

1,061,379.

3 SHEETS—SHEET 1.



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1,061,379.

Patented May 13, 1913.

3 SHEETS—SHEET 2.

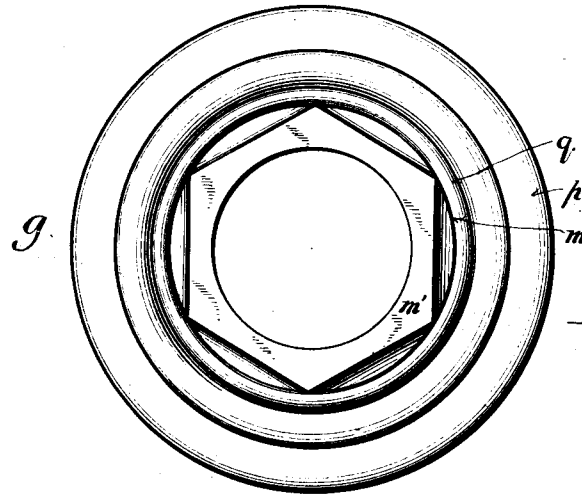


Fig. 5.

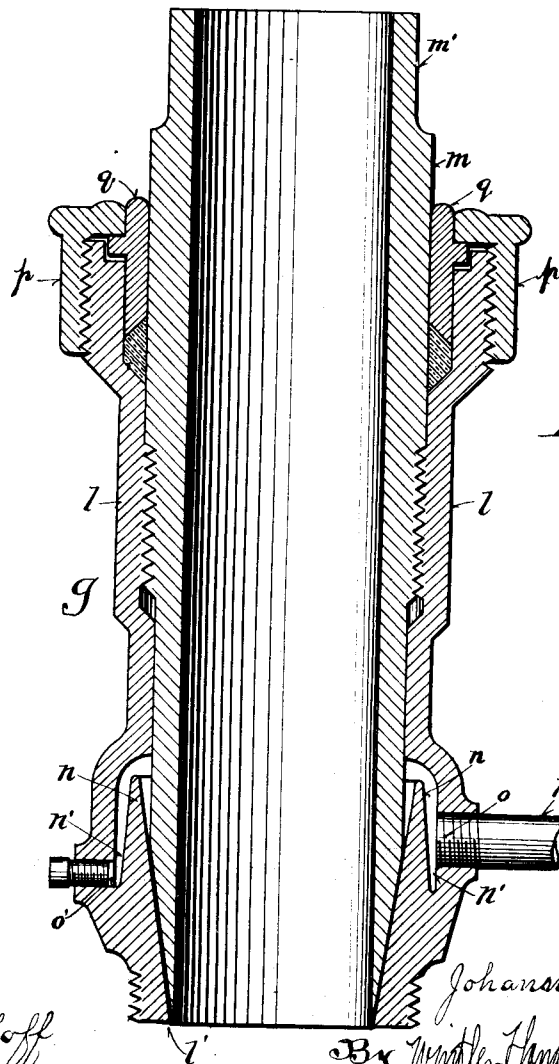


Fig. 4.

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BOILER FURNACE.
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3 SHEETS—SHEET 3.

Fig. 7.

