

(No Model.)

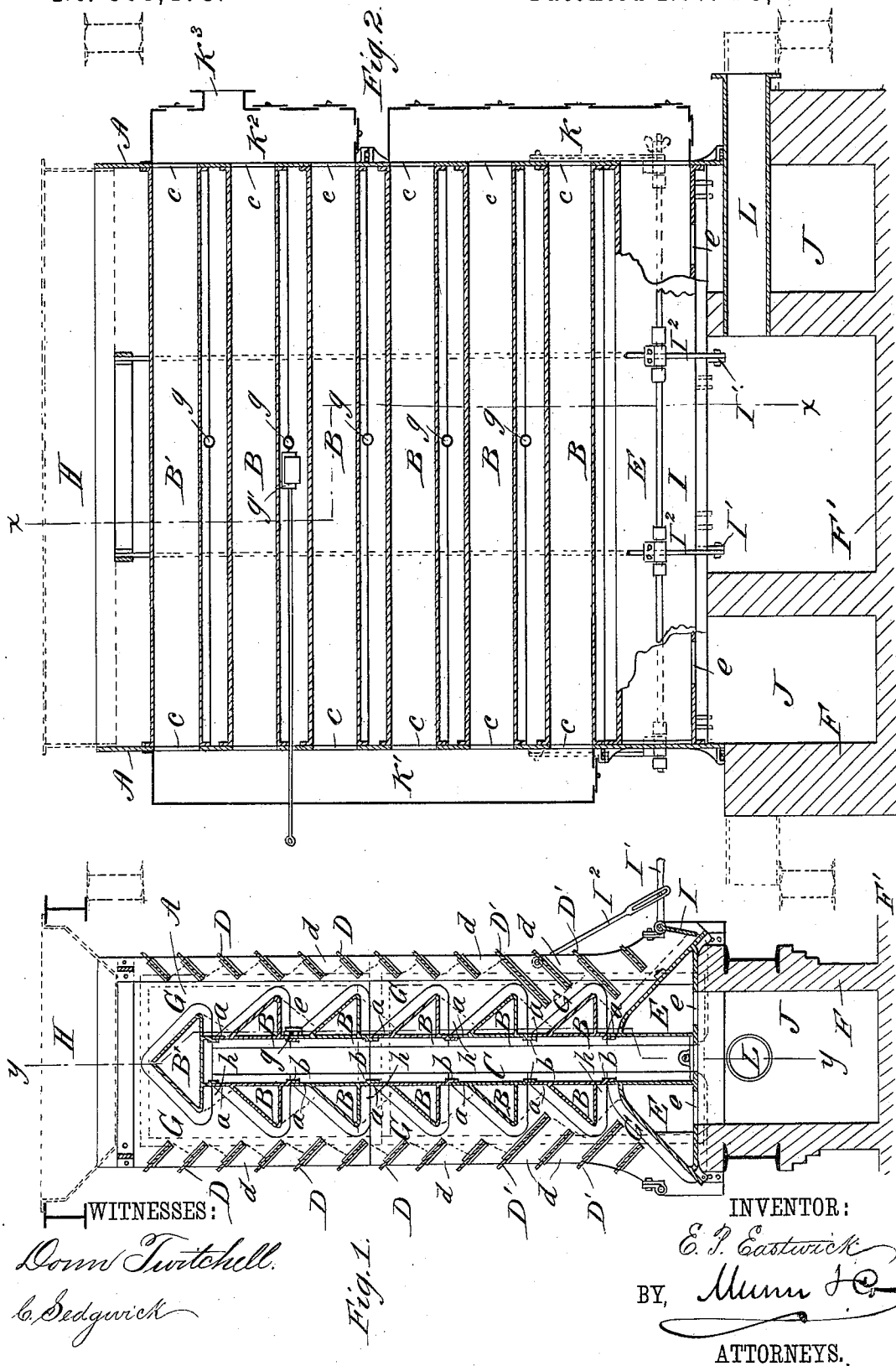
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E. P. EASTWICK.

BONE BLACK DRIER.

No. 308,475.

Patented Nov. 25, 1884.



