United States Patent

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[33] **Austria**
[31] **11429/67**

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[54] **INSTALLATION FOR ONE OR MORE STACKS**
7 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **52/148,**
52/40, 52/296, 52/652
[51] **Int. Cl.** ..... **E04h , 12/10**
E04h 12/28
[50] **Field of Search** 52/146,
651, 687, 688; 52/40, 148, 296, 652

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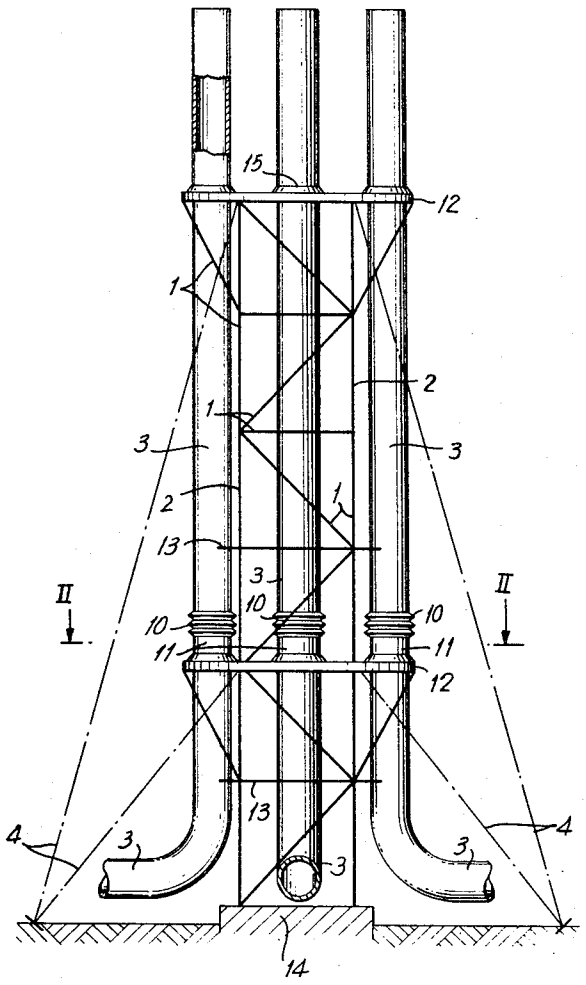
ABSTRACT: An installation for at least one stack in the form of a tubular chimney stack made of steel for example. The installation includes a trusswork tower and at least one stack extending alongside the tower at the exterior thereof. A means as provided for fixing the stack to the tower, and suitable stay cables can be operatively connected with the tower for staying the latter against lateral forces.



