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METHOD OF AND APPARATUS FOR TREATING ORGANIC SUBSTANCES.

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3 SHEETS—SHEET 3.
METHOD OF AND APPARATUS FOR TREATING ORGANIC SUBSTANCES.

To all whom it may concern:

Be it known that I, JAMES N. ALSOP, a citizen of the United States, residing at Owensboro, in the county of Daviess and State of Kentucky, have invented new and useful Improvements in Methods of and Apparatus for Treating Organic Substances, of which the following is a specification.

The present invention relates to a method and apparatus for curing substances which it is desirable to treat for the purpose of curing, conditioning, or otherwise imparting thereto the characteristics of any treating media which are capable of or suitable for utilization for the purposes of practicing my invention.

In the present disclosure of my invention, I shall describe and illustrate it as applied to the curing of meats, and the specific curing disclosed will be the smoking of meats.

While the present disclosure utilizes the smoking of meats as an illustrative example of the uses to which my process and apparatus may be put, it will be understood that this example is merely illustrative and in no sense restrictive of my invention, as it is obvious that it may be applied to the treatment of substances other than meats, and, furthermore, that treating agents other than smoke may be used.

In order that the invention may be clear to those skilled in the art, I have shown in the accompanying drawings, somewhat conventionally, but with sufficient clearness to enable my invention to be practised, apparatus designed to carry out my method, and in said drawings:

Fig. 1 is a view in section, some of the parts being diagrammatically indicated, of an apparatus for practising my invention.

Fig. 2 is a sectional view at right angles to Fig. 1.

Fig. 3 is a vertical, longitudinal sectional view of a portion of the receiving and delivery opening or chute.

Fig. 4 is a horizontal sectional view on substantially the line 4—4 of Fig. 3.

Fig. 5 is a vertical, transverse sectional view on substantially the line 5—5 of Fig. 3.

Referring to the drawings by numbers, like numbers indicating like parts in the several views, 10 indicates a smoke house or container being conventionally and diagrammatically indicated. Said container is provided with a receiving and delivery opening as are shown near the bottom thereof, and such opening may be provided with suitable closures hereinafter to be described.

Within the smoke house 10 are mounted a plurality of sprocket wheels 11, the number of which may, of course, be increased or decreased, dependent on the desired capacity of the smoke house or chamber to be installed.

The sprocket wheels 11 are disposed as shown, so as to provide up and down runs for sprocket chains 12 on which the substances, in this instance, meat, to be treated will be carried.

The sprocket wheels 11 are preferably arranged in pairs, as shown in Fig. 2, their shafts being suitably mounted in any preferred arrangement of bearings, so that the sprocket wheels will stand opposed to each other, as shown in Fig. 2, with the chains 12, passing over them, thereby giving a clearance between the facing sprocket wheels 11 for the passage of the substances carried by said chain.

One set of sprocket wheels 11 will be utilized as the driving set, that pair located in the upper right hand corner of the smoke house (Fig. 1) being shown in the present instance as the driving sprockets. The sprocket driving mechanism will comprise any suitable driving means, and, as here shown, I have adopted gear wheels 13, one on each of the shafts of the pair of driving sprocket wheels 11, which gear wheels 13 mesh with driving gears 14 on a shaft 15 mounted in suitable bearings, one end of which shaft 15 may extend outside of the smoke house where it is provided with any suitable drive as a pulley, gear, or other equivalent driving element 16.

The carrier chains 12 are shown in the present instance as coupled by cross-bars 17, which cross-bars are provided with suitable suspending means, as hooks 18, or equivalent devices, from which the substances to be treated may be suspended.

With this construction, an endless flight of carrier chains is provided so that the substances to be cured may be carried in a zigzag fashion through the smoke house, passing from one sprocket to another, as indi-
cated, this arrangement giving a very compact construction.

It will be apparent, of course, that similar or other carrier means arranged in different or similar lines of travel may be provided, but the present disclosure shows one efficient arrangement.

The carrier chains at one point in their line of travel are so disposed as to permit the ready loading and unloading of the meats or other substances to be cured, this point, as shown in the present instance, being at the lower left hand corner of the smoke house or chamber, where there are arranged carrier pulleys 19, so that the lower leg of the carrier chain may be thrown outwardly over the pulleys 19, which pulleys are located conveniently to the loading and unloading station, so that a workman may suspend the meats on the ingoing run of the carrier chain for treatment in the smoke house or chamber and remove the treated meats or substances from the outcoming run of the chain.

