No. 781,981. PATENTED FEB. 7, 1905.

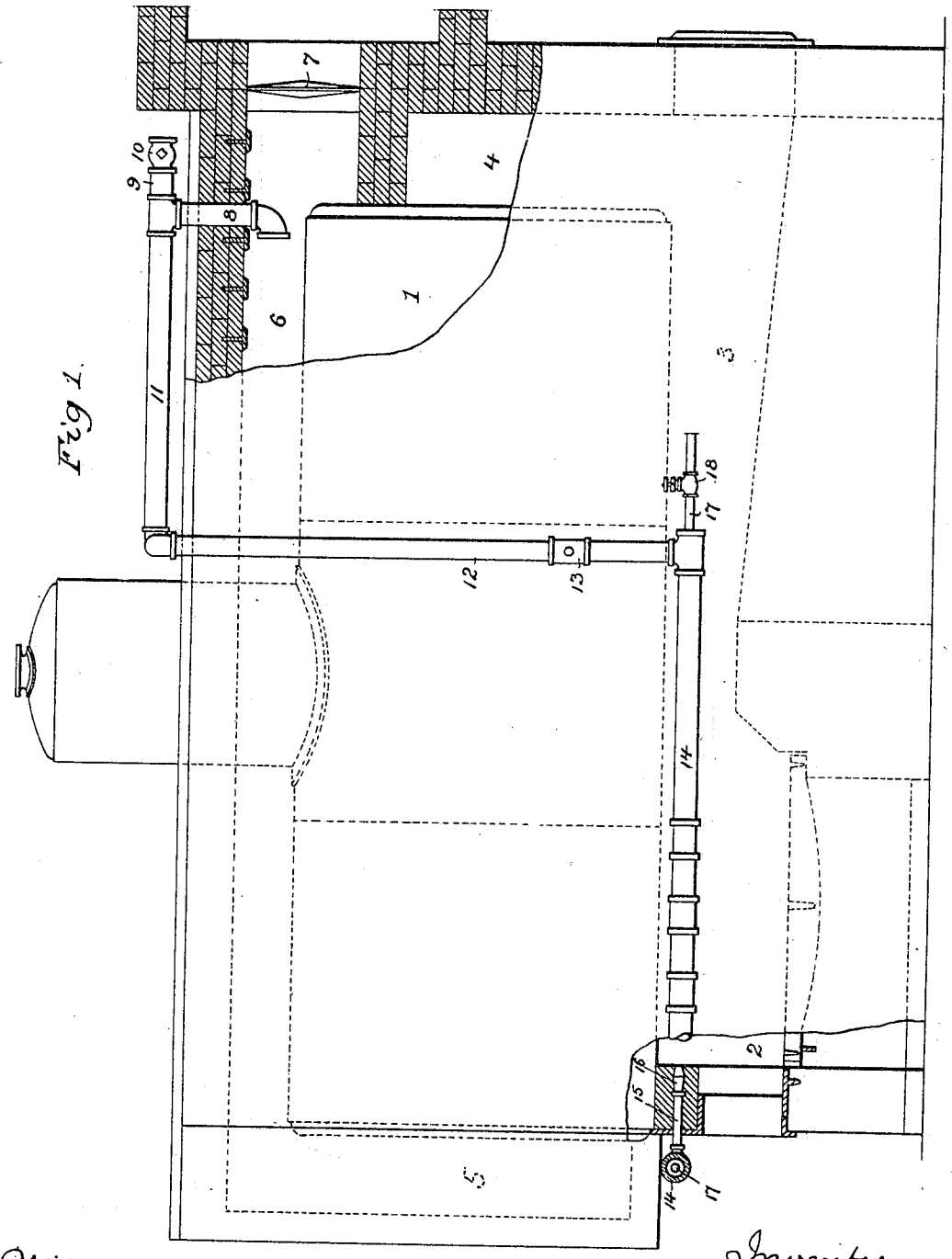
B. E. WRIGLEY.

SMOKE CONSUMING FURNACE.

APPLICATION FILED AUG. 13, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 3.

