

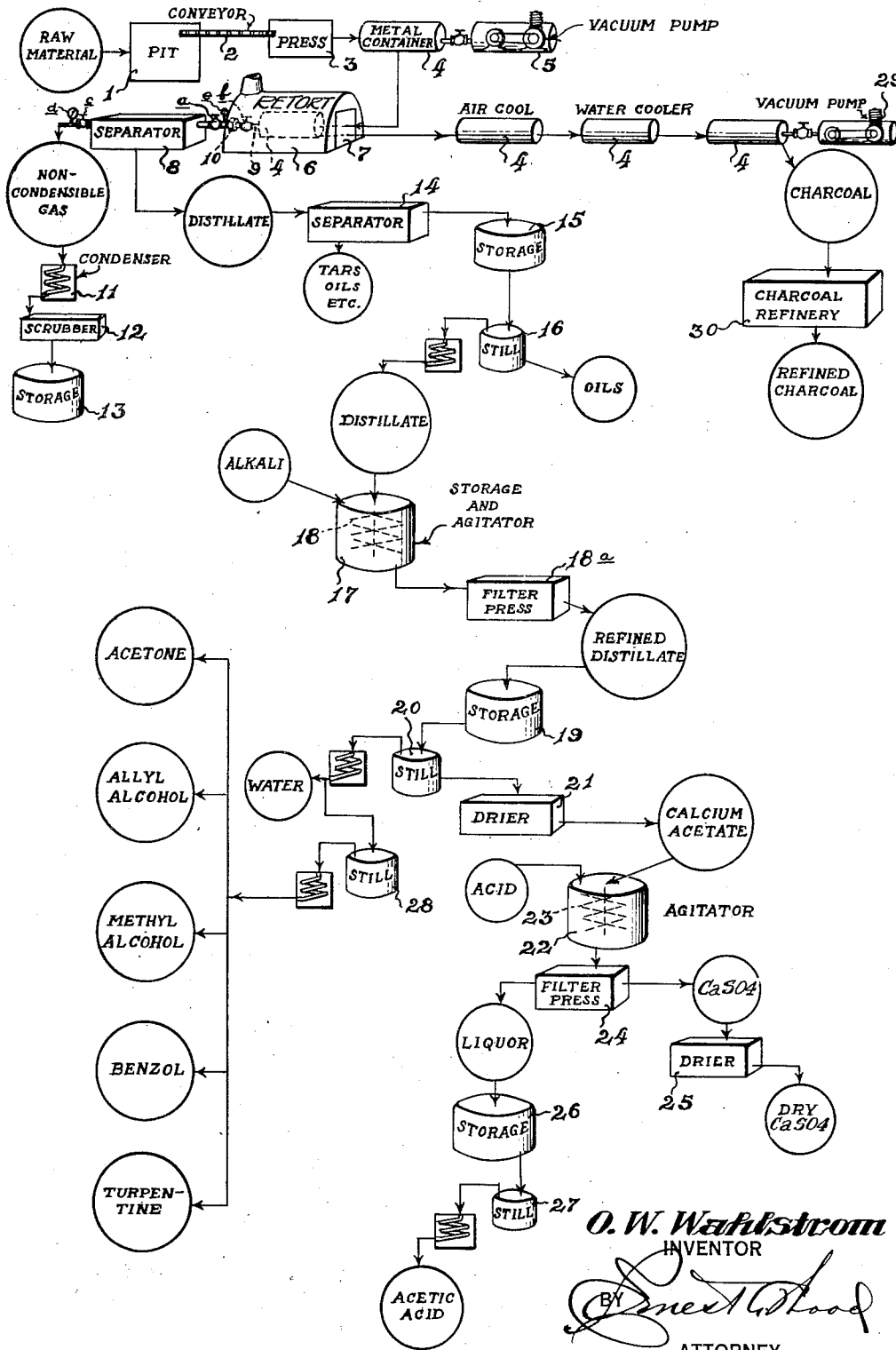
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O. W. WAHLSTROM

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PROCESS OF DESTRUCTIVE DISTILLATION AND CARBONIZATION OF WASTE MATTER

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UNITED STATES PATENT OFFICE

OSCAR W. WAHLSTROM, OF DALLAS, TEXAS

PROCESS OF DESTRUCTIVE DISTILLATION AND CARBONIZATION OF WASTE MATTER

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This invention relates to destructive distillation and it has particular reference to a method or process for the destructive distillation and carbonization of all types of vegetable matter and waste matter, and the recovery therefrom of valuable tars, oils, acids, alcohols and other chemical products, together with artificial gas, and charcoal of a high quality.

