MODULAR INCINERATOR CONSTRUCTION

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7 Claims

ABSTRACT OF THE DISCLOSURE

A multi-section incinerator construction wherein each of the modules making up the assembled incinerator are of a conventional height, width, breadth and weight for ease of shipment to the location where the assembled incinerator is to be located. The modules are so constructed that each is a separate, independent member that may be easily assembled in co-acting relationship to form an integral unit. Thusly, the off-site, in-plant construction of large incinerator units made up of modules provides a superior construction more economically than has heretofore been available.

Background of the invention

Commercial incinerators being both relatively large in size and constructed of heavy materials, such as refractory brick, are exceptionally difficult to transport from the place of manufacture to that of eventual use, because of certain commercial carrier limitations. Primarily, these limitations are the vehicles which are used to transport the cargo, and fabrication eliminates some transportation problems, it is undesirable because of the time consumed and the attendant high costs of the construction. Moreover, the on-site construction of an incinerator unit introduces problems of quality control and precision because the construction sites are normally scattered throughout the country and it is necessary to hire local laborers who may or may not be accustomed to performing the type of work necessary to construct an incinerator of high quality.

While an attempt has been made to solve some of these problems, as for instance in U.S. Patent 3,233,565 (assigned to the same assignee as the instant application) the patented construction, while satisfactory for the smaller types of incinerators, is totally unsatisfactory for the larger incinerators. For instance, the incinerator constructions with which this invention is involved have total weights in the range of 50 to 65 thousand pounds. In other instances the total weight greatly exceeds this range. Thus, while the aforesaid patent contains teachings suitable for the smaller incinerators, the instant invention vitiates many of these incinerator construction limitations and sets forth an improvement over the aforesaid patent.

It is therefore an object of this invention to provide an improved incinerator construction.

It is another object of this invention to provide an improved incinerator construction employing at least four modules, each of which is structurally independent.

It is a further object of this invention to provide an improved incinerator construction comprising at least four structurally independent co-acting modules, each of which are of a suitable conventional shipping size.

A still further object of this invention is to provide an improved incinerator construction having at least four co-acting modules which may be conventionally shipped and which provides a superior construction more economically than has heretofore been available.

These and other further objects of the present invention will become apparent from the hereinafter following commentary when taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a perspective, exploded view of the incinerator of the present invention depicting the four modules which make up the incinerator;

FIGURE 2 is a horizontal sectional view of the incinerator construction showing the modules in their co-acting positions as assembled on the incinerator site;

FIGURE 3 is a sectional, elevational view of the incinerator taken along the line 3—3 of FIGURE 2;

FIGURE 4 is another view of the incinerator construction taken along the line 4—4 of FIGURE 2; and

FIGURE 5 is a broken, fragmentary exploded view showing a portion of the structure of two of the modules and the mode in which they are assembled.

Generally, the incinerator construction of this invention comprises at least four structurally independent co-acting modules each of which is of a suitable conventional shipping size. The construction includes a burning-chamber module having a flame port opening in the upper portion thereof and having a structural frame adapted to align with and be secured to a lower positioned ash-pit module. The ash-pit module has a frame support structure which is adapted to receive the burning-chamber module and means are provided to secure each of the modules in substantially rigid relationship. A third module forming the upper portion of the combustion-chamber and up-pass section, has one portion of a sleeve projection which is adapted to align with and project into the upper portion of the flame port opening of the burning chamber module and has support structure upon which refractory brick is supported and is adapted to align with and be secured to a fourth module. The fourth module forms the lower portion of the combustion-chamber and up-pass section and has a structure which is adapted to receive the third module and means are provided to facilitate alignment of each module of the combustion-chamber and up-pass sections during assembly and to secure them to one another after assembly.

