

C. A. MIDGLEY.
BOILER FURNACE.
APPLICATION FILED MAR. 22, 1912.

1,036,299.

Patented Aug. 20, 1912.

2 SHEETS—SHEET 1.

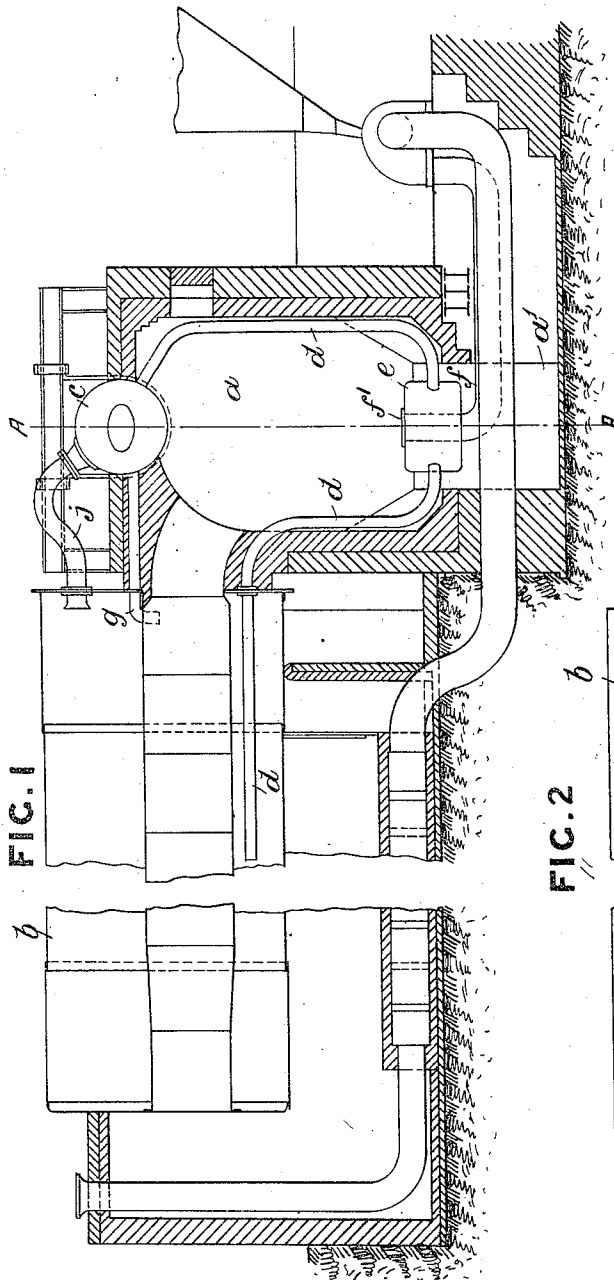


FIG. 1

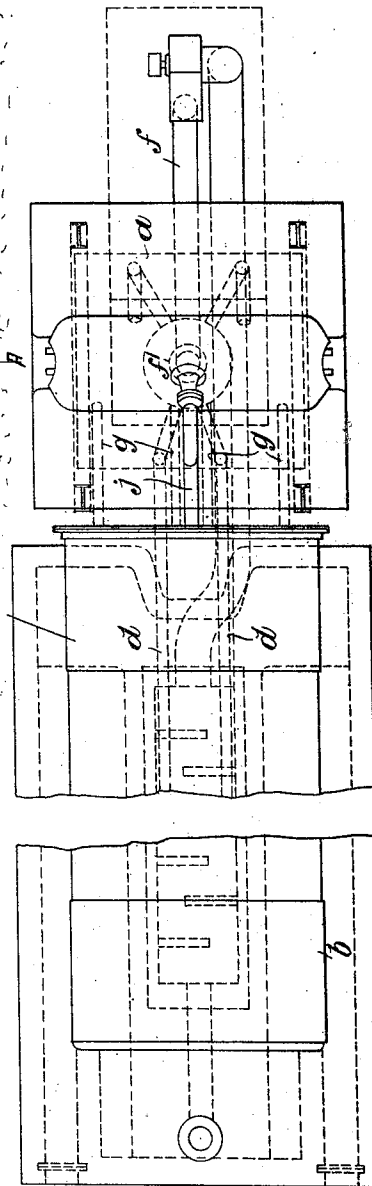


FIG. 2

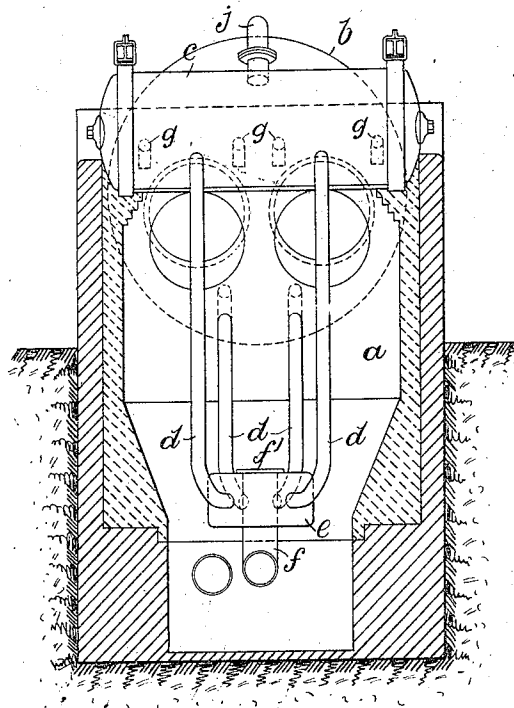
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2 SHEETS—SHEET 2.

FIG. 3



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BOILER-FURNACE.

1,036,299.

Specification of Letters Patent.

Patented Aug. 20, 1912.

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To all whom it may concern:

Be it known that I, CHARLES AUGUSTUS MIDDLEY, a subject of the King of Great Britain and Ireland, residing at Sycamore House, Nessfield, Ilkley, county of York, England, engineer, have invented Improvements in Boiler-Furnaces, of which the following is a specification.

My invention relates to improvements in boiler-furnaces, and it has for its objects:— To construct an apparatus that can easily be erected as a distinct and separate addition to existing boiler plant, to quicken the boiler water circulation, to increase the evaporative effects, and to utilize the very high temperature of the improved combustion that results from using pulverized fuels by working between wider limits of temperature than hitherto.

To carry my objects into effect I make use of the following details of apparatus:— an air-blast producer or blower, and a fuel pulverizer or disintegrator for reducing the fuel to powder of the requisite degree of fineness for effective combustion under the conditions determined, and I may avail myself of any of the several well-known devices now on the