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3 Sheets-Sheet 1

FIG. 1

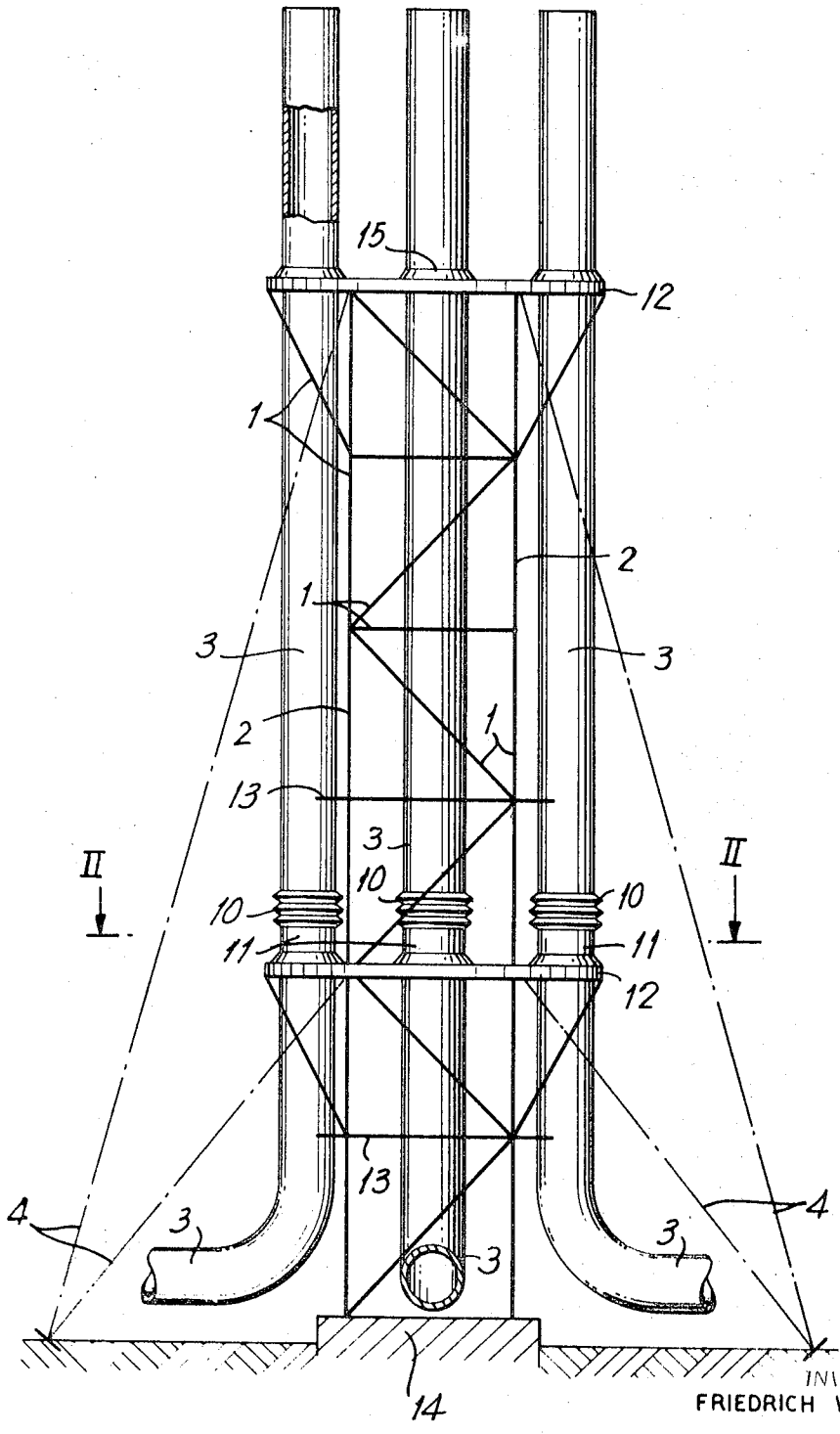

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FIG. 2

