

July 16, 1968

H. MANDELBAUM ETAL

3,392,690

BURNING APPARATUS

Original Filed Oct. 21, 1965

2 Sheets-Sheet 1

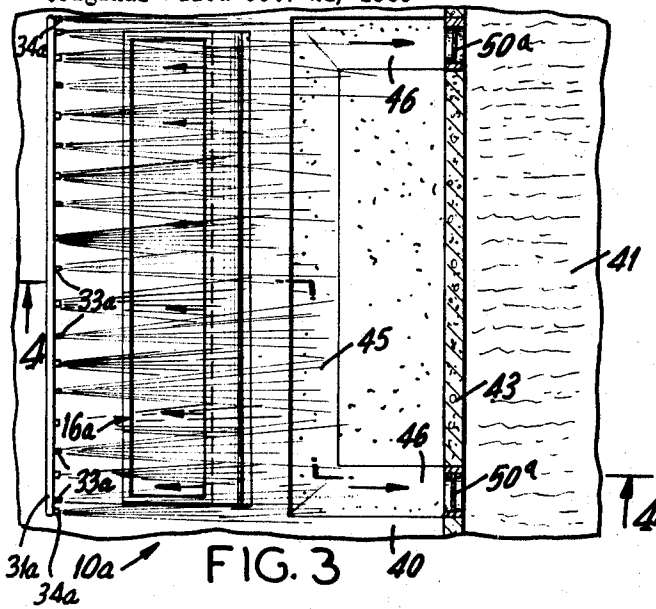


FIG. 3

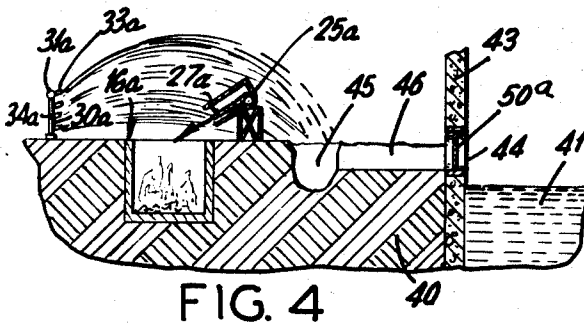


FIG. 4