While I have shown, for the purpose of illustration, carrier chains 12 and hanger rods 17 so proportioned as to carry a single article to be treated, it will, of course, be understood that these proportions may be varied and the chains 12, their pulleys 11, and the rods 17 connecting the chains be of such proportions and so related as that a number of articles can be hung from the same carrier rod.

Adjacent the several runs of the carrier chains, I provide electrodes 20, these being disposed, preferably as shown in Fig. 1, parallel to and alternating with the runs of the carrier chain, the said electrodes 20 being preferably in the form of wires hung at their upper ends from suitable supports 21 insulated from the smoke house. The said electrodes 20 are preferably free at their lower ends and provided with a suitable weight 22 to maintain them in proper position, although, their lower ends could, of course, if desired, be fastened to insulating bars or supports similar to the bars or supports 21 at the upper end.

I have shown in the present example, as will be apparent from Fig. 1, a single electrode 20, this being disposed in alignment with the path of movement of the substances being treated. It will be obvious, of course, that the number of electrodes 20 can be increased and, preferably, there will be provided one electrode for each line of substances being treated so that in event of the proportions of the carrier chains being increased, as stated above, to provide for supporting several rows of articles being treated on the rod 17, there would be provided an electrode 20 for each of the lines of substances being treated, this, of course, being mere duplication of the parts.

The electrodes 20 are connected in any suitable manner, with a source of electric current, and one satisfactory means for leading the current to the electrodes 20 is the provision of a conductor passing through the wall of the smoke house or chamber, which conductor will be connected at its inner end with the electrode 20, and at its outer end coupled with the lead wire from the source of electricity. This conductor 23 may, if desired, be a rigid conductor, and will, in that case, serve to maintain the electrode 20, if it be of the loose swinging type, in substantially the same position.

The electrodes 20, described, when connected in circuit as set forth, preferably become the positive elements or anodes of the apparatus.

The carrier chains 12 and their sprockets are grounded in any suitable manner, as, for example, by the ground wire 23', shown in Fig. 3, so that they, together with the substances carried on the chain, become preferably the negative terminals or cathodes of the apparatus, and an electrical field is created through which the substances to be treated pass as they travel over the sprockets arranged as described, in the smoke house.

While the relation of the anodes and cathodes to one another may, of course, be varied, and will probably be varied under different conditions, I have found in the apparatus which I have used, that a distance of 30 inches between the electrodes 20, giving a clearance of 15 inches on each side of the chains 12 is satisfactory for standard sizes of meats, but with different substances and with meats of different sizes, it is obvious that variation in the disposition of the parts and their relative distances from one another may be resorted to and still be within the range of my invention.

The anodes 20 are, as stated, connected with a source of electricity, and this may be either a static machine, an induction coil, a direct current generator, or an alternating current generator. In my present experiments, I have found that an alternating current, say 220 volts, the usual municipal voltage, passed through a transformer to step the current up to the degree required and then rectified to give a unidirectional current is admirably suited to my purpose.

Phase, voltage, and amperage of the current used may, of course, vary. In my experiments I have used currents ranging from a voltage which will produce, in air, a spark from 3 inches up to 10 inches, so that it will be seen a wide range, both in current and phase, intensity, and flow is permitted in practising my invention. These examples of suitable electrical conditions are given merely to illustrate what I have determined, by my experiments, to be practicable, but
it is to be understood that I do not confine
myself, by reason of giving these practical
examples, to any particular range of cur-
rent flow, phase or intensity.
5 Under the conditions and with the appa-
ratus specified, the negative side, namely,
the carriers with the meats suspended there-
on, is brought to a highly electrified condi-
tion while in the electrical field, and, in such
10 condition, takes up very rapidly the treating
agent. In this case a curing smoke, and meats
so treated will, in much less time than is
now possible with present smoking methods,
become uniformly and completely smoked.
15 For example, with the apparatus conven-
tionally illustrated in the drawings, the meat
is in transit in the smoke house for
substantially 30 minutes, and is in the elec-
trical field substantially 15 minutes; where-
as, under present smoking methods, the
20 period of time required to smoke meats of
the standard sizes is a considerable number of
hours; and, as is well known, to give
what is called a "hard" smoke to meats, a
25 greater length of time is required.

One great advantage of the system of
smoking meats herein disclosed, in addition
to the saving in time of curing, is that the
20 heats are not subjected to high tempera-
tures and consequent shrinkage in weight
by reason of loss due to heat, and the per-
centage of saving in weight over the present
known methods is, therefore, very consider-
able. Under the present methods, heat is
35 essential to proper smoking, as the meat
will not, while cold, take the curing agent
at all satisfactorily, and unless the meat is
brought to a relatively high temperature,
the period of curing is correspondingly
40 lengthened. Meats cured by the old meth-
ods, since they are necessarily subjected to
a relatively high temperature, lose, to a con-
siderable extent, their firmness, whereas, by
my method and using my apparatus the
45 meats are not subjected to the action of heat,
the temperature remaining substantially the
same during the treatment of the meats in
the smoke house.

