Aug. 12, 1952 C. S. McMULLEN 2,606,546

SMOKE GENERATOR

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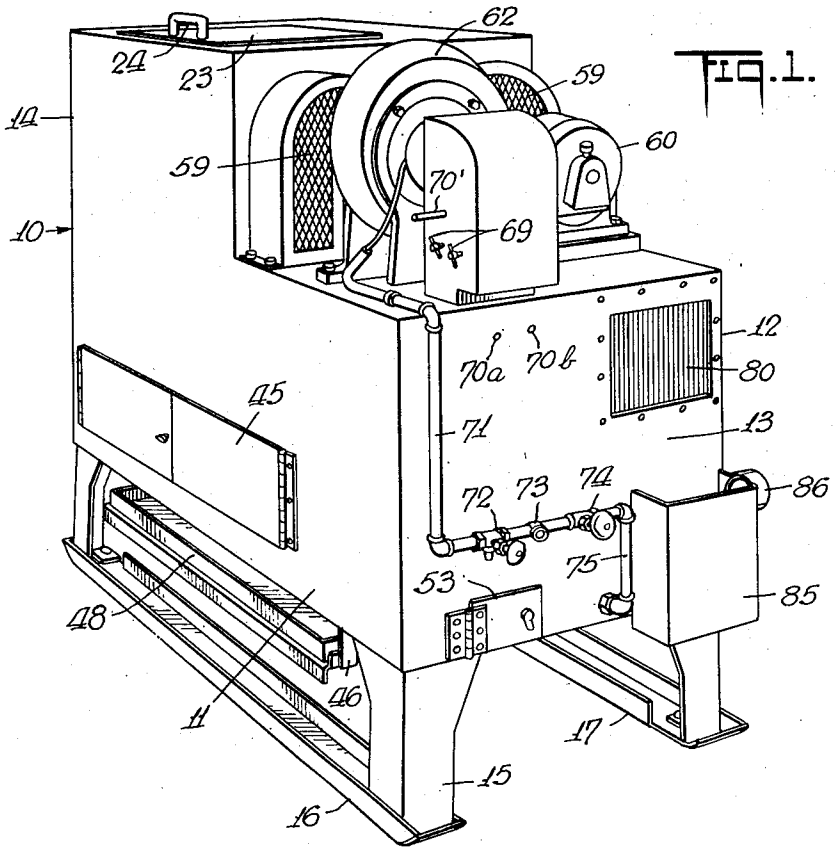

Fig. 1.

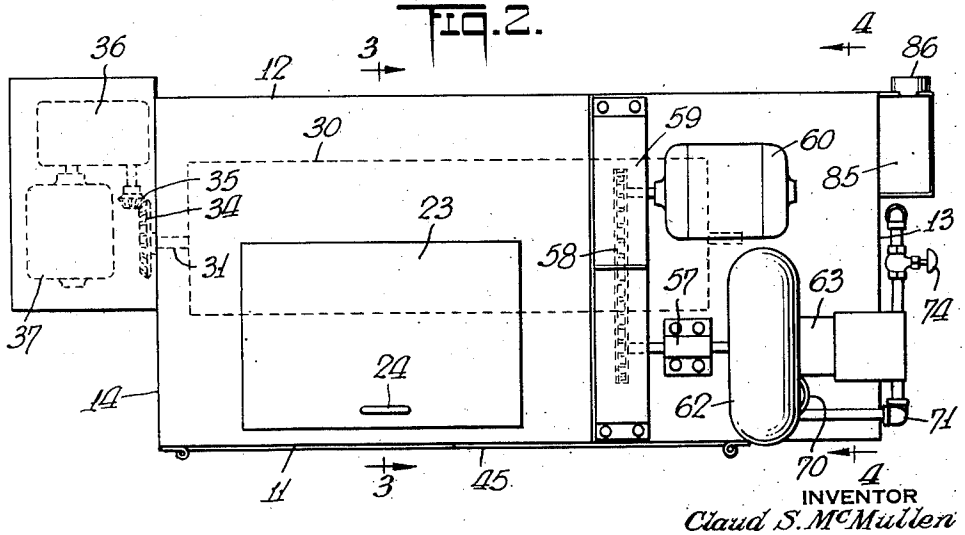

Fig. 2.

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FIG. 3.

