United States Patent [19]

Gerard

[11] **3,768,446**

[45] **Oct. 30, 1973**

[54] **THERMAL POWER PLANTS**

[75] Inventor: **Paul Gerard,** Creteil, France

[73] Assignee: **Societe Generale D'Entreprises,** Paris, France

[22] Filed: **Oct. 29, 1971**

[21] Appl. No.: **193,845**

[30] **Foreign Application Priority Data**

Oct. 30, 1970 France 7039318

[52] **U.S. Cl.** **122/1,** 98/58, 110/184, 122/494

[51] **Int. Cl.** **F22b 37/36**

[58] **Field of Search** ..... 110/1 R, 8 R, 18 R, 110/184; 98/58; 52/218, 219, 245; 122/1, 2, 494

[56] **References Cited**

UNITED STATES PATENTS

973,313	10/1910	Stearns	110/10
673,520	5/1901	Frey et al.	98/58
859,616	7/1907	Repetto	98/58 X
519,530	5/1894	Fulton	110/1
553,574	1/1896	Thackeray	110/10
719,545	2/1903	Williams	110/10
1,106,491	8/1914	Casa-calvo	98/58
3,367,075	2/1968	Pierce et al.	98/58 X

Primary Examiner—Kenneth W. Sprague
Attorney—Richard C. Sughrue et al.

[57] **ABSTRACT**

A thermal power station for the production of thermal energy, having at least one boiler and at least one chimney for the evacuation of smoke produced by the boiler, has for said boiler and said chimney at least one tower, one portion of which is common.