The principal object of the invention is the provision of means whereby the raw material can be handled in an efficient manner, and thus avoid the usual difficulties encountered in the handling of bulky material.

Another object of the invention is the provision of means whereby the various products obtained can be separated and purified to meet market requirements.

Broadly, the invention comprehends the provision of a new and improved method or process involving the several steps necessary for the efficient and economical extraction of commercially valuable tars, oils, acids, alcohols, gases, charcoal and other products from vegetable waste matter and other combustible matter.

One of the novel steps of the method or process includes the compressing and binding of the raw material into bales of such compact size as to permit of their introduction into a metal container of a size and shape which may be readily received and processed in a retort so designed as to permit of the ready destructive distillation of the raw material. The steps further include the separation, fractional distillation, refining and storing of the resultant products of the process for ultimate dispensation.

The drawing diagrammatically illustrates the several steps employed for carrying out the herein-described method or process.

Referring more in detail to the drawing, the raw material, which may be any kind of combustible material such as rubbish, garbage, refuse, sawdust or the like is first received into a pit 1, in which a separation of products of a non-combustible nature is made, either by hand or by mechanical means. The combustible material is dried, if necessary, and then carried by a conveyor 2, to a

press 3, where it is compressed into bales and bound. The bales may be either cylindrical or any other suitable shape.

The bales are then conveyed to a suitable loading platform and loaded into metal containers 4, which are of sufficient size to accommodate the desired charge of material. The containers may be either cylindrical or any other suitable shape. After the loading is completed the door at the charging end of the container 4 is sealed air tight and the air in the metal container is withdrawn by means of the vacuum pump 5.

The metal container is next conveyed into a retort 6 equipped with a quick opening door 7, which is opened to permit the container to be placed within the retort in the desired position, and closed immediately thereafter. The retort 6 may be fired with gas, oil or other fuel and is so designed to give a uniform temperature around the metal container.

Immediately after the container 4 is charged into the retort, it is connected to a separator 8 by means of a pipe 9 which projects through the back end of the retort, and a quick connecting union 10. It will be noted that the pipe 9 is provided with a valve *b* while a valve *a* is provided on the opposite side of the union 10. The valves are both located exteriorly of the retort 6. A valve *c* is disposed in the main line of the separator 8 leading to the condenser and this valve, together with valves *a* and *b* are closed to prevent exchange or loss of gases and are opened after the union 10 is connected. To insure against indrawing of gas into the container 4 from the separator 8, due to the pressure differentials, pressure gauges *d* and *e* are disposed on either side of the separator 8, as shown. Valve *b* is first opened and the valve *a* is not opened until pressures are equalized on both sides of the separator, after which valve *c* is opened.

During the destructive distillation of the charge, both condensible vapors and non-condensable gases are released, and separated one from the other in the separator 8. The non-condensable gases are piped to a water or air cooled condenser 11 and through a

scrubber 12 of suitable design and into a gas holder 13 from which the gas is withdrawn for use in the retort 6 or for other purposes.

The remaining distillate is conveyed to a separator 14, in which a removal of various tars and oils is effected, after which the distillate is conveyed to a storage tank 15 and then into a still 16 where it is distilled. The residuum of this distillation consists of a large number of known oils which can be recovered from a conglomerate mass of vegetable and animal waste matter. These oils are further treated to reduce them to satisfactory commercial products. The distillate is conveyed to a storage tank 17 equipped with an agitator 18, and may be neutralized with an alkali. The distillate is then conveyed to a filter press 18a, or other suitable equipment for the mechanical separation of solids from the distillate. The refined distillate, the fractions of which will be later defined, is conveyed to a storage tank 19 for subsequent treatment.

The distillate is then conveyed to a still 20 from which various chemical products and water are recovered. The residuum from the still 20 is conveyed to a drier 21 and dried, the product being calcium acetate in the event lime is used for neutralization in the tank 17.

