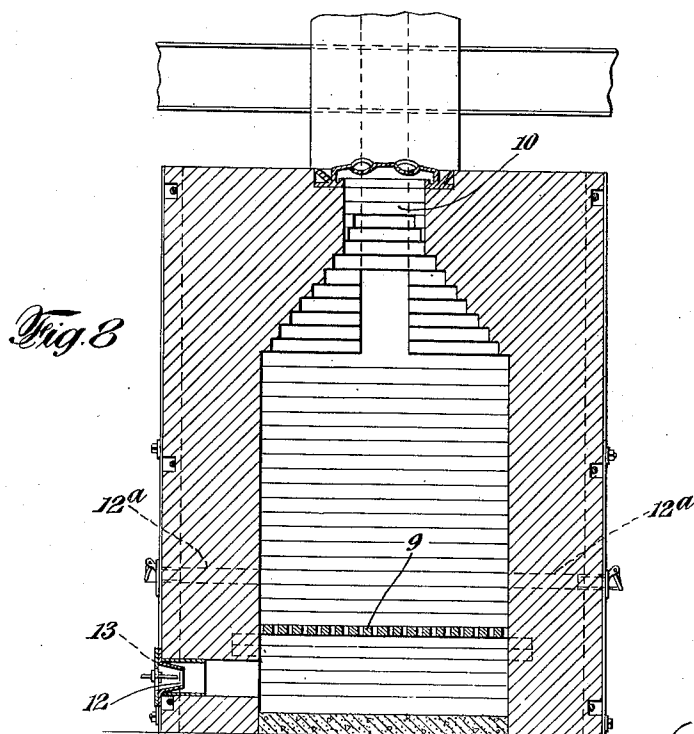
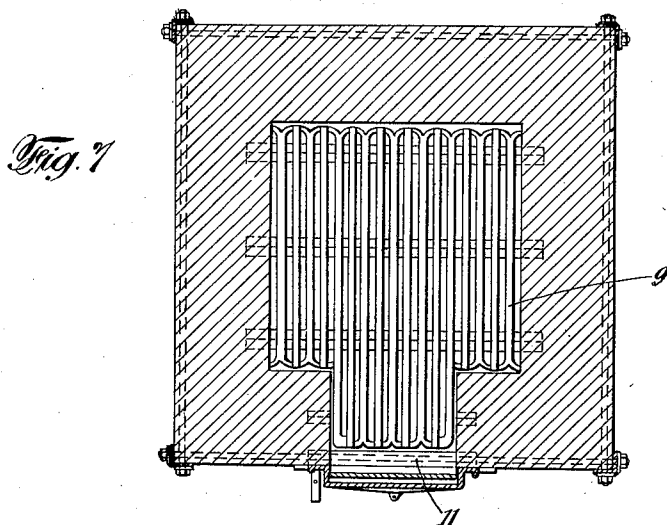
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PROCESS OF CARBONIZATION

Filed July 11, 1919

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE.

MILTON C. WHITAKER, OF NEW YORK, N. Y., ASSIGNOR TO U. S. INDUSTRIAL ALCOHOL CO., A CORPORATION OF WEST VIRGINIA.

PROCESS OF CARBONIZATION.

Application filed July 11, 1919. Serial No. 310,131.

To all whom it may concern:

Be it known that I, MILTON C. WHITAKER, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented a certain new and useful Improvement in Processes of Carbonization, of which the following is a specification.

My invention relates particularly to a process of producing decolorizing carbons and the product thereof.

An object of my invention is to provide a process of treating distillery waste and analogous and equivalent materials to provide a porous carbon having a very pronounced decolorizing function or effect. Still another object of my invention is to provide a process by means of which a larger yield of the decolorizing carbon may be obtained.

Further objects of my invention will appear from the detailed description thereof contained hereinafter.

While my invention is capable of being carried out in many different ways, for the purpose of illustration I shall describe only certain ways of conducting the same, and while it is capable of being carried out in connection with many different types of apparatus, I have shown only one type of apparatus in the accompanying drawings, in which—

Figure 1 is a side elevation of an apparatus used in accordance with my invention.