market for blowing and pulverizing purposes. This combined pulverizer and fan carries the coal dust along a pipe, the coal dust being supplied with hot or cold air as may be deemed desirable; this pipe passes through a water vessel at the base of the furnace which serves the object of keeping the fuel pipe end or burner cool. The pulverulent fuel is then burned in a separate brick chamber, in the crown of which is a water drum or supplementary boiler. By disposing a water drum at the crown of the furnace where the heat of combustion is most intense, I obtain what I term a stage heater. The drum or stage heater is connected by a pipe or pipes with the chamber *c* at the base of the furnace, and by a pipe or pipes to the water space of the primary boiler above the boiler flues, and also connected by a pipe or pipes with the steam space of the primary boiler.

Owing to the intense heat of a furnace of this description, the water and steam in the stage heater at the crown of the furnace, are raised to a higher degree of temperature than the temperatures in the primary boiler, consequently a flow of water and steam fol-

lows from the stage heater to the primary boiler. This rate of flow can be regulated at will by fixing a superheated steam jet in the water pipes connected to the stage heater and also by fixing a valve in the pipe connecting the steam spaces of the stage heater and the primary boiler.

In the accompanying drawings illustrating my invention and to which I hereinafter refer, Figure 1 is a sectional elevation, Fig. 2 a plan and Fig. 3 an end elevation on line A A. In these views the same letters refer to like parts.