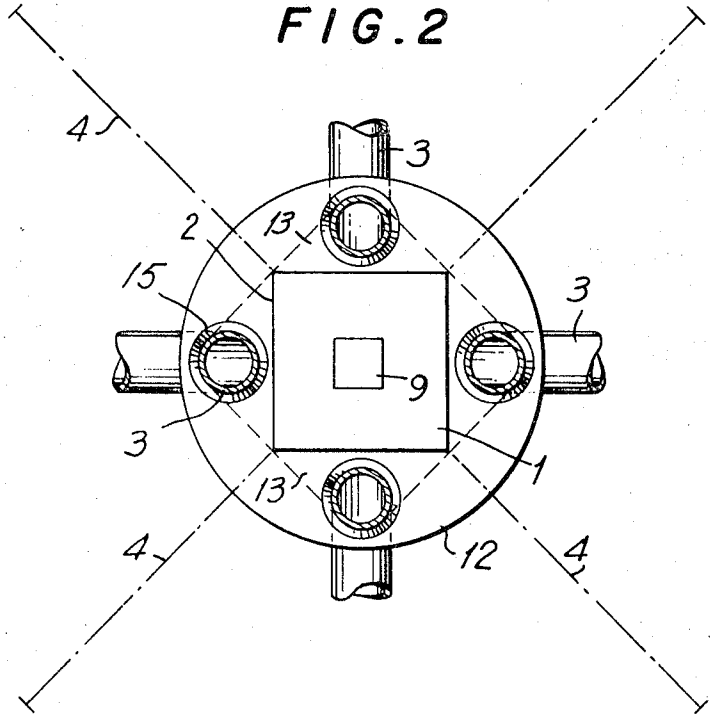

FIG. 4

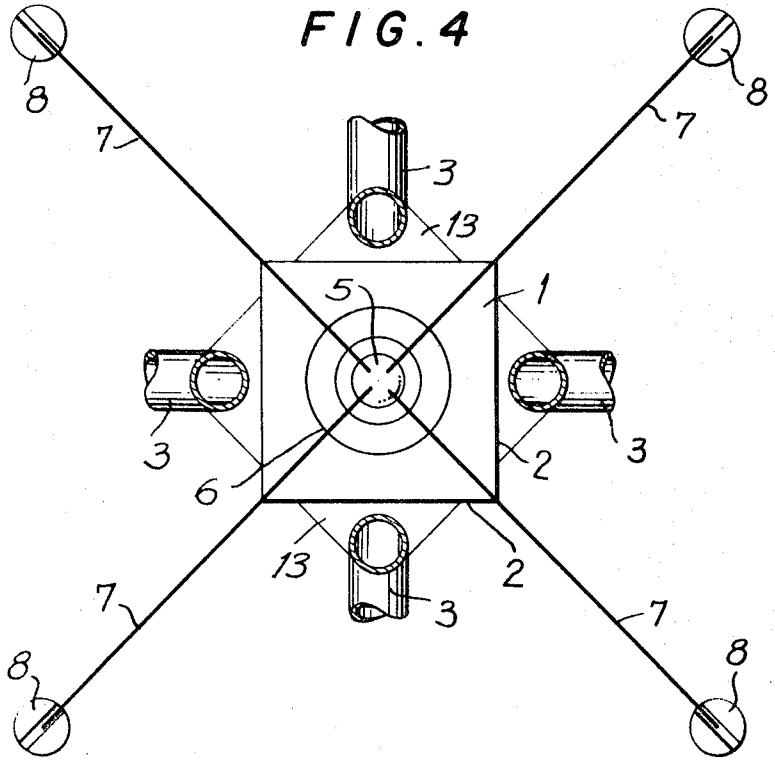

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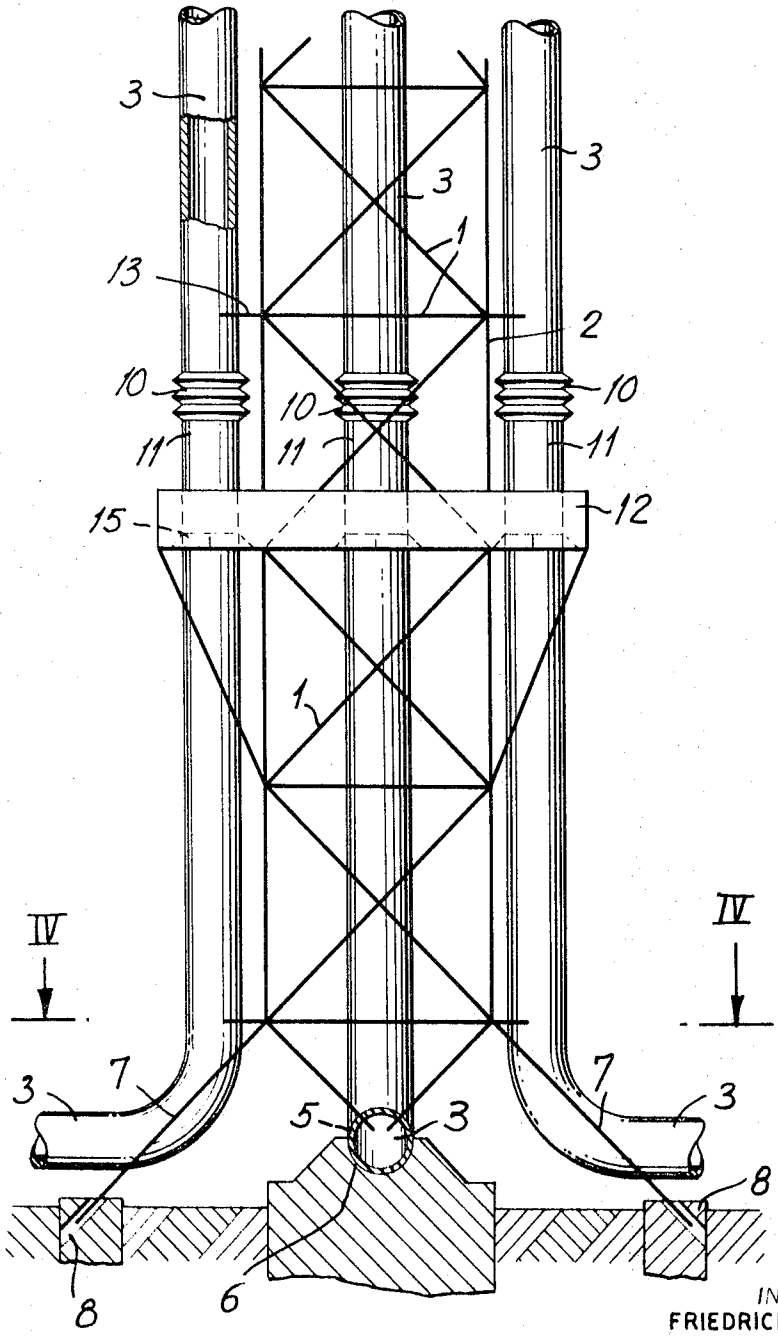
FIG. 3