(No Model.)

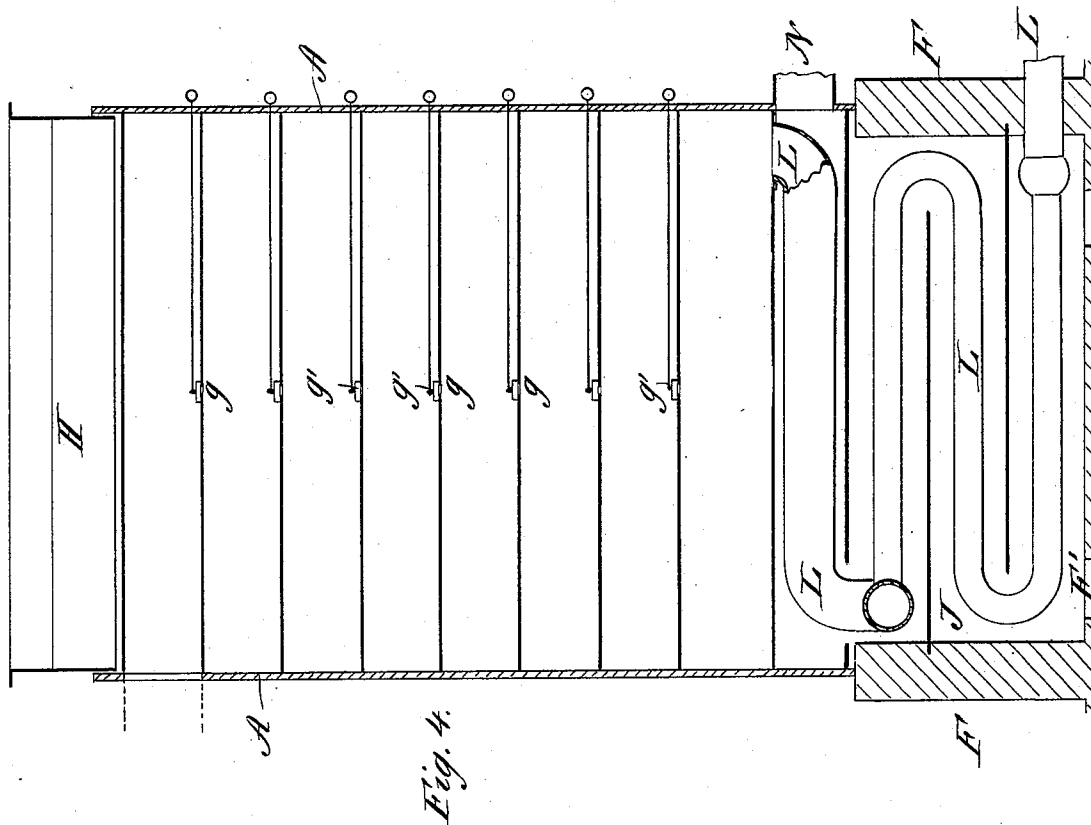
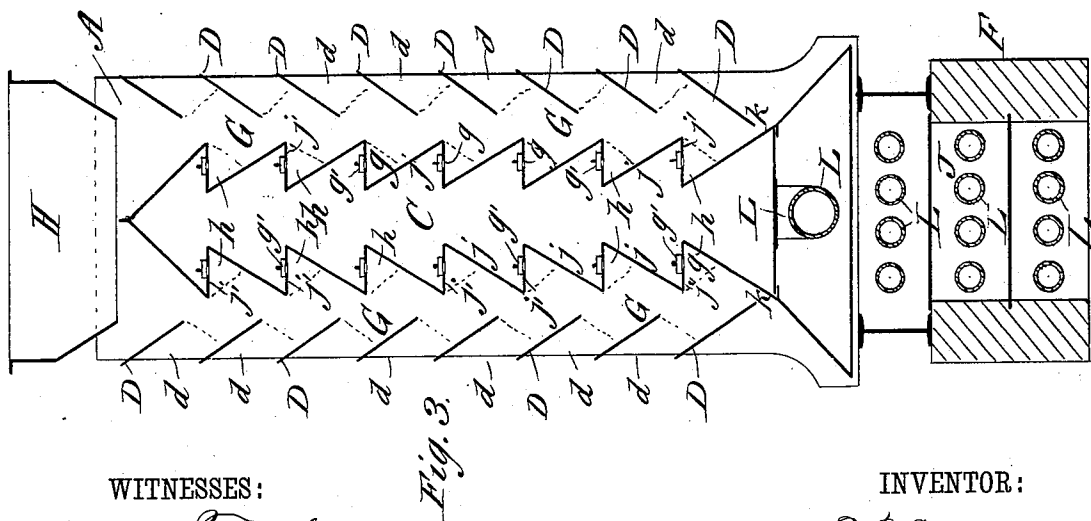
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WITNESSES:

