No. 707,364. Patented Aug. 19, 1902.

I. D. SMEAD.

HEATING APPARATUS.

(Application filed July 29, 1901.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

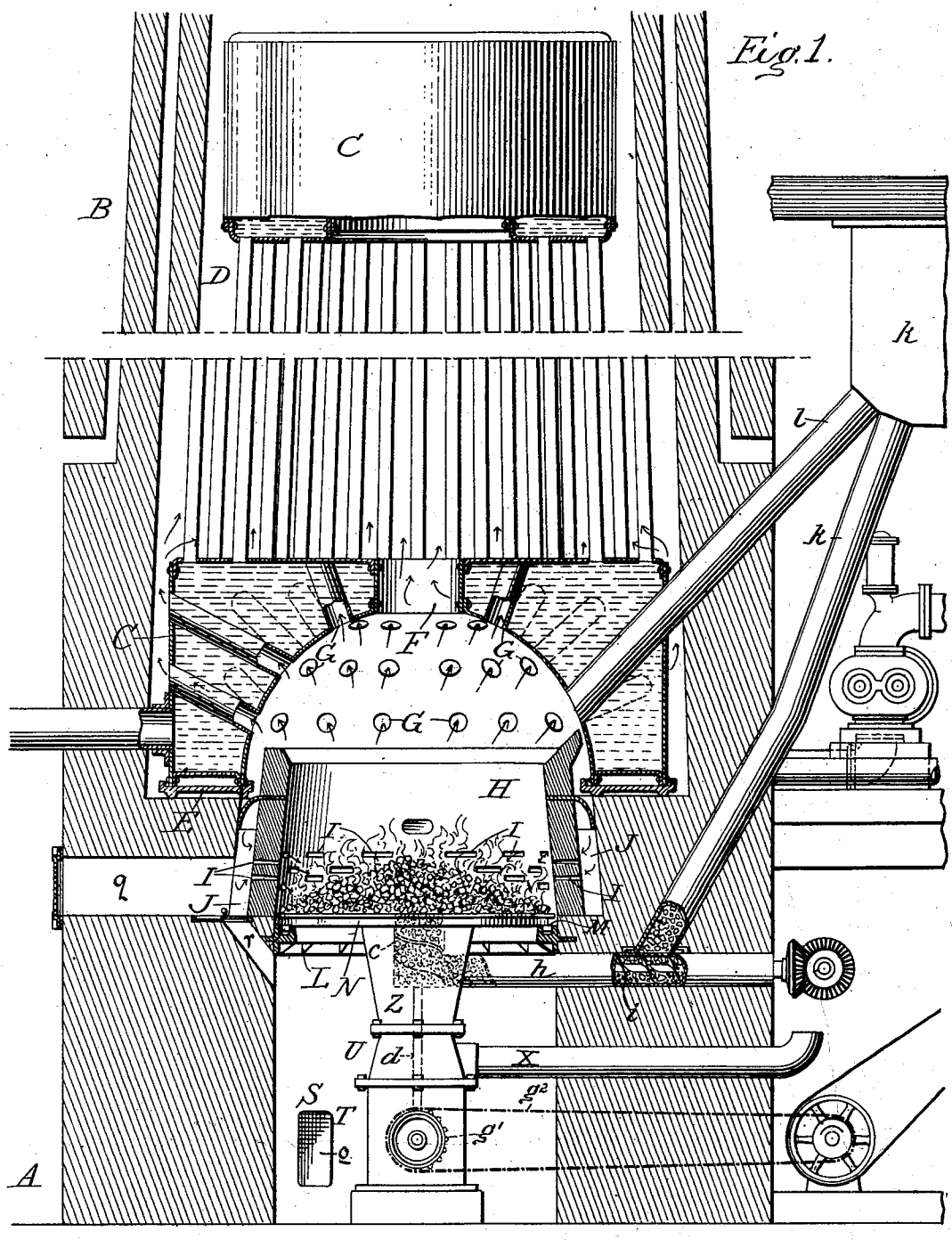

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Fig. 2.

