

(No Model.)

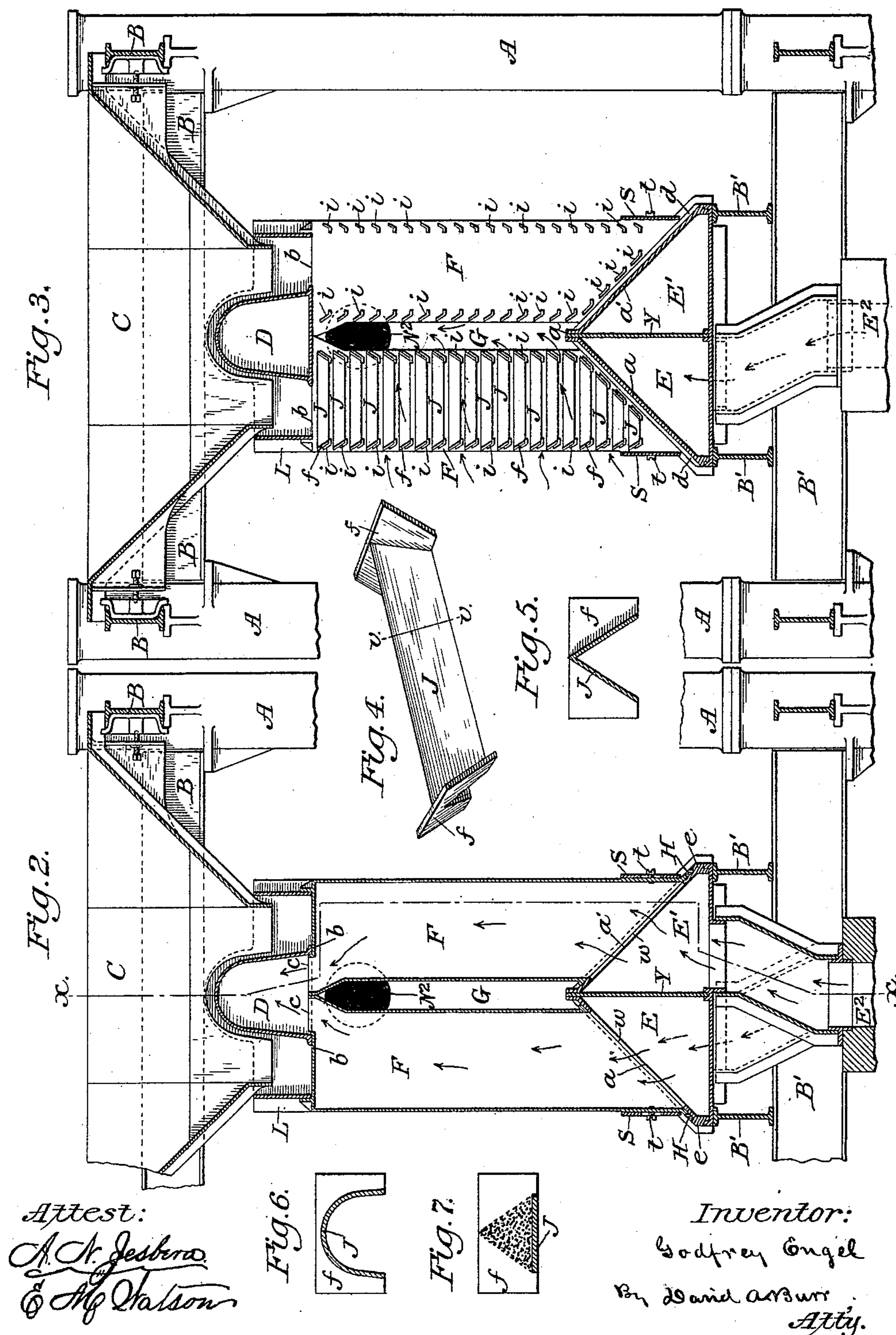
2 Sheets—Sheet 2.

G. ENGEL.

APPARATUS FOR DRYING BONE BLACK.

No. 438,577.

Patented Oct. 14, 1890.



UNITED STATES PATENT OFFICE.

GODFREY ENGEL, OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-HALF TO
THEODORE H. KRAFT, OF SAME PLACE.

APPARATUS FOR DRYING BONE-BLACK.

SPECIFICATION forming part of Letters Patent No. 438,577, dated October 14, 1890.

Application filed May 19, 1890. Serial No. 352,328. (No model.)

To all whom it may concern:

Be it known that I, GODFREY ENGEL, of the city of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Apparatus for Drying Bone-Black in Sugar-Refineries; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

My invention relates to apparatus for drying the char or bone black which has been used for the filtration of the sugar-liquor in a sugar-refinery or other like wet material, and has for its object to produce a simple effective apparatus for the purpose.

