

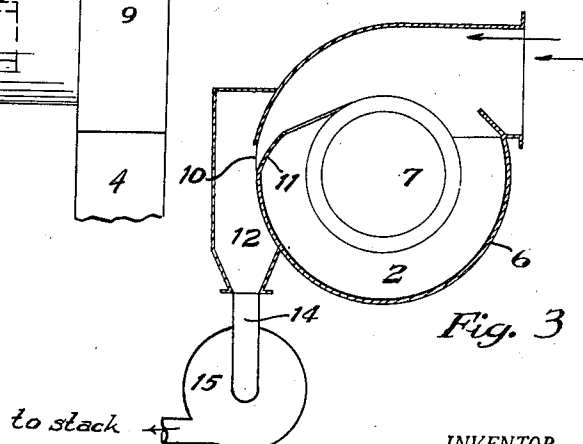
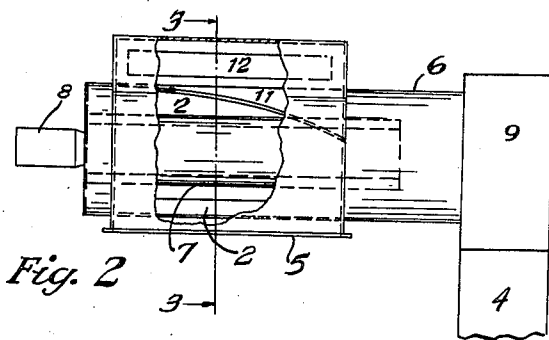
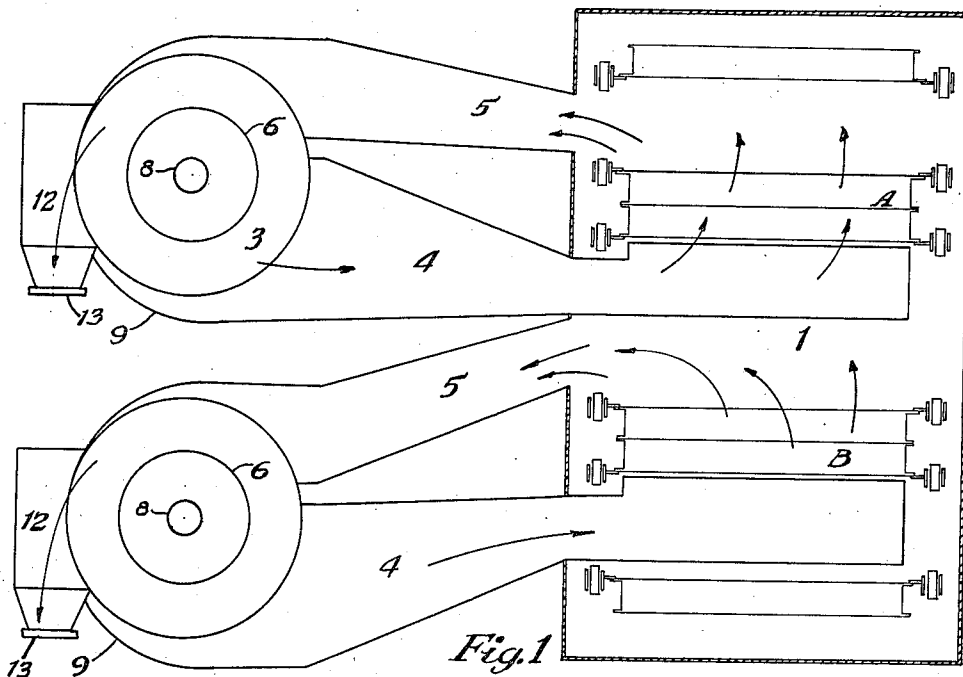
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FURNACE FOR ROASTING CORN FLAKES OR THE LIKE LOOSE DISCRETE MATERIALS

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FURNACE FOR ROASTING CORN FLAKES OR
THE LIKE LOOSE DISCRETE MATERIALSEugene Oscar Engels, Saginaw, Mich., assignor to
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3 Claims. (Cl. 107—55)

This invention relates to apparatus for roast-
ing discrete materials such as cereal flakes, coffee
or cocoa beans, for popping corn, and for like
processes in which recirculated hot combustion
gases from a furnace are directly applied to the
material. It has for its object the provision in
combination with the furnace structure of im-
proved means for removing from the recirculated
stream of gases inflammable particles such as
corn flake fragments, chaff or the like before
they are carried into the combustion zone where
they would be ignited.

In the instant specification the invention is
shown and described as applied to an oven for
toasting corn flakes, described in my copending
application for Letters Patent, Serial No. 317,305,
filed February 5, 1940. In this, as well as in
other roasting processes referred to above the
material being treated is both heated and agi-
tated by one or more rapidly moving streams
of combustion gases from an oil or gas burning
furnace. In all of these processes small parti-
cles of inflammable material such as chaff, hulls,
etc., escape from the treating compartment and
which ignite or become charred if carried by the
gases to the furnace. When recirculated to the
treating compartment such charred or incan-
descent particles may contaminate or even set
fire to the corn flakes or like product being
treated.

As a subordinate feature of the invention, the
novel chaff-removing device may be combined
with the flue and exhaust system necessary in
closed recirculating heating systems to vent away
that proportion of the gaseous stream which is
being replaced by fresh products of combustion
from the fuel burner, so that one flue or suction
device performs both functions. Thus it is not
periodically necessary to empty a receptacle for
the material cleaned from the heating gases.

The invention is particularly adapted for use
as an integral part of a recirculating furnace of
the kind shown in my United States Patents Nos.
1,857,447, issued May 10, 1932, and 2,110,209, is-
sued March 8, 1938. By utilizing the inherent
operation of furnaces of this kind the necessity
for individual separators or screens for cleaning
the recirculated gases is eliminated. Specific
features and advantages of the invention are
further set forth in the following specification.