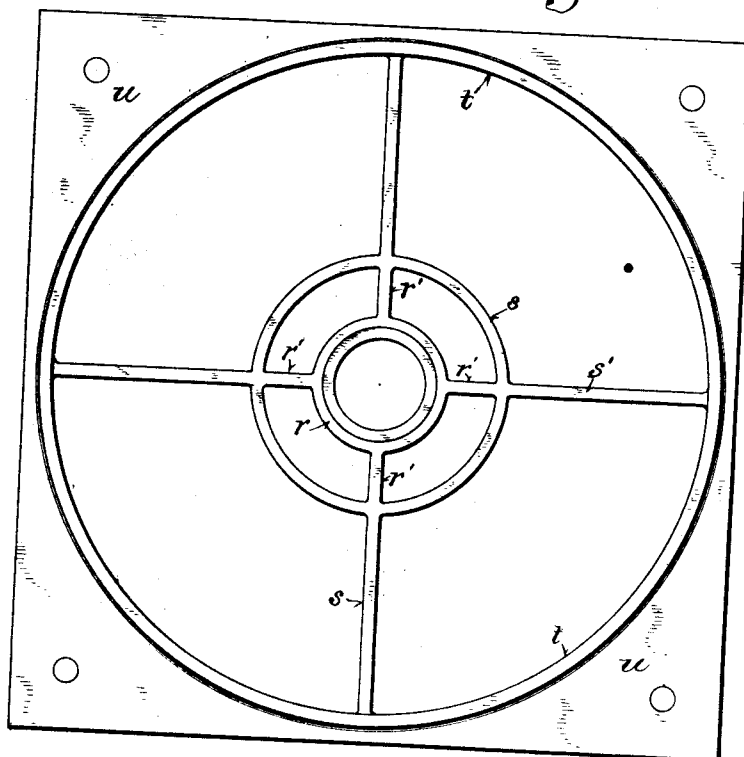
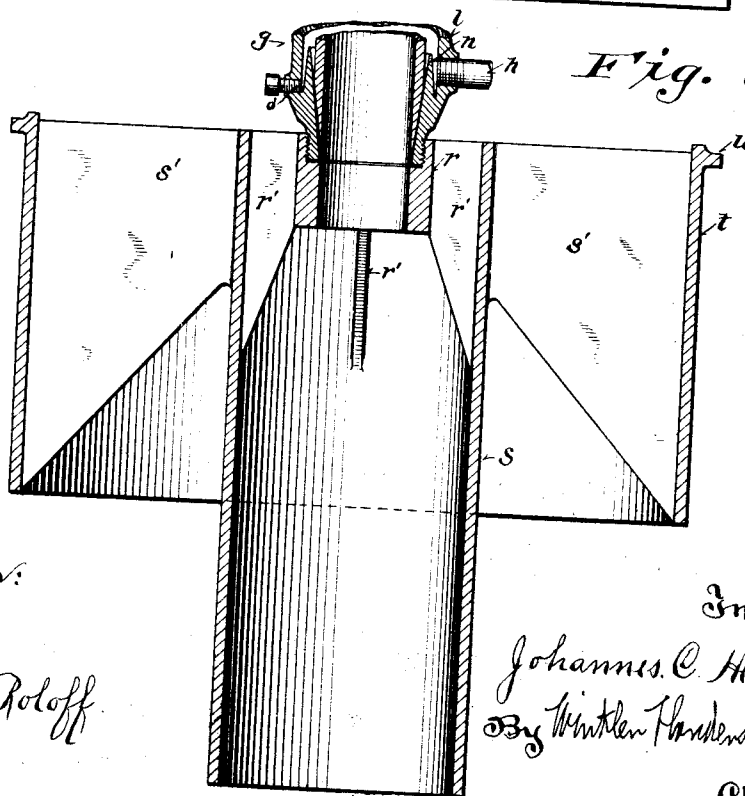


Fig. 6.



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UNITED STATES PATENT OFFICE.

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BOILER-FURNACE.

1,061,379.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed June 5, 1907. Serial No. 377,301.

To all whom it may concern:

Be it known that I, JOHANNES CHRISTOPHER HEINRICH, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Boiler-Furnaces, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates particularly to the class of furnaces employing heated air or mingled heated air and steam in forced draft. Its objects are to secure automatic regulation of steam pressure and forced draft, to effect a thorough preheating of the air utilized for draft, affording better combustion and creating a more intense heat than is possible with the ordinary furnace. Other objects are to prevent the formation of clinkers on the grate, the deposit of soot upon the walls of the flues, to consume all combustible gases, and in general to provide an economical furnace.

It consists in certain novel features of construction and in the arrangement of parts hereinafter particularly described and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical longitudinal section on the line 1—1 Fig. 2, Fig. 2 is a horizontal section on line 2—2 Fig. 1, Fig. 3 is a transverse section on line 3—3 Fig. 1. Fig. 4 is an enlarged detail vertical section of the steam blower forming part of the apparatus, and Fig. 5 is a plan view of the same. Fig. 6 is a vertical section of the steam blower base showing the blower (partly broken away) in place on the same, and Fig. 7 is a plan view of the blower base.