It consists in the combination and arrangement of the several mechanical devices which are embodied in the construction of my improved drier, as hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of the drier, partly in longitudinal section, in line $x x$ of Fig. 2, the gas-flues and deflecting-plates being removed with the exception of a few at each end thereof. Fig. 2 is a vertical section in line $y y$ of Fig. 1 through two of the gas-flues; Fig. 3, a similar section in line $z z$ of Fig. 1 through one of the drying-spaces between the gas-flues; Fig. 4, a detached view in perspective of one of the deflectors; Fig. 5, a cross-section in line $v v$ of Fig. 4, and Figs. 6 and 7 similar sections illustrating modifications therein.

Similar letters indicate like parts in the several figures.

The entire apparatus is supported by and upon a metallic frame-work, which consists of the pillars $A A$ at the four corners and the intervening flanged connecting-beams $B B B' B'$ at top and bottom thereof. The upper beams $B B$ serve to uphold a hopper C , constructed of plates which are arranged to converge centrally from the sides and ends of the frame, leaving a central opening in the bottom of the hopper extending nearly the length thereof.

An inverted-U-shaped flue D is fitted to

extend longitudinally centrally within the opening in the bottom of the hopper and to form a longitudinal partition therein. This partition-flue D is supported independently of the hopper upon the end plates of the apparatus and terminates at one end in a flanged pipe D' to communicate with a discharge-flue, its opposite end being closed by a blank flange or other form of cover, which will permit it to be opened for cleaning purposes.

Two longitudinal distributing-flues $E E'$ are provided immediately beneath the hopper C and at a suitable distance below it to extend the length of the frame, said flues being inclosed in a casing which is triangular in cross-section, (see Figs. 2 and 3,) and whose peak is central under the upper flue D . The flues $E E'$ are separated within the casing by a central longitudinal partition-plate Y . The one flue E connects at one end and the other flue E' at the opposite end of the frame with conducting-pipes E^2 , through which hot air and the products of combustion from any suitable furnace are supplied thereto.

The inclined top plates $a a'$ of the distributing-flues $E E'$ are transversely slotted at regular intervals, and an independent hot-air or gas flue F , preferably made of a single casting, is fitted vertically over each slot. The lower open end of each hot-air or gas flue F is beveled to adapt it to the inclination of the plate a upon which it rests, and so much of its upper end as extends under the opening in the hopper is closed, the remainder c of said upper end being adapted to connect with a corresponding transverse slot in the bottom of the flue D .

An open central circulating space or chamber G is left between the two sets of flues E and E' , mounted upon the inclined plates a and a' , and the upper open ends $c c$ of the flues are made to incline inward so as to meet above this space under the flue D , as shown in Fig. 2, and afford it support.

The detachable vertical hot-air or gas flues $F F$ are secured by means of lateral flanges d , which are formed on either side of each of the slots in the plates $a a'$, upon which said flues rest, so as to severally embrace the lower

ends of the flues placed over the slots, each in connection with a transverse flange *e*, intersecting the outer ends of said lateral flanges *d d* along the edge of the plate *a* or *a'*. The
 5 outer ends of the lateral flanges *d d* are extended out far enough beyond the foot of each flue *F* when the flue is in its vertical position to leave a recess between it and the transverse flange *e*, and a loose block *H* is
 10 fitted in said recess to lock the flue in its vertical position, as shown in Figs. 1 and 2. By the removal of the block *H* from the foot of any one of the vertical gas-flues *F* the lower end of the flue may be slipped forward far
 15 enough to loosen and detach its upper end from its connection with the upper flue *D* and allow it to be readily removed from the frame independently of the remaining vertical flues.

Each vertical flue *F* is formed with a uniform series of lugs *i i* upon its outer lateral faces to serve as supports for a series of deflectors *J J*, adapted to be placed thereon. These deflectors are preferably V-shaped in cross-section, as shown in Figs. 1, 4, and 5, or
 25 arched in cross-section, as shown in Fig. 6, and are made of a length equal to the width of the vertical flues *F F*, and they may also be formed with a flat base, as shown in Fig. 7. The ends of each deflector are constructed of plates *f f*, cast in one therewith
 30 and inclined inward toward the divergent edges of the body thereof. These end plates are of a width equal to the distance between the vertical gas-flues *F F*, so as to admit of resting for support upon the lugs *i i*. The extreme distance between the two lower edges
 35 of each deflector is less than the width of its end plates *f f*, so that when the deflectors are inserted between the gas-flues *F F* to rest one above the other with their end plates upon
 40 the lugs *i i* and their peaks upward an opening is left for the descent of the char between each of said lower edges and the face of the proximate gas-flue. When the deflectors are
 45 thus fitted in position in the drying-spaces between the gas-flues, the inward inclination of their end plates *f f* permits a free circulation of the outer air under the lower edges of said end plates into the spaces through which
 50 the char descends, as well as over the upper surfaces of the deflecting-plates and out into the central circulating-chamber *G*, as indicated by the arrows in Fig. 3, while the longitudinal angular space under each deflector
 55 forms also a direct passage from the outer air into said central chamber.

