

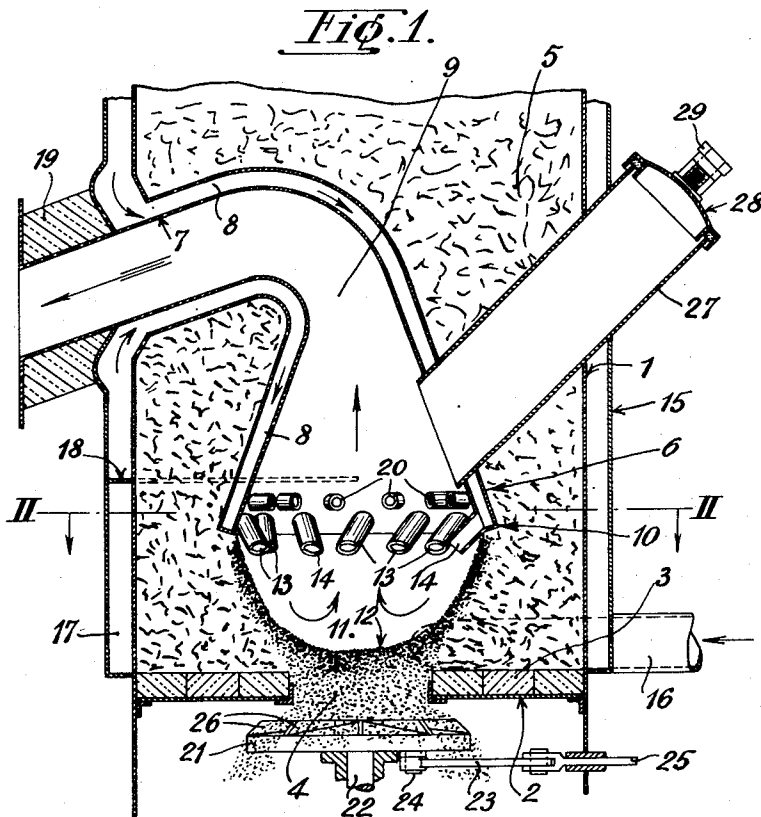
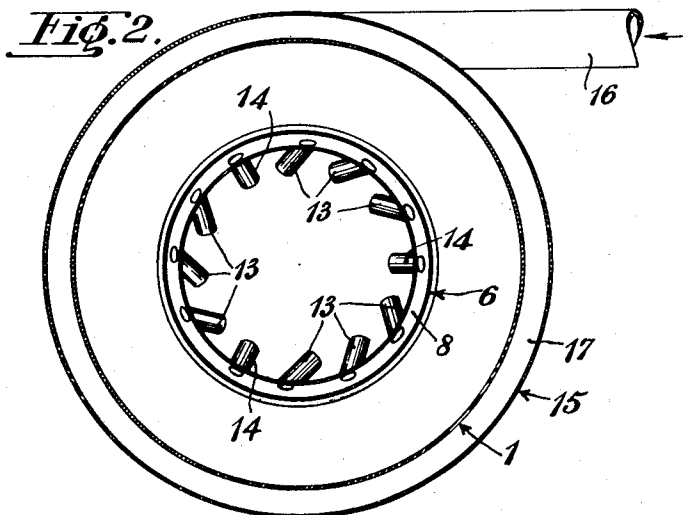
Nov. 2, 1948.