Referring to the drawings, wherein like numerals of reference designate like elements throughout the several views, and specifically referring to FIGURE 1, incinerator 2 is shown as comprising four modules. Burning-chamber module 4 is shown equipped with flame port opening 6 and the conventional guillotine type loading door 8 and having an outer, metal protective sheath supported by structural framing 10. Module 4 is of suitable length and width to align with ash-pit module 12. Ash pit module 12 is adapted to receive burning-chamber module 4 and also has exterior metal walls 14 which in this instance are made up of individual plates, not shown, welded together. Ash-pit module 12 has corner angles 16 secured to each corner as by means of welding, or other suitable means, such that when burning-chamber module 4 is lowered thereon, means are provided by which modules 12 and 4 may be secured in substantially rigid relationship. Apertures are provided in the upper portion of bracket 16 and may align with suitable bolt holes provided in framing 10 of module 4. Obviously, where desired, the bolts may be dispensed with and weld joints provided. In some instances it will be found that the weight of the module 4 will be sufficient in and of itself to insure resistance of movement between modules 4 and 12.

Module 18 is the third module and forms the upper portion of the combustion chamber and up-pass sections of the incinerator. The module 18 has brackets 20 secured at appropriate locations to permit ease of cable attach-
ment so that the module may be readily lowered into position on top of module 22 which forms the lower portion of the combination combustion-chamber and up-pass section. At each of the four corners of module 22 and supported from frame structure 23 are aligning means or up-pass walls are intended to pass through apertures 26 provided in module 18. It is readily apparent that once the module 22 has been placed in position, refractory cement is placed along the peripheral surface of module 22, the module 18 is lowered to a superposed position of module 22 by a bottom hook or the like, the apertures 26 aligned with the rods 24 and lowering continued until the module 18 comes to rest on the upper cement-coated surface of module 22. Appropriate steps are thereafter taken to insure the proper relationship and sealing of the members which will hereinafter be described. The modules 18 and 22 when joined together connect to form a sleeve or projection (FIG. 3) which projects through and into the burning chamber 4 through flame port 6. The mode of joining together the bi-modular sections, the first comprising modules 4 and 12, and the second comprising modules 18 and 22, is similar to that described in U.S. Patent 3,233,565.

Referring to FIGURES 2, 3 and 4, the burning chamber module 4 has outside metal walls 27 from which may extend tabs 28 which are adapted to retain insulation material 30, such as rockwool or the like, and refractory brick 32 in substantially rigid relationship with respect to metal walls 27. Burning chamber module 4 has aperture 34 into which a burner nozzle (not shown) may project in order to combust the materials introduced into the burning chamber 4 through the charging opening 36. Charging opening 36 has plate or loading platform 38 onto which the material to be incinerated may be disposed prior to introduction into the burning chamber 4. The ash-pit module 12 has a series of grates 40 disposed between the two sections to allow ashes, carbon and unburnt residue of small size to pass therethrough into the ash-pit chamber proper. Ash-pit module 12 has the conventional clean out opening (not shown) through which ashes may be removed. Base vent openings 39 are provided, as is usual, to provide an ample supply of oxygen for the combustion of materials introduced into burning chamber 4. Combustion chamber 4 and the up-pass section 44 formed by the modules 18 and 22 have similar exterior walls, insulation and refractory brick layers as previously described and the up-pass section 44 provides means for receiving a stack or flue (shown in phantom). The I-beam supports 46 and rai members 48 as well as tie rods 50 are as described in the aforementioned incinerator patent.

Referring to the modules 18, 22, and 22 making up the combustion chamber 42 and up-pass section 44, it is readily apparent that the sleeve projection 50 which projects into flame port 6, of module 4, is formed of two sections of a satisfactory refractory brick material. The first or upper portion 52 is a part of the module 18 while the lower portion 54 of the sleeve is a part of the module 22. Suitable refractory cement is of course disposed on the sleeve 50 while it is being positioned in flame port 6 so as to form a close tolerance fit.