8 Claims, 11 Drawing Figures

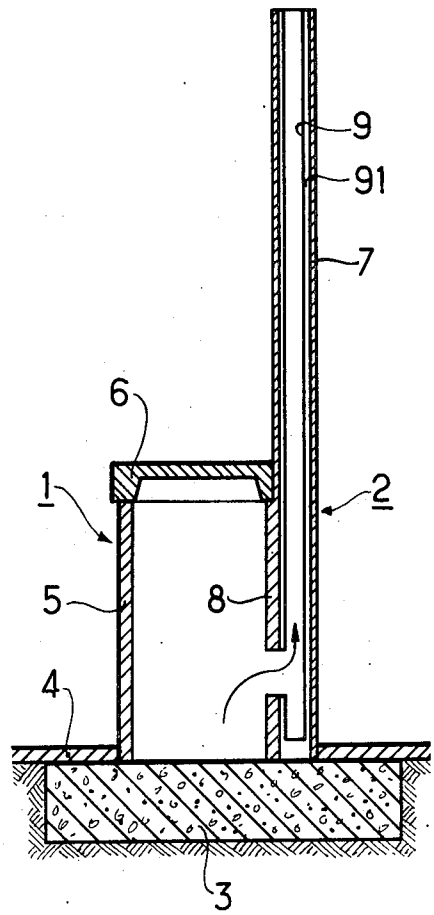


FIG. 1

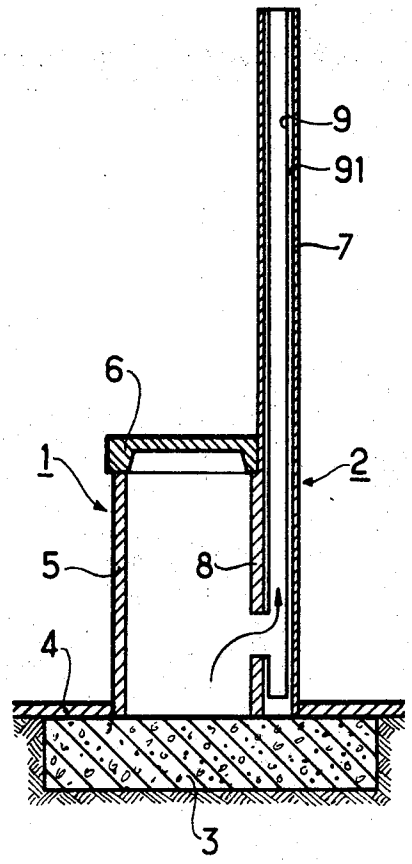


FIG. 2

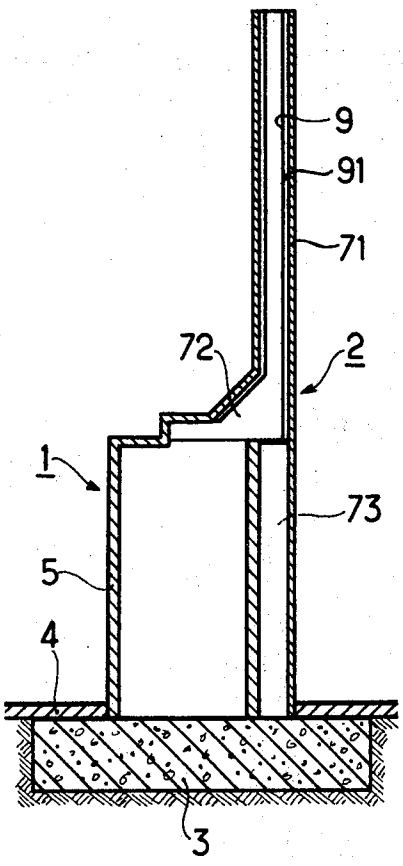


FIG. 3

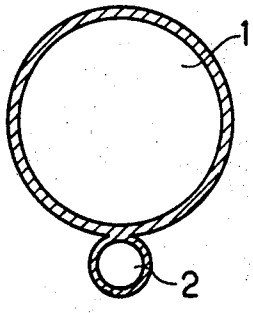


FIG. 4

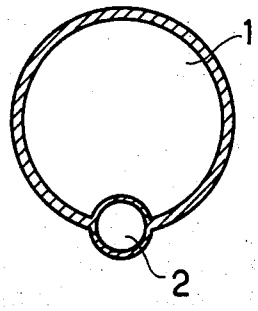


FIG. 5

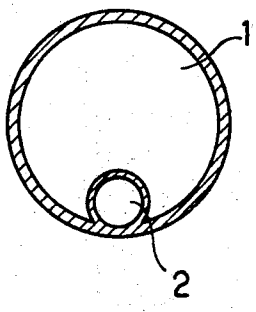


FIG. 6

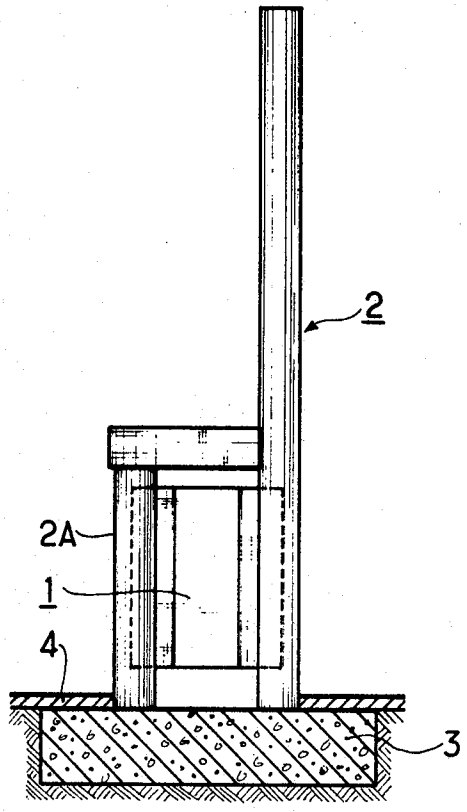
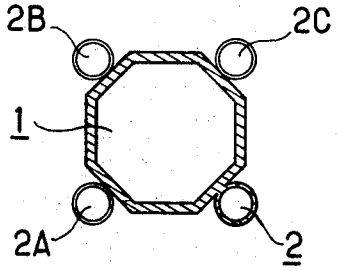