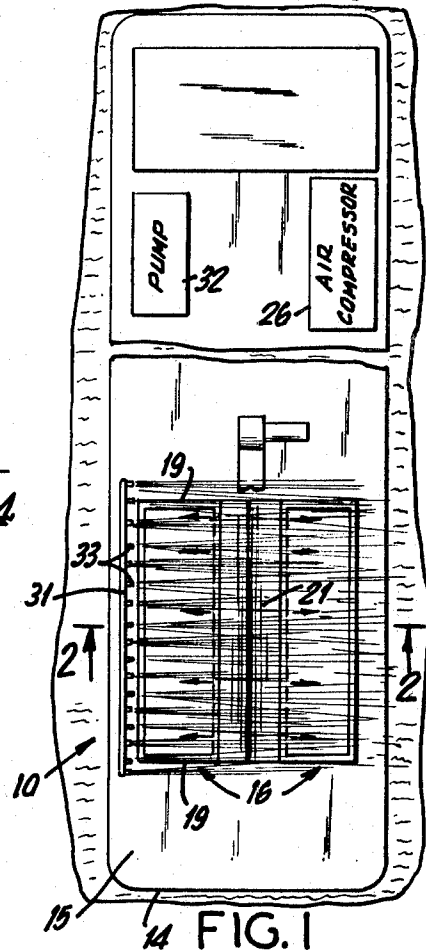


FIG. 1

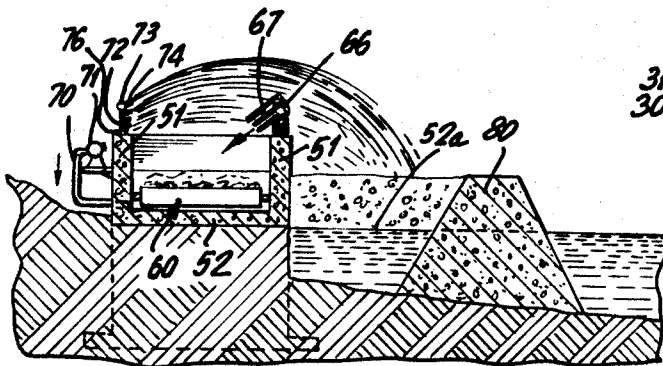


FIG. 7

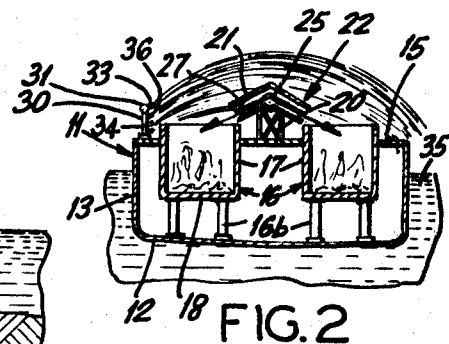


FIG. 2

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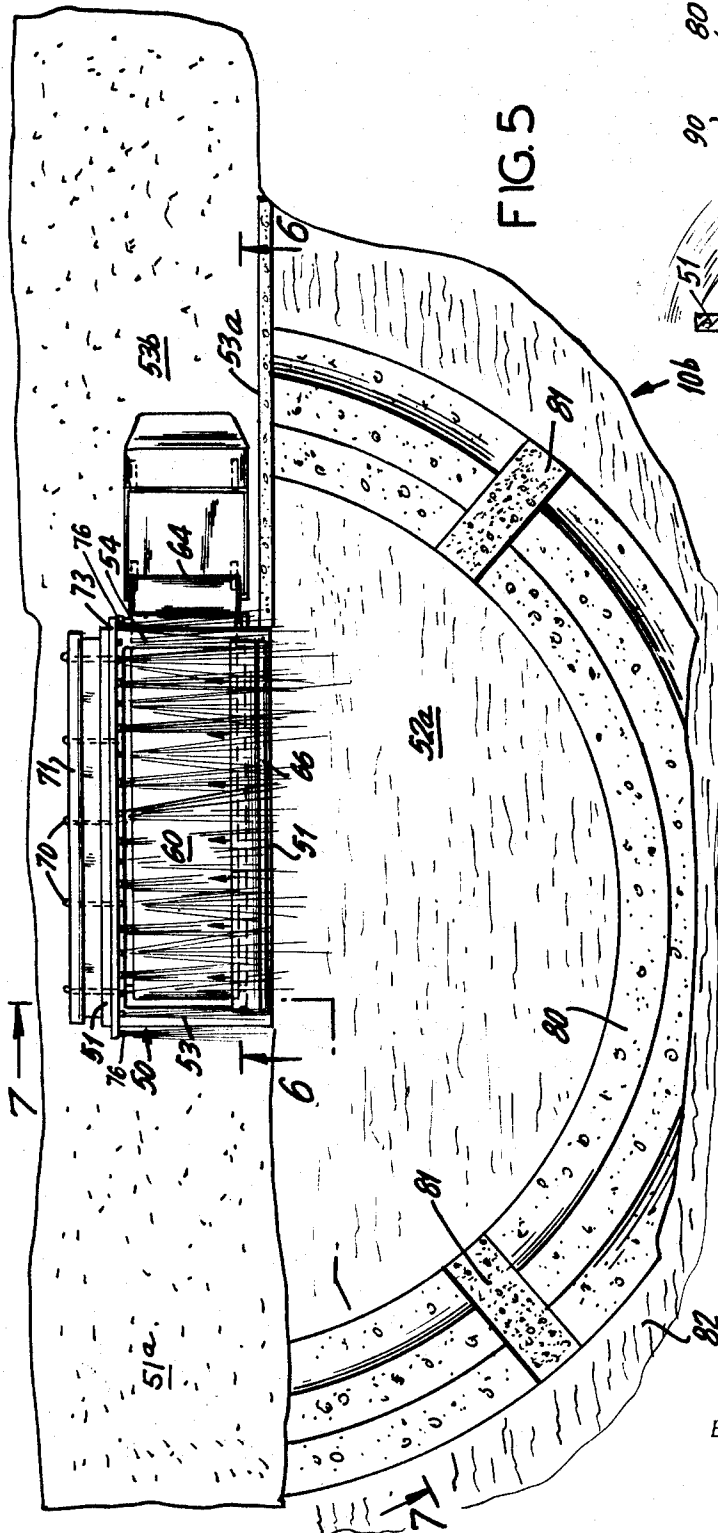