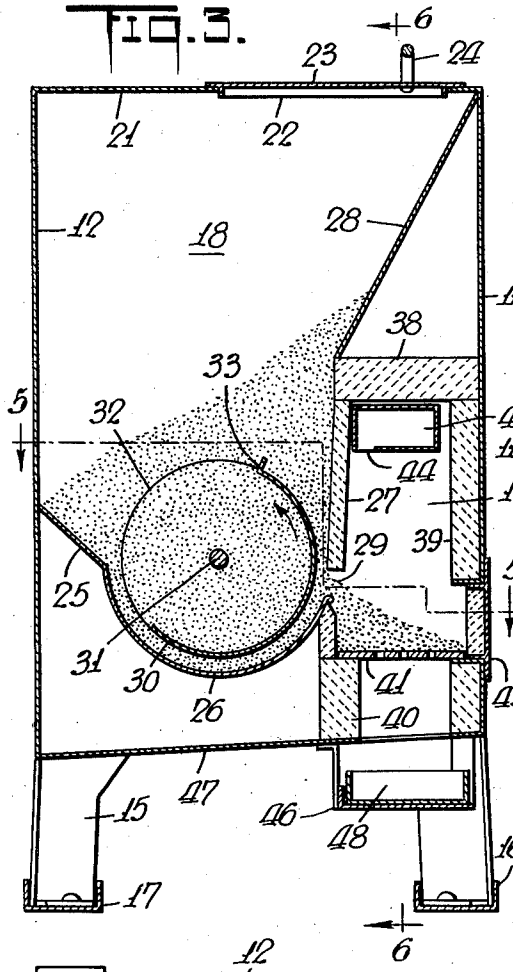

FIG. 4.

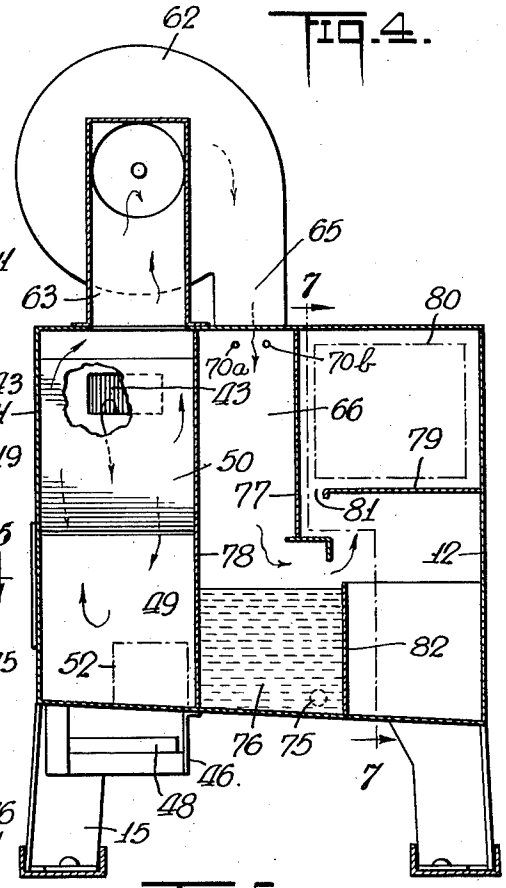

FIG. 5.

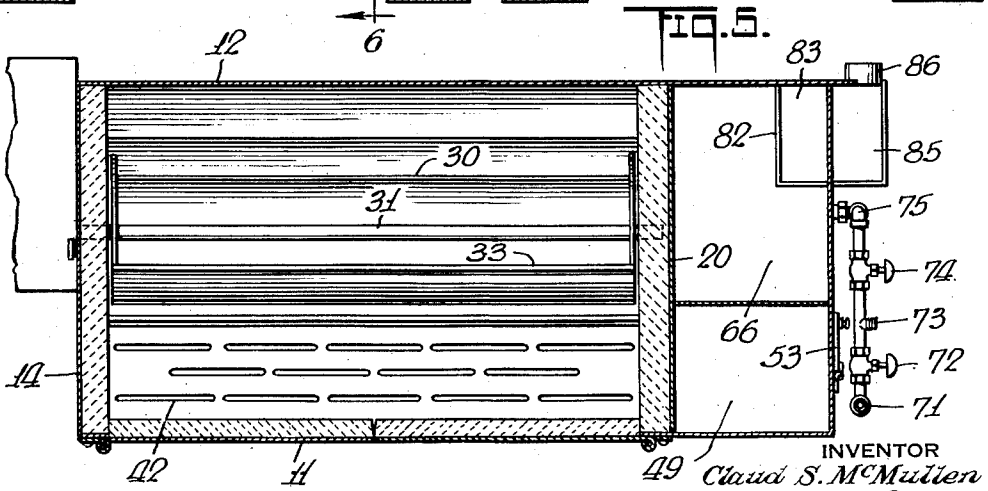

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Fig. 6.

