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METHOD FOR THERMAL DECOMPOSITION
OF METALLIC NITRATES

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of the United States, as represented by the Sec-
retary of the Interior

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3 Claims. (Cl. 23—145)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manu-
factured and used by or for the Government of
the United States for governmental purposes
without the payment to us of any royalty thereon
in accordance with the provisions of the act of
April 30, 1928 (Ch. 460, 45 Stat. L. 467).

This invention relates to the production of
metallic oxides, and more particularly to the
production of such oxides by the thermal decom-
position of metallic nitrates. In the production
of metallic oxides by the thermal decomposition
of metallic nitrates, such as manganese nitrate,
the customary way of accomplishing the decom-
position is to heat a body of the metallic nitrate
until it is fused and thereupon to continue the
heating until nitrogen oxides are liberated and
the metallic oxide remains as a residue. However,
the heating of metallic nitrates by direct com-
bustion gases is impractical for large scale com-
mercial operations since the success of such oper-
ations depends economically upon the recovery
of the nitrogen oxides evolved. Obviously, dilu-
tion of the evolved nitrogen oxides with large
quantities of flue gases renders their recovery
impractical. Furthermore, if a body of metallic
nitrate, such as manganese nitrate, is heated in-
directly by means of steam coils or application of
heat to the container in which the body of
nitrates is held, the liberated metallic oxide
forms a hard, impervious coating upon the in-
terior of the container which soon insulates the
main body of molten nitrate from the heat source,
and the deposit is also very difficult to remove.

It is accordingly the object of this invention to
provide a method of heating metallic nitrates
to decompose them so that the thermal decom-
position of such nitrates can be carried out with-
out forming scaling or dilution of the evolved
gases. Other objects will be apparent or will
appear hereinafter as the description proceeds.

In accordance with this invention, metallic
nitrates, such as manganese nitrate, are ther-
mally decomposed by heating such nitrates with
a portion of the gases liberated from a previous
decomposition, said gases having been heated at
an intermediate stage of the process. During
operation, the evolved gases from the decomposi-
tion of the manganese nitrate or other metallic
nitrate are collected, a portion of such gases are
heated to a temperature at least as high as de-
composition temperature of the nitrate being
treated, and then the heated gases are passed
over additional metallic nitrate undergoing de-
composition.

In the foregoing fashion, the decomposition of

suitable metallic nitrates is carried out in a simple
fashion without diluting the evolved gases and
without a formation of scaly deposits and exces-
sive foam.

Suitable metallic nitrates for decomposition in
accordance with this invention include the ni-
trates of manganese, cobalt, aluminum, and many
others too numerous to mention. Manganese ni-
trate, either in the hydrated or anhydrous form,
constitutes a preferred metallic nitrate for de-
composition in accordance with this invention.

The thermal decomposition of manganese ni-
trate, suitably in the form of its hexahydrate,
liberates manganese dioxide, nitric oxides, and
water. Manganese nitrate hexahydrate melts or
fuses at 25° C. and is completely decomposed
at 160° C.

The liberated reaction gases and vapors, here-
in called "gases," are withdrawn from the reac-
tion zone and a portion of them is heated to a
temperature at least as high as the decomposi-
tion temperature of the nitrate being treated.
For example, in the case of manganese nitrate,
the withdrawn portion of the evolved gases is
heated to a temperature of at least 160° C., and
preferably to about 400° C. to 500° C. After heat-
ing, the gases are brought into contact with ad-
ditional quantities of metallic nitrate being de-
composed. Thus, the process lends itself particu-
larly well to operation in a cyclic continuous
manner.

In operation, we have found that a desirable
rate of decomposition is achieved when the re-
heated or superheated gaseous products of de-
composition are passed over a shallow pool of
molten manganese or other metallic nitrate. In
this case the liberated manganese or other oxide
forms a fine suspension in the pool of molten
material, and no foaming or frothing has been
observed.

It will be apparent from the foregoing that
there has been provided a desirable and efficient
method for decomposing molten metallic nitrates.

Various changes may be made in the invention
by those skilled in the art without departing from
the spirit and scope of the invention.

What we claim is:

1. In a process for the production of manganese
dioxide by the thermal decomposition of man-
ganese nitrate, the improvement which com-
prises collecting the evolved gases from such a de-
composition, heating a portion of such gases to
a temperature at least as high as the decom-
position temperature of manganese nitrate, and
passing said heated gases into contact with ad-

ditional manganese nitrate undergoing decomposition.

2. In a process for the production of manganese dioxide by the thermal decomposition of manganese nitrate, the improvement which comprises collecting the evolved gases from such a decomposition, heating a portion of such gases to a temperature at least 160° C., and passing said heated gases into contact with additional manganese nitrate undergoing decomposition.

3. In a process for the production of manga-

nese dioxide by the thermal decomposition of manganese nitrate, the improvement which comprises collecting the evolved gases from such a decomposition, heating a portion of such gases to a temperature of about 400° C. to 500° C., and passing said heated gases into contact with additional manganese nitrate undergoing decomposition.

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