

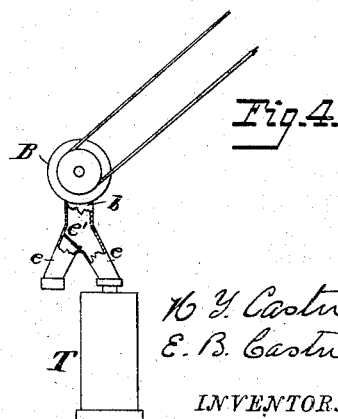
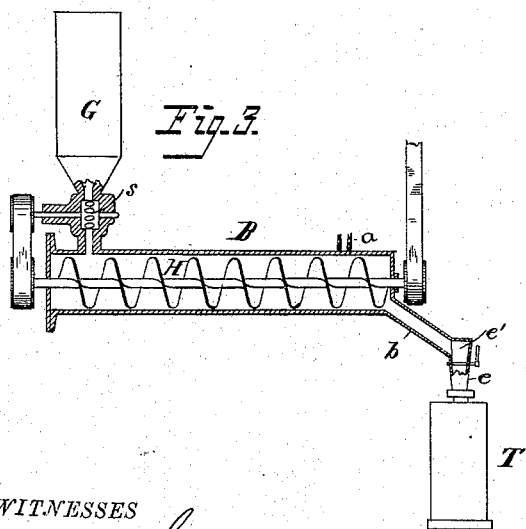
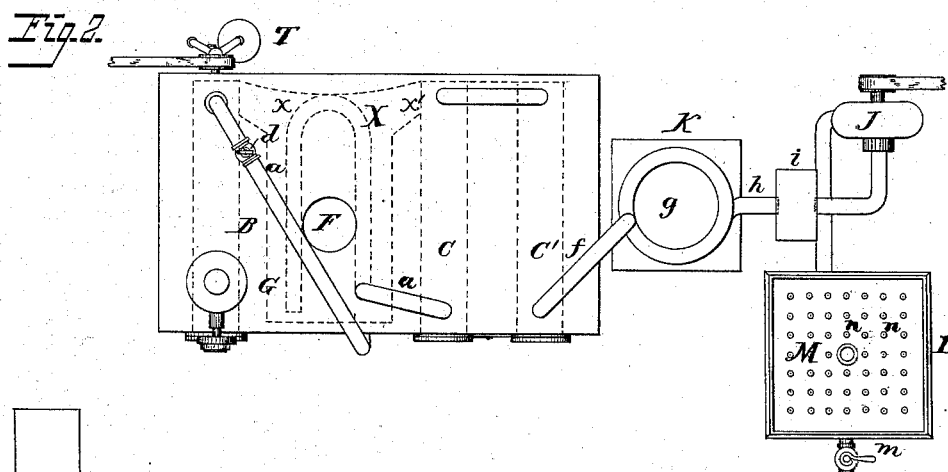
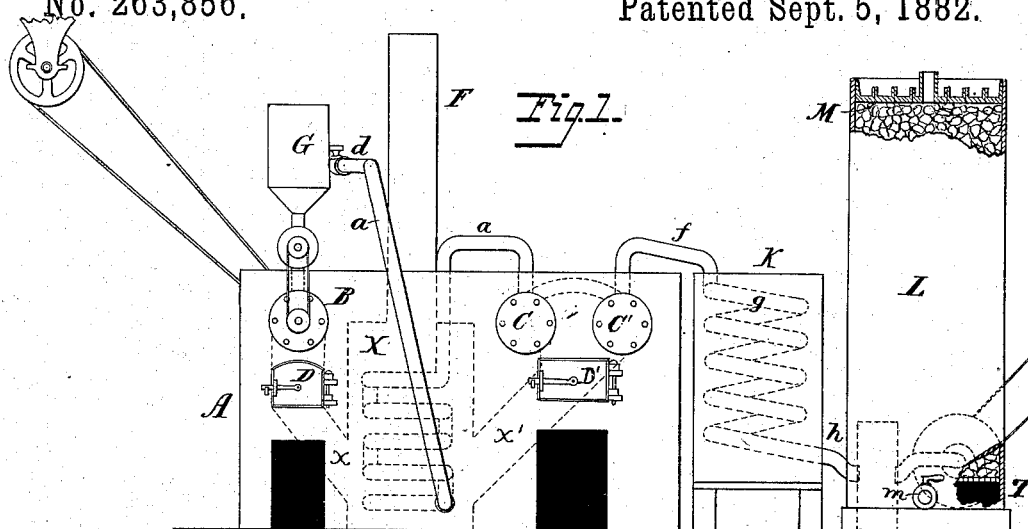
(No Model.)

H. Y. & E. B. CASTNER.

MANUFACTURE OF AMMONIA AND BONE BLACK.

No. 263,856.