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INSTALLATION FOR ONE OR MORE STACKS

BACKGROUND OF THE INVENTION

The invention relates to installations for one or more stacks in the form of tubular chimneys made of steel, for example.

It is known to support such stacks, which are of substantially great height, in the interior of a supporting structure with the several stacks, in the event that there are more than one, suspended from their top ends independently of each other.

Constructions of this latter type are of considerable disadvantage. In the first place they are complex and expensive. Moreover, when repairs are necessary, it is only possible to repair the stacks with operations which are extremely expensive.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide an installation which will avoid the above drawbacks.

In particular, it is an object of the invention to provide an installation capable of accommodating one or more stacks in such way that the entire installation is far less costly than conventional installations.

Furthermore, it is an object of the invention to provide an installation of this type which renders the stacks of the installation readily accessible so that repairs, when necessary, can be carried out in a manner which is far less expensive than has heretofore been possible.

Also, it is an object of the invention to provide a construction where the installation is protected to a very great degree against forces such as lateral forces or torsion forces tending to twist the entire installation about its vertical, longitudinal axis.

With the installation of the invention there is a trusswork tower which extends vertically, and at least one stack is situated at the exterior of and extends alongside this tower. A means is provided for fixing the stack to the tower. With this arrangement the entire installation is of extremely lightweight while at the same time each stack is freely accessible at the exterior of the tower.

With one embodiment of the invention the tower is supported at its lower end by a support means which provides for the tower the possibility of moving freely in all directions, and this support means may take the form of a ball-and-socket joint, for example. Suitable stay cables are provided for staying the tower against lateral forces in at least three different directions. Moreover, in order to transfer to the foundation torsion moments tending to twist or turn the tower about its longitudinal axis, arms which are elongated and substantially rigid are connected with the tower and with the foundation to transmit the torsion moments thereto.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a schematic elevation of one possible embodiment of an installation according to the invention;

FIG. 2 is a schematic plan view taken along line II–II of FIG. 1;

FIG. 3 is a fragmentary schematic elevation of another embodiment of an installation according to the invention; and

FIG. 4 is a plan view of the structure of FIG. 3 taken along line IV–IV of FIG. 3.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIG. 1, the installation illustrated therein includes a trusswork tower 1 which is stayed by suitable guy wires or the like and which has at its corners the vertical beams 2 which extend parallel to each other in a vertical direction. At the outside of the tower 1 are a plurality of stacks 3 which are situated adjacent and extend alongside the tower 1 in a vertical direction. A fixing means is provided for fixing each stack to the tower 1, and in the illustrated example this fixing means includes platforms 12 horizontally surrounding the tower and supported thereon as by way of inclined bars or beams extending from the outer periphery of each platform to the vertical beams 2 of the tower beneath each platform, as illustrated schematically in FIG. 1. Each stack 3 is composed of a plurality of sections which respectively extend through openings of the platforms 12, as shown most clearly in FIG. 2, and any suitable means 15 may be provided for directly fixing each stack section to a platform 12. In fact, these connecting devices 15 may have a construction for adjusting the elevations of the stack sections with respect to the platforms 12 while at the same time fixing the stack sections thereto in their adjusted positions.

As may be seen from FIG. 1, the plurality of stack sections of each stack 3 are respectively fixed at the region of their upper ends to the platforms 12, so that the several stack sections are free to expand downwardly. Moreover, between each pair of successive stack sections there is a fluid-tight expansion joint 10 fluid-tightly connected with the adjoining stack sections and permitting them to expand and contract. For example, the expansion joint means 10 may take the form of a bellows type of structure.