Wm Twitchell

C. Sedgwick

INVENTOR:

E. P. Eastwick

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ATTORNEYS.

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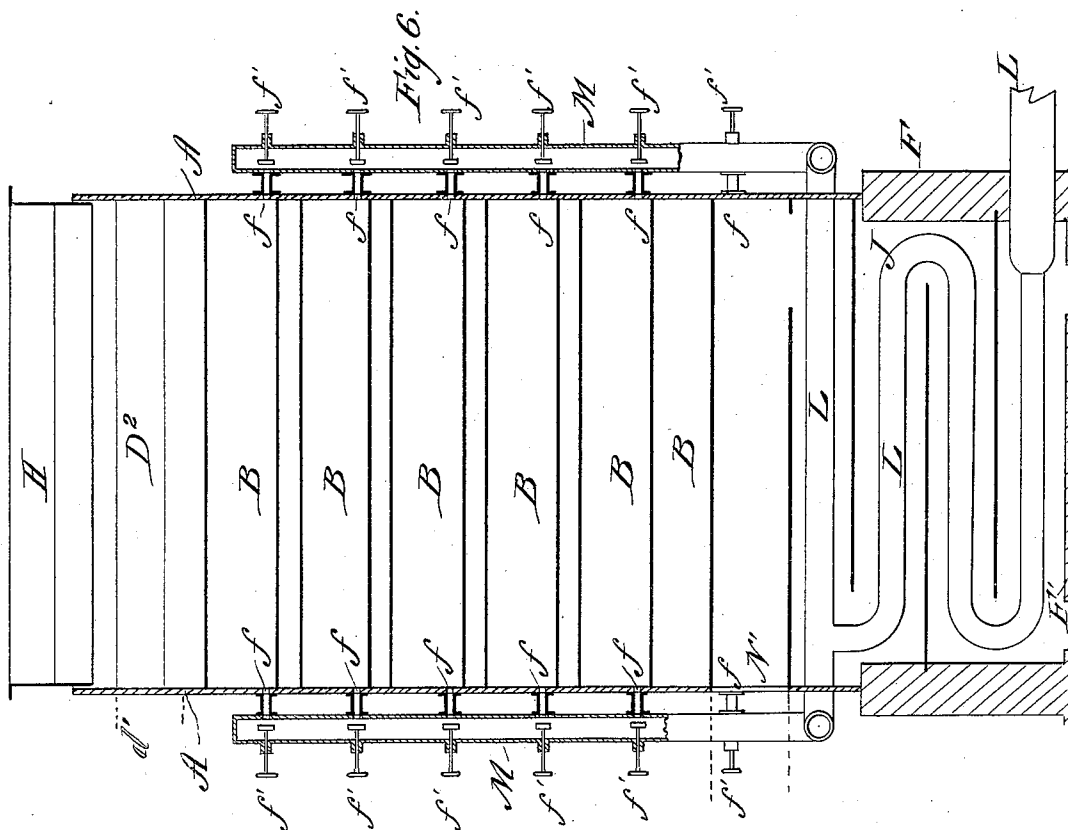
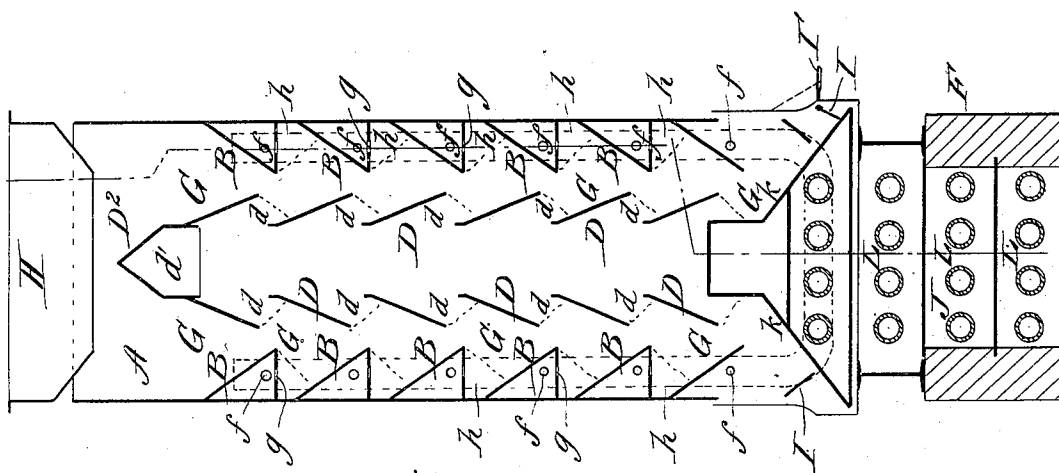