Figure 2 is a plan view of the same.

Figure 3 is a detailed vertical section taken on line 3—3 of Fig. 1.

Figure 4 is a vertical section taken on line 4—4 of Fig. 3.

Figure 5 is a fragmentary section taken on line 5—5 of Fig. 2.

Figure 6 is a front elevation of the portion of the apparatus for producing heating gases.

Figure 7 is a horizontal section taken on line 7—7 of Fig. 5, and

Figure 8 is a vertical section taken on line 8—8 of Fig. 5.

In the preferred embodiment of the invention I treat the distillery waste to produce therefrom an extraordinarily efficient decolorizing carbon, as will appear from the following description. The distillery waste utilized in my process can be dried slop,

slop evaporated to a density of 25° to 40° Bé., or such evaporated slop admixed with other carbonizable materials, or inert materials, such as sawdust, nut shells, ground bone, dried blood, lime, kieselguhr, fuller's earth or limestone. These added materials may be used not only to provide a body to the evaporated slop so as to give the same the form of a solid and to facilitate the feeding thereof, but may be used also to improve the decolorizing carbons produced in accordance with my process. When such added materials are used, they may be added in any quantity desired, but for example, may be added to a sufficient extent to change the form of the evaporated slop from that of a liquid to that of a solid.

In the use of the apparatus shown distillery waste of this character either in the form of a liquid or partially or completely dried is fed into a hopper 1, having a feeding valve 2 which delivers into a retort chamber 3 having a progressively increasing diameter towards the bottom. The retort is discharged by a continuously rotating feeding screw 4 driven from any suitable source of power, which delivers into a hopper 5 below the same, arranged to be intermittently dumped, when desired, by means of a hand valve 6 located thereon. The retort 3 is shown as heated by means of burning producer gas in passageways 7 located around the same. The producer gas for this purpose is formed in a furnace 8 having a grate 9 for supporting a body of coke and charging and clean-out openings 10 and 11. Air is forced into the furnace 8 through an opening 12 by a steam jet 13. Peepholes 13^a are also provided around the furnace. A movable brick producer gas damper 13^b controls the passage of the producer gas out of the furnace 8. The producer gas thus formed and containing considerable carbon monoxide is conducted by a passageway 14 and passages 14^a to the passageways 7, where they meet an incoming current of heated air supplied from two passageways 15, and discharged through openings 16 and 17. The heated air for this purpose is brought from an air port 18 and openings 18^a through a series of passageways 19, and conducted to the passageways 15. The incoming air conducted through this series of passageways is heated by reason of the fact that the products of

combustion pass adjacent to the same through a series of passageways 20 leading from the passageways 7 to a stack 21. The volatile materials produced by the heating of the distillery waste, and which will contain oils, water, ketones, ammonia, amines, hydrogen, carbon dioxide, methane, etc., are carried off by an outlet pipe 22 leading out of the top of the retort, and which may conduct the same to any suitable point for recovery by condensation or treatment in any other desired manner. The uncondensed gases and vapors may, for example, be scrubbed, washed and separated for use.

Inasmuch as the materials to be carbonized containing a large percentage of water are fed into the retort at the point where the retort is heated to the highest temperature by the combustion of the producer gas, that is to say, at the top of the retort, a very high yield of the decolorizing carbons is obtained, owing to the fact that while the highest temperatures are being applied, these high temperatures can not raise the materials under treatment to an excessive temperature, because the temperature is controlled by the evaporation of the water from the same. In fact, the temperature in the materials in this part of the retort is below the temperatures in the remainder of the retort because of this evaporation of the water present. Furthermore, by driving off the water initially and completely before the carbonizing temperatures are applied to any part of the materials under treatment, there is no danger of loss due to the production of water gas from the carbonized product. Again by feeding the materials from the top towards the bottom of the retort, the entry of the air with the materials being introduced is practically entirely eliminated, as the gaseous products, such for example as oils, water, ammonia, ketones, amines, hydrogen, carbon dioxide, methane, etc., will by their presence at the inlet end of the retort exclude the entry of the air. In this way, loss due to oxidation by the presence of the air is obviated. Furthermore, by carrying out the treatment in this way, the decolorizing carbons are produced in accordance with a continuous process involving continual feeding of the materials to be treated into the apparatus, and the continuous discharge of the same from the lower end of the retort. Furthermore, by treating the materials in this manner and in a retort of an elongated character, the materials receive a uniform treatment, and the decolorizing carbons produced thereby are consequently of a uniform quality.

