

No. 709,372.

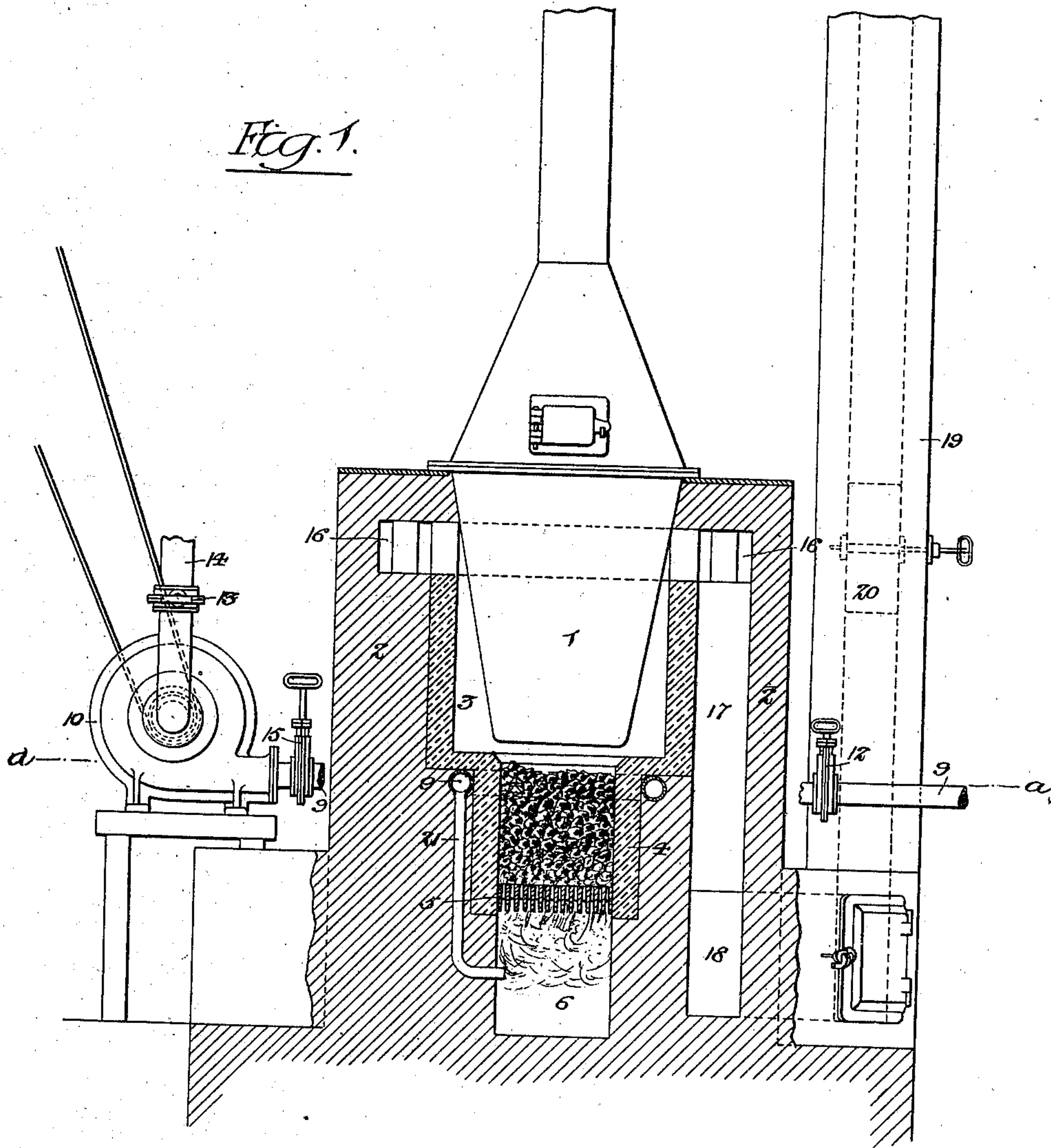
Patented Sept. 16, 1902.