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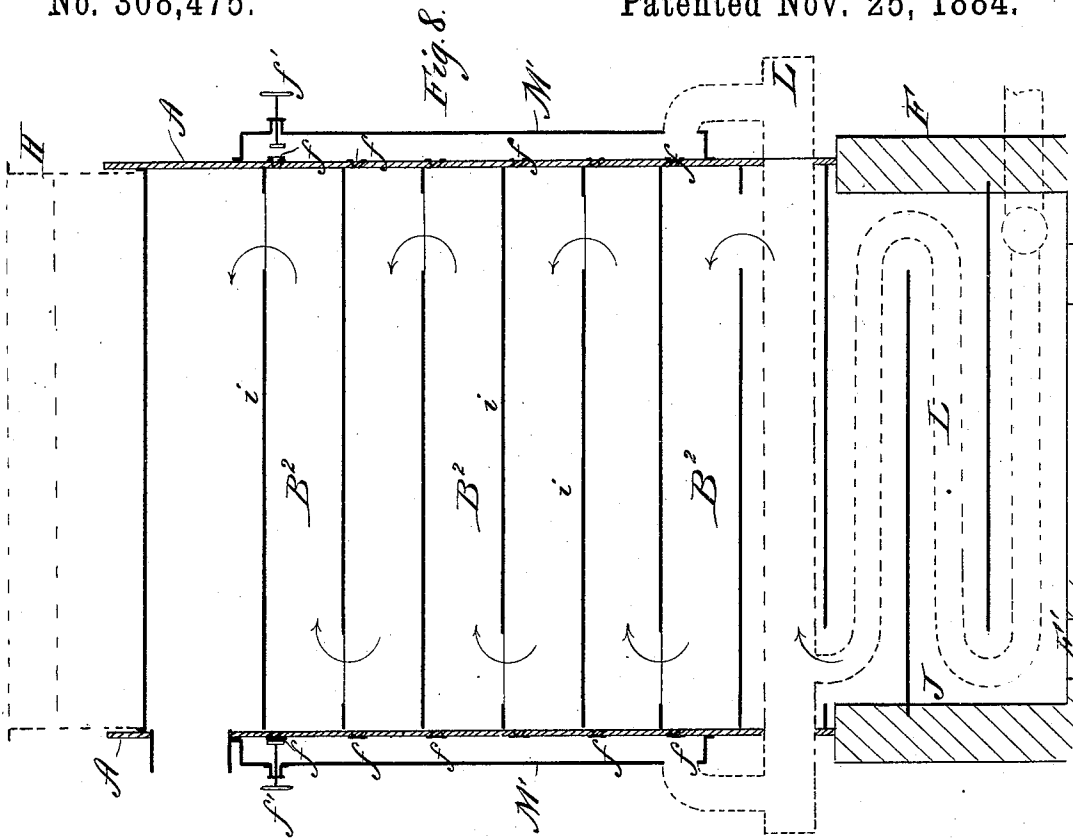
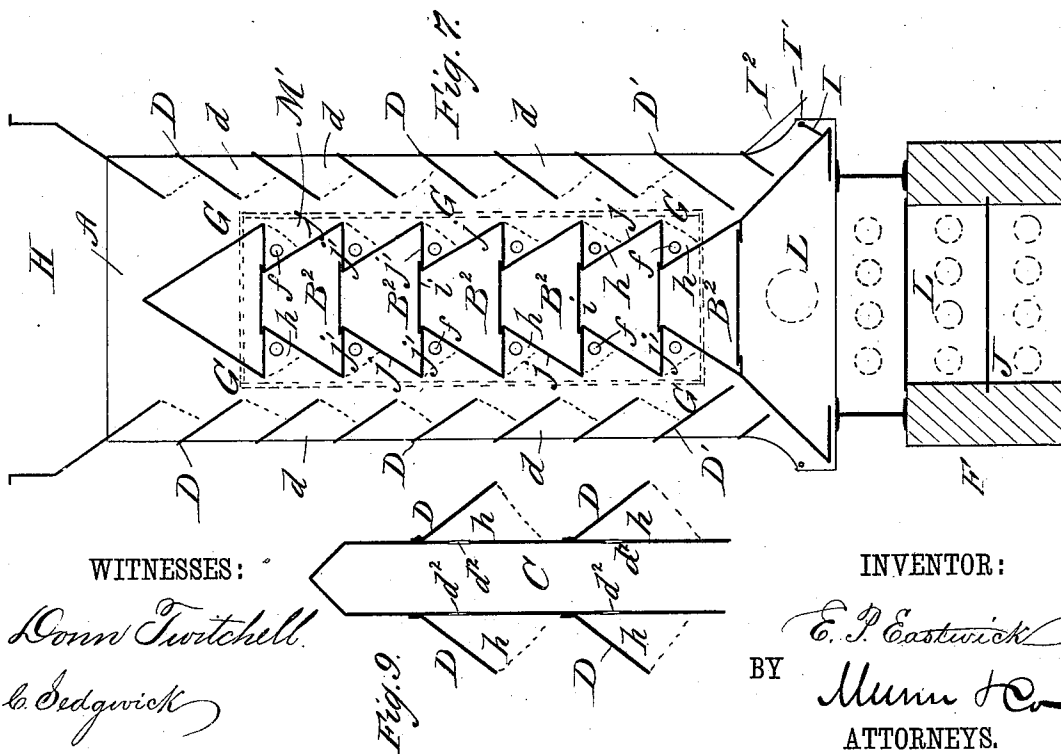
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UNITED STATES PATENT OFFICE.