Referring to Figs. 1, 2, and 3 of the drawings, my invention is shown applied to a horizontal steam boiler *a* of a common type having a steam dome *b* and to a furnace having a bridge-wall *c* and a wall *d* extending from the bridge wall to the rear wall and forming a chamber *e* under the combustion chamber adapted to heat air used for forced draft before it is delivered to the fire. The rear wall has a large vertical flue *f* through which air is conveyed from the furnace room through a blower *g* to the air chamber *e*. Steam is carried from the boiler through a

pipe *h* including an automatic steam pressure regulating valve *i*. The pipe *h* also includes the hand valves *h'* and *h''* and a branch pipe *j* leads into and through the flue *f* to two auxiliary blowers *k—k* located in the chamber *e*.

Referring to Figs. 4 and 5 the blower *g* comprises a casing *l* internally screw-threaded for a portion of its length to engage an externally screw-threaded tubular nozzle *m* having a wrench-head *m'*. At its lower end the casing *l* is internally tapered to engage the externally tapered end of the nozzle *m* and near this end is provided with an annular deflector *n* surrounded by an annular channel *n'*. A steam inlet *o* into which the pipe *h* is threaded, is provided on one side of the casing opposite the annular deflector *n*, and on the side of the casing opposite the steam inlet *o* is a blow-out opening *o'* on a line with the bottom of the annular channel *n'*. The blow-out opening is normally closed with a cap or plug and has for its object to permit blowing out dirt, scale, oil and other foreign matter which might gather in the channel *n'*. At its upper end the casing is provided with a stuffing box comprising a collar *p* fitting over the end of the casing, a packing gland *q* between the casing and the nozzle adjustably held by the collar the latter having a shoulder engaging an annular rib on the gland, and a quantity of packing below the gland, this forming a steam tight joint between the casing and the nozzle. The nozzle *m* being adjustable lengthwise of the casing, by means of the screw-threaded engagement with the casing, the wrench-head *m'* being provided to permit the nozzle being raised and lowered, the opening or slit *l'* between the nozzle and the casing may be enlarged or reduced to admit more or less steam as is found most desirable in practice. The lower end of the casing *l* is externally screw-threaded to engage the internally screw-threaded tube *r* in the blower base shown in Figs. 6 and 7. The tube *r* is supported by a series of radial wings *r'* in the center of a larger and longer tube *s* similarly supported by radial wings *s'* in the center of the outer tube *t* which fits in the flue *f* resting on the plate *u*. The plate *u* is provided with bolt holes whereby it may be bolted or otherwise securely held on the flue *f*.

With certain kinds of fuel and under certain conditions the auxiliary blowers *k* may

be used. These blowers are similar to the large blower *g* and are adapted to force heated air from the chamber *e* to twyer pipes *v* embedded in fire brick on each side of the combustion chamber and having outlets directed into and across the same.

A large opening *c'* in the bridge-wall *c* leads from the chamber *e* to the ash-pit of the furnace.