FIG. 7



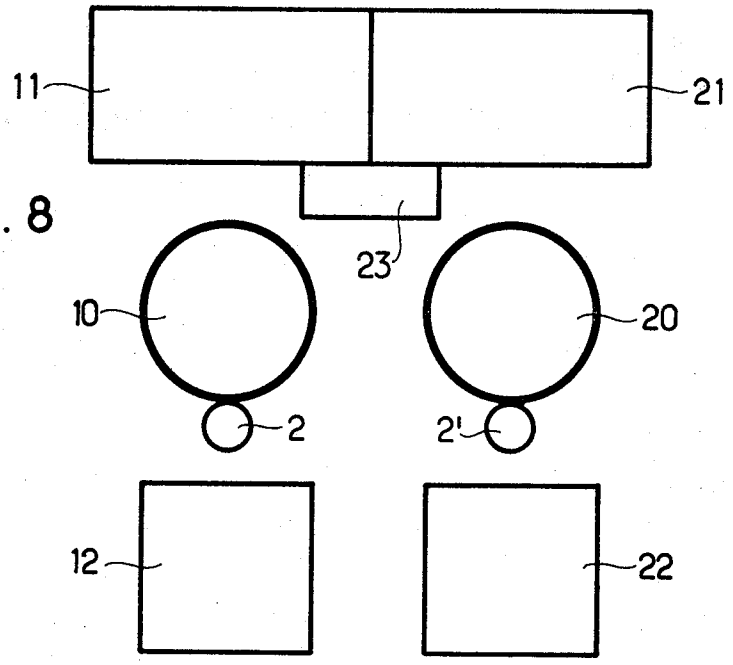


FIG. 8

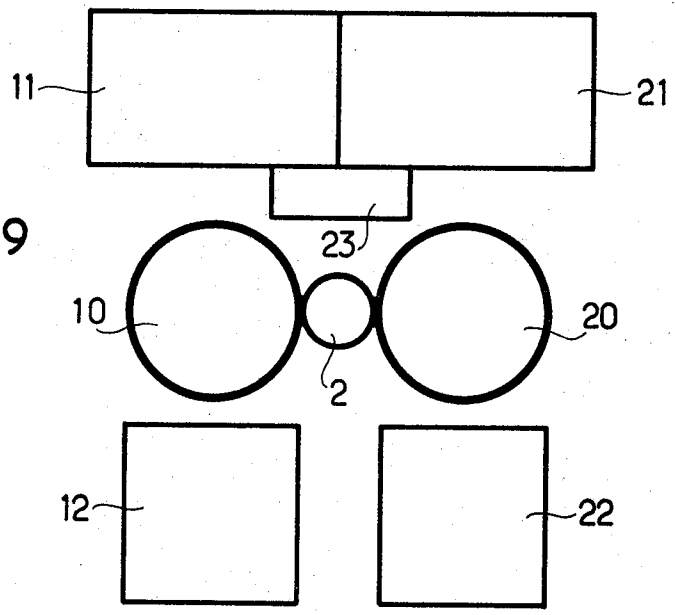


FIG. 9

FIG. 10

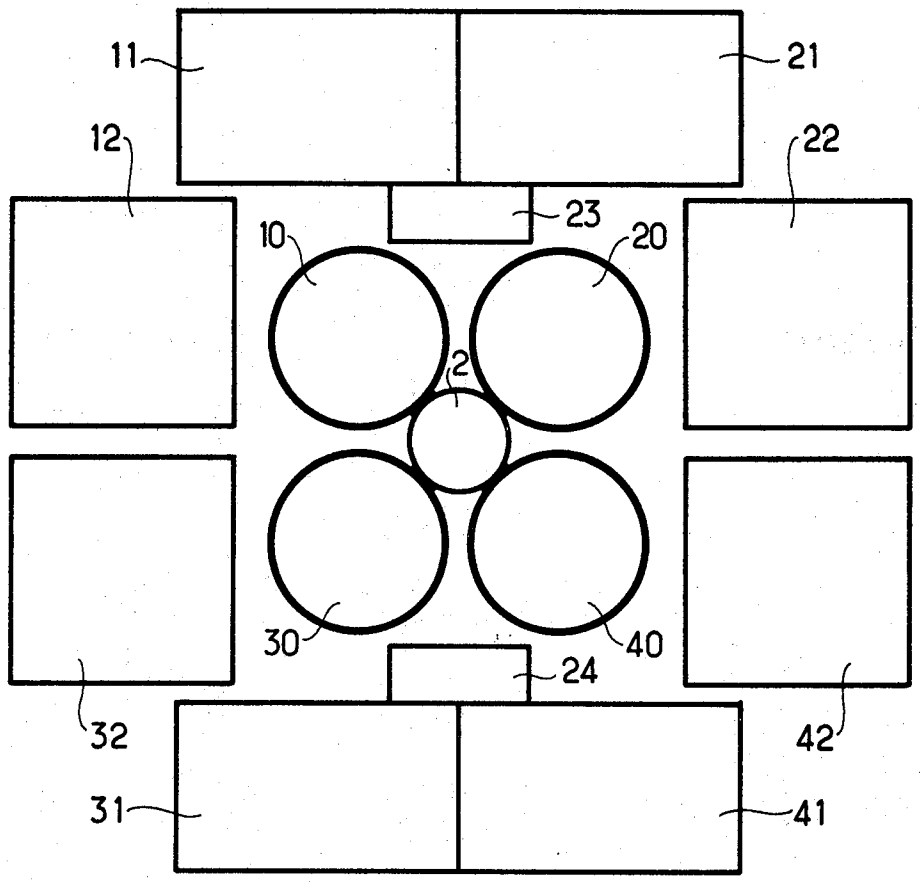
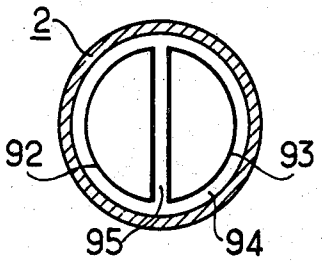


FIG. 11



THERMAL POWER PLANTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to thermal power plants and particularly the boiler houses and chimneys which are a part of them.

2. Description of the Prior Art

The term "boiler house" of a heating plant is defined as the structure which, in particular, supports and possibly shelters the boiler or boilers.

In most of the thermal power plants, the boiler houses and the chimneys are set up in clearly separated buildings or, more rarely, they are close together, as a function of the factors of available surface and esthetics; but in all cases, the buildings are of a different nature and they are necessarily independent. For example, boiler houses may involve a metal structure whereas that of the chimneys is generally masonry.

Such solutions imply a large surface on the ground in order to place the foundation for each one of the structures, to put a foundation slab on the ground, to put up a large metal skeleton, a suitable shingle roof, and the need for a conical chimney; all of these are particularly expensive and cumbersome arrangements.

The purpose of this invention is to provide a boiler house and chimney assembly for a thermal power plant which will make it possible to achieve a noteworthy saving, compared to the above-mentioned solutions.

SUMMARY OF THE INVENTION

The object of the invention is a thermal power plant, especially with a view to the production of electric power, including at least one boiler house equipped with a boiler and at least one chimney for the evacuation of the fumes produced by the boiler, characterized by the fact that said boiler house and said chimney present a common lateral wall portion and are made up of a unitary concrete structure.

The schematic drawings attached here give examples of preferential versions of the invention, by way of illustration and without any restrictions.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation and cross-section view of a first version of an assembly made up of a boiler house and a chimney.

FIG. 2 is an elevation and cross-section view of a variation of one version of an assembly made up of a boiler house and a chimney.

FIGS. 3, 4 and 5 represent a cross-section view of various versions according to the relative preferential positioning in the assembly of the boiler house towers and the chimneys.

FIGS. 6 and 7 show another example of building a boiler house with multiple towers.

FIGS. 8, 9 and 10 are plan views of a preferential grouping of an assembly of boiler houses and chimneys.

FIG. 11 shows a cross-section view of the distribution — in a single chimney assoicated with several boilers — of several smoke flues corresponding to each one of the boilers.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 we have shown one way of setting up the thermal power plant, including the boiler house with a

tower 1 and a chimney 2. A common supporting structure consists of foundations 3 which support a floor slab plate 4. The boiler house and the chimney reveal a vertical portion with a common lateral wall 8.

These structures are made of concrete and constitue a continuous assembly; in particular, the tower of the boiler house consists of a layer of reinforced concrete 5, with a thickness of about 20 centimeters, surmounted by a belt made of reinforced concrete 6.