Referring to the drawing in which like num-
erals designate like parts throughout the var-
ious views—

Fig. 1 is a diagrammatic end view of a corn
flake roasting oven as shown in my copending

application referred to, equipped with two fur-
naces embodying the invention;

Fig. 2 is a top plan view of a furnace of Fig.
1, partly broken away to show the invention;

Fig. 3 is an enlarged vertical cross-section of
the furnace taken along lines 3—3 of Fig. 2.

In Fig. 1, numeral 1 indicates a corn flake
toasting oven having two working conveyor runs
A, B. Each run is heated by a furnace assembly
3, connected to it by a supply duct 4 and a return
duct 5 for the circulation of hot gases from the
furnace. Referring to Figs. 2 and 3, the furnace
3 consists of an elongated substantially cylindri-
cal housing 6 containing a coaxially mounted
cylindrical combustion chamber 7, at the end of
which a fuel burner 8 is mounted.

The return duct 5 is directed tangentially of
the housing 6 and is faired into it spirally, as
shown in Fig. 3, so that the exhaust gases from
the oven are directed circumferentially of the
combustion chamber 7.

The return gases travel helically around the
combustion chamber and at its end are mixed
with fresh hot products of combustion from the
burner 8. The reheated gases are then driven
by an impeller 9 through the return duct 4 to the
oven 1.

The construction and operation of the furnace,
as so far described, are set forth in my Patent
No. 2,110,209 above referred to. I will now de-
scribe the structure which embodies the inven-
tion.

Approximately ninety degrees from the ver-
tical axis of the furnace housing 3 (Fig. 3) an
elongated slot 10 in the jacket 6 extends trans-
versely of the return duct 5 and lengthwise of
the jacket for the full width of the duct 5 at that
point. A stationary lip or baffle 11 extending
the length of the lower edge of slot 10 projects
upward and inward part way into the annular
passage 2 surrounding the combustion chamber
7. In any given furnace baffle 11 should project
a distance determined by the circumferential
velocity of the gases from return duct 5 and
the weight of the entrained flakes or other par-
ticles which are to be removed.

Referring especially to Fig. 2, the baffle 11
is tapered so that its free edge extends inward
from the jacket 3 a distance progressively in-
creasing from that end nearest the burner to its
other end. This for the reason that gases enter-
ing from duct 5 pass over the opening fastest at
that end nearest the burner, inasmuch as here
they travel substantially circumferentially of the

combustion chamber 6; while toward the opposite end of the opening 11, the gases progressively take on a component of helical travel, lengthwise of the combustion chamber 6. Therefore, their circumferential velocity is progressively diminished and the centrifugal force tending to throw entrained flakes or particles outwardly against the housing 3 progressively decreased from the end of baffle 11 nearest the burner to the other, that is, from left to right in Fig. 3.

The operation of the separator shown is believed to be self-explanatory. In brief, the gases drawn at high velocity from duct 5 tangentially into the annular passage 2 change their direction so that the heavy particles which are to be separated are thrown outwardly adjacent the wall of the housing and the layer of gas carrying the particles is skimmed off by the baffle 1. The flake particles fall into a suitable receptacle 12 outside of slot 9. Receptacle 11 is closed to form a dead air pocket by a bottom gate 13.

Alternatively if desired the bottom of the receptacle 11 may be connected by a duct 14 to a suction fan 15 which sets up enough suction to remove the particles continuously and also venting off the necessary proportion of the recirculated gases to maintain the desired pressure balance within the system and compensate for the fresh gases introduced by the burner 8. This last construction is illustrated diagrammatically in Figure 3.

The invention affords a particularly simple, inexpensive, and durable means for effectively removing all fragments of flakes, chaff or other bits of material which might become charred or ignited if they passed into the furnace beyond the end of the combustion chamber, and thence would return to the oven to contaminate or ignite the corn flakes being treated therein. It is applicable not only to the corn flake toasting apparatus shown and described herein, but also to use wherever furnaces and recirculating systems are employed for roasting cocoa beans, coffee, popping corn, in drying systems, or wherever loose chaff or particles picked up by the gas stream would have undesirable effects if returned to the furnace.

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

1. In a heating system for toasting or baking light discrete materials by a recirculated current of hot combustion gases, comprising a furnace having a cylindrical combustion chamber open at one end, a substantially cylindrical jacket surrounding said chamber, spaced therefrom and connected to the baking chamber, a conduit for gases recirculated from the baking chamber tangentially joining said jacket adjacent the burner end of the combustion chamber to direct said recirculated gases circumferentially of the annular passage between said chamber and jacket, in combination, a receptacle outside of said jacket and connected therewith by an opening extending transversely of the said conduit and lengthwise of the jacket wall along a line removed from said return conduit circumferentially of the jacket, and a stationary baffle at an edge of said opening directed slantingly counter to the flow of gases in said annular passage and extending inward a distance sufficient so that flakes or chaff particles entrained in said recirculated gases and urged centrifugally outward adjacent the jacket wall by their change of direction are intercepted and directed into said receptacle.

2. Apparatus as claimed in claim 1, wherein the stationary baffle is tapered throughout its length so that it projects progressively farther into the jacket from its end nearest the burner to its other end.

3. In apparatus as claimed in claim 1 wherein a major portion only of the recirculated gases from the treating chamber is returned to the furnace, mixed with fresh products of combustion and impelled to the treating chamber, the balance of the returned gases being displaced from the system by the fresh products of combustion introduced by the furnace, in combination, suction means connected to the opening in the jacket operable to withdraw the said balance of the returned gases together with the entrained flakes or chaff particles intercepted by said stationary baffle.

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