The operation of the furnace is as follows: Fire is started in the grate in the manner usual to ordinary furnaces, draft being supplied through the ash-pit and fire-box doors until the steam-pressure has reached a predetermined point, then the hand-valve *h'* in the steam pipe *h* is opened to admit steam to the blower *g*. The fire-box and ash-pit doors may then be closed, the automatic regulating valve *i* allowing steam to pass through the pipe *h* to the steam blower *g*. Steam entering the annular channel *n'* through the opening *o* in the blower, circles around the same and impinging on the annular deflector *n* continues its course over it, and through the annular opening *l'* between the casing and the tubular nozzle *m*. Issuing in an annular jet from the lower end of the nozzle, the steam entrains air downwardly through said nozzle from the upper part of the boiler-room where it is slightly heated, and forces the same through the tube *r* into the upper end of the larger tube *s*. As the combined column of air and steam issues from the lower end of the tube *r* it entrains more air through the openings at the upper end of the tube *s* between the wings *r'* and mingling therewith issues from the lower end of said tube *s*, entraining a larger body of air through the openings between the upper ends of the tubes *s* and *t*. During its passage down the flue *f* and through the super-heating chamber *e*, the body of mingled air and steam is still further heated by the hot walls with which it comes in contact, and passing thence through the opening *c'* in the bridge wall and upwardly through the grate into the combustion chamber in a highly heated condition it readily combines with and produces perfect combustion of the fuel. The fresh supply of mingled steam and air from the auxiliary blowers *k*, which is also highly heated in its passage through the twyer pipes *v v* on each side of the combustion chamber, furnishes the required oxygen in proper condition to combine with and produce complete combustion of the inflammable gases above the fire. The steam in the air serves to keep the fuel soft and porous and prevents clinkers from adhering to and burning the grate. The superheated air supplied by the auxiliary blowers being very hot, all of the inflammable gases are consumed in the combustion chamber, thus preventing

the deposit of soot upon the walls of the flue and stack and reducing the quantity of smoke emitted from the stack. When the steam pressure in the boiler reaches a predetermined point the automatic regulating valve *i* cuts off the steam from the blowers and stops the forced hot air supply, thereby checking the fire. By this means the furnace is operated in the most economical manner. When the steam pressure falls below the required limit, the automatic regulating valve *i* will open, putting the blowers in operation until the steam has again reached the required pressure. A positive and certain operation of the draft regulation is thus secured and this operation, which usually requires careful watching on the part of the engineer, is rendered practically automatic.

Various changes in the construction and arrangement of parts may be made without departing from the principle and intended scope of the invention.

I claim:

1. In a steam boiler furnace the combination with the combustion chamber, ash pit, grate and bridge wall, of an air heating chamber located behind the bridge wall and below the combustion chamber and communicating with the ash pit through an opening in the bridge wall, a flue leading downwardly in the furnace wall into said heating chamber and having an air intake opening at its upper end, a blower in said flue having a steam supply connection and an air inlet, a twyer pipe in the furnace wall leading from said heating chamber and having an outlet directed into and across the space above the grate, and an auxiliary blower connected with said twyer pipe.

2. In a steam boiler furnace the combination with the combustion chamber, ash pit, grate and bridge wall of a heating chamber located behind the bridge wall and below and adjacent to the combustion chamber with which it communicates through the ash pit, a blower connected with said heating chamber and having an air intake opening and a steam supply connection with the boiler, twyer pipes communicating with and leading from said heating chamber on opposite sides of the combustion chamber and having outlets directed across and over the grate and auxiliary blowers arranged to force air from said heating chamber through said pipes into the combustion chamber, substantially as described.

3. In a steam boiler furnace the combination with the combustion chamber, ash pit, grate and bridge wall of a heating chamber located behind the bridge wall and below and adjacent to the combustion chamber and communicating with the ash pit through an opening in the bridge wall, an

air supply flue leading downwardly in the furnace wall into said heating chamber and having an air intake opening at its upper end, a blower connected with the upper
5 part of said flue and having a steam supply connection with the boiler, a twyer pipe leading from said heating chamber through the furnace wall to the combustion chamber above the grate and an auxiliary blower
10 connected with said pipe and having a steam supply connection with the boiler, substantially as described.

4. In a steam boiler furnace the combination with the combustion chamber, ash pit,
15 grate and bridge wall, of an air heating chamber located behind the bridge wall and below the combustion chamber, from which it is separated by a heat conducting wall, and enlarging from the rear toward the

bridge wall through an opening in which it 20 communicates with the ash pit, a blower connected with the smaller end of said heating chamber and having a steam supply connection and an air intake opening, a
25 pipe leading from said heating chamber through the furnace wall to the combustion chamber above the grate and in front of the bridge wall, and a blower having a steam supply connection and arranged to
30 force air through said pipe from the heating chamber into the combustion chamber.

In witness whereof I hereto affix my signature in presence of two witnesses.

JOHANNES CHRISTOPHER HEINRICH.

Witnesses:

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HERBERT R. MANGER.