The two ends of the drier are closed by casing-plates *L L*, terminal spaces *N N* being left between said casing-plates and the end
 60 gas-flues on each side, these terminal spaces being closed laterally by side plates *M M*. The terminal space thus formed at that end of the drier which is under the closed end of the upper horizontal gas-flue *D* is fitted with
 65 a discharge-opening *N²*, as shown in Fig. 1 and by dotted lines in Fig. 3, and communication is established by means thereof be-

tween said discharge-flue and the central space or chamber *G* (see Figs. 2 and 3) left
 70 between the inner ends of the vertical flues.

Within the terminal circulating-spaces *N N* a series of parallel slats *p p* are fitted adjacent to the outer face of each of the gas-flues
 75 *F F* and parallel therewith, these slats being supported at each end and severally inclined toward the face of said lugs *i i*, as illustrated in Fig. 1.

Lateral gate-plates *S S* are secured horizontally against the outer faces of the gas-flues *F F* just above the lower ends thereof,
 80 to inclose at said lower end the drying-spaces between the flues in which the deflectors are fitted. These gate-plates are supported by bolts *t t*, (see Fig. 1,) passing through vertical slots therein, and which are screwed into the
 85 gas-flues, the slots permitting of a vertical adjustment of the lower edge of the gate to and from the inclined plates *a* or *a'*, so as to leave more or less of an opening under the gate for the discharge of the dry bone-black from the
 90 driers.

In the operation of the drier the products of combustion or hot air and gases from a suitable furnace are admitted through the
 95 pipes *E² E²* to the horizontal distributing-flues *E E'*, from which they pass upward through the narrow vertical gas-flues *F F* to the upper horizontal flue *D*, by which they are discharged from the apparatus. By this means
 100 the vertical gas-flues and the intervening spaces in which are fitted the deflectors *J J* become highly heated. The wet char or bone black taken from the sugar-refining vessels is placed in the hopper *C* and, dropping through the openings in the bottom thereof on either
 105 side of the flue *D*, fall upon the upper deflectors *J J* in each drying-space and, passing down the inclined faces of the deflectors, drop from the one to the other through the openings left between the lower edge of each face
 110 and the face of the approximate gas-flue. The bone-black is thus carried by its gravity in a thin sheet or layer in close proximity to or contact with the hot outer radiating-surfaces
 115 of the gas-flues and slides from one deflector to another over openings, through which currents of air admitted from without the apparatus and passing under the end plates *f f* of
 120 the deflectors are constantly passing, said currents being drawn through and under the deflectors from their outer ends into the central space or chamber *G* between the inner
 125 ends of the gas-flues *F F*, and from thence to the terminal circulating-space *N* at one end of the apparatus and out through its discharge-pipe at *N²*. The wet bone-black is thus subjected first to the lowest temperature in the apparatus, and is gradually carried to the lower hottest portion thereof, whence, sliding
 130 down the inclined plates *a a'*, it is discharged, fully dried, out under the gate-plates *S S* on each side into the receptacle arranged below the outer edges of said inclined plates *a a'* to receive it.

The inward inclination of the ends *f f* of the deflectors *J J* prevents an escape of the bone-black thereat, and yet allows free ingress of air under them, and the inclined slats *p p* at each end of the drier prevent a waste of the bone-black into the end circulating-spaces *N N*.

I claim as my invention—

1. The combination, in a char-drier, of the upper and lower parallel horizontal hot-air or gas flues, the series of intermediate detachable vertical flues connecting the one and the other, the hopper mounted above them to communicate with the drying-spaces between the vertical flues, the circulating-chamber communicating with said drying-spaces, a discharge-flue connected with said circulating-chamber, and deflectors, substantially as described, fitted in said drying-spaces, substantially in the manner and for the purpose herein set forth.

2. The combination, in a char-drier, with a vertical char-drying space, of a series of superimposed deflectors fitted in said space, each formed with inwardly-inclined end plates having openings to communicate with the angular space under the inclined plates of the deflector, substantially in the manner and for the purpose herein set forth.

3. The combination, in a char-drier, of the two series of vertical hot-air or gas flues, the two parallel horizontal distributing-flues having laterally-inclined transversely-slotted top plates upon which the gas-flues are fitted, with an open circulating-space between the

two series, the upper horizontal discharge-flue having a transversely-slotted bottom plate to which the upper ends of the gas-flues are connected, the hopper mounted above said upper flue to open into the vertical drying spaces between the gas-flues, the deflectors mounted one above the other in said drying-spaces and having inwardly-inclined ends, end plates inclosing terminal chambers at each end of the drier communicating with said circulating-space, and a discharge-pipe connected with one of said chambers, substantially in the manner and for the purpose herein set forth.

4. In a char-drier, the combination, with the vertical gas-flues having char-drying spaces between them and inclosing a central circulating-chamber communicating with an outer discharge or exhaust pipe, the supporting-plates for said flues, the upper discharge-flue communicating therewith, and a hopper communicating with the drying-spaces, of deflecting-plates arranged in said drying-spaces with intervening air-channels communicating with the central circulating-chamber, substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name to this specification in the presence of the subscribing witnesses.

GODFREY ENGEL.

Witnesses:

JNO. D. LIPSCOMB,

THEO. H. KRAFT,

WM. H. JONES.