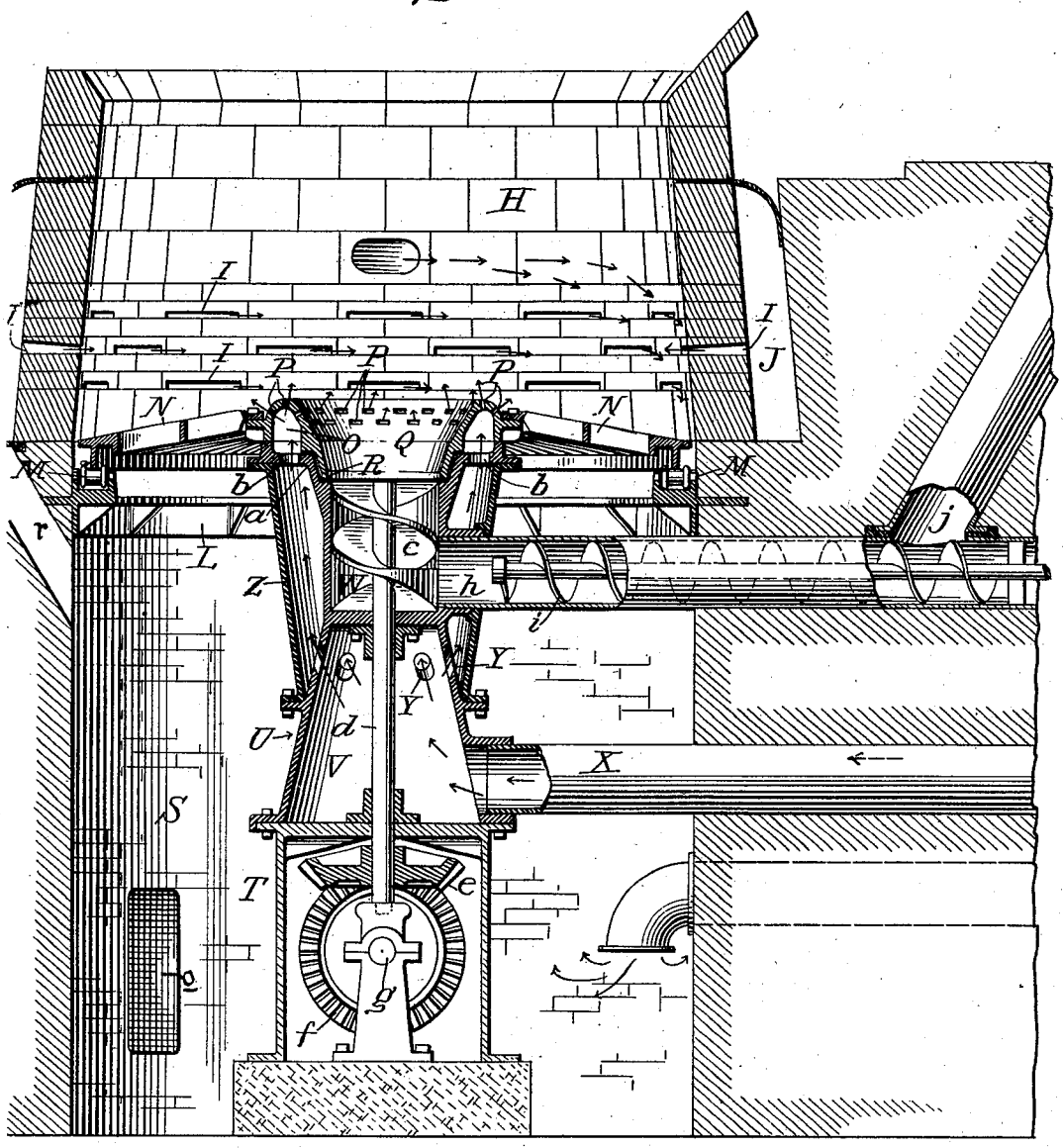

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