In this example, the tower has a cylindrical revolution shape. The concrete layer of this tower serves as a cover for this boiler house which supports and shelters the boiler as such, which is not shown here.

The tower of the chimney as such consists of a revolution cylinder of reinforced concrete 7 with a thickness of about 30 centimeters.

A smoke flue 9 is ranged concentrically inside the chimney while leaving a free space 91 between the chimney and the flue. This flue, which in our example here is made of metal, is designed to protect the concrete of the chimney against heat stress, that is to say, against the chemical attack of hot gases; the free space guarantees heat insulation and at the same time permits any possibly necessary maintenance or repair work.

The version described here, involving two cylindrical towers made of concrete and forming a continuous block, resting on the same foundations, ensures the stability of the chimney which, if it were built separately, would require a conical structure with foundations of its own and with a floor slab plate of its own. This arrangement makes it possible to achieve considerable savings, especially in terms of the volume and the weight of the tower of the chimney, and its construction cost, for example, using cylindrical sliding cofferings, which are half as expensive as conical sliding cofferings; second, it facilitates savings in terms of the weight and the volume of the common foundations here, as well as the floor slab plate surface which is now smaller; finally, it is possible to use the concrete cover of the boiler house in place of the shingle covering which we can thus save.

On the other hand, it should be noted that the time to build these structures is much shorter due to the fact that we are using cylindrical sliding cofferings; this is not without significance in terms of construction time.

By way of indication, to build a conventional thermal power plant, involving, on the one hand, a boiler with a weight of 6,000 tons, requiring a metal skeleton figured at 1,200 tons, taking up a ground surface of 650 square meters and a height of 60 meters, and, on the other hand, to put up a conical chimney with an inside base diameter of 18 meters, with a thickness of 0.42 meter, an inside diameter at the top amounting to 8 meters, with a thickness of 0.25 meter, a height of 160 meters, on normal terrain, figuring on a working rate of 3.5 kilograms per square centimeter, it would be necessary to provide the following:

Weight of skeleton of boiler	1,200 t
Surface of boiler covering	7,200 m²
Volume of boiler foundations	625 m³
Volume of concrete for shaft of chimney	2,800 m³
Surface of coffering of chimney shaft	13,400 m²
Volume of chimney foundation	730 m³

By comparison, construction according to the invention would give us the following:

Volume of concrete for shaft of boiler tower	1,200 m³
Surface of coffering for shaft of boiler tower	8,300 m²

Volume of concrete for tower belt	760 m³
Surface of coffering for tower belt	950 m³
Volume of reinforced concrete for chimney shaft	1,040 m³
Surface of coffering of chimney shaft	8,300 m²
Volume of concrete for foundations	660 m³

The figures given in meters here would — in case of construction according to the invention — lead to a reduction in the cost of these comparative elements on the order of 60 percent, compared to the cost of the conventional solution, and this would hold true within the framework of the construction of a single boiler unit.

In FIG. 2, we have a variation where the boiler tower is shown at 1 while the chimney 2 involves, on the one hand, a smoke flue 71, starting at the upper portion of the tower of the chimney through a collector 72, and, on the other hand, a lower flue 73.

In this version, the evacuation of the smoke from the chimney is directed toward its upper part and only the upper part of the chimney is useful for the evacuation of the smoke. The lower portion of the chimney thus becomes available for technical uses, such as staircases, freight elevators. Moreover, the height of the smoke flue is reduced by the height of the lower flue which enables us to achieve a further considerable saving.

Besides, it is possible to arrange the tower of the chimney with respect to the boiler house in different positions, according to such factors as the available ground surface or the esthetic appearance of the entire assembly.

In FIG. 3 we have thus shown a chimney tower 2, supported externally against a boiler house 1, which constitutes the simplest version, but which occupies a larger ground surface.

In FIG. 4, on the other hand, we have shown a chimney tower 2 which is internally supported against a boiler house; this gives us a solution in which we take up less ground surface.

In FIG. 5, in an in-between solution, we have shown the chimney tower 2 placed astride on the boiler house 1.

However, the boiler house would not necessarily be made up of a single closed concrete cover, especially in the case of "out-door" construction.