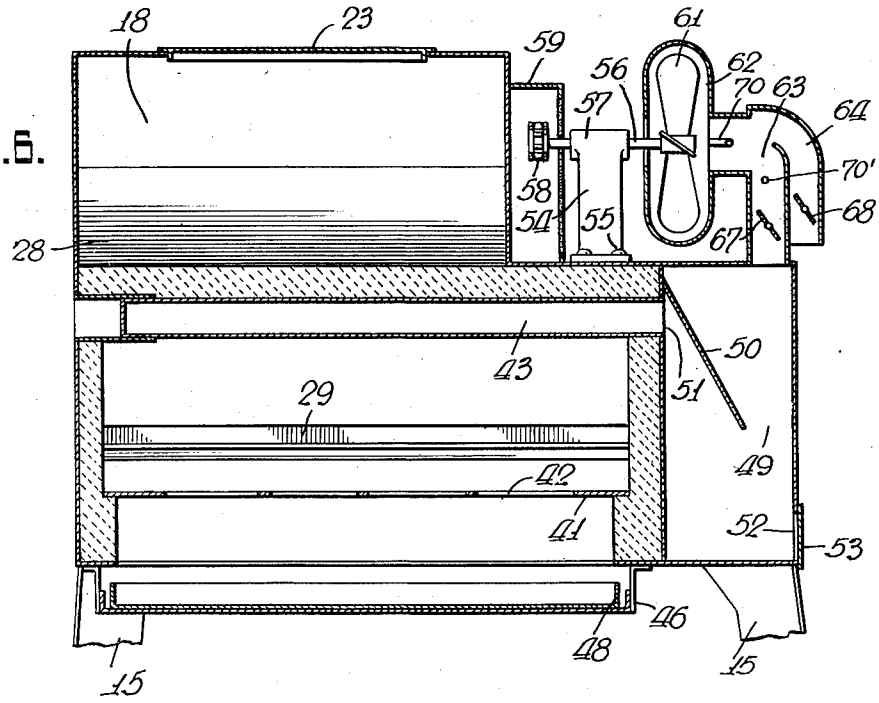
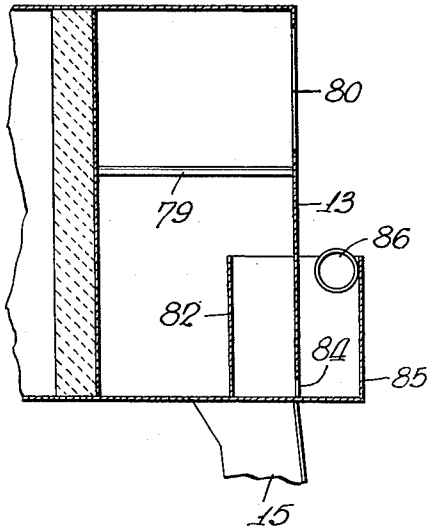


Fig. 7.



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UNITED STATES PATENT OFFICE

2,606,546

SMOKE GENERATOR

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Application December 23, 1947, Serial No. 793,502

6 Claims. (Cl. 126—59.5)

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This invention relates to a smoke generator for use in producing smoke for the smoke curing and preserving of comestibles such as meat or fish.

Smoke generators heretofore available have operated on the principle of supplying to a relatively deep bed of sawdust an amount of air insufficient to support combustion of the sawdust and causing the sawdust to smolder to generate the smoke which, after washing, if desired, is fed to the smoke houses. These generators produce smoke of varying density with consequent variation in the color or other properties of the comestibles cured or preserved by treatment therewith. Furthermore, such generators require frequent attention and convert only a minor portion of the sawdust to smoke, the remainder of the sawdust being required for combustion purposes. Moreover, such generators are relatively inflexible, i. e., they can be operated at full capacity or not at all. In those cases in which a smoke generator is employed to supply smoke for a plurality of smoke houses and for some reason it is desired to supply smoke to only some of the houses, the inflexibility of the smoke generator presents a serious problem. Usually the smoke generator is run at its full capacity and the smoke supplied to the smaller number of smoke houses; under these conditions comestibles are subjected to a correspondingly greater volume of smoke with consequent deleterious effect on the product and uneconomic utilization of the sawdust employed to produce the smoke.

It is an object of this invention to provide a smoke generator for producing smoke for treatment of comestibles which generator produces a uniform volume of substantially constant density smoke, can readily be adjusted to produce any desired volume of such smoke or to produce smoke of different density, if desired, requires a minimum of attention by the operator, is compact and simple in design and efficient in operation.

Other objects and advantages of this invention will be apparent from the following detailed description thereof.

In accordance with this invention, a controlled amount of relatively cool moist sawdust is fed on to a grate or other support to form a relatively thin layer of sawdust thereon and a blast of air or other oxygen containing gas is introduced into contact with this thin layer of sawdust to consume the sawdust substantially at the same rate as it is fed on to the support, thus continuously generating a uniform volume of smoke per unit weight of sawdust fed on to the support. The amount of oxygen containing gas thus contacted with the sawdust is in excess of the stoichiometric amount required to support combustion thereof.