Patented Sept. 5, 1882.



WITNESSES

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# UNITED STATES PATENT OFFICE.

HAMILTON Y. CASTNER AND EDWIN B. CASTNER, OF NEW YORK, N. Y.

## MANUFACTURE OF AMMONIA AND BONE-BLACK.

SPECIFICATION forming part of Letters Patent No. 263,856, dated September 5, 1882.

Application filed July 24, 1882. (No model.)

### *To all whom it may concern:*

Be it known that we, HAMILTON Y. CASTNER and EDWIN B. CASTNER, citizens of the United States, and residents of the city, county, and State of New York, have invented certain new and useful Improvements in the Manufacture of Ammonia and Bone-Black, of which the following is a specification.

Our invention relates to the manufacture of ammonia and bone-black; and it consists in a process, and also in an apparatus, hereinafter fully described, whereby we are enabled to secure a superior article of bone-black, and obtain a very large percentage of ammonia in a form readily available for future conversion; also securing final products free from bone, oil, and tar. An important feature is the continuity of the process, whereby a large percentage of ammonia is secured and a uniform grade of black produced.

Our process consists essentially in first passing crushed bone continuously through a heated vessel or cylinder, thereby charring the bone, then conducting it without exposure to air into an air-tight receptacle, in drawing the gaseous products from the cylinder, combining them with air, passing the combined gases through heated pipes, then over heated slaked lime, and finally cooling the gases and bringing them in intimate contact with an acid, thereby forming salt of ammonia in solution. By this process the production of the bone-black and the salts of ammonia is rendered continuous, the loss of time, labor, and heat resulting from intermittent processes is avoided, and a much larger percentage of valuable products is secured.

Different appliances may be employed in carrying out the process. In the drawings we show an apparatus which has proved to be the most efficient, Figure 1 being a front elevation, in part section, of the apparatus; Fig. 2, a plan; Fig. 3, a longitudinal section of the carbonizing-cylinder and feed appliances; and Fig. 4, a rear view of the cylinder, its outlets, and bone-black-receiving vessel.

The outer walls, A, of the apparatus inclose flues, chambers, and fire-places, as hereinafter described, and support three or any desired number of hollow vessels, B C C', of any suitable shape, cylinders being shown, each extend-

ing from the front to the back, the cylinders C C' being connected together at or near the rear ends. The cylinder B is the carbonizer, and is arranged above a fire-place, D. The cylinders C C' are above a fire-place, D', both fire-places communicating through a flue, x x', with a central chamber, X, (shown in dotted lines, Fig. 1,) from which the products of the combustion of the coal escape to an uptake, F.

Above the cylinder B is arranged a receptacle, G, from which the ground or broken bone is fed by a feed-roll, S, into the cylinder at the front end, and within the cylinder the bone is carried, by a revolving screw, N, or other suitable appliance, along the bottom of the cylinder to the rear, the heat thoroughly charring the bone and eliminating the volatile portions, which escape through a pipe, a. As the access of air to the heated bone-black discharged from the rear end of the cylinder would cause the instant burning of the bone, it is necessary to exclude the air, which we effect by collecting the particles in a closed receptacle, T, and to maintain the continuity of the operation without using too large a receptacle we provide the discharge-pipe B with two forks or branches, e e, each with a coupling to connect it to the receptacle T, and with a switch-valve, e', by means of which the black may be directed to either branch, so that when a receptacle, T, is filled the flow may be sent into another receptacle communicating with the other branch, while the first is removed, cooled, and emptied.

In the pipe a, receiving the gases from the cylinder B, is an air-inlet, d, into which air will be drawn, together with the gases from the cylinder B, by an exhaust-fan, J, or other exhaust apparatus, as hereinafter described. The pipe a extends downward to the bottom of the chamber X, and is then formed into coils Z, (dotted lines, Figs. 1 and 2,) of any suitable form, so as to expose a large surface to the heat produced from fires D and D' for the purpose of oxidizing the hydrocarbons and reducing the nitrogen compounds to a simple form.

The pipe a, leading from the coil Z, extends to and connects with the front end of one of the cylinders C C'. These cylinders are partially filled with slaked lime, part of which combines with the hot gases flowing from the

pipe *a*, forming, with portions of said gases, a carbonate of lime, the nitrogenous gases being simultaneously converted into ammonia by the hydrogen of the decomposing hydrate of lime.

5 The ammoniacal gas, together with part of the products of combustion of the hydrocarbon while in the coil *Z*, passes into a pipe, *f*, which is formed into a worm, *g*, and arranged in a tank, *k*, through which cold water constantly

10 flows, thus cooling the gas and condensing the water resulting from the extraction of water from the lime, and from the charring of the bone and the combustion of the volatile products. The lime which has become partially

15 carbonated may be withdrawn from the cylinders, reslaked, and used again until completely saturated with carbonic acid.