My invention consists of a specially constructed combustion chamber *a* that is external to the boiler *b* and designed to embody the essentials of my invention: this element of my apparatus may be described as a combination of combustion chamber into which the pulverized fuel is fed with air, with a combined circulator and stage evaporator consisting of a cylindrical drum or supplementary small boiler *c* which, by preference, is set in the crown of the combustion chamber *a*, and is there fed by water taken from the primary boiler by an education pipe or pipes *d* that lead from a point or points at or near the base of the primary boiler *b*, about midway from either end thereof, and carrying the received water thence to a device *e* at the base of the combustion chamber. This device is a water-jacket for cooling the nozzle *f'* of the twyer *f* by which the air and pulverized fuel is fed in for combustion. From the water jacket *e* surrounding the twyer nozzle *f'* the heated water is led away by a pipe or pipes *d* onward and upward to the cylindrical drum, sub-boiler or evaporator *c* of the supplementary stage heater and circulator, and at some convenient point in its course is, by preference, supplied with an injection jet (not shown) of superheated steam for quickening or speeding up the circulation, and for placing the same under control. From the receiving drum *c* into which the quickened current is delivered for the stage heating, further communication is made with the primary boiler by two distinct sets of effluence channels or conduits *g* and *j*. One of these sets *g* leads from a point or points at or near the base of the drum *c* and delivers water therefrom into the primary boiler *b* at selected points adjacent to the

fire flues and against the heated plates of which the water from the base of the drum is discharged. The other eduction pipe *j*, which is of much larger capacity, leaves the supplementary drum *c* from the steam space above the water level and delivers both steam and carried-over water into the steam space of the primary boiler *b*. Vent is thus found for the energetic ebullition and rapid steam generation effected in the supplementary drum while the water level is maintained in both drum and primary boiler. In this manner a quickened and controlled circulation is established and maintained, so as automatically to adapt the whole combination of parts to the increased duty made possible.

I may, if I so please, establish in the larger or steam eduction pipe a pressure delivery valve (not shown) by which I may set up a differential action, and so utilize any given difference of pressure between the drum and the primary boiler to enforce a differential flow of water from the base of the drum to the boiler-flues by the first set of eduction pipes.

To facilitate the complete removal of all slag, clinker, ashes and incombustible dust, the combustion chamber is open below and may discharge into a receiver as *a'* at the base in many well-known ways to permit of the refuse being carried easily away at convenient times.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. A combined cylindrical boiler, stage heater and water circulator for producing circulation in a manner parallel to the flow of the gases, consisting of a boiler as *b*, a combustion chamber as *a*, a stage heater and water circulator *c*, eduction pipes *d*, *g* and *j*, all in combination.

2. The combination of a primary boiler; a supplementary boiler; means for heating the water in the supplementary boiler to a higher degree than the water in the primary boiler, the lowest portion of the water space of the primary boiler being below the lowest portion of the water space of the supplementary boiler; a feed water passage extending from the water space of the primary boiler to the supplementary boiler; and a return water passage extending from the water space of the supplementary boiler to the primary boiler.

3. The combination of a primary boiler; a supplementary boiler; means for heating the water in the supplementary boiler to a higher degree than the water in the primary boiler; a feed-water passage extending from the water space of the primary boiler to the supplementary boiler; a return water passage extending from the water space of the supplementary boiler to the primary

boiler; and a passage extending from a point above the level of the water in the supplementary boiler to the primary boiler.

4. The combination of a primary boiler; a heating chamber having a passage leading to the primary boiler; a supplementary boiler mounted within the heating chamber; a heat supplying jet mounted within the heating chamber for supplying heat to the supplementary boiler; a water jacket surrounding the jet; a water-feed passage leading from the primary boiler to the supplementary boiler; a second water feed passage leading from the water jacket to the supplementary boiler; a return water-feed passage leading from the supplementary boiler to the primary boiler; and a passage leading from the space above the water level in the supplementary boiler into the steam space of the primary boiler.

5. The combination of a primary boiler; a heating chamber having a passage leading to the primary boiler; a supplementary boiler mounted within the chamber; a jet mounted within the chamber; means for directing fuel through the jet and toward the supplementary boiler; a water jacket for the jet; a passage for conveying the water from the primary boiler to the water jacket; a passage for conveying the water from the water jacket to the supplementary boiler; a return water passage from the supplementary boiler to the primary boiler; and a passage leading from the supplementary boiler at a point above the water level therein to the steam space of the primary boiler.