Furthermore, since the rapid smoking of
the meat in this electrified condition occu-
pies but a small period of time, the saving
in the curing agent is considerable. In the
case of smoking meats with hickory smoke,
for example, this item of cost of the curing
55 agent amounts to considerable in the hand-
ling of large batches of meats, as wood or
sawdust, which is the practical form by
which smoking may be effected in large op-
erations, is a considerable item of cost in
the matter of curing meats.

By practising my process and utilizing
the apparatus described, fresh meats may
be cured very satisfactorily, as the curing
action is so rapid and uniform that there is
65 no opportunity for putrefaction to set in, as
would be the case were it attempted to
treat fresh meats by the ordinary smoke
house methods.

The smoking agent or other treating agent
may, of course, be introduced into the smoke
70 house, heretofore described, in any suitable
manner, but preferably I will introduce that
smoke by means of a suitable blower 26,
conventionally shown in Fig. 1. This blower
26 being supplied from any suitable source
75 with smoke or other treating agents and
delivering to the smoke house or chamber
10, preferably near the bottom thereof, so
that the smoke, after being introduced, will
envelop the apparatus and the substances
80 being cured and will then pass upwards in
the smoke house. I find that under the
conditions of electrification described, the
smoke is very rapidly taken up by the meat,
so that the air in which the smoke constitu-
eants are suspended rises to the top of the
85 chamber or house in a relatively pure con-
dition. This air may, of course, pass out
through suitable ventilating openings or be
disposed of in any usual manner, but pre-
ferably there will be provided an exhaust
apparatus 27 comprising the exhaust fan
28 coupled into the smoke house or chamber
10 at the top thereof and having any suit-
able delivery pipe.

The relative speed of introduction of
smoke into, and exhaustion of air from, the
smoke house or chamber 10 through the
blower 26 and the exhaust fan 27 may, of
90 course, be varied to meet conditions and
100 regulated in accordance with the needs of
the work being performed.

In my experiments and use of the appa-
ratus I have so proportioned the blower 26
and exhaust device 27 as the exhaust
105 27 would have a capacity slightly greater
than the blower 26, so as to insure the move-
ment of the smoke upwardly through the
smoke house or chamber and guard against
the smoke escaping through the loading
110 opening 28, where the workman puts on and
removes the meat from the carrier chain.

The blower 26 and exhaust device 27 may,
if desired, be supplemented by what I term
115 a "smoke lock" to further guard against
the escape of smoke.

The loading opening 28 extends from the
120 container 10 a considerable distance and is
provided interiorly with spring doors.
There are two sets of spring doors 29, pre-
ferably arranged as shown, one set between
the runs of the carrier chain 12, and the
125 other set below the carrier chain so that be-
tween the two sets of spring doors an effec-
tive lock is provided.

These spring doors 29 will be automati-
130
tions 30 on the chain, which projections 30 are arranged adjacent the points of suspension of support of the meat and are of sufficient length to maintain the doors 29 in open position until the meat has passed through, whereupon the spring doors 29 will automatically close.

With this arrangement it will be seen that as the chain travels in and out of the container 10 through the loading opening 28, the spring doors 29 will be opened and closed automatically so that the meat will pass, both as it is fed to the smoke house and delivered therefrom, into the smoke lock and the egress of smoke through the loading opening will be prevented, thus eliminating all danger of the escape and consequent annoyance of smoke through the loading opening.

While I have shown the carrier chains as forming the negative side of the apparatus, and the electrodes lying between those chains as the positive side of the apparatus, and this, according to my present experiments, is the best disposition of the parts, the treatment could be accomplished by making the chains and the substances carried thereby the positive side, and the electrodes lying between the chains the negative side of the system.

The results, however, are not as satisfactory, and from a practical standpoint, of course, it is more desirable that the chains form the negative and grounded side of the system, as there is then no danger to the workmen who are manipulating the apparatus and placing the meat upon and removing it from the carrier chains.

I have also found in the practice of my invention that good results may be obtained by suspending the meats or other substances to be cured both from the negative terminals and the positive terminals. I prefer, however, the arrangement and apparatus herein shown and described, although, so far as the mechanical features of the apparatus are concerned, it will be understood that they may be varied within wide limits without departing from my invention.