J. TATHAM.
COMBUSTION PROCESS.

(Application filed Oct. 11, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:-
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Inventor:-
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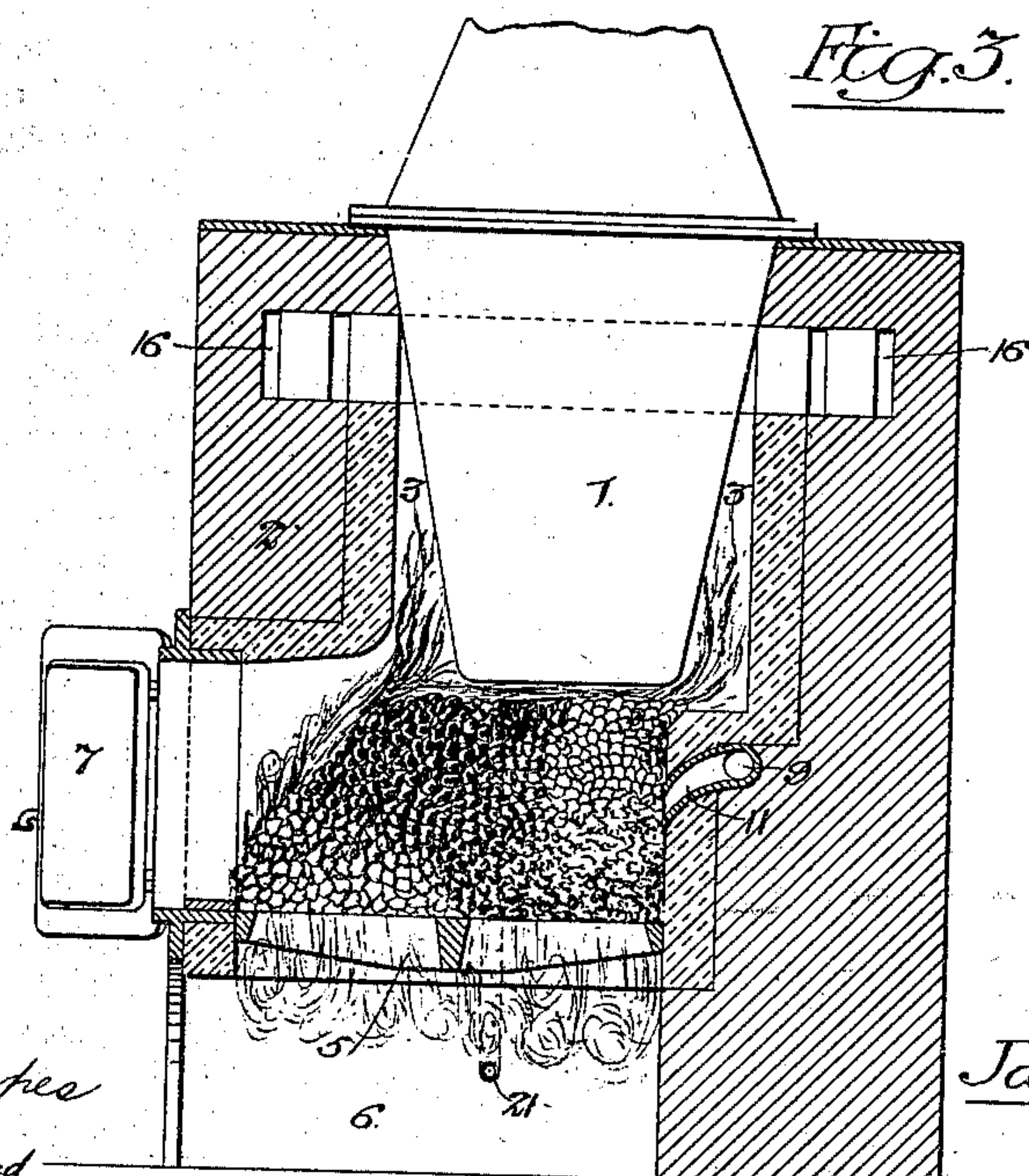
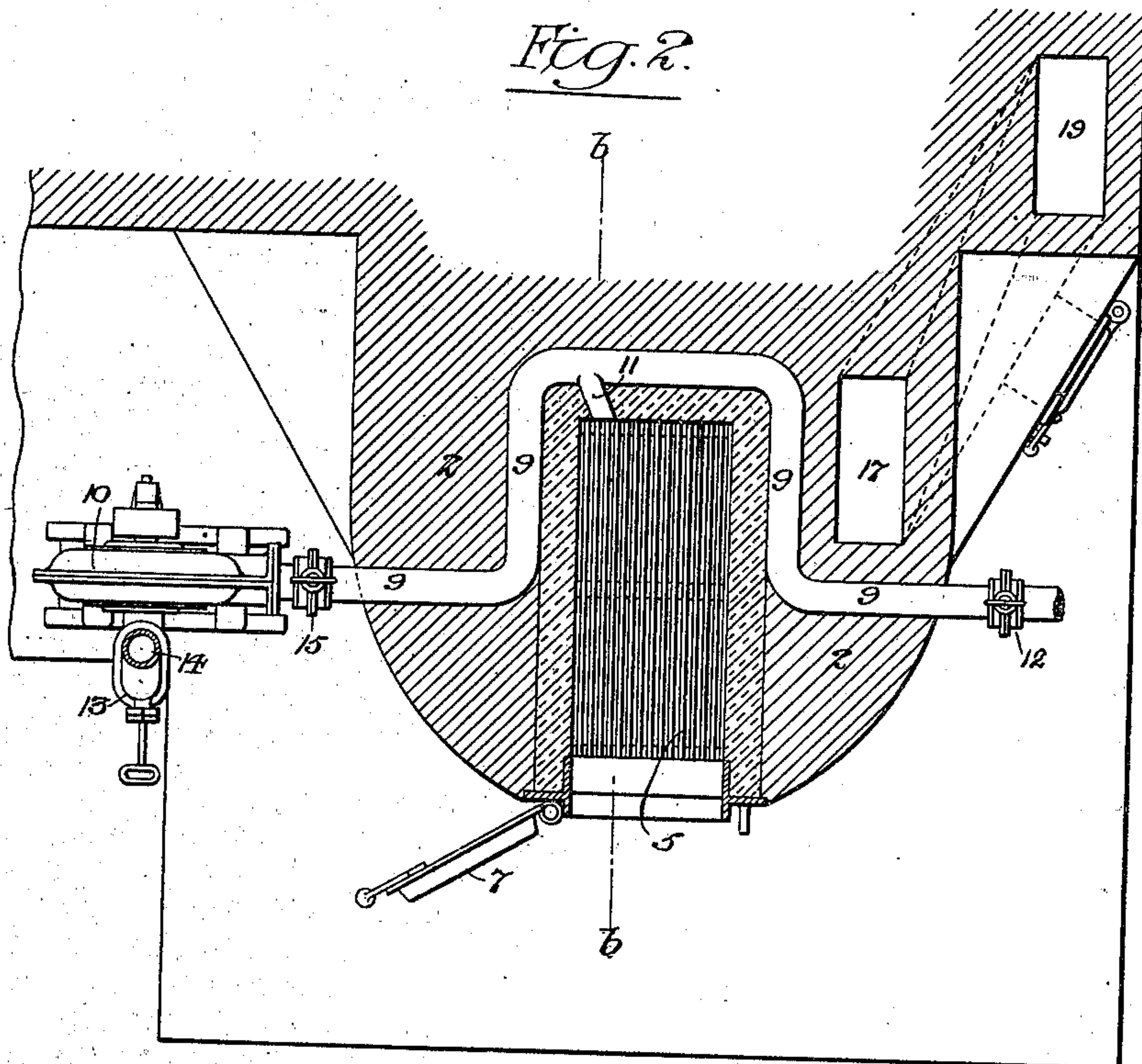
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2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

