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J. L. TORKELSON

ELASTIC FLUID CLEANER

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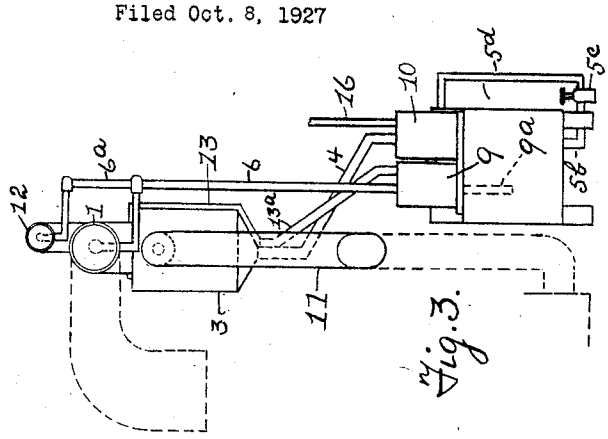


Fig. 3.

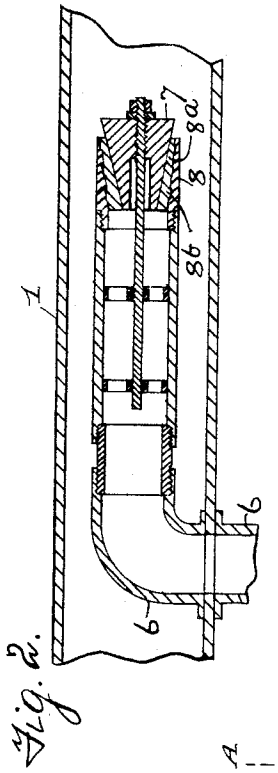


Fig. 2.

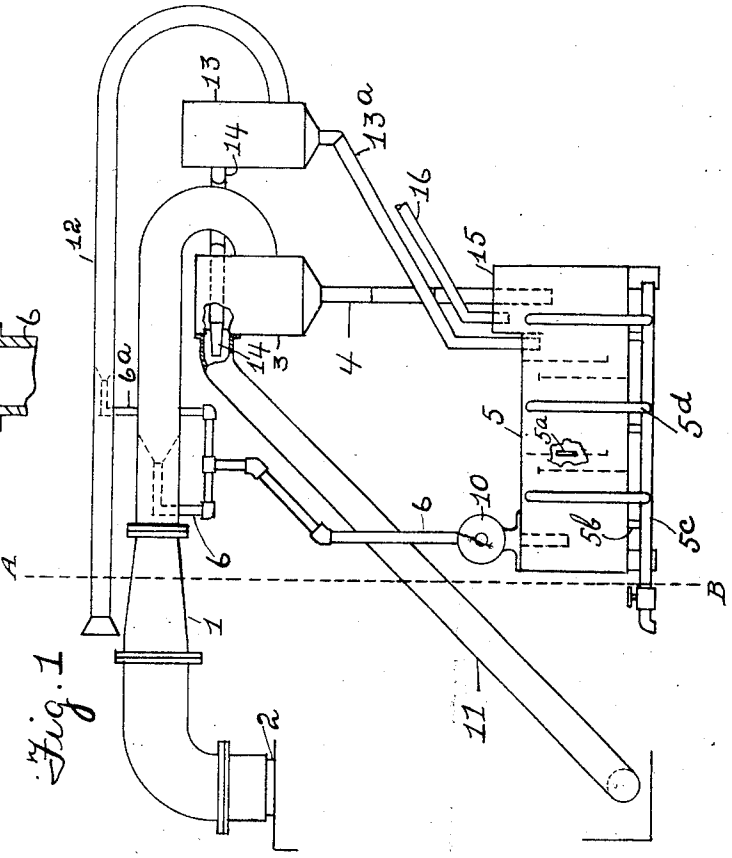


Fig. 1

Witnesses
Ida Josephine Watson.
Albert Anderson,

INVENTOR
John L. Torkelson
BY James T. Watson
ATTORNEY

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UNITED STATES PATENT OFFICE.

JOHN L. TORKELSON, OF BURKE, IDAHO.