FIG. 5

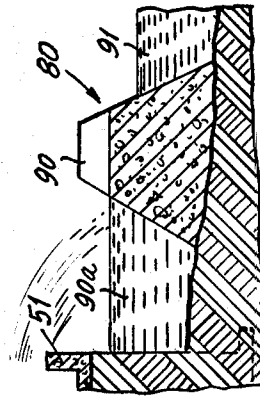
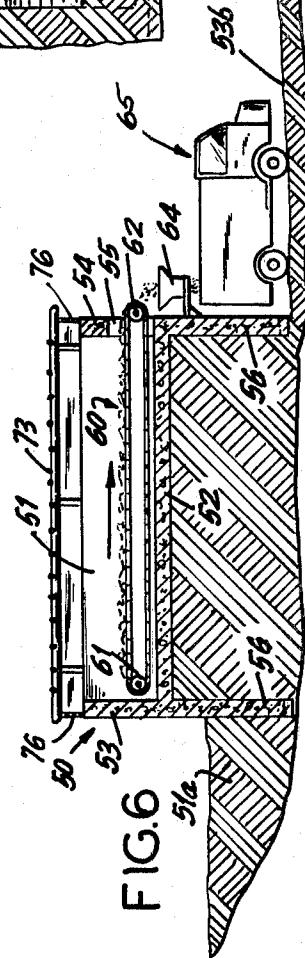


FIG. 7a



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3,392,690

BURNING APPARATUS

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Continuation of application Ser. No. 499,482, Oct. 21,
1965. This application Mar. 29, 1967, Ser. No. 626,903
18 Claims. (Cl. 110-119)

ABSTRACT OF THE DISCLOSURE

An apparatus for burning refuse material in which an open furnace receives the refuse and a curtain of water is provided over the open furnace to act as a shield to prevent ash from discharging into the atmosphere.

This application is a continuation of application Ser. No. 499,482 filed Oct. 21, 1965, now abandoned.

This invention relates to apparatus and installations for burning driftwood and other debris at sea, or in a harbor, or on land where there is a good supply of water.

An object of this invention is to provide an installation of the character described in which a spray curtain of water is provided over the furnace to act as a shield so that any ash going up into the air will collide with droplets of water in the curtain thereby preventing fly ash from going out into the atmosphere, and to catch the ash and carry it into the sea or harbor or into a collection means.

Another object of this invention is to provide in an installation of the character described, means to filter or otherwise remove from water into which the spray curtain falls, ash carried into the water by the spray, to thereby prevent the ash from contaminating surrounding waters.

Yet another object of this invention is to provide a highly improved installation and apparatus of the character described, which shall be relatively inexpensive to make, and which shall be practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims.

In the accompanying drawing, in which are shown various illustrative embodiments of this invention,

FIG. 1 is a top plan view of a barge provided with apparatus embodying the invention;

FIG. 2 is a cross-sectional view taken on line 2-2 of FIG. 1;

FIG. 3 is a top plan view of an installation embodying a modified form of the invention;

FIG. 4 is a cross-sectional view taken on line 4-4 of FIG. 3;

FIG. 5 is a top plan view illustrating yet another form of the invention;

FIG. 6 is a cross-sectional view taken on line 6-6 of FIG. 5;

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FIG. 7 is a cross-sectional view taken on line 7-7 of FIG. 5; and

FIG. 7a is a modification of the structure shown in FIG. 7.

Referring now in detail to the drawing, particularly to FIGS. 1 and 2 thereof, 10 designates apparatus embodying the invention here shown incorporated into a barge 11 at sea or in a harbor.

The barge 11 has a bottom wall 12, side walls 13, end walls 14, and a deck 15. Supported on the bottom wall 12 of the barge, are a pair of furnaces 16, each having longitudinal side walls 17, a bottom wall 18 and end walls 19. These furnaces are open at the top. The furnaces may be made of refractory materials, or water cooled walls. The upper ends of the furnaces may project above deck 15. The furnaces are parallel to each other and to the side walls 13 of the barge and may be located nearer one end of the barge than the other end thereof. The furnaces 16 may be supported on stanchions 16b or on other supporting means located on the bottom wall 12 of the barge.