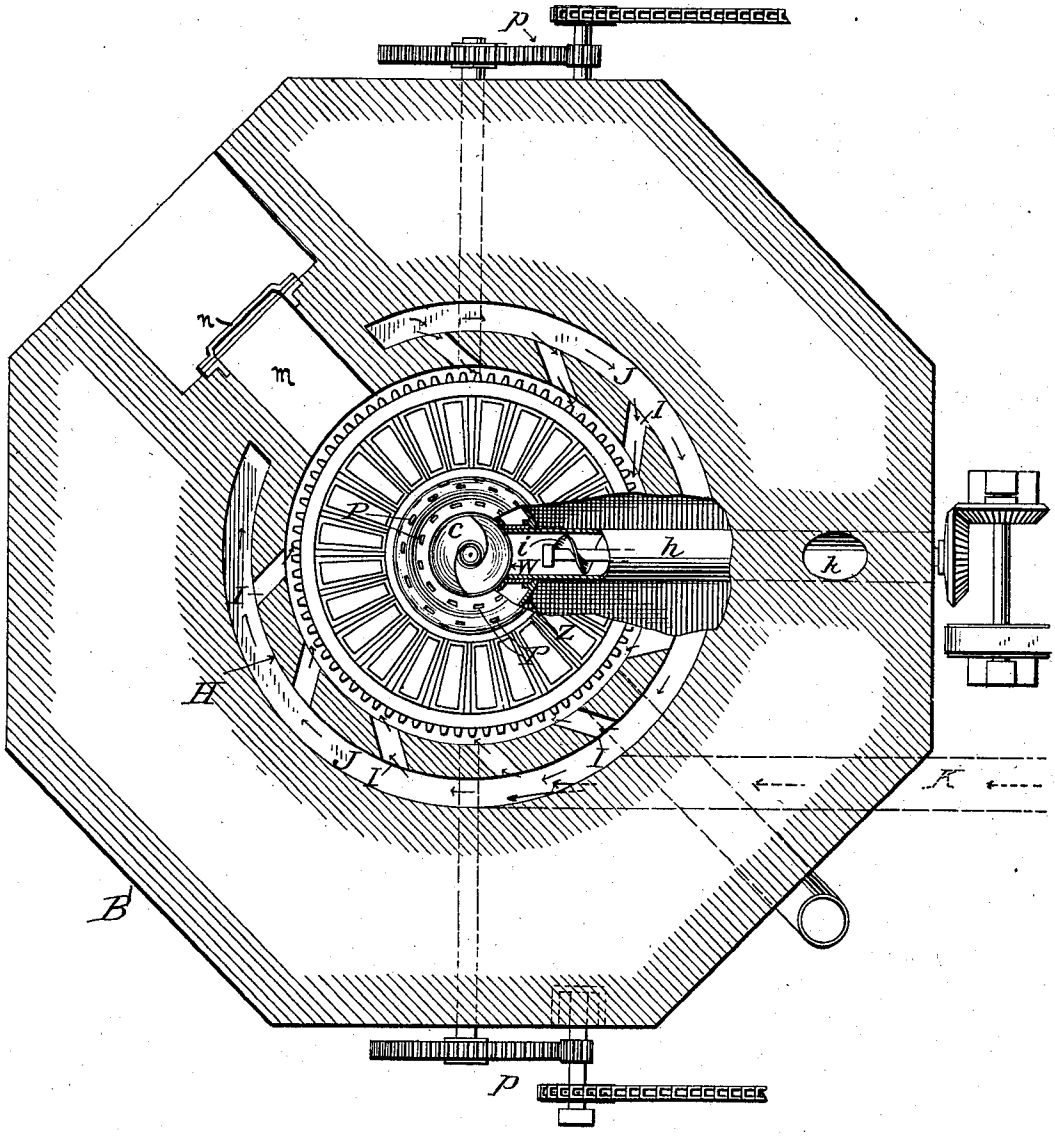
Fig. 3.



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UNITED STATES PATENT OFFICE.