EDWARD P. EASTWICK, OF NEW YORK, N. Y.

BONE-BLACK DRIER.

SPECIFICATION forming part of Letters Patent No. 308,475, dated November 25, 1884.

Application filed October 24, 1883. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. EASTWICK, of the city, county, and State of New York, have invented a new and Improved Apparatus for Drying Bone-Black, of which the following is a full, clear, and exact description.

The ordinary process of revivifying bone-black after it has lost its effectiveness from use consists in first thoroughly washing the bone-black in water, drying it, and then heating it in red-hot retorts out of contact with air to destroy and carbonize adhering organic matter; and for the sake of economy the drier is usually placed over the kiln containing the retorts, so as to become heated by the waste gases therefrom, and sometimes the drier constitutes a part of the kiln.

This invention relates to the construction of the drier and to the method of drying, consisting in the application of currents of air for rapidly absorbing and carrying off the moisture which the bone-black contains, and for oxidizing organic matter contained in the bone-black.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a transverse sectional elevation of a drier made in accordance with my invention, and taken on the line *xx* of Fig. 2. Fig. 2 is a longitudinal sectional elevation of the drier, taken on the line *yy* of Fig. 1. Figs. 3 and 4 are respectively transverse and longitudinal sectional elevations of a modified form of the drier. Figs. 5, 6, 7, and 8 are similar views showing two other modifications of the apparatus; and Fig. 9 is a detailed view showing a modification of the central air-flue.