The temperature applied to the upper end of the retort 3 is approximately 1100° C., while the temperature applied to the lower portion thereof is approximately 1000° C. At no point in the retort, however, is the

material under treatment heated to a temperature higher than 1500° C. As the carbon is removed from the retort, it is leached with warm water to recover the soluble salts, such for example as potassium chloride, potassium sulphate and potassium carbonate, and the carbon is thereafter washed with a small quantity of dilute hydrochloric or sulphuric acid in order to remove the remaining traces of carbonates. Thereafter, the carbon is commonly dried by the application of heat. In order to reduce the carbon to particles of the desired size it may be ground immediately after its removal from the retort, or after the drying of the carbon following the leaching and treatment with the dilute acid, so as to obtain granules, all of which will pass through a sieve four meshes to the inch. The comminuted dried carbon is then screened so as to obtain the different grades having different degrees of fineness, and so as to be applicable to the various industrial arts. The coarser grades are suitable especially for operations involving percolation in the decolorizing of materials passing through the same, and the finer grades are used in filter presses by mixing them with the materials to be decolorized, and then passing the mixture through filter presses. It should be noted that all of the mentioned preferred temperatures are merely approximate, and these temperatures may be varied between considerable limits to produce desired results, variations depending upon the care with which the retort is heated and upon the requirements of materials in hand.

The decolorizing carbon thus obtained is much more effective in the decolorizing of materials of various kinds, as for example, petroleum oils, dyestuffs, cottonseed oils, sugar solutions, etc., than previous decolorizing carbons, as for example, bone black, inasmuch as the same decolorizing effect can be obtained by the use of a smaller quantity of the carbon made in accordance with my invention. This is important as some decolorizing operations require a large quantity of the decolorizing carbon, and it is this which largely determines the market price of the decolorized product. Furthermore, the carbon made in accordance with my invention is more porous than other decolorizing carbons, as for example, bone black, and the materials to be decolorized can, therefore, be passed through the carbon much more readily and effectively.

While I have described one example of my invention above in detail, I wish it to be understood that many changes may be made therein without departing from the spirit thereof.

I claim:

1. The process of producing porous decolorizing carbon having highly active sur-

faces, comprising feeding distillery waste into a highly heated zone to drive off the water, and then feeding it into a zone of a lesser temperature to complete the carbonization.

2. The process of producing decolorizing carbon comprising feeding distillery waste into the top of a retort, heating the retort and maintaining the highest temperature around the top thereof, and progressively removing the carbon which is formed from the bottom of the retort.

3. The process of producing decolorizing carbon comprising evaporating distillery waste, feeding it into the top of a retort, heating the retort and maintaining the highest temperature near the top thereof, and progressively removing the carbon from the bottom of the retort.

4. The process of producing decolorizing carbon, comprising evaporating distillery

waste, adding filling materials thereto in order to supply body to the mixture, feeding the mixture into the top of a retort, heating the retort and maintaining the highest temperature at the top thereof, and progressively removing the carbon from the bottom of the retort.

5. The process of producing decolorizing carbon comprising evaporating distillery waste to about 25° to 50° Bé., adding filling materials to give body to the mixture, feeding the mixture into the top of a retort, heating the retort and maintaining the highest temperature around the top thereof, and progressively removing the carbon from the bottom of the retort.

In testimony that I claim the foregoing, I have hereunto set my hand this 3rd day of July, 1919.

MILTON C. WHITAKER.