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In accordance with a preferred embodiment of the invention, the smoke generator comprises an oblong housing. At one end of this housing disposed in side by side relationship are a sawdust receiving compartment and a smoke generator compartment. These compartments extend almost the full length of the oblong housing and occupy the major portion of the volume of the housing, the sawdust receiving compartment being the larger of the two to provide a substantial storage of sawdust. The sawdust receiving compartment is suitably insulated so that the sawdust therein is not heated by the heat generated within the smoke generating compartment but is maintained in cooled moist condition in which condition it is fed continuously at a controlled rate to the smoke generating compartment. The smoke generating compartment contains a grate on to which sawdust is fed from the sawdust receiving compartment. A flue extends the full length of the smoke generating compartment near its top for receiving the smoke generated.

At the other end of the oblong housing are disposed in side by side relationship a smoke receiving passage communicating with the flue and a settling out and cooling passage communicating with the smoke receiving passage. A fan is provided for exhausting smoke from the smoke receiving passage and introducing it into the settling out and cooling passage. This fan also provides the forced draft which causes atmospheric air to flow under relatively high velocity into contact with the sawdust to generate smoke as hereinabove described, which smoke flows through the flue, the smoke receiving passage and the fan, and is pumped by the fan into and through the settling out and cooling passage into the smoke discharge port at the exit end of the latter passage. A spray of water is fed to the fan and serves to keep the fan shaft and bearings cool and to quench any sparks which may be carried off by the smoke into the fan. This water is broken up into fine particles by the fan, which particles are dispersed in the stream of smoke to cool the smoke stream. The fan also communicates with a channel leading into the atmosphere. This channel and that connecting the fan with the smoke receiving passage are each provided with a damper which may be controlled manually or automatically to regulate the amount of air mixed with the smoke to produce a smoke

stream of any desired density. The stream thus produced is introduced into the settling out and cooling passage. In its flow through the settling out and cooling passage tarry material and other suspended material are removed from the smoke stream, settle into a body of water maintained at the base of this passage, and are flushed out of the smoke generator.

In the accompanying drawings forming a part of this specification and showing for purposes of exemplification a preferred form of this invention without limiting the claimed invention to such illustrative instance:

Figure 1 is a perspective view of a smoke generator embodying this invention;

Figure 2 is a plan view of the generator shown in Figure 1;

Figure 3 is a vertical section taken in a plane passing through line 3—3 on Figure 2;

Figure 4 is a vertical section, partly in elevation, taken in a plane passing through line 4—4 on Figure 2;

Figure 5 is a horizontal section taken in planes passing through line 5—5 on Figure 3;

Figure 6 is a vertical section taken in a plane passing through line 6—6 on Figure 3; and

Figure 7 is a fragmentary vertical section taken in a plane passing through line 7—7 on Figure 4.

In the drawing 10 indicates an oblong housing consisting of a front wall 11, back wall 12, and end walls 13 and 14, desirably of cast iron or steel or other suitable material. This housing is supported on suitable legs 15 desirably positioned at each of the corners thereof. The front and rear pairs of legs, viewing Figure 1, rest on and desirably are bolted or otherwise secured to channel irons 16 and 17, respectively, which impart rigidity to the leg support for the housing and carry the entire weight of the generator.

Disposed at one end of the housing in side by side relationship are a sawdust receiving compartment 18 and a smoke generating compartment 19 (Figure 3). Both of these compartments, as shown in Figure 5, extend from end wall 14 of the housing to an intermediate wall 20 and occupy a major portion of the volume of the housing. The top of the sawdust receiving compartment 18 extends across the full width of the housing 10, is provided with a charging opening 22 normally closed by cover 23 equipped with a handle 24 through which opening 22 sawdust may be supplied to compartment 18.

The base of the sawdust receiving compartment 18 is defined by an inclined shelf 25 and a semi-cylindrical section 26. Wall 27 separates the sawdust receiving compartment 18 from the smoke generating compartment 19 and is made of suitable high temperature heat insulating material such as asbestos cement. A longitudinally extending narrow slot or opening 29 places the sawdust receiving compartment 18 in communication with the smoke generating compartment 19.

Feed of the sawdust through feed slot 29 is accomplished by a cylindrical drum 30 mounted on a shaft 31. Drum 30 has approximately 180° of its peripheral surface removed to form an opening 32 which when in the position shown in Figure 3, permits the sawdust to enter the drum. A flange or extension 33 extends above the periphery of the drum the full length thereof. This flange, when the drum is rotated, serves to agitate the cool moist sawdust in compartment 18 insuring flow of the sawdust into the interior of drum 30 through opening 32. As the rotation of the drum is continued in the direction indicated by the full line arrow on Figure 3, flange 33 moves through semi-cylindrical section 26 with very little clearance between it and the wall of section 26, forcing a layer of sawdust through feed opening 29. In the operation of this feeder a constant amount of sawdust is fed through opening 29 per revolution of drum 30. If it is desired to change the amount of sawdust fed to the smoke generating compartment 19, it is only necessary to change the rate of rotation of drum 30.