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COMBUSTION APPARATUS FOR SOLID
COMBUSTIBLES IN FRAGMENTS

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3 Sheets-Sheet 1



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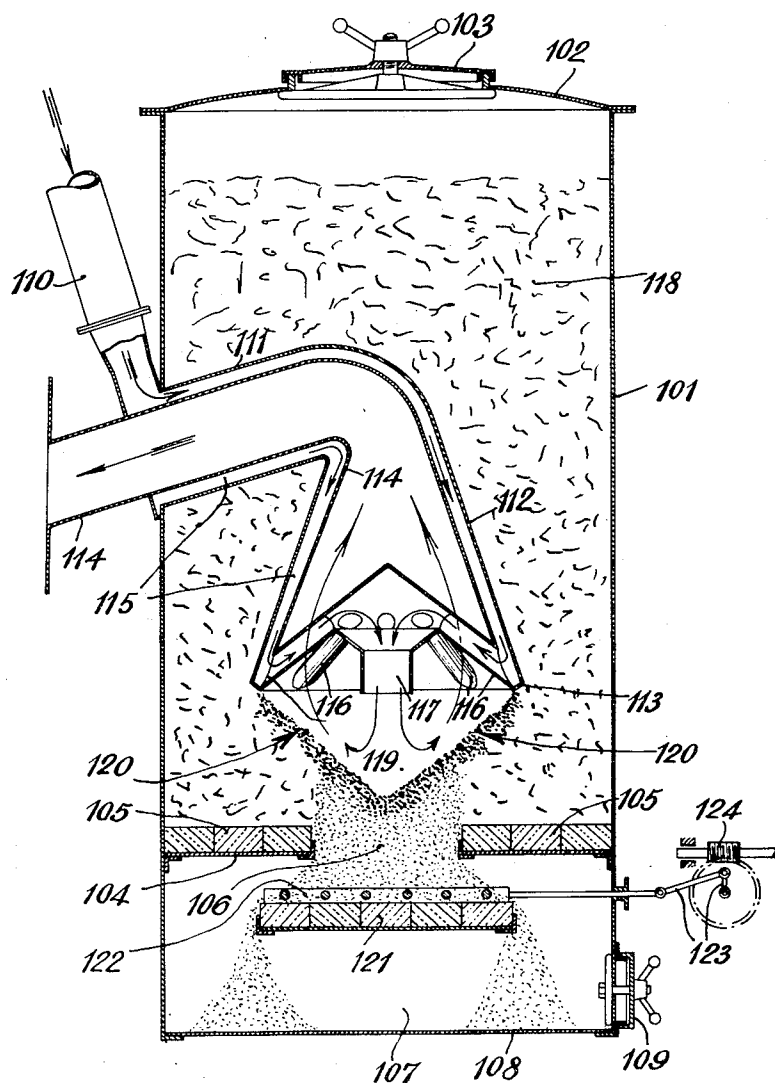
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Fig. 5.



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COMBUSTIBLES IN FRAGMENTS

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The present invention has for its object a process for the combustion of solid combustibles in fragments which is characterized in that the combustion zone affects the shape of at least one crumbling slope, the surface of which is swept by at least one jet of air, so that such surface is licked up by the air without its penetrating deeply in the mass of the combustible. Such jet or jets of air may be previously heated especially in the case of low quality combustibles.

This invention also comprises a combustion apparatus for solid combustible in fragments, for carrying out the process, the apparatus being characterized in that it comprises a container for the combustible, inside which are located means which compel the combustible to crumble in the form of at least one slope and a device for bringing the air and evacuating the combustion gases and which directs that air in the form of at least one jet which sweeps the slope or slopes and turns towards the outlet without having deeply penetrated into the mass of the combustible, so that the combustion remains localized to the superficial zone of the slope.

The annexed figures represent, by way of examples, several embodiments of the apparatus, object of the present invention.

Figure 1 is a vertical sectional view through the vertical axis of the apparatus in a first embodiment.

Figure 2 is a horizontal sectional view through II—II of Figure 1.

Figure 3 is a vertical sectional view through the vertical axis of a second embodiment.

Figure 4 is a horizontal sectional view through IV—IV of Figure 3.

Figure 5 is a vertical sectional view through the vertical axis of a third embodiment.

The apparatus represented on Figures 1 and 2 comprises a container 1, here supposed to be cylindrical, and which is only partly visible. The lower portion of container 1 is provided with a horizontal annular partition 2, the upper surface of which is protected by a refractory coating 3. A passage 4 is spared in the central region of parts 2 and 3. The combustible in fragments which may be of low quality such as turf, brown coal (lignite) is shown at 5, inside container 1, and above the coating 3. The combustion zone is located above passage 4. In the central region of container 1, above passage 4, is disposed a conic frustum bell 6 with double walls and laterally prolonged at its upper part in the form of a channel 7, also double walled. Such bell constitutes at the same time an external annular channel 8, 55