A guide means is provided to guide each stack for vertical movement with respect to the tower 1. In the illustrated example the guide means takes the form of guide elements 13 carried by the tower and distributed along each stack 3, engaging the latter to guide the same for vertical movement. For example, the guide means 13 may have a sliding engagement with the stack or the stack may engage suitable rollers carried by the guide means 13.

The trusswork tower 1 is fixedly carried by a suitable foundation 14. Moreover, the tower is stayed in a number of different directions by guying means including suitable guy wires in the form of stay cables 4 indicated in dot-dash lines in FIG. 1. The distribution of the guy wires or stay cables 4 about the tower is apparent from FIG. 2. It is apparent, therefore, that this staying structure opposes lateral forces in at least three different directions.

The several stacks 3, through which smoke or other waste gases are directed are distributed about the tower 1, preferably in a symmetrical manner. However, it is within the scope of the present invention to situate more than a single stack along one side of the tower. Also, the tower itself, instead of being in the form of a trusswork, can take the form of a tubular structure of steel or concrete.

The section where FIG. 2 is taken is situated directly over a platform 12. As is apparent from FIG. 2 the particular tower of this embodiment has a rectangular or square cross section. Thus, with this construction the cables 4 extend in four different directions from the tower, with the latter being connected at different elevations to different series of four cables. In FIG. 1 it is apparent that one set of cables is connected to the tower beneath the lower platform 12, while another set of cables is connected to the tower beneath the next higher platform.

In the particular example illustrated there are four stacks respectively situated at the four sides of the tower. However, such an arrangement, while preferred, is not absolutely essential. The trusswork tower can be of any suitable polygonal cross section having a number of corners which is at least as great as the number of stacks.

Within the interior of the tower is situated a means 9 for facilitating movement by personnel up and down the tower. This means 9 may take the form of an elevator, stairs, or ladders. In the case of an elevator, the foundation 14 forms a support for the power unit which drives the elevator in the interior of the tower.

With the embodiment of the invention which is illustrated in FIG. 3 the several steel stacks 3 are situated at the exterior of and extend alongside a tower 1 which in this case is in the form of a trusswork supported at its lower end by a support means which makes it possible for the tower to move in all directions.

In the illustrated example this support means takes the form of a balldand-socket joint according to which the bottom end of the tower is fixed to a spherical ball member 5 which is supported within a socket member 6 for movement in all directions. Thus, with this construction not only can the tower tilt in all directions but also it can turn about its vertical axis.

The stacks 3 of FIG. 3 are fixed to the tower 1, in particular at the platforms 12 which surround the tower 1, in the manner described above in connection with FIGS. 1 and 2, so that further description of this construction is believed to be unnecessary. Also, the tower of FIG. 3 is stayed by suitable guy wires, stay cables, or the like in exactly the same way as the embodiment of FIGS. 1 and 2, but this staying structure which stays the installation against lateral forces such as substantially horizontal winds and the like is not illustrated in FIGS. 3 and 4 in order to simplify the illustration of the structure therein.

When the installation of FIGS. 3 and 4 is subjected to a nonsymmetrical load or to the force of winds coming from certain directions, there is a tendency for torsion moments to be created with the installation tending to twist or turn about the vertical axis of the tower. In order to absorb such torsion moments, the guying means includes a plurality of elongated substantially rigid arms 7, in the form of robust elongated bars, are operatively connected on the one hand to the tower 1 at the region of the lower end thereof and on the other hand to a foundation means 8 for transmitting the torsion moments to the foundation means. For this purpose the upper ends of the several arms 7 may be pivotally connected to the lower ends of the vertically extending beams at the corners of the tower while the outer ends of the substantially rigid arms or beams 7 are guided for longitudinal movement in suitable guides of the foundation elements 8. As is schematically indicated in FIGS. 3 and 4, the lower ends of the rigid bars 7 extend into bores or passages which have axes respectively coinciding with those of the bars 7. Actually, the foundation elements 8 may carry rigid elements formed with inclined slots receiving the ends of through-bolts extending transversely through the bars 7 at the lower ends thereof, to guide the bars 7 only for longitudinal movement at the foundation elements 8 with a minimum of lateral play of the bars 7 in the guides of the foundation elements 8. Since the bars 7 are fixed to the lower ends of the vertical beams at the corners of the tower 1 only for pivotal movement about a substantially horizontal axis, without being capable of moving horizontally or in any other direction with respect to the tower 1, any tendency of the tower to turn or twist about its longitudinal vertical axis will be transmitted to the foundation means 8.