Shaft 31 of drum 30 is mounted for rotation in suitable bearings in walls 14 and 20 defining the opposite end walls of the sawdust receiving and smoke generating compartments. Rotation of this drum may be effected by any suitable driving mechanism, for example that shown in Figure 2 involving a bevel gear 34 keyed to shaft 31 and meshing with a bevel gear 35 on a shaft extending from reducing gear box 36. A motor 37 drives this shaft through suitable reduction gears disposed in box 36.

The smoke generating compartment 19 desirably has a firebrick top wall 38, a firebrick lined side wall 39 and a firebrick portion 40 in alignment with heat insulating wall 27 as shown in Figure 3. A grate 41 is suitably supported on firebrick supports in the base portion of compartment 19 just below opening 29 as shown in Figure 3. This grate may consist of a flat metal plate provided with a number of elongated slots 42 which as shown in Figure 5 are arranged in three parallel rows, the slots of one row being staggered with respect to those of a contiguous row. The number and size of such elongated slots should be such as to provide a high velocity of air therethrough in contact with the relatively thin layer of sawdust supplied to grate 41 by the hereinabove described sawdust feed. A smoke receiving flue 43, desirably metal lines, is positioned at the top of the smoke generating compartment 16 and has an opening 44 running the full length thereof through which smoke generated in compartment 16 enters the flue 43. This flue conducts the smoke generated in compartment 16 to a smoke receiving passage 49 hereinafter more fully described and also provides a confined path which communicates with the smoke generating compartment through opening 44. Fan 61 hereinafter described exerts a suction through this path causing air to enter through slots 42 to support combustion of the sawdust fed on to grate 41.

Disposed in the front wall 11 just above grate 41 is a cleanout door 45 which when removed gives access to the top of the grate and the feed opening 29. Suitable supports 46, desirably angle irons, are fastened to the base 47 of the housing and are arranged to removably receive an ash pan 48 into which fall the ashes from grate 41. This ash pan is readily removable so that the ashes may be dumped and the pan replaced, when desired, on the supports 46.

Flue 43 communicates with a smoke receiving passage 49 desirably positioned at the opposite end of housing 10 from that containing the compartments 18 and 19 as shown in Figure 5. A baffle 50 (Figures 4 and 6) extends downwardly from near the top of passage 49 across the inlet port 51 with which flue 43 communicates. This baffle deflects the smoke in a downward direction and causes it to flow first toward the base of passage 49 and then upwardly therethrough.

A cleanout opening 52, normally closed by a door 53, is provided just above the floor or base of passage 49. Suspended material carried by the smoke stream and settling out therefrom due to change in direction of flow caused by baffle 50 may be removed from time to time, as desired, through opening 52.

A bearing standard 54 is bolted or otherwise secured to the top of housing 10 as at 55. Fan shaft 56 is rotatably mounted in bearing 57 carried by this standard. This fan shaft may be driven through a belt or chain and sprocket drive 58 disposed in a removable housing or guard 59 and actuated by the drive mechanism hereinabove described. This fan is disposed within a housing 62 provided with one passageway 63 (Figure 6) connecting the fan with passage 49, a second passageway 64 communicating with the atmosphere, and a third passageway 65 (Figure 4) leading from the base portion of housing 62 into a settling out passage 66 disposed in side by side relation to the smoke receiving passage 49. Dampers 67 and 68 (Figure 6) are disposed in passageways 63 and 64, respectively. By properly positioning these dampers which may be operated, for example, by a handle 69 (Figure 1) individual to each damper, the ratio of air to smoke drawn in by the fan may be regulated as desired to produce a smoke of desired density. For any given adjustment of dampers 67 and 68, a smoke of constant definite density is produced, as will be pointed out more fully hereinafter. If it is desired to change the density for any reason, this is accomplished by changing the setting of dampers 67 and 68.

A water spray or jet 70 is positioned to discharge water onto the fan bearings as shown in Figure 6. The water thus serves to cool the fan bearings and is dispersed in fine drops by the fan blades into the smoke stream flowing through the fan housing functioning to partially cool this smoke stream. Jet 70 is supplied by water from a line 71 (Figure 1) having a valve 72 therein, provided with a threaded coupling 73 for connection to any suitable water line, a second valve 74 controlling flow through a branch 75 leading into a water sump 76 (Figure 4) disposed at the base of the settling out and cooling passage 66.