The calcium acetate is treated with an acid in a tank 22 equipped with an agitator 23 and as soon as the chemical reaction between the calcium acetate and the acid is complete, the resulting liquor is run through a filter press or centrifuge 24, the product not passing through, or the solids, being calcium sulphate in the event sulphuric acid is used in treating the calcium acetate. The calcium sulphate is conveyed to a drier 25 and dried, after which it is ground and sacked or barreled in accordance with market requirements.

The liquor passing through the filter press or centrifuge 24 is conveyed to a storage tank 26 and subsequently distilled in a still 27, securing acetic acid.

The distillate secured from the still 20 includes a number of chemical products and water. These products are fractionated in a still 28 to meet market requirements, and include acetone, allyl alcohol, methyl alcohol, benzol, turpentine and other chemical products.

The charcoal remaining in the metal container after the condensible and non-condensable gases have been driven off, is retained in the metal container 4. The latter is then disconnected from the separator 8. The valve *a* is closed near the separator 8 preventing the loss of gases in the separator and the valve *b* near the metal container is closed to prevent the admission of air or the escape of any gases, after which the door 7 at the front of the retort 6 is opened and the metal container quickly withdrawn, per-

mitting the immediate reloading of the retort with a freshly charged container by means of a monorail system or other suitable equipment, not shown.

The withdrawn metal container 4, being loaded with charcoal having a high temperature is conveyed to a point where it is permitted to cool atmospherically for a period of time and subsequently conveyed to a spray pond where water is sprayed over the container until the contents are sufficiently cool to effect their withdrawal from the container.

Subsequently, the container is conveyed to a suitable unloading platform, and connected to a vacuum pump 29 to recover any non-condensable gases remaining in the container. These gases are subsequently conveyed to the storage tank 13. Afterwards, the door at the discharge end is opened and the contents discharged. The container is then available for a fresh charge and repetition of the process.

The charcoal is refined in a refinery 30 by pulverization, magnetic separation, suitable screening, aspiration and other standard or conventional methods for the refinement of charcoal to meet market requirements, after which the product is sacked or barreled.

The invention has been described with great particularity for the purpose of teaching the specific application thereof, but it will be understood that all or any one of the several steps of the method herein defined are subject to slight changes and modifications without departing from the spirit or intent of the invention as set forth in the appended claims therefor.

What is claimed is:

1. The hereindescribed method of destructive distillation of conglomerate vegetable and animal waste material, characterized by initially compressing the material into bales for confinement, in sealing the compressed material in a container, in introducing the sealed container into a retort, in heating to effect decomposition of the material therein and volatilization of the condensible and non-condensable volatile constituents, in releasing pressure accumulating within the container and subsequently withdrawing the container from the retort, and finally in recovering charcoal from the residuum.

2. The hereindescribed method of obtaining various products from conglomerate vegetable and animal waste material, characterized by initially compressing the material into bales for confinement, in sealing the bales in a container, in introducing the container into a retort, in heating to effect decomposition of the material therein and destructive distillation of the volatile constituents, in withdrawing the sealed container from the retort, and finally in recovering charcoal from the residuum.

3. The hereindescribed method of destructive distillation of garbage characterized by compressing said garbage, into bales and introducing the same into a sealed container, in
5 creating a vacuum in said sealed container about said bales to remove air, in subjecting said garbage in said container to the action of heat and in driving off vapors and gases by pressure created in the container by the de-
10 composition of said garbage in said container, in moving the container out of the influence of said heat, in atmospherically cooling the container, and finally in recovering charcoal from the residuum.

15 4. A method for obtaining various products from garbage and other conglomerate vegetable and animal waste material by destructive distillation, characterized by compressing said waste material into bales and
20 introducing the same into a sealed container, in introducing the sealed container into a heated retort, in heating to effect decomposition of the material and volatilization of the volatile constituents, and thus condensing
25 and separating the condensible volatile constituents, in moving the container out of the retort, and finally in recovering charcoal from the residuum.

5. A method for decomposition of rubbish,
30 refuse, garbage, and other conglomerate waste material, characterized by compressing the material into bales for confinement, in sealing the compressed material in a container, in creating a vacuum in said container
35 about said bales, in introducing the container into a retort in heating the retort, in driving off gases and vapors by pressure created in the container by the decomposition of the material therein, in condensing said vapors,
40 in separating the condensate into its constituents, in removing said container from said retort, and finally in recovering charcoal from the residuum.

In testimony whereof I affix my signature.

45 OSCAR W. WAHLSTROM.

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