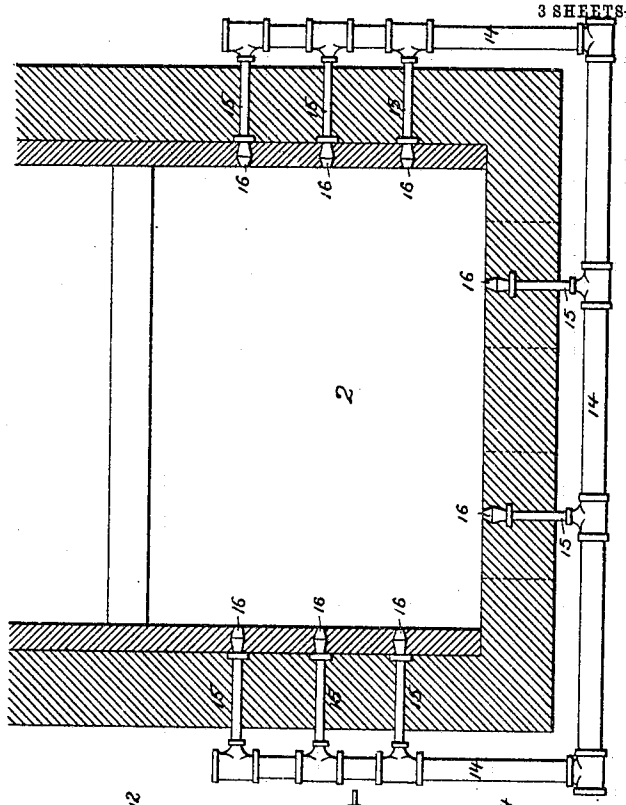
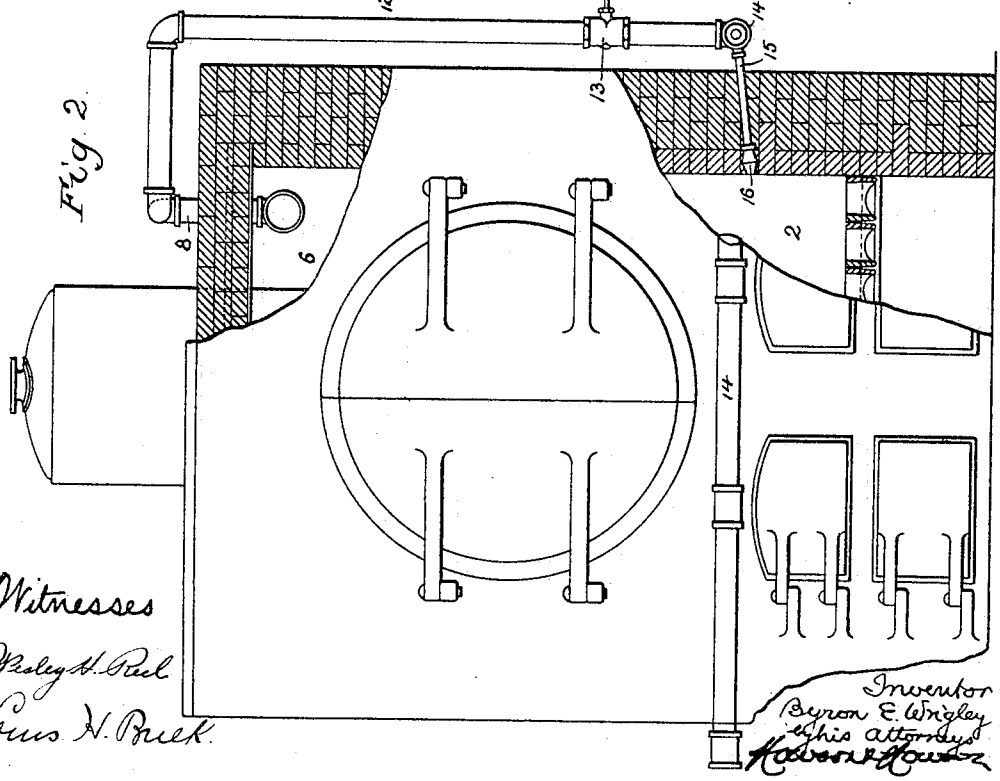


Fig. 2.