A steam jet 70' is disposed in the passageway 63 and may be turned on when the temperature of the smoke is too low, say below 120° F., to introduce steam to raise the temperature to the desired value. Desirably steam jet 70' and water jet 70 are equipped with control valves operated by well known throttling type thermostat controls 70*a* and 70*b* (Figures 1 and 4) located at the top of passage 66. If the temperature of the smoke entering passage 66 is too high, the water and steam jet valves are operated to control the flow of these media so that the temperature of the smoke entering passage 66 is maintained at the desired constant value. Thus, for example, should the temperature of the smoke rise, more cooling water is admitted through jet 70 and should the temperature fall below the desired value, steam is turned on, or more steam admitted through jet 70'. Since the controls 70*a* and 70*b* may be of any well known type, further description thereof is considered unnecessary.

A baffle 77 is disposed in passage 66 substantially parallel to wall 78 separating the smoke receiving passage 49 from the settling out and cooling passage 66. A second baffle 79 extends at right angles to baffle 77 from wall 12 defining a

side wall of passage 66. Baffles 77 and 79 cause the smoke stream to flow through a tortuous path in its passage through 66, the smoke stream first flowing vertically downwardly, then horizontally at right angles to its initial direction under baffle 77, then vertically through the space between baffles 77 and 79 into the port 80 leading from the exit end of the settling out and cooling passage 66. As the smoke stream changes its direction of flow, contacts baffle 79, and is caused to pass through the restricted passageway 81 between baffles 77 and 79, tarry material, suspended liquid and solid particles are removed therefrom, the material thus removed gravitating into the sump 76.

Water is continuously supplied to sump 76 by branch line 75 to provide a stream of water flowing over the partitions 82 (Figures 4 and 5) in the corner of the passage 66. Partitions 82, with the corner of housing 10, form a drain box 83 over the top of which water containing tarry and other suspended material continuously flows. Near the base of the drain box, in the base of side wall 13, is an opening 84 (Figure 7) through which the water flows into a drain box 85 provided with an overflow 86. Box 85 is dimensioned such that a column of water is maintained therein of a height to provide a liquid seal for opening 84, which seal adequately prevents escape of smoke through opening 84.

It will be noted from Figure 5 that the sawdust containing compartment 18 and the smoke generating compartment are disposed in side by side relationship at one end of housing 10 and extend from this end the major portion of the length of the housing. The smoke receiving passage 49 and the smoke settling out passage 66 are disposed in side by side relation at the other end of housing 10 occupying the remaining minor portion of the volume of the housing. Passage 49, as clearly shown in Figure 5, is disposed in longitudinal alignment with compartments 19 and 66 in longitudinal alignment with compartment 18; the top of compartment 19 through port 51 communicates with passage 49; the top of passage 49 through fan 61 communicates with passage 66; and smoke discharge port 80 is disposed at the exit end of passage 66. Hence a compact and simple smoke generator is provided having a long tortuous path of travel for the generated smoke to effect cooling thereof and removal therefrom of suspended material, including water added for cooling purposes. Further, the fan (*a*) furnishes the draft for providing a blast of air to support combustion of the sawdust, (*b*) draws the resultant smoke through the flue 43 and smoke receiving passage 49, (*c*) effects mixing of the smoke with air in proportions to produce a smoke of desired density depending upon setting of dampers 67 and 68, (*d*) disperses cooling water into the smoke stream, and (*e*) forces the resultant smoke stream through settling and cooling chamber 66 into and through discharge port 80 which communicates with one or more smoke houses.

In operation, cool moist sawdust is charged into compartment 18. The moisture content of the sawdust will depend on the nature of the sawdust, i. e., type of cellulose material, atmospheric humidity conditions, etc. The sawdust should be sufficiently moist so that if pressed between the fingers the particles tend to adhere to each other to form a lump. If the sawdust is so dry that the individual particles readily separate when pressed, water should be added thereto

and the sawdust and water mixed to produce a moist mass, i. e., one from which water will not drain off but is sufficiently moist so that the particles when pressed between the fingers tend to lump or agglomerate. Motor 37 is then energized to feed the sawdust in regulated amounts onto grate 41, the sawdust on this grate having previously been ignited. Motor 60 is energized at the same time to actuate fan 61 to cause a blast of air to pass through slots 42, the slot arrangement giving effective distribution of air into contact with the thin layer of sawdust on grate 41. The rate of air blast and sawdust fed is such that the sawdust is transformed into smoke at substantially the same rate as it is fed by drum 30 through slot 29. The smoke thus generated flows through flue 43, first down and then up through passage 49 into passageway 63 where it mixes with air drawn into passageway 63 through passageway 64 by fan 61 to produce a smoke stream of desired density. The resultant smoke stream, if too hot, is cooled by water dispersed therein by the fan 61 and if too cool, is warmed by steam admitted through 70' and then flows through the tortuous path in passage 66 exiting through discharge port 80 after tarry material, moisture and other suspended material has been removed therefrom. The above described operation is continuous, sawdust in chamber 18 being replenished when necessary.