From the foregoing, it will be seen that an apparatus is provided and a method is disclosed by which the continuous smoking of meats may be expeditiously and satisfactorily carried on. While I have referred to the substance treated, I contemplate the treatment of other edible substances, potable liquids, and in fact any substance which it is desired to rapidly and thoroughly impregnate with a treating agent.

I claim:

1. The method of treating substances, which consists in moving them through an electrical field, and subjecting them while passing through such field to the action of a treating agent.

2. The method of treating meat, which consists in moving it through an electrical field, and subjecting it while passing through such field to the action of a treating agent.

3. The method of smoking meat, which consists in moving it through an electrical field, and subjecting it while passing through such field to the action of a smoking agent.

4. The method of treating substances, which consists in bringing the substances to an electrified condition, moving the substances so electrified past a terminal of opposite polarity to that of the electrified substance, and while in such relation subjecting them to the action of a treating agent.

5. The method of treating substances which consists in constituting such substances the negative terminal of an electric circuit, moving them past a positive terminal, and while so moving them subjecting them to the action of a treating agent.

6. The method of treating meat, which consists in constituting such meat the negative terminal of an electric circuit, moving it past a positive terminal, and while so moving it subjecting it to the action of a treating agent.

7. The method of smoking meat, which consists in constituting such meat the negative terminal of an electric circuit, moving it past a positive terminal, and while in such condition subjecting it to the action of a smoking agent.

8. The method of smoking meat, which consists in subjecting such meats to one of the terminals of an electric circuit, moving it past a terminal of opposite polarity, and while in such condition subjecting it to the action of a smoking agent.

9. In apparatus of the class described, the combination of a suitable container, an electric terminal in said container, means for moving the substance to be treated past said terminal and through the electric field created thereby, and means for introducing a treating agent into said container.

10. In apparatus of the class described, the combination of a container, electric terminals of opposite polarities in said container, means for moving one of said terminals relative to the other, means for supporting the substance to be treated on one of said terminals, and means for introducing a treating agent to said container.

11. In apparatus of the class described, the combination of a container, electric terminals of opposite polarities in said container, means for moving one of said terminals relative to the other, means for supporting the substance to be treated on the movable terminal, and means for introducing a treating agent to said container.

12. In apparatus of the class described, the combination of a container, a fixed positive electric terminal in said container, a
morable negative electric terminal in said container, means for supporting the substance to be treated on said movable negative terminal, and means for introducing a treating agent to said container.

13. In apparatus of the class described, the combination of a container, a plurality of electric terminals in said container, a movable carrier passing between said terminals, means for supporting the substance to be treated on said carrier, and means for introducing a treating agent to said container.

14. In apparatus of the class described, the combination of a container, a plurality of positive electric terminals in said container, a carrier of opposite polarity, movable between said positive terminals, means for supporting the substance to be treated on said carrier, and means for introducing a treating agent to said container.

15. In apparatus of the class described, the combination of a container, a plurality of positive electric terminals in said container, an endless carrier of opposite polarity passing between said positive terminals, means for supporting the substance to be treated on said carrier, and means for introducing a treating agent to said container.

16. In apparatus of the class described, the combination of a container, a plurality of staggered or offset electric terminals in said container, an endless carrier of a polarity opposite that of said terminals threaded through and about said terminals, means for supporting the substance to be treated on said endless carrier, and means for introducing a treating agent to said container.

17. In apparatus of the class described, the combination of a container, a plurality of vertically disposed and horizontally offset electric terminals in said container, an endless carrier of a polarity opposite to the polarity of said terminals threaded between and about said terminals, means for supporting the substance to be treated on said carrier, and means for introducing a treating agent to said container.

18. In apparatus of the class described, the combination of a container, a plurality of fixed electric terminals therein, a endless carrier of opposite polarity to the polarity of said fixed terminals threaded between and about said terminals, means for driving said carrier, means for supporting substances to be treated upon said carrier, means for introducing to said carrier a treating agent, and means for exhausting said carrier.

19. In apparatus of the class described, the combination of a container, an electric terminal in said container, carrier supporting pulleys in opposed and spaced relation in said container, a carrier of opposite polarity to the polarity of said terminal mounted on said pulleys, means for driving said pulleys and carrier, means for supporting substances to be treated on said carrier, means for introducing a treating agent to said container, and means for exhausting said container.

20. Apparatus for effecting the continuous smoking of meat, comprising a substantially closed container, an endless meat carrier mounted in said container and accessible from the outside of said container for the deposit thereon and removal therefrom of meat, means for driving said carrier, means in said container for creating an electrical field along and about the path of movement of said carrier and the meat thereon, and means for introducing smoke to said container.