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comprised between both walls of bell 6, and is used for leading in the air for combustion and an internal circular channel 9, used for evacuating the combustion gases. The inferior border 10 of the bell determines inside the mass of the combustible a crumbling pouch 11, the surface of which is constituted by a crumbling slope 12 which, here, affects a generally circular shape. Bell 6 presents at its lower border a series of nozzles which, in the present example, are 12 in number and which communicate at their base with that of the annular channel 8 and project inside the bell. Nine of these nozzles, as numbered 13, are inclined at the same time downwards and tangentially so that the air issuing from them sweeps the surface of slope 12 in the general form of a hyperbolic sheet which goes downwards in a whirling manner; the combustion so taking place at the surface of the slope and the gases of the combustion which have swept said slope being evacuated upwards, through 9, as mentioned. Three other nozzles, which are numbered 14, have their axes directed downwards and in a plane which nearly passes through the general axis of the bell; they assure the combustion in the bottom of pouch 11. A cylindrical casing 15 is disposed at a short distance around wall 1 and extends downward about the height of coating 3. A channel 16 brings tangentially the combustional air in the lower region of the annular space 17 which is comprised between walls 1 and 15. An annular partition 18 extends through an arc of at least 180° inside space 17 in a horizontal plane. Its role is to compel the air which has penetrated said space 17 to turn around wall 1 before reaching space 8. The upper region of the apparatus, which is not represented, may comprise an air inlet similar to 16 and a partition similar to 18 which prevents the air from passing directly to space 8 without turning around body 1. The air jacket 17 as comprised between walls 1 and 15, allows to recuperate and bring back into the fire centre the heat which has been dissipated through the combustible and the heat lost by radiation through the cavity of the apparatus when the surface of combustible has come down. The extremity of channel 7 is heat insulated as shown at 19 and the combustion gases may then be led into a boiler or a series of boilers or heat-exchangers.

If one were to blow air only through the nozzles 13 and 14, the combustion gases might comprise a little CO. For burning it, if any, several additional nozzles 20, communicating with space 8, lead a moderate amount of the combustion air into channel 9 where it mixes with the combus-

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tion gases and completes their combustion if necessary. These additional nozzles 20 are disposed radially inside bell 6 in a horizontal plane slightly above the crown of the nozzles 13 and 14.

The ashes are received on a circular plate 21 which is situated at a certain distance below passage 4 and held on a vertical shaft 22. Plate 21 receives an angularly oscillating movement through a connecting rod 23 which is connected on one of its ends with a crank-pin 24 which projects vertically from the inferior face of plate 21, and on its other end with a sliding rod 25 which is animated with a to and fro movement under small speed. The superior face of plate 21 is slightly conical and presents radial ribs 26. The circular oscillations of said plate are utilized for evacuating the ashes which fall in the bottom of the apparatus underneath the circumference of plate 21.

A sloping tube 27 which opens in bell 6 and projects outward of the apparatus is used for setting the combustible on fire, by introducing through such tube 27 inflammable material like paper, light wood, live-embers, etc. into pouch 11. A movable cover 28 comprises a fastening device 29 which provides a tight closing of tube 27. The section of such tube is preferably oval so as to impeach as little as possible the descending movement of combustible 5 inside casing 1.

The embodiment represented on Figures 3 and 4 only differs from that which has been described by the construction of bell 6. The following description will then be limited to said bell.

The outer wall 30 of bell 6 presents at its lower border a ring 31 which serves as a support for the inner bell body 32 which may, for instance, be constituted of cast-iron or refractory material of any kind; it presents the same shape as that of Figures 1 and 2, except in that its upper part terminates in a cylindrical form and engages the entrance of channel 7.

At its inferior border it bears a series of pockets 34 which play the same role as the nozzles 13—14 played in the case of Figures 1—2, the whirling movement of the jets of air issuing from said pockets is assured firstly by their tangential inclination as visible on Figures 3—4 and, additionally secured by helical vanes 33, such vanes being by turns disposed between the pockets and in the middle of each of them, thus providing the whirling movement with which the jets of air shall sweep the circular crumbling slope 12 of the combustible.

The embodiment represented on Figure 5 comprises a container 101 which may be cylindrical as shown, the head 102 of which being fitted with a cover 103 for filling it with the combustible, such cover being provided with means allowing its tight closing.

The inferior region of container 101 comprises an annular horizontal partition 104, the upper face of which bears a refractory coating 105. A central passage 106 is then reserved in the central region of said partition, below which a room 107 is disposed as an ashes receiver and is fitted with a door 109 which comprises means allowing its tight closing.