If it is desired to reduce the amount of smoke generated, this is accomplished by reducing the speed of rotation of drum 30 and, if desired, of fan 61, the motors driving these units being variable speed motors so that they can drive the drum and fan, respectively, at any selected speed. These two motors, the drum 30 and fan 61 are designed so that for a given speed of the motor driving drum 30 and a correlated speed of the motor driving fan 61, a blast of air providing oxygen in excess of the stoichiometric amount required to support combustion of the thin layer of sawdust maintained on grate 41 is supplied to this grate. Once combustion of this thin layer is initiated, the blast of air initially contacting the sawdust particles, due to the arrangement of slots 42 in grate 41, causes a minor portion of the sawdust to burn, generating high temperatures instantaneously which effect liberation of the volatile constituents of the sawdust, producing a maximum amount of smoke per unit weight of sawdust consumed.

It will be noted the process of this invention results in the production of a uniform volume of smoke per unit weight of sawdust consumed, which smoke is of constant density, and that the density of the smoke can be changed, if desired. It will be further noted the smoke generator embodying this invention is unusually flexible in that the volume of smoke generated can readily be changed by manipulating the controls for the motors driving the sawdust feed and the fan, requires a minimum of attention by the operator, and is compact and simple in design and efficient in operation.

The term "sawdust" is used herein in a broad sense and is intended to include wood chips and chips or dust of other cellulose material suitable for use in generating smoke for heating comestibles.

Since certain changes in carrying out the above process and in the smoke generator, which embody the invention, may be made without departing from its scope, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A smoke generator comprising a sawdust receiving compartment, a smoke generating compartment disposed contiguous to the sawdust receiving compartment, a grate in the smoke generating compartment, means in the sawdust receiving compartment for feeding sawdust therefrom in controlled amounts on to said grate, a flue in the top of the smoke generating compartment extending substantially the full length thereof and communicating therewith, a smoke receiving passage communicating with said flue, a settling out and cooling passage disposed adjacent the smoke receiving passage, a fan communicating with both of said passages for exhausting smoke from the smoke receiving passage and for introducing the smoke into the settling out and cooling passage, and a smoke discharge port at the exit end of the settling out and cooling passage.

2. A smoke generator comprising a sawdust receiving compartment, a smoke generating compartment disposed contiguous to the sawdust receiving compartment, a grate in the smoke generating compartment, means in the sawdust receiving compartment for feeding sawdust therefrom in controlled amounts on to the grate in the smoke generating compartment, a flue in the top of the smoke generating compartment extending substantially the full length thereof and communicating therewith, a smoke receiving passage having an inlet port, said flue leading into said inlet port of said smoke receiving passage, a baffle in said smoke receiving passage disposed in front of and extending below said inlet port to cause the smoke to flow first downwardly in said smoke receiving passage and then upwardly therethrough, a settling out and cooling passage disposed adjacent the smoke receiving passage, a fan communicating with both of said passages for exhausting smoke from the smoke receiving passage and for introducing the smoke into the settling out and cooling passage, and a smoke discharge port at the exit end of the settling out and cooling passage.

3. A smoke generator for producing smoke for treatment of comestibles comprising an oblong housing, a sawdust receiving compartment, a smoke generating compartment, said compartments being disposed in side by side relationship at one end of said housing and occupying a major portion of the volume of said housing, said compartments being in communication with each other through a narrow elongated slot disposed in a wall separating said compartments, a grate in the smoke generating compartment disposed beneath said narrow elongated slot, means in the sawdust receiving compartment for feeding a regulated amount of sawdust from said compartment through said slot on to said grate, a smoke receiving passage having an inlet port, and a settling out and cooling passage disposed in side by side relationship therewith at the other end of said housing and occupying the remainder of the volume of said housing, a flue in the top of and extending the length of the smoke generating compartment and communicating therewith and also with said inlet port to the smoke receiving passage, a baffle in the smoke receiving passage disposed in front of and extending below said inlet port to cause the smoke to flow first down-

wardly in said smoke receiving passage and then upwardly therethrough, a fan communicating with both of said passages for exhausting smoke from the smoke receiving passage and for introducing the smoke into the settling out and cooling passage, and a smoke discharge port at the exit end of the settling out and cooling passage.