ISAAC D. SMEAD, OF CINCINNATI, OHIO.

HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 707,364, dated August 19, 1902.

Application filed July 29, 1901. Serial No. 70,137. (No model.)

To all whom it may concern:

Be it known that I, ISAAC D. SMEAD, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Heating Apparatus, of which the following is a specification.

My present invention pertains to improvements in heating apparatus, the construction and advantages of which will be hereinafter set forth, reference being had to the annexed drawings, wherein—

Figure 1 is a vertical sectional view of the apparatus; Fig. 2, a similar view of the fire-chamber, the grate, and the feeding mechanism; and Fig. 3, a horizontal sectional view on the line 1 1 of Fig. 2.

The main object of the present invention is to provide a superior furnace for hot-water heaters or steam-generators, and a further specific object is to construct a highly efficient underfeed for such a furnace.

With central hot-water heating-stations such as have of late been installed by me it is of course essential that as great efficiency in the boiler be maintained as possible, and this with a minimum fuel consumption and with the assurance that the plant shall be maintained in working condition at all times. With a central plant where many are dependent thereon for their heat the construction must be such that the liability of failure of the apparatus is practically *nil*. The present application presents a simple and efficient system.

Referring to the drawings, A denotes the base or foundation, surmounted by a stack or chimney B, in which is mounted a boiler, preferably made up of a series of drums C, connected by tubes D, the lowermost section resting upon a bed-plate E, seated upon the foundation. The lower section is by preference constructed as shown in Fig. 1, wherein it will be seen that its under face is arched, forming a dome. A central opening F and a series of smaller radial openings or passages G are formed in this section, passing from the dome through the section or drum and discharging into the chimney proper. Immediately below the dome is arranged the combustion-chamber H, the wall of which in its lower part is pierced by a series of tangential inlets I, communicating with a passage or channel J, formed in the foundation or wall of the furnace. A pipe K, Fig. 3, leads from a suitable fan or blower to said channel J.

Supported by and extending out from the wall of the foundation is a bracket or shelf L, carrying rollers M, which in turn form the support for the outer edge of a circular rotating grate N. The central portion of the grate is formed by a collar or ring-shaped member having a channel or groove O formed in its under face, said channel communicating with a series of openings P. The central opening Q in the collar converges gradually toward the bottom thereof, the walls of the skirt R being practically vertical. As will be seen upon reference to Fig. 2, the center of the grate is highest, the grate or grate-bars inclining downwardly therefrom toward the periphery of the grate.

The space S within the foundation below the grate is termed the "ash" or "cinder" chamber, and it is within this chamber that the main operative portions of the fuel-feeding devices are located.

T designates a box or housing surmounted by a shell or casing U, having two chambers V and W formed therein. A pipe or conduit X, connected to a blower or fan, leads into the chamber V, and any air passing into said chamber finds its way through opening Y into a sleeve Z, which surrounds the upper portion of the casing U. The upper end *a* of the casing is extended out horizontally beneath the central member of the grate, and in said extension are formed openings *b*, so that the air may pass from the chamber formed intermediate the collar Z and the shell or casing U into the channel O and out through the openings P. Chamber W is made cylindrical, and in it is mounted a screw *c*, its shaft *d* extending down through chamber V into the box or casing T. There it is provided with a bevel-gear *e*, which meshes with a similar gear *f*, carried by a shaft *g*, said shaft *g* passing out to one side of the box or casing T, where it is provided with a

sprocket g'. A sprocket-chain g^2 passes about said sprocket-wheel and through an opening formed in the base of the furnace to a suitable source of power. A pipe or conduit h opens into the lower part of chamber W, and in said pipe is located a feed-screw i, motion being imparted to said screw by means of suitable gearing. A supply or delivery pipe j extends from a bin or hopper k to the conduit h, the point of communication being at or near the outer end of the screw. A second conduit or pipe l leads from the bin and discharges directly onto the grate. This may be used in case of emergency.