JAMES TATHAM, OF PHILADELPHIA, PENNSYLVANIA.

COMBUSTION PROCESS.

SPECIFICATION forming part of Letters Patent No. 709,372, dated September 16, 1902.

Application filed October 11, 1901. Serial No. 78,344. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES TATHAM, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented an Improved Combustion Process, of which the following is a specification.

The object of my invention is to effect the combustion of fuel in furnaces with better effect than is possible with the methods now employed. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical sectional view, partly in elevation, of a furnace constructed for carrying out my invention. Fig. 2 is a view of the same, partly in plan and partly in section, on the line *a a*, Fig. 1; and Fig. 3 is a view, partly in elevation and partly in vertical section, on the line *b b*, Fig. 2.

Under the present method of burning fuel in furnaces with natural or induced draft or with forced draft in the ash-pit there is considerable loss of heat, due to imperfect combustion and to the escape of hot gases to the chimney or stack; and it is the object of my invention to so effect the combustion of the fuel in the furnace as to save the greater portion of the heat which thus usually goes to waste. This object I attain by causing a blast or current of air to pass directly downwardly through one portion of the mass of fuel on the grate and then upwardly through the other portion of said mass of fuel, the result being the generation of carbonic oxid and the burning of the same in the combustion-chamber of the furnace without the usual strong draft through a chimney or stack, and consequently without waste of a considerable portion of the products of combustion through said chimney or stack.

The drawings illustrate a simple form of furnace intended for carrying out my invention in the heating of a melting-pot 1, which is mounted upon the walls 2 of the furnace, so as to be suspended within the combustion-chamber 3, the furnace having below this combustion-chamber a fire-pot 4, a grate 5, and an ash-pit 6, the fuel being introduced through an opening provided with a door 7 and being piled upon the grate to any desired height. Embedded in the wall surrounding the fire-pot is a pipe 9, which communicates

at one end with a rotary fan 10 or other available form of blast apparatus, this pipe having a branch 11, which discharges directly into the fire-pot of the furnace in such manner that it will deliver the air forwardly and downwardly into the rear portion of the mass of fuel contained in said fire-pot, the air being heated in its passage through the pipe, owing to the high temperature of the walls in which said pipe is embedded. The opposite end of the pipe 9 projects from the furnace structure and is preferably provided with a valve 12, so that any desired percentage of the air from the blast-pipe 9 may be discharged through the branch 11 into the combustion-chamber or fire-pot of the furnace, the surplus heated air being conveyed to any point where it can perform useful duty. The supply of air to the pipe 9 can be regulated either by adjusting the valve 13 in the supply-pipe 14 of the blower 10 or by adjusting the valve 15 in the discharge-pipe of said blower, or by both means. The upper portion of the combustion-chamber communicates through orifices in the side walls of the furnace with an annular flue 16, which discharges into a descending flue 17 in one of the side walls of the furnace, this descending flue 17 communicating at the bottom through a transverse flue 18 with the bottom of the discharge flue or stack 19, which has a valve or damper 20, whereby outflow through the same can be regulated as desired. In starting a fire in the furnace this damper 20 may be opened or partially opened, so as to provide natural draft; but as soon as the fire is well started the damper may be partly closed and the air-blast from the branch 11 of the pipe 9 directed into the rear portion of the furnace. This blast is therefore directed first downwardly through the rear portion of the mass of fuel into the ash-pit, and the gas thereby produced is mingled with air in the ash-pit, thence rises through the front portion of the mass of fuel in the fire-pot, and escapes from the top of the same into the combustion-chamber.

Supposing that a fire has been started and the grate supports a mass of incandescent fuel extending up to the mouth of the blast-pipe, the damper 20 is opened only to such an extent as to discharge the nitrogen and

other waste products of combustion, and the blast is turned on. When fresh fuel is supplied, gases evolved from that part of the fuel at the rear of the fire-pot are caused to pass downward through the rear part of the mass of fuel, owing to the downdraft caused by the action of the blast. The blast, however, does not cause downdraft in the front part of the mass of fuel, in which therefore the gases follow their natural inclination to rise, this inclination being assisted by the fact that there is not the usual flow of gases from the rear portion of the mass of fuel into the combustion-chamber, and consequently there is a lessened pressure in said combustion-chamber. The gases which have been caused to pass downwardly through the rear part of the mass of fuel enter the ash-pit, flow forwardly in the same, and rise through the front portion of said fuel mass, the force of the blast being so governed that the gases entering the ash-pit will not be blown out of the front of the same. The green fuel in the front part of the fire-pot therefore burns from the bottom upward, being ignited at the bottom by the mass of incandescent fuel onto which it is thrown; but the green fuel at the rear of the fire-pot is ignited at the surface by the gases of combustion, which after being ignited in the front portion of the combustion-chamber by the heat to which they are therein subjected pass over the surface of the rear portion of the mass of fuel. Owing to the down draft maintained in said rear portion of the mass of fuel, some of these ignited gases are caused to contact with the surface of said mass. Hence in this portion of the fire-pot combustion may be said to proceed from the top downward, the lower portion of the layer of green fuel in this part of the fire-pot being the last to become incandescent, by which time the fuel in the front part of the fire-pot has become wholly incandescent and the fire is in condition to be raked down for the purpose of adding fresh fuel, whereupon the operations are repeated. The gases of combustion are thus caused to pass from an incandescent portion of one part of the mass of fuel through the green or non-incandescent portion thereof and then to traverse in like sequence another part of the mass.