It will be noted that the arched upper portion 52 of the burning chamber 4 is not in any way interfered with because of the multi-modular construction of the incinerator. The up-pass section 44 is provided with a clean-out aperture with an appropriate closure thereover and the modular sections 18 and 22 before being joined together are provided with a layer of refractory cement, as previously indicated, therebetween to provide substantially fluid tight relationship. In order to insure this relationship, a plate or cover 56 is provided to cover the joint line between the modules and may be secured by means of bolts or other similar means not shown.

Referring specifically to FIGURE 5, the structural supporting members for modules 18 and 22 are clearly shown wherein module 18 has a flanged bottom structure 60 which supports refractory and insulation 62 thereof in a unitary manner. The refractory 64 and insulation 66 of the module 22 is provided with a top flanged angle 66 again to provide a unitary structure which may be easily manipulated. When the modules 18 and 22 are joined together using the aligning means previously discussed, a splice plate 56 covers the adjacent surfaces of each of the modules and may be the type of material which has a recessed groove adapted to engage the outer exposed flanges 60a and 66a of members 60 and 66 respectively.

It will be noted that the module 12 is of comparable size to module 18 whereas the modules 4 and 22 are of comparable size. Providing modules with this configuration allows for the construction of large incinerator units which may be broken down into structurally independent co-acting members each of a size suitable for conventional shipping all without sacrificing ideal incinerator design. For instance, following the principles of the herein disclosed invention an incinerator may be constructed wherein the modules 4, 12, 18 and 22 had a total weight of 33,600, 4,600, 5,600 and 20,600 pounds respectively, and each were of a size suitable for conventional shipping.

While the invention has been described in relation to specific embodiments thereof, it should be understood that various modifications and variations will suggest themselves to those skilled in the art and will fall within the spirit and scope of the invention. For instance, while an incinerator construction of four modules has been specifically illustrated, it is readily apparent that an incinerator having six, nine or more modules may be constructed following the principles disclosed for the four module incinerator.

The embodiments of this invention in which an exclusive property or privilege is claimed are defined as follows:
1. A multi-section construction for an incinerator facilitating portability and on site construction thereof, comprising a burner chamber section having a sheath and outer structural frame, interior refractory lining, and a flame port opening through said sheath and lining in the upper portion thereof; an ash pit section having a sheath and outer structural frame with guide means on the upper portion thereof to receive and fasten said burner chamber section in aligned position adjacent said upper portion; an upper combustion chamber and up-pass chamber section having a sheath and outer structural frame with receiving aligning means on the lower portion thereof, interior refractory lining having the upper portion of a sleeve member receivable in the upper portion of said flame port opening, and a supported refractory partition dividing said section vertically into a combustion chamber and an up-pass chamber; and a lower combustion chamber and up-pass section having a sheath and outer structural frame with upstanding aligning means for aligning with said receiving aligning means, interior refractory lining having the lower portion of a sleeve member receivable in the lower portion of said flame port opening, and a supported refractory partition dividing said section vertically into a lower combustion chamber and a lower up-pass chamber having communication at the bottom portions thereof; whereby said four sections can be individually transported and joined together for on site construction of said incinerator.
2. An incinerator construction according to claim 1 wherein said guide means comprise vertical upright projections at each corner of said ash pit section.
3. An incinerator construction according to claim 1 wherein said aligning means comprise upstanding rods.
4. An incinerator construction according to claim 1 wherein said outer structural frame of the upper combustion chamber and up-pass chamber section comprise
lower flanged members adapted to support refractory brick and insulation.

5. An incinerator construction according to claim 1 wherein spaced tie-in tabs extend inward into the insulation and refractory brick from the interior surfaces of the metal sheath.

6. An incinerator construction according to claim 1 wherein the refractory lining of said burner chamber section is substantially thicker than said combustion chamber and up-pass chamber sections.

7. An incinerator construction according to claim 1 having horizontally split refractory linings which are sealed with refractory cement upon assembly of said sections forming an integral refractory lining capable of withstanding both high temperatures and extreme variations in temperature.

References Cited

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