4. A smoke generator for producing smoke for treatment of comestibles comprising an oblong housing, a sawdust receiving compartment, a smoke generating compartment, said compartments being disposed in side by side relationship at one end of said housing and occupying a major portion of the volume of said housing, said compartments being in communication with each other through a narrow elongated slot disposed in a wall separating said compartments, a grate in the smoke generating compartment disposed beneath said narrow elongated slot, means in the sawdust receiving compartment for feeding a regulated amount of sawdust from said compartment through said slot on to said grate, a smoke receiving passage having an inlet port, and a settling out and cooling passage disposed in side by side relationship therewith at the other end of said housing and occupying the remainder of the volume of said housing, a flue in the top of and extending the length of the smoke generating compartment and communicating therewith and also with said inlet port, a baffle in the smoke receiving passage disposed in front of and extending below said inlet port for causing the smoke to flow first downwardly into said smoke receiving passage and then upwardly therethrough, a fan communicating with both of said passages for creating a draft through the grate and for exhausting smoke from the smoke receiving passage and introducing said smoke into the settling out and cooling passage, and a smoke discharge port at the exit end of the settling out and cooling passage.

5. A smoke generator for generating smoke for treatment of comestibles, which comprises an oblong housing, a sawdust receiving compartment and a smoke generating compartment disposed in side by side relationship and extending from one end of said housing to near the opposite end thereof across the full width thereof, high temperature heat insulation on the inner walls of said smoke generator compartment to minimize the transfer of heat therefrom to the sawdust in the sawdust receiving compartment, the side wall separating the sawdust receiving compartment from the smoke generating compartment having an elongated slot therein through which the two compartments are in communication with each other, said slot being disposed near the base of the sawdust receiving compartment, a grate in the smoke generating compartment disposed below said slot, a cylinder having a substantial area of its periphery open rotatably mounted in the lower portion of said sawdust receiving compartment arranged to receive sawdust, means for rotating said cylinder to cause sawdust to be fed in regulated amounts through said slot on to said grate to form a thin layer of sawdust on said grate, a flue extending the full length of said smoke generating compartment at the top thereof and communicating therewith, a smoke receiving passage having an inlet port, and a settling out and cooling passage disposed in side by side relationship therewith at the other end of said housing, the exit end of said flue leading into said inlet port, a baffle in said smoke receiving passage disposed in front of and extending below said inlet port to cause smoke flowing from said flue to flow first in a downward direction then in an upward direction about said baffle through said smoke receiving passage, a fan communicating with both of said passages for creating a draft of air through said grate to support combustion of the sawdust supplied thereto and for exhausting the resulting smoke through said flue and into and through said smoke receiving passage and introducing the smoke into the settling out and cooling passage, means for supplying water to the fan bearing and fan blades to cool the fan bearings, the rotating fan blades dispersing said water into said smoke, a water sump for collecting tarry material and suspended particles removed from the smoke disposed at the base of the settling out and cooling passage, and a smoke discharge port at the exit end of the settling out and cooling passage.

6. A smoke generator for generating smoke for treatment of comestibles, which comprises an oblong housing, a sawdust receiving compartment and a smoke generating compartment disposed in side by side relationship and extending from one end of said housing to near the opposite end thereof across the full width thereof, high temperature heat insulation on the inner walls of said smoke generator compartment to minimize the transfer heat therefrom to the sawdust in the sawdust receiving compartment, the side wall separating the sawdust receiving compartment from the smoke generating compartment having an elongated slot therein through which the two compartments are in communication with each other, said slot being disposed near the base of the sawdust receiving compartment, a grate in the smoke generating compartment disposed below said slot, a cylinder having a substantial area of its periphery open, said cylinder being rotatably mounted in the lower portion of said sawdust receiving compartment, an extending portion on said cylinder running substantially the full length thereof, means for rotating said cylinder to cause sawdust to be fed in regulated amounts through said slot on to said grate to form a thin layer of sawdust on said grate, a flue extending the full length of said smoke generating compartment at the top thereof and communicating therewith, a smoke receiving passage having an inlet port, and a settling out and cooling passage disposed in side by side relationship therewith at the other end of said housing, the exit end of said flue leading into said inlet port, a baffle in said smoke receiving passage disposed in front of said inlet port and extending therebelow to cause smoke flowing from said flue to flow first in a downward direction then in an upward direction about said baffle through said smoke receiving passage, a fan, a channel connecting said fan with said smoke receiving passage, said fan being also connected with said settling out and cooling passage for creating a draft of air through said grate to support combustion of the sawdust supplied thereto, for exhausting the resultant smoke from said flue and said smoke receiving passage and introducing the smoke into said settling out and cooling passage, a second channel connecting said fan with the atmosphere, a damper in each of said channels to regulate the relative proportions of air and

smoke supplied by said fan to said settling out and cooling passage, means for supplying water to the fan bearings and fan blades to cool the fan bearings, the rotating fan blades dispersing said water into said smoke, a water sump for collecting tarry material and suspended particles removed from said smoke disposed at the base of the settling out and cooling passage, and a smoke discharge port at the exit end of the settling out and cooling passage.

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