When the ash-pit is a closed one, a branch of the pipe 9 may extend into said ash-pit—as shown, for instance, at 21 in Fig. 1—for the purpose of supplying air for admixture with the gas therein.

The supply of air need not in all cases be heated before entering the mass of fuel; but I prefer to thus preheat it.

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

1. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of one part of a

mass of fuel, and then causing these gases to traverse in like sequence another part of said mass, substantially as specified.

2. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of a mass of fuel by means of a current of air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass of fuel, and then passing said gases in like sequence through another part of said mass, substantially as specified.

3. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of a mass of fuel by means of a current of preheated air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass of fuel, and then passing said gases in like sequence through another part of said mass, substantially as specified.

4. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of a mass of fuel by means of a current of air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, then passing these gases in like sequence through another part of the said mass of fuel, and finally passing the resulting ignited gases over that part of the mass of fuel in which the downdraft is maintained, substantially as specified.

5. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of a mass of fuel by means of a current of preheated air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, then passing these gases in like sequence through another part of the said mass of fuel, and finally passing the resulting ignited gases over that part of the mass of fuel in which the downdraft is maintained, substantially as specified.

6. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of part of a mass of fuel, mixing the gases thus produced with air and then causing the mixture to traverse in like sequence another part of the mass of fuel, substantially as specified.

7. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of the mass of fuel by means of a current of air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, mixing the gases thus pro-

duced with air and then passing the mixture in like sequence through another part of the mass of fuel, substantially as specified.

8. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of the mass of fuel by means of a current of preheated air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, mixing the gases thus produced with air and then passing the mixture in like sequence through another part of the mass of fuel, substantially as specified.

9. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of the mass of fuel by means of a current of air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of the mass, mixing the gases thus produced with air, then passing the mixture in like sequence through another part of the said mass of fuel, and finally passing the resulting ignited gases over that part of the mass of fuel in which the downdraft is maintained, substantially as specified.

10. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of the mass of fuel by means of a current of preheated air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, mixing the gases thus produced with air, causing the mixture to traverse in like sequence another part of the said mass of fuel and finally passing the resulting ignited gases over that part of the mass of fuel in which the downdraft is maintained, substantially as specified.

11. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in causing gases of combustion to pass from an incandescent portion of one part of the mass of fuel through a non-incandescent portion thereof, mixing the gases thus produced with preheated air and causing the mixture to traverse in like sequence another part of the mass of fuel, substantially as specified.

12. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of the mass of fuel by means of a

current of air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, mixing the gases thus produced with preheated air, and causing the mixture to traverse in like sequence another part of the mass of fuel, substantially as specified.

13. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of the mass of fuel by means of a current of preheated air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, mixing the gases thus produced with preheated air, and causing the mixture to traverse in like sequence another part of the mass of fuel, substantially as specified.

14. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of the mass of fuel by means of a current of air, thereby causing the gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, mixing the gases thus produced with preheated air, causing the mixture to traverse in like sequence another part of the said mass of fuel, and then passing the resulting ignited gases over that part of the mass in which the downdraft is maintained, substantially as specified.

15. The mode herein described of effecting combustion of carbonaceous fuel, said mode consisting in creating a downdraft through one part of the mass of fuel by means of a current of preheated air, thereby causing gases of combustion to pass from an incandescent portion through a non-incandescent portion of this part of the mass, mixing the gases thus produced with preheated air, causing the mixture to traverse in like sequence another part of the said mass of fuel, and then passing the resulting ignited gases over that part of the mass in which the downdraft is maintained, substantially as specified.

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

JAMES TATHAM.

Witnesses:

F. E. BECHTOLD,
JOS. H. KLEIN.