In FIGS. 6 and 7 we have thus shown, respectively, an elevation view and the horizontal cross-section of one particular way of construction according to the invention, where, in an "outdoor" construction, the boiler house consists of an assembly of four posts 2, 2A, 2B, 2C and constitutes the chimney as such, while the three others can be set aside for technical uses, other than the evacuation of smoke, and in particular for storage purposes, especially fuel or water.

When a power plant has several boiler units, it is worthwhile to group the units geographically with the chimneys and their dependent components.

In FIG. 8 we have shown a general model of a thermal power plant consisting of two boilers 10 and 20, combined according to the invention with their chimneys 2 and 2', the units being set up opposite each other.

In the left portion of the figure we thus have, going from top to bottom, the boiler room 11, the boiler 10, the chimney 2, and then the generator zone 12, while, in the right-hand portion, going from top to bottom, we have the boiler room 21, the boiler 20, the chimney 2', and generator zone 22, with a control room 23 adjoining the boiler rooms 11 and 21.

This arrangement is worthwhile because it enables us to come up with a wise and harmonious grouping of installations.

In FIG. 9, which shows a variant compared to FIG. 8, we place — in one special version of the inventon — a common chimney 2 between the two boilers 10 and 20, so that the axis formed by boiler 10, the common chimney, and boiler 20 will be laid out parallel to the facilities in engine rooms 11 and 21, on the one hand, and the zone of generators 12 and 22, on the other hand.

This arrangement, which consists in the utilization of a single chimney, coupled with two boilers, leads to a further reduction in the cost of the structures on the order of 8–10 percent.

In FIG. 10 we have shown one particular version of constructing a thermal power plant according to the invention, with four boilers 10, 20, 30 and 40, associated with a single chimney 2. Boiler rooms 11 and 21 are juxtaposed so as to face — along with the common control room 23 — the boilers 10 and 20, while boiler rooms 31 and 41 are juxtaposed so as to face, along with common control room 24, the boilers 30 and 40.

The zones of generators 12 and 32 are juxtaposed so as to face the boilers 10 and 30, while the zones of generators 22 and 42 are juxtaposed so as to face the boilers 20 and 40.

Here again the presence of a single boiler, placed in the center, enables us to cut the cost of the structures involved in the assembly of towers and chimney.

Finally, in the case where we have a chimney commonly shared by several boilers, it may be worthwhile to subdivide the chimney by means of particular smoke flues, corresponding to the various boilers involved.

In FIG. 11 we have shown a cross-section view of a chimney 2 and metal smoke flues 92 and 93, associated with two boilers, not shown in the figure, and surrounded by free spaces 94 and 95 with a width on the order of 60 centimeters.

Independently of the heat insulation of the reinforced concrete of the chimney, the subdivision of the flues enables us to ensure the independence of the draft of the smoke from each one of the boilers and their independent maintenance.

In this example, the chimney was divided into two circular sectors but it is evident that it can be divided into a larger number of circular sectors, for example, three or four.

What is claimed is:

1. In a thermal power plant including at least one boiler house said boiler house having a boiler and at least one chimney for the evacuation of the smoke produced by the boiler, the improvement comprising: a common lateral wall forming an integral part of said boiler house and said chimney, said boiler house and said chimney being made up of a unitary concrete structure integrally with said common lateral wall.

2. The thermal power plant according to claim 1, wherein: said boiler has the shape of a cylindrical tower.

3. The thermal power plant according to claim 1 wherein: said chimney has the shape of a cylindrical tower.

4. The thermal power plant according to claim 2 wherein said chimney has the shape of a cylindrical tower.

5. The thermal power plant according to claim 1 wherein said boiler house communicates with the outside by means of a metallic smoke flue arranged inside a portion of said chimney.

6. The thermal power plant according to claim 5 wherein said smoke flue leads to the upper portion of said boiler house.

7. The thermal power plant according to claim 5, wherein said smoke flue is subdivided into two flues, each of said two flues being parallel to each other and having a cross-section in the shape of a circular sector.

8. The thermal power plant according to claim 6, wherein said smoke flue is subdivided into two flues, each of said two flues being parallel to each other and having a cross-section in the shape of a circular sector.

* * * * *