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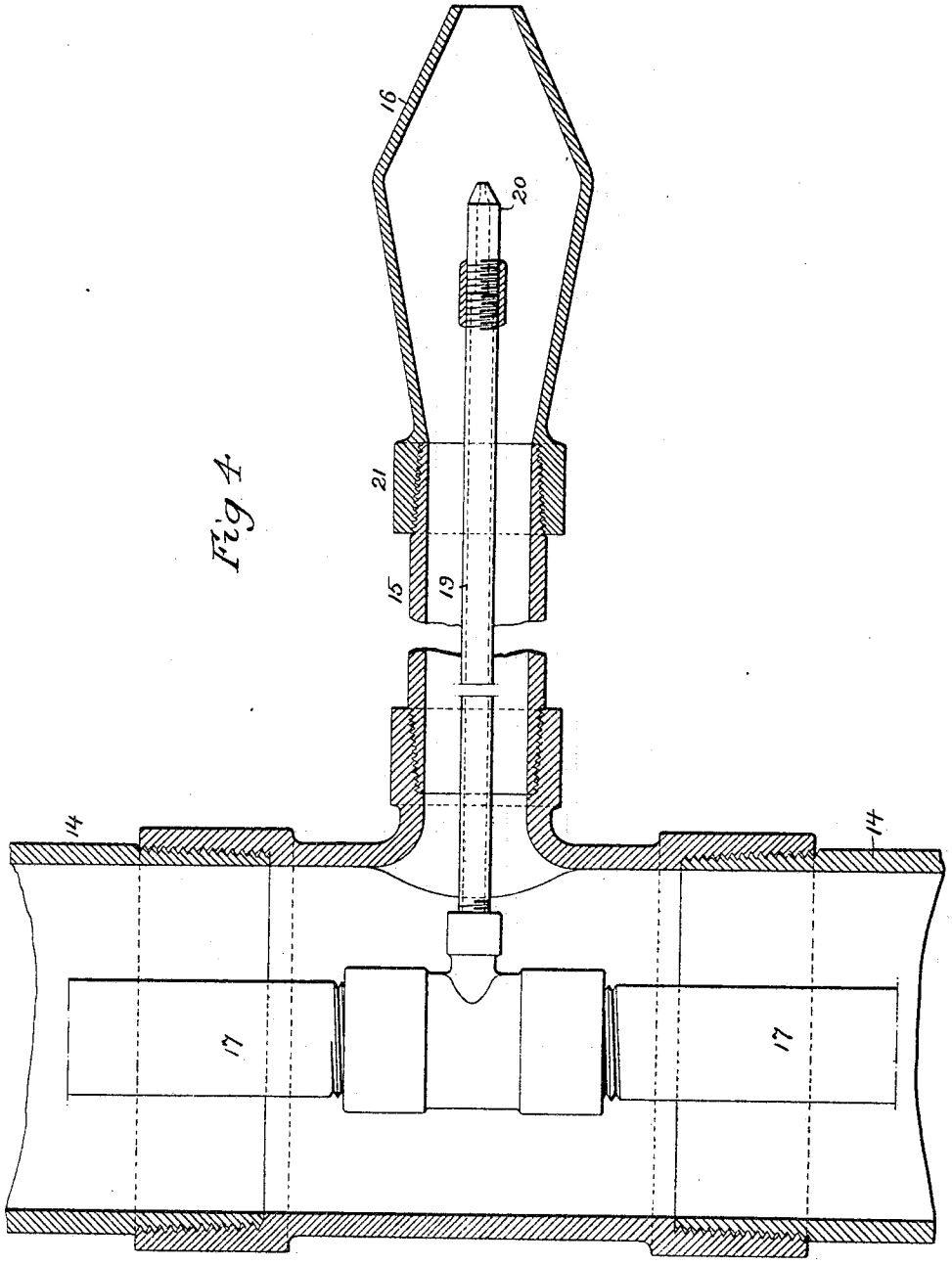
3 SHEETS—SHEET 3.

Fig 4.



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No. 781,981. Patented February 7, 1905.

UNITED STATES PATENT OFFICE.

BYRON E. WRIGLEY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE WRIGLEY COMBUSTION COMPANY, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 781,981, dated February 7, 1905.

Application filed August 13, 1904. Serial No. 220,663.

To all whom it may concern:

Be it known that I, BYRON E. WRIGLEY, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Smoke-Consuming Furnaces, of which the following is a specification.