21. Apparatus for effecting the continuous smoking of meat, comprising a substantially closed container, spaced-apart carrier pulleys in said container, an endless double-chain carrier having transversely disposed meat-supporting connections mounted on said pulleys and accessible from the outside of said container for the deposit and removal of meat, means for driving said carrier, means in said container for creating an electrical field along and about the path of movement of said carrier and the meat thereon, and means for introducing smoke to said container.

22. Apparatus for effecting the continuous smoking of meat, comprising a substantially closed container having an opening in its wall for receiving and delivering meat, an endless meat carrier in said container a section of which is accessible through said opening, means for driving said carrier, means in said container for creating an electrical field along and about a section of the carrier and the meat thereon in said container, and means for introducing smoke to said container.

23. Apparatus for effecting the continuous smoking of meat, comprising a substantially closed container having an opening in its wall for receiving and delivering meat, an endless meat carrier having a leg within said container and a second leg delivering to said opening, means for driving said carrier, means for creating an electrical field along and about the said first-named leg, and means for introducing smoke to said container.

24. Apparatus for effecting the continuous smoking of meat, comprising a substantially closed container having an opening in its wall for receiving and delivering meat, an endless meat carrier having a vertically disposed leg within said container and a second horizontally disposed leg delivering to said opening, means for driving said carrier, means for creating an electrical field along and about the said vertically disposed leg, and means for introducing smoke to said container.
25. Apparatus for effecting the continuous smoking of meat, comprising a substantially closed container having an opening in its wall for receiving and delivering meat, an endless meat carrier in said container having a plurality of vertically disposed legs and a horizontal leg delivering to said opening, means for driving said carrier, means adjacent each vertically disposed carrier leg to create an electrical field along and about said leg and the meat thereon, and means for introducing smoke to said container.

26. Apparatus for effecting the continuous smoking of meat, comprising a substantially closed container having an opening in its wall for receiving and delivering meat, an endless meat carrier in said container having a plurality of vertically disposed legs and a horizontal leg delivering to said opening, means for driving said carrier, means adjacent each vertically disposed carrier leg to create an electrical field along and about said leg and the meat thereon, and means to cause movement of the smoke introduced to said container away from said opening.

27. Apparatus for effecting the continuous smoking of meat, comprising a substantially closed container having an opening in its wall for receiving and delivering meat, an endless meat carrier in said container having a plurality of vertically disposed legs and a horizontal leg delivering to said opening, means for driving said carrier, means adjacent each vertically disposed carrier leg to create an electrical field along and about said leg and the meat thereon, and an exhaust device to cause the smoke introduced in said container to move upwardly therethrough and prevent its escape through the meat receiving and delivering opening.

28. In apparatus of the class described, the combination of a container having a loading opening, a closure for said loading opening, an endless carrier to receive and deliver through said opening, and means on said carrier for opening said closures at predetermined intervals.

29. In apparatus of the class described, the combination of a container having a loading opening, normally closed spring doors for said opening, an endless carrier to receive and deliver meat through said opening, and means on said carrier for opening said doors at predetermined intervals.

30. In apparatus of the class described, the combination of a container having a loading opening, a plurality of closures in said opening, an endless carrier to receive and deliver through said opening, and means for opening said closures alternately at predetermined intervals.

31. In apparatus of the class described, the combination of a container having a loading opening, a plurality of closures in said opening, an endless carrier to receive and deliver through said opening, and means on said carrier for opening the said closures alternately at predetermined intervals.

32. In apparatus of the class described, the combination of a container having a loading opening, a plurality of closures in said opening, an endless carrier to receive and deliver through said opening, and means on said carrier for opening the said closures alternately at predetermined intervals and maintaining each closure in open position for a predetermined length of time.

33. In apparatus of the class described, the combination of a container having a loading opening, a plurality of spring doors in said opening, an endless carrier to receive and deliver through said opening, and means on said carrier for opening the said spring doors alternately at predetermined intervals and maintaining each spring door in open position for a predetermined length of time.

34. In apparatus of the class described, the combination of a container having a loading opening, an endless carrier to receive and deliver through said opening, a plurality of closures disposed between the runs of said carrier, a plurality of closures disposed below said carrier, and means on said carrier for opening said closures alternately at predetermined intervals and maintaining them in open position for a predetermined length of time.

35. In apparatus of the class described, the combination of a container having a loading opening, an endless carrier to receive and deliver through said opening, a plurality of normally closed spring doors disposed between the runs of said carrier, a plurality of normally closed spring doors disposed below said carrier, and means on said carrier for opening said spring doors alternately at predetermined intervals and maintaining them in open position for a predetermined length of time.

In testimony whereof I have hereunto set my hand.

JAMES N. ALSOP.