About midheight of container 101, Figure 5 shows the inlet-outlet device comprising a pipe 110 through which the combustion air is admitted to the annular duct 111 which penetrates through the lateral wall of container 101 towards the central region of said container where it continues downwardly between walls 112 and 114, gradually enlarging and so constituting a double walled bell.

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Such bell bears on the inner side of its lower border a series of tubes 116, going upwards and converging on a central chamber from which hangs downwardly a central vertical nozzle 117.

The air admitted through pipe 110, goes through the annular channel 115 to the lower part of the double bell where it penetrates tubes 116 and emerges through nozzle 117 in the form of a downward jet which, following the arrows, goes to the bottom of pocket 120, the circular slope of which it sweeps in expanding upwardly and centrifugally for passing between tubes 116 and being evacuated through channel 114, at first vertically and then laterally for being finally evacuated, to a boiler for instance.

As in the former embodiments, the bell determines a crumbling slope of combustible, the general form of which is circular; the surface of the combustible is swept by the combustion air without its penetrating deeply in it.

The air and gases circulate at counter-flow, the first so gaining heat from the latter all along that course.

The evacuation of ashes is performed in a way which is a slight modification of those previously described: a plate 121, which is preferably coated with refractory material, supports a grid-iron 122 able to horizontally slide on it with a slow to and fro movement of determined amplitude by means for instance of a connecting-rod and crank device 123, the slow motion of which being obtained for instance through a tangential wheel and screw 124; the ashes then fall on each side of plate 121 and their continuous evacuation assures the crumbling of the combustible as it consumes. A door 109 allows the evacuation of ashes; it remains tightly closed whilst the apparatus is in action.

It is important to notice that, notwithstanding their aspect, the apparatus as described, have nothing in common with a gazogene. It could even be said that they are the contrary of a gazogene as, in the latter, the air goes through a mass of combustible which is offered in excess, so that the CO₂ initially formed is reduced into CO in the subsequent layers attained. On the contrary, in the present invention, the air can only penetrate around the superficial fragments of the combustible, so that a sufficient amount of oxygen is always afforded and the CO, if any, immediately burns into CO₂. One can then appreciate how much it is justified to speak of the contrary of a gazogene for an apparatus in which the maximum possible amount of CO₂ is produced, when, in the former, one is doing all one's best for obtaining the maximum possible amount of CO.

In the apparatus object of the invention, in all its embodiments, the circulation of air is assured by means which have not been represented, generally a ventilator, either by blowing or by suction.

I claim:

1. A combustion apparatus for solid combustibles in fragments, comprising a container for the combustible, the bottom of which has a central aperture for the passage of the ashes, a grate below said central aperture, a substantially bell-like means positioned within said container and defining a channel for evacuating the combustion gases, said channel extending downwardly within the container above said central aperture, means defining an annular air feeding channel surrounding said combustion gases exhausting channel and adapted to be surrounded by descending combustible which is inserted into said container,

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means for introducing air to said air feeding channel to cause the air and the combustion gases to circulate at counter-flow in said channels, means on the outlet end of said annular air feeding channel for projecting the air downward and toward the center of the container above the central aperture and below the bell-like means, whereby the combustible will be caused to crumble in the form of a central crater and the combustion will be localized in the superficial zone of said crater.

2. A combustion apparatus for solid combustibles in fragments as claimed in claim 1 wherein the means for projecting the air downward and toward the center of the container above the central aperture are downwardly inclined and tangentially extending nozzles arranged as outlets from the annular air feeding channel so as to give the air a whirling motion.

3. A combustion apparatus for solid combustibles in fragments as claimed in claim 1 wherein the means for projecting the air downward and toward the center of the container above the central aperture are in the form of nozzles.

4. A combustion apparatus for solid combustibles in fragments as claimed in claim 1, wherein the means for projecting the air downward and toward the center of the container above the central aperture comprises a corrugated wall struc-

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ture providing pockets projecting from the inner wall of the outer channel.

5. A combustion apparatus for solid combustibles in fragments as claimed in claim 1 wherein the means for projecting the air toward the center of the container above the central aperture comprise means defining orifices for directly leading a minor part of the air into the combustion gases exhausting channel.

6. A combustion apparatus for solid combustibles in fragments as claimed in claim 1 wherein the grate is constituted by a plate adapted for oscillating movement placed at a certain distance below the central passage for the ashes.

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