Referring more particularly to Figs. 1 and 2, the letters *A A* represent the end walls of the drier.

B B represent double sets of horizontally-arranged flues. These flues are made triangular in cross-section, and each flue is formed with the upwardly-projecting flange *a* and downwardly-projecting lip *b*, and the flues *B* are secured at their ends to the walls *A A* in such manner as to register with the openings *c c*, made in these walls, and so as to form the central hot-air passage or flue, *C*.

Placed upon flues *B B*, and arranged in such manner as to close the top of the passage *C*, is the triangular flue *B'*, and at the bottom the flues *B B* rest upon the triangular flues *E E*, which rest upon the walls *F* on the kiln *F'*, forming the base of the apparatus.

The sides of the drier are built up of the inclined retaining-slats or iron plates *D D'*, held in diagonal position and a short distance apart to form passages *d d* between them out to the open air, and the said plates *D D'* are so placed relative to the flues *B B* as to form the irregular spaces or passages *G G*, to which the bone-black to be dried is fed from the hopper *H*.

The plates *D'* at the lower part of the drier are made wider than the plates *D* above, for the purpose of bringing the bone-black into closer contact with the heated surfaces at the bottoms of the passages *G G*.

The doors *I I*, when opened by levers *I' I'* and held by rods *I² I²*, serve to regulate the gradual discharge of the dried bone-black from the drier.

The flues *E E*, in the form of apparatus shown in Figs. 1 and 2, have the openings *e e* formed in them, through which the flame and products of combustion from the chambers *J J* pass into the said flues, and from these flues *E E* the products of combustion pass into the lower side chamber, *K*, thence through the six lower flues, *B*, (serving to heat them,) to the opposite side chamber, *K'*, thence back through the four upper flues, *B*, and flue *B'* to the upper chamber, *K²*, thence out of the opening *K³* to the chimney.

In the heating-chambers *J* is placed the air-heating pipe *L*, through which air is forced by a suitable fan or blower, and in which the air is heated.

In the form of apparatus shown in Figs. 1, 2, 3, and 4 the heated air passes from the pipe *L* to the central flue, *C*.

In the form of drier shown in Figs. 5 and 6 the heated air enters the side pipes, *M M*, from the pipe *L*, and from these passes through the valved openings *f* into the triangular flues *B*, which in this construction are arranged at the sides of the drier, as will be hereinafter described.

In the form of drier shown in Figs. 1 and 2

the heated air passes from the central passage, C, through the valved openings *g g*, made between the flues B B, and out into the spaces *h*, formed below the flues B by the banking of the bone-black upon the upper inclined surfaces of the flues, as indicated in dotted lines; thence the air passes through the thin vertical body of bone-black and out of the drier through the spaces *d d* between the inclined plates D D', absorbing and carrying with it the moisture contained in the bone-black.

In the form of drier shown in Figs. 3 and 4 the products of combustion from the kiln F are not carried to the top of the drier, as in Figs. 1, 2, 7, and 8, but pass through the opening N, made near the bottom of the drier, directly to the chimney, and the central air-chamber, C, instead of having plain vertical side walls, its side walls are serrated or stepped to form the inclined supporting-surfaces *j* and the ledges or horizontal portions *j'*. The openings *g g* are made through these horizontal portions *j'*, for admitting heated air from the chamber C to the spaces *h*, formed by the bone-black and the ledges *j'*, as indicated in dotted lines, and in this form of apparatus the heated air is almost wholly depended upon for drying the bone-black, there being no direct application of heat from the products of combustion, as in Figs. 1 and 2, except at the inclined planes *k*.