As will be noted upon reference to Fig. 2, the cylindrical chamber W and its feed-screw are somewhat larger in cross-section than the lateral conduit h and its feed-screw. By this construction and by proper regulation of the speed at which the screws are rotated the proper amount of coal can be fed up to the grate at all times and this without clogging the upright screw.

Suitable gearing p, Fig. 3, is employed for imparting rotary movement to the grate, which serves to distribute the coal evenly over its surface and also keep it free from accumulation of ashes, clinker, and the like.

In the operation of the furnace the coal passing down through the conduit j into the conduit h is fed along by the screw i and, passing into the chamber W, is elevated by the screw c, the coal passing up through the central collar of the grate and flowing over onto the grate or grate-bars proper.

A passage or way m extends through the wall of the structure and leads directly to the grate. It is closed at its outer end by a door n. A similar opening or passage-way o leads to the ash-pit or chamber S.

A manhole q extends through the base or foundation of the furnace in line with the bottom of the channel J, and a passage r extends from the lower portion of the channel or way into the ash-pit below. (See Fig. 1.) This passage r is preferably valved. It affords means for cleaning out the channel or way J of any accumulated dust, cinders, or the like.

When combustion is once started, it is properly maintained by the introduction of air through the openings in the collar and also by the introduction of air through the openings I, as well as up through the grate from the ash-pit. The openings I, as formerly noted, are arranged tangentially, so that the air has a vertical or whirling movement within the fire-chamber. By proper regulation of the air which is forced in through the various openings, all of which are under control of the furnace attendant, the fire may be regulated to a nicety and perfect combustion thereby secured. The rotation of the grate in one direction and the introduction of the air through the tangential openings I in a counter direction tend to more thoroughly commingle the heated air and the gases from the coal. When a fresh charge of fuel is forced up through the central opening in the grate, a sufficient quantity of air may be forced up through the collar to properly consume all the gases arising from the fresh fuel. The products of combustion which pass from the fire-chamber H impinge directly against the dome-shaped under face of the lowermost boiler section or drum and passing through the central opening F and the tubes G serve to thoroughly heat the water in said section, at which point it of course is the coolest. The products of combustion then pass up through the chimney around the various pipes and drums forming the boiler proper.

It is to be noted that the actuating mechanism for the vertical feed-screw is located wholly within the ash-pit and is incased, so as to be protected from the ashes and cinders.

No claim is herein made to the structure disclosed for supplying air to the grate-passages and to the combustion-chamber, nor is any claim here presented for the particular formation of the boiler structure. These matters will form the subjects of separate applications to be hereafter filed; but specific reference and illustration is made herein in order that the heating apparatus as a whole may be fully understood.

Having thus described my invention, what I claim is—

1. In a furnace, the combination of a grate having a central perforate collar; a shell located below the grate and having two compartments or chambers V and W, the latter opening into the collar; a feed-screw mounted in said upper chamber W; means for forcing air into the lower chamber; and a sleeve surrounding the shell, said sleeve serving to form a passage for air passing from chamber V to the perforate collar.

2. In a furnace, the combination of a grate having a feed-opening; a fuel-chamber located beneath the grate and in line with the opening; a feed-screw located in said chamber; and a separate and independent feed-conduit leading to the upper side of the grate, substantially as and for the purpose specified.

3. In a furnace, the combination of a grate; an under fuel-feed for said grate; and a conduit or pipe leading from the fuel-supply and discharging at a point above the grate.

4. In a furnace, the combination of a grate having a central feed-opening; means for forcing fuel from below up through said opening to the grate; a boiler drum or section located above the grate; and a fuel conduit or pipe extending through said boiler-section and discharging upon the upper side of the grate.

5. In a furnace, the combination of a grate having a central opening; a chamber located below the grate and in line with said open-

ing; a feed-screw mounted in said chamber; means for feeding fuel into the chamber; a boiler-section mounted above the grate; and a fuel-feed conduit extending through said section and discharging onto the upper face of the grate.

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

ISAAC D. SMEAD.

Witnesses:
ANTHONY KUEFER,
M. E. REISINGER.