Instead of providing a means for fixing the stacks to the tower in the form of the platforms 12 it is also possible to use suitable bracket constructions for supporting the stacks 3 as well as for accommodating safety devices for high structures, such as, for example, air-alarm firing devices.

It will be noted from FIG. 4 that there are with this embodiment also four stacks 3 respectively situated at the four sides of the tower. However, such an arrangement is not essential and it is possible to provide for the installation of the invention a number of towers which is less than the number of corners of the tower.

As contrasted with known stack installations, where the stacks are suspended within a supporting structure, the installation of the present invention has the primary advantage of rendering the several stacks easily accessible so that repairs can be carried out at relatively low cost. A further important advantage of the invention also resides in the fact that there is a considerable difference between the weight of the structure of the invention as contrasted with the weight of the known constructions. Thus, the structure of the present invention is far lighter than previously known installations.

It is to be noted that the embodiment of the invention which is illustrated in FIGS. 3 and 4 presents certain advantages over that embodiment which is illustrated in FIGS. 1 and 2. Thus, with the embodiment of FIGS. 3 and 4 it is an exceedingly simple matter to calculate the size and arrangement of the structure required to oppose the expected forces with a suitable safety factor, since the behavior of the embodiment of FIG. 3 at the lower ball-and-socket support means 5, 6 is far less complex and lends itself to much easier design calculations than is the case with the embodiment of FIGS. 1 and 2 where the fixing of the tower in the foundation 14 results in exceedingly complex calculations. Moreover, since the tower of FIG. 1 will tend to bend with respect to the foundation 14 when subjected to lateral forces or the like while the tower of FIG. 3 will tend to tilt, the horizontal forces encountered with the embodiment of FIG. 3 at the ball-and-socket support means 5, 6 are much less than those encountered with the construction of FIGS. 1 and 2. However, the foundation 14 does provide a convenient support for a power installation for driving an elevator up and down the interior of the tower, as pointed out above.

It is apparent from the above description that with the structure of the invention a stack installation has provided a trusswork tower which forms in and of itself a complete, upright, independent unit. At least one stack, which is completely distinct from and forms no part of the trusswork tower, is spaced from and extends alongside the tower outwardly beyond the latter at the exterior thereof. A means, such as the platforms described above, serves to connect each stack to the tower for maintaining each stack in an upright position by connection thereof to the tower.

I claim:

1. A stack installation comprising a foundation, a skeleton tower of generally polygonal cross-sectional configuration disposed on and extending upwardly from said foundation, guying means operatively connected with said tower for holding the latter upright, at least one connecting means situated along said tower and spaced along the tower axis above said foundation, said connecting means being secured to and projecting laterally from the periphery of the tower, and at least one chimney stack spaced outwardly of the tower, said stack being offset from the corners of the tower, said connecting means securing said stack to said tower.

2. The combination of claim 1 and wherein said foundation has a ball-and-socket supporting said tower for movement in all directions, said guying means comprising a plurality of elongated substantially rigid arms connected with and extending outwardly from said tower at the region of the lower end thereof, said foundation having means coacting with said arms to oppose any tendency of the tower to turn about its longitudinal axis.

3. The combination of claim 1 and wherein there is within the tower a means facilitating movement of personnel up the tower.

4. The combination of claim 1 and wherein said tower has corners the number of which is at least as great as the number of stacks.

5. The combination of claim 1 and wherein said stack is composed of a plurality of longitudinally extending sections situated one above the other, and said stack having a fluid-tight expansion joint means situated between and connected to said sections thereof, said connecting means being operatively connected with said sections adjacent upper ends thereof, respectively, so that each stack section is free to expand downwardly.

6. The combination of claim 1 and wherein said connecting means includes a platform carried by the tower and to which said stack is fixed.

7. The combination of claim 1 and wherein a guide means is carried by said tower and coacts with said stack to guide the latter for vertical movement.