In the form of apparatus shown in Figs. 5 and 6 the heated air is admitted to the triangular flues B, and these flues and the inclined plates D are reversed from the positions they occupy in the other figures of the drawings—that is, the flues B are at the sides of the drier, while the plates D are placed one above the other in the center of the drier. The heated air from heating-pipes L is conducted to the flues B through the pipes M M and valved openings *f*, as above mentioned, and from the flues B it passes through openings *g g* into spaces *h*, formed by the banking of the bone-black, and thence through the thin columns of bone-black in the spaces G and out to the open air through spaces *d d* and opening *d'*, made near the top of the drier, the space between the plates D D being covered at the top by the peaked roof D², which directs the current of air to the opening *d'*. This roof D² also serves to direct the bone-black as it enters the drier from the hopper H into the drying-spaces G G at both sides of the drier.

In the form of apparatus shown in Figs. 7 and 8 the products of combustion pass to the top of the drier through the central serrated or stepped flue, B², so that direct heat from the products of combustion is applied to the bone-black from the time it enters the drier. In their passage up through the flue B² the products of combustion are given a circuitous course by means of the plates *i*, placed upon the horizontal portions *j'*, as will be understood from the drawings, and in this form of apparatus the heated air from pipe L enters

the side chambers, M' M', and from these chambers passes through the valved openings *f* into the spaces *h*, formed by the banking of the bone-black upon inclined surfaces *j* of the flue B², whence it passes through the bone-black in the spaces G, and out of the drier through openings *d* left between the adjacent edges of the side slats, D D and D'.

In Fig. 9 the flue C (adapted for arrangement centrally in the drier, as are the flues C, shown in Figs. 1 and 3) is shown formed of straight plates having the perforations *d'* made through them for the passage out of the drier of the heated air after it has passed through the bone-black, and over these openings or perforations *d'* are secured the inclined plates D, which cause the bone-black to bank upon them and form the flues *h*, as in the other figures of the drawings.

In all the different forms of the apparatus shown in the drawings it will be seen that irregular drying passages or spaces G for the bone-black are formed, causing the bone-black, when filled into the drying-spaces, to form the air-spaces *h*, into which the currents of air are forced, and that free passages for the air out of the apparatus after it has passed through the bone-black are furnished by the spaces left between the edges of the plates D or D and D'.

In operation the bone-black is introduced into the hopper H, and from thence passes down into spaces G G between the retaining plates or slats D D' and flues B, and becomes heated from contact with the external surfaces of the flues B, which are heated by the products of combustion or by heated air passing through them, and the bone-black in the heating-spaces G presents columns or shallow layers, through which the heated air, issuing from openings *g g* or *f f* is forced. The quantity of material and speed at which it may pass through the drying-spaces G may be regulated by the doors I at the bottom of the columns, and the necessary quantity of air may be regulated by means of the valves *g'* or *f'*, which may be moved from the outside of the drier to open more or less the openings *g* and *f*, respectively. In passing through the bone-black the heated air rapidly absorbs and carries off the moisture contained therein, and at the same time oxidizes organic matter contained in the bone-black.

In the form of apparatus shown in Figs. 5 and 6, the products of combustion pass to the chimney through the opening N', (shown clearly in Fig. 6,) made near the bottom of the drier, so that in this form, as in that shown in Figs. 3 and 4, no direct heat from the products of combustion is applied to the bone-black except at the inclined planes, marked *k*.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The chamber J at the top of the kiln, containing the heating-pipes L, in combina-

tion with the drying apparatus, the pipes L being connected with the hot-air passages of the drying apparatus, substantially as and for the purposes set forth.

5 2. The chamber J, in combination with the horizontal flues and the heating-pipes L, connected with the hot-air passages, and valved openings arranged to discharge the hot air into the drying-spaces *h*, substantially as and
10 for the purposes set forth.

3. The vertical series of horizontal flues B, the inner walls of which are formed of inclined

plates arranged at the sides of the drier, and the two central series of plates D, composed of plates, each inclined in a direction opposite to that of the inclined plates of flues B, to form spaces *d*, in combination with the heating-pipes L, pipes M, and valved openings *f*, arranged to operate substantially as and for the purposes described.

ED. P. EASTWICK.

Witnesses:

H. A. WEST,

C. SEDGWICK.