Several cylinders *C* may be arranged and connected, so that one or more may be emptied

20 and refilled while the gas is directed to the others to avoid interrupting the process. The gas and liquid from the coil *g* pass through a pipe, *h*, which is connected with a small tank, *i*, to receive the liquid, which consists of water

25 holding in solution carbonate of ammonia formed in the cylinders *C* *C'* and the condenser *g*, and constituting one of the products of the process. The uncondensed ammonia and other gases passing from the tank *i* and received by

30 the exhaust-fan *J*, which exerts a suction on the whole apparatus, are driven into a chamber at the bottom of a tower, *L*, which contains a mass of coke or other suitable material, through which the gas flows upward, while sulphuric

35 or hydrochloric acid of moderately concentrated strength flows downward, the ammonia-gas being absorbed by the acid to form sulphate or chloride of ammonia in a solution, which is discharged through a cock, *m*. The gas which

40 has been deprived of ammonia by the acid passes out of the top of the tower. The acid solution which is drawn off at the cock *m* is pumped back to flow down the tower again and take more ammonia, which operation is

45 repeated until the acid has become saturated or neutralized.

To insure a uniform, steady flow of the acidulated liquor, a tank, *M*, is placed at the top of the tower, and a series of hollow nipples, *w*,

50 extend upward from the bottom of the tank to a uniform height. The liquor flows into the end of the nipples and is evenly dispersed over the coke.

We do not limit ourselves to the use of an absorbing apparatus of the kind described, as

55 various other forms may be employed, and other details of our apparatus may be varied while carrying out the principle of our process.

Any hydrate of an alkali will be an equivalent of the lime in the process described.

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It will be apparent, where it is desired only to manufacture ammonia, guano, hair, or other material rich in nitrogen may be used in place of bone.

65 We are aware that in the formation of ammoniacal products from bone air has been introduced into the calcining-retort, and the

gaseous and vaporous products escaping from the retort have been conducted over highly-heated lime and through a spray of acidulated

70 water; but our invention is distinguished from such treatment by the admission of the air to the vapors and gases after the same have left the calcining-retort, whereby the final product is continuously secured in a more perfect con-

75 dition and in larger quantities.

We claim—

1. The improvement in the manufacture of bone-black and ammonia, consisting in charring the bone in closed vessels without access

80 of air, and subsequently combining air with the volatile portions from the bone, heating the mixed gases, and then passing such gases over hot slaked lime through a cooler, and then into intimate contact with acid, substan-

85 tially as set forth.

2. The process herein described for manufacturing ammonia, which consists in passing the bone or like nitrogenous material continuously through a highly-heated closed cham-

90 ber, the gases developed being simultaneously conducted from the heated chamber and mingled with air, substantially as and for the purpose specified.

3. In the manufacture of ammonia, charring the material, oxidizing the gases by passing the same, with air, through heated pipes, and decomposing the nitrogenous gases, and forming ammonia by passing the said gases over

95 hot slaked lime, substantially as set forth.

4. In apparatus for the manufacture of ammonia from bone and like material, the combination of a closed retort, a pipe for conducting the gases and vapors therefrom, said pipe provided with an air-induction orifice, and a

100 detachable closed receptacle for the reception and cooling of the material which has been heated in the retort, substantially as and for the purpose specified.

5. The combination, with the closed retort

110 having the screw-conveyer arranged therein, of the branched discharge-pipe having a valve arranged to control the branch pipes alternately, and the detachable cooling-receptacle, substantially as and for the purpose specified.

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6. In an apparatus for the treatment of bone and similar material and the manufacture of ammonia, the combination of a closed retort having a vapor or gas pipe provided with an

120 air-inlet, a closed receptacle for receiving the contents of the retort, a heating-worm connected with the vapor-pipe of the retort, and one or more lime-retorts connected with the heating-worm, substantially as and for the purpose specified.

125

7. The combination, with the carbonizing and lime cylinders, of a pipe, *a*, having an air-inlet, and formed into coils arranged within a heating-chamber, for the purposes set forth.

8. The combination, with the carbonizing

130 and lime cylinders and connecting-pipe and heating-coil, of an air-inlet and an exhaustor, for the purposes set forth.

9. The combination of the carbonizing and

lime cylinders, condensing-coil, exhaust and converter, and appliances whereby the gas from the coil is brought into intimate contact with acidulated fluid, as set forth.

- 5 10. The combination of the carbonizing-retort and appliances for feeding the material continuously, the pipe *a*, having an air-inlet, and the lime-retorts, condensing-coil, and absorption and exhaust apparatus, as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HAMILTON Y. CASTNER.  
EDWIN B. CASTNER.

Witnesses:

JNO. LEONARD,  
F. S. WEEMAN, Jr.