My invention relates to furnaces of that type in which the unconsumed smoke and gases or a portion of the same are returned to the fireplace of the furnace for combustion, the object of my invention being to so construct a furnace of this character that the return of the gases will be effected in such manner as to insure their proper combustion in the fireplace.

This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of a steam-boiler furnace to which my invention has been applied. Fig. 2 is a front view of the same, partly in section. Fig. 3 is a sectional plan view of the fireplace of the furnace, and Fig. 4 is an enlarged section of one of the jet-nozzles of the apparatus.

Referring to Fig. 1 of the drawings, 1 represents a steam-boiler of the return-tube type; 2, the fireplace; 3, the bottom flue; 4, the rear flue; 5, the front flue, and 6 the top flue, which ordinarily communicates with the stack through an opening provided with a suitable damper 7. With this top flue communicates the inlet end of a pipe 8, which has a branch 9 with valve 10 open to the air, this valve being preferably of the butterfly type, so that it can be set to permit of any desired rate of inflow of air through the same. The pipe 8 is also in communication, through pipes 11 and 12, (the latter having a check-valve 13 opening downward,) with a pipe 14, which encircles the fireplace of the furnace and has at intervals branch pipes 15 projecting through the front and side walls of the boiler-setting and terminating at their inner ends in nozzles 16. Extending through the encircling pipe 14 is a steam-pipe 17, provided with a valve 18, and this steam-pipe has branches 19—one within each of the branches 15—each of said branch steam-pipes 19 terminating in a jet-pipe 20.

Each of the nozzles 16 presents, as shown in Fig. 4, a double flaring outline—that is to say, it diverges from the base 21 to a point practically in line with the discharge end of the jet-pipe 20 and then converges to the outlet, which is some distance in advance of said discharge end of the jet-pipe. In consequence of this construction the escaping steam-jet causes a partial vacuum in the nozzles 16 and in the pipes communicating therewith. Hence there is an induced flow of the smoke and other products of combustion from the top flue 6 through said pipes, a supply of air regulated in volume by adjustment of the valve 10 being also drawn in through the pipe 9 for admixture with the gases and the combined mixture of gas, air, and steam being projected into the fireplace 2 from the nozzles 16 and being subjected to such heat in said fireplace that its combustion is readily effected, the emission of smoke from the chimney or stack being thus prevented or very largely reduced.

The branch pipes 15 and their nozzles 16 are inclined slightly downward toward the discharge ends, so that the mixture of gas, air, and steam is directed downwardly toward the surface of the incandescent mass of fuel on the grate, at which point the greatest heat is maintained. Hence the proper combustion of the mixture is assured. The passage of the steam-pipe 17 through the encircling pipe 14 provides for a certain superheating of the steam, and therefore aids in the decomposition of the same by the heat of the fire-place.

I find that by the use of reversely-flaring nozzles of the character described in connection with a steam-jet pipe terminating at the point of greatest area of the nozzles a more effective admixture of the gas, air, and steam is insured than when other types of nozzle are employed, and by projecting the mixture of gas, air, and steam into the fireplace in the form of a number of separate jets directed from the opposite sides and also from the front of the fireplace all portions of said mix-

ture are subjected to such a degree of heat as will insure perfect combustion of the same.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination of the fireplace and gas-flue of a furnace with a pipe communicating with said flue and having nozzles discharging into the fireplace, each of said nozzles consisting of a pair of reversely-arranged conical shells united at the bases of the cones, the rear shell being of greater length than the diameter of the nozzle, and an internal steam-jet pipe communicating with said nozzle at or about the point of junction of the bases of the cones, substantially as specified.

2. The combination of the fireplace and gas-flue of a furnace, with a pipe communicating with said flue and having a portion extending around three sides of the fireplace and provided with nozzles discharging into said fireplace, each of said nozzles consisting of a pair of reversely-arranged conical shells united at the bases of the cones, the rear shell being of greater length than the diameter of the nozzle, and a steam-pipe contained within and extending throughout said encircling pipe and having branches terminating in jets within said nozzles at or about the point of junction of the bases of the cones, substantially as specified.

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

BYRON E. WRIGLEY.

Witnesses:
WALTER CHISM,
JOS. H. KLEIN.