Mounted on the deck 15, between said parallel furnaces 16, is a supporting structure 20 formed at its upper end with downwardly and outwardly inclined walls 21 forming a shed 22, with said walls 21 directed toward the upper open ends of the furnaces. A horizontal air pipe, 25, is disposed at and beneath the apex of the shed 22. Air from an air compressor 26 may be fed under pressure to pipe 25. Said pipe has a plurality of downwardly inclined nozzles 27 along the length thereof and at opposite sides thereof directed down to the open upper ends of the furnaces. The air curtain produced by flow of air serves to remove fly ash rising from the top open end of the furnace. The flow of air accelerates combustion to give intense heat.

Mounted on deck 15 between one of the furnaces 16 and an adjacent side wall 13 of the barge, is a wall 30 supporting a horizontal pipe 31, and a pair of vertical pipes 34 at the ends of the wall. Pipes 31 and 34 receive water from a water pump 32 on the barge. Pump 32 may draw water from the body of water 35 in which the barge floats. Attached to pipe 31 are a plurality of upwardly inclined nozzles 33 slanted to direct water over the furnaces and over the shed 22 so as to spray water beyond the opposite side of the barge, into the water 35 in which the barge floats. Attached to pipes 34 are a plurality of nozzles 36 progressively slanted more relative to the horizontal from bottom to top of the vertical pipes 34, to spray a vertical side wall of water over the ends of the furnaces and beyond the barge into water 35.

The nozzles 33 and 36 are close enough together to produce a spray curtain, to substantially enclose the fire.

Driftwood or other debris burning in the furnaces produce fly ash which rise but any fly ash not removed by the air curtain, contact the droplets of water in the spray curtain. This spray curtain thus prevents the ash from floating up into the air. Furthermore, the spray curtain catches and carries the fly ash over the barge and into the sea or water 35 in which the barge floats.

In FIGS. 3 and 4 of the drawing there is shown an installation 10a illustrating a modified construction. Installation 10a comprises a furnace 16a similar to furnace 16 but embedded or supported on land 40 adjacent a body of water 41. A horizontal air pipe 25a is provided with

downwardly slanted nozzles 27a to supply air to the open end of the furnace to aid burning of the driftwood or other debris in the furnace. Air may be supplied to pipe 25a in any suitable manner by means of an air compressor.

Between the land 40 and water 41 is a wall 43 provided with openings 44. Between the barrier or wall 43 and the furnace is a relatively deep channel 45, parallel to one side of the furnace 16a. Relatively shallow channels 46 interconnect the ends of channel 45 with said openings 44.

Wall 30a supports a horizontal water pipe 31a, and vertical pipes 34a located above the furnace 16a and to the outer sides thereof. Extending from pipes 31 and 34a are spaced nozzles 33, 36a, respectively, which spray a curtain of water over the furnace and over the air pipe 25a and into the deeper channel 45. Ashes carried by the spray curtain settle to the bottom of channel 45, and relatively clear water can spill off through the shallower channels 46 and through openings 44 to the water 41.

If desired, water filters or strainers 50a may be inserted into openings 45 to prevent ash from passing to the water 41.

Suitable means, not shown, are provided to provide water under pressure to the nozzles 33a and 36a. This water may be drawn from the body of water 41, or from any other source, such as wells, if water is plentiful in the area.

In FIGS. 5 to 7 there is shown an installation 10b illustrating a further modification of the invention.

In FIGS. 5 to 7, installation 10b comprises a furnace 50 set up on land 51a adjacent to a body of water 52a.

A sea wall 53a between the land and water provides for a pit 53b at one end of the furnace 50.

The furnace 50 comprises elongated side walls 51, a bottom wall 52, and end walls 53, 54. These walls may be made of either refractory material or may be water cooled, or may be made of any other suitable material. End wall 54 has a cross opening 55 near bottom wall 52. At the end of the furnace 50 are downwardly extending support members 56 embedded in the earth.

At the bottom of the furnace is a grate belt 60 disposed above bottom wall 52 and moving on end rollers or sheaves 61, 62. Rollers 61, 62 are supported and driven by any suitable means, not shown. Sheave 62 is outside the furnace wall 54. The grate belt thus passes through opening 55 of wall 54. Burnt ash can drop off the belt into a hopper 64 and therethrough to a truck 65 in the pit 53b.