6. The combination of a primary boiler; a heating chamber having a passage leading to the primary boiler; a supplementary boiler mounted within and adjacent the top of the heating chamber; means adjacent the base of the chamber for supplying heat directly to the supplementary boiler; a feed water passage leading from the primary boiler to the supplementary boiler; and a return water passage leading from the supplementary boiler to the primary boiler.

7. The combination of a primary boiler; a heating chamber having a passage leading to the primary boiler; a supplementary boiler mounted within and adjacent the top of the heating chamber; means adjacent the base of the chamber for supplying heat directly to the supplementary boiler; a feed-water passage leading from the primary boiler to the supplementary boiler; a return water passage leading from the supplementary boiler to the primary boiler; and a passage leading from the supplementary boiler at a point above the water level to the steam space of the primary boiler.

8. The combination of a primary boiler; a heating chamber having a passage leading to the primary boiler; a supplementary boiler mounted within and adjacent the top

of the heating chamber; means within the chamber for supplying heat to the supplementary boiler; a feed water passage leading from the primary boiler to the supplementary boiler; and a return water passage leading from the supplementary boiler to the primary boiler.

9. The combination of a primary boiler; a heating chamber having a passage leading to the primary boiler; a supplementary boiler mounted within the heating chamber; a fuel supplying jet mounted within the heating chamber to direct the fuel toward the supplementary boiler; a water jacket adjacent the said jet; a water supply passage leading from the primary boiler to the water jacket; a water passage leading from the water passage to the supplementary boiler; a return water passage leading from the supplementary boiler to the primary boiler; and a passage leading from the supplementary boiler at a point above the water level therein to the steam space of the primary boiler.

10. The combination of a primary boiler; a heating chamber having a passage leading from a point adjacent one end of the primary boiler, said passage having a curved deflecting surface; a supplementary boiler mounted within and adjacent the said end of the heating chamber; a fuel supplying jet for directing the fuel toward the said end of the heating chamber; a water jacket adjacent to said jet; a water supply passage leading from the primary boiler to the water jacket; a water passage leading from the water jacket to the supplementary boiler; a return water passage leading from the supplementary boiler to the primary boiler; and a passage leading from the supplementary boiler at a point above the water level therein to the steam space of the primary boiler.

11. The combination of a primary boiler; a heating chamber having a passage leading from a point adjacent the top thereof to the primary boiler, said passage having a curved deflecting surface; a supplementary boiler mounted within and adjacent the top of the heating chamber; a fuel supplying jet for directing fuel toward the top of the heating chamber; a water jacket adjacent to the jet; a plurality of feed water passages leading from the primary boiler to the water jacket; a plurality of water

passages leading from the water jacket to the supplementary boiler; a plurality of return water passages leading from the supplementary boiler to the primary boiler; and a passage leading from the supplementary boiler at a point above the water level therein to the steam space of the primary boiler.

12. The combination of a primary boiler; a heating chamber having a passage leading from a point adjacent the top thereof to the primary boiler, said passage having a curved deflecting surface; a supplementary boiler mounted within and adjacent the top of the heating chamber; a fuel supplying jet for directing fuel toward the top of the heating chamber; a water jacket adjacent to the jet; a feed water passage leading from the primary boiler to the water jacket; a water passage leading from the water jacket to the supplementary boiler; a return water passage leading from the supplementary boiler to the primary boiler; and a passage leading from the supplementary boiler at a point above the water level therein to the steam space of the primary boiler.

13. The combination of a primary boiler; a heating chamber; a supplementary boiler mounted within the heating chamber, a heat supplying jet arranged to direct heat toward the supplementary boiler; a feed water passage extending from the primary boiler to the supplementary boiler; and a return water passage extending from the supplementary boiler to the primary boiler.

14. The combination of a primary boiler; a heating chamber; a supplementary boiler mounted within the heating chamber; a heat supplying jet arranged to direct heat toward the supplementary boiler; a feed water passage extending from the primary boiler to the supplementary boiler; a return water passage extending from the supplementary boiler to the primary boiler; and a passage leading from the supplementary boiler at a point above the water level therein to the steam space of the primary.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

CHARLES AUGUSTUS MIDGLEY.

Witnesses:

THOMAS PRESCOTT,
HAROLD WALKER.