Mounted on one side wall 51 is an air pipe 66 provided with nozzles 67 slanting down to the upper open end of the furnace to supply air for combustion. Air may also be fed to the region of the belt by conduits 70 passing through the other side wall 51. Air may be fed to conduits 70 by any suitable air pump 71.

A wall 72 on said other wall 51 supports a horizontal water pipe 73, and end vertical pipes 73a, supplied with water under pressure. As in the embodiment of FIGS. 3 and 4, the water may be re-circulated or drawn from any other suitable means. A plurality of upwardly inclined nozzles 74 on pipe 71, and side nozzles 76 on vertical pipes 73a serve to spray a curtain of water over the furnace and into body of water 52a.

Means is provided to filter out ash carried into the water 52a by said spray curtain. To this end, a barrier 80 is built around the area of water 52a which receives the spray curtain. This barrier may be made of earth or masonry, or any other suitable material. It may have one or more filter sections 81 made of sand and gravel or any other suitable material. The barrier may have stable slanting inner and outer surfaces. Water within the barrier will flow out to the body of water 82 surrounding the barrier, through the filters 81, to filter out ash carried by the spray curtain to water 52a within the barrier. The ends of the barrier go from land 51a to wall 53a as shown in the drawing at FIG. 5.

In FIG. 7a there is shown a modification of the structure of FIGS. 5 to 7. In place of the filters 81, wall 80 is

provided with weirs 90. Weirs 90 may be placed higher in the wall so that the level of water 90a on the inside of the wall will be higher than the level of water 41. The fly ash in water 90a will settle out.

It will thus be seen that there is provided an apparatus and article in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein set forth and shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. In combination, a furnace having a combustion area and being open at its upper end substantially across the entire combustion area, means to spray a curtain of water substantially directly above and substantially across the whole upper end of the furnace from one side only thereof to beyond the other side thereof thereby enclosing the upper open end of said furnace to catch fly ash from the furnace and to carry the fly ash beyond the furnace, and means to blow air under pressure down at an angle toward and into the upper open end of said furnace and substantially across said open end and beneath said curtain of water.

2. The combination of claim 1, and means to receive the sprayed curtain of water with the fly ash carried thereby.

3. The combination of claim 2, and means to separate fly ash caught by the curtain of water received in said receiving means, from the received water.

4. The combination of claim 1, a barge on which said furnace is mounted, and said means to spray said curtain of water comprising means to spray said curtain beyond said barge.

5. The combination of claim 2, said means to receive said sprayed curtain of water with fly ash caught thereby comprising a barrier to hold back said received water.

6. The combination of claim 5, said barrier being provided with filter means to let the held back water pass therethrough leaving the caught fly ash within said receiving means.

7. The combination of claim 6, said barrier comprising a wall and said filter means comprising sand and gravel sections of said wall, said wall having downwardly diverging opposite sides.

8. The combination of claim 2, said means to receive said sprayed curtain of water comprising a relatively deep channel, a relatively shallow channel communicating with said relatively deep channel to catch spill off from said relatively deep channel.

9. The combination of claim 8, and filter means to filter water flowing from said relatively shallow channels.

10. The combination of claim 1, said furnace having grate belt means therein to remove burnt ash from said furnace to the outside of said furnace.

11. The combination of claim 10, and means to receive ash removed from said furnace by said grate belt means.

12. The combination of claim 1, said furnace being on land adjacent a body of water, a barrier to enclose a portion of said body of water receiving said spray curtain, and said means to spray a curtain of water comprising means to spray said curtain into said enclosed portion.

13. The combination of claim 12, said barrier having stable side slopes, and part of said barrier being made of sand and gravel to filter water passing therethrough.

14. The combination of claim 10, and means to blow air into the furnace in the region of said grate belt means.

15. The combination of claim 12, said barrier being provided with weir means to let the held back water pass therethrough.

16. A process comprising burning debris in a combustion area of an open top furnace, supplying a curtain of air

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under pressure over and to the combustion area across the open top of said furnace, and spraying a curtain of water to substantially enclose the combustion area, and above said curtain of air flow, whereby to catch fly ash from the fire in the furnace in said curtain of air and curtain of water to prevent the fly ash from entering the atmosphere said curtain of water being sprayed across the open top of said furnace from one side only thereof to beyond the other side thereof.

17. The process of claim 16, and trapping the sprayed water.

18. The process of claim 17, and separating the fly ash from the trapped water.

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