ELASTIC-FLUID CLEANER.

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My invention relates to elastic fluid cleaners and has for one of its objects the provision of means for removing soot from gases discharged from heating furnaces. It has for another object the provision of means whereby at least part of said gases may be returned to the furnace for consumption therein. With these, and other objects in view, it consists of the structures, combinations and arrangements of parts hereinafter described and claimed.

In the drawings, Fig. 1, is a side elevation of one form of my said invention, partly broken away. Fig. 2 is a central vertical longitudinal section of the hereinafter described primary gas washing chamber, and Fig. 3, is a vertical transverse section of said invention approximately on the line A—B of Fig. 1.

In the drawings, 1 is a primary gas washing chamber communicating at its forward end with the smoke box or breeching 2 of a boiler heating furnace, not completely shown. The opposite end of said chamber is adapted to discharge into a gas reclaiming tank 3 from the lower end of which extends a waste pipe 4 which is preferably adapted to discharge into water receptacle 5 of any suitable nature or construction. Said receptacle 5 may, if desired, constitute a reservoir for retaining and supplying water for the operation of the cleaner, so that much of the same water can be used over again. In such case, said reservoir is provided with vertical baffle plates 5^a extending alternately from the top and bottom of the reservoir, whereby an ascending and descending current is produced in the flow of water from one end to the other of said reservoir and whereby the precipitation of soot, dust, or other materials discharged into said reservoir with the water is facilitated. Such reservoir may be drained by any suitable drainage pipes, as 5^b, 5^c. Overflow pipes, as 5^d, are provided for the purpose of removing excess water and for removing light materials which may be floating thereon.

Positioned within said primary gas washing chamber, is a water nozzle of any suitable construction spaced from the sides of said chamber and adapted to direct a conical sheet of water rearwardly against the sides of said chamber. Said nozzle preferably embodies a water supply pipe 6, a spreader 7, which is preferably adjustable, and a sleeve 8, for said spreader, which sleeve is mounted on the inward end of said pipe 6 and is normally spaced from said spreader. The opposite end of said pipe 6 extends to any suitable source of water supply, as to a pump 9, of any suitable structure mounted on said reservoir and adapted to be driven by any suitable means, as by an electric motor 10.

Said pump is adapted to draw water from said reservoir through a pipe 9^a extending into the same. Either the spreader member 7, or the sleeve 8 is preferably provided with a spirally directed rib or groove 8^a, or 8^b, respectively, on its water-conducting face, for the purpose of giving a twist to the sheet of water discharged by said nozzle.

A reclaimed-gas pipe 11 extends from said gas reclaiming tank or chamber 3 and is adapted to discharge reclaimed gas into said furnace at any suitable point, as into a space beneath the grates (not shown) whence it is carried through the grates into the combustion chamber by the draft.

A free air intake pipe 12 contains a water nozzle constructed and positioned similarly to the nozzle above described; said nozzle in said free air pipe being connected in any suitable manner, or by any suitable means with any suitable source of water supply, as by a branch pipe 6^a extending from said pipe 6. Said free air pipe is open at one end for the admission of air, and at its opposite end is adapted to discharge water or air or both into a free air drum or chamber 13, from which a waste pipe 13^a extends to any suitable point or receptacle of discharge, preferably into said reservoir.

Said free air drum or chamber communicates by a pipe or conduit 14 with said reclaimed gas pipe 11 for the purpose of mixing air with the reclaimed gas discharged thereby below said grates. Said pipe 14 preferably extends through said tank 3, and a short distance into said pipe 11. The discharge end of said pipe 14 is spaced from the walls of said pipe 11, and is preferably contracted to form a simple nozzle.

A gas dome 15 is formed on said reservoir, and is adapted to receive excess gas carried down with the waste water in said pipe 4. Extending from said dome is a waste gas pipe 16 preferably connected with a stack or chimney (not shown).

Said gas reclaiming tank and free air chamber are positioned at a sufficient eleva-

tion to provide a suitable fall for the water which flows into them respectively from said chamber 1 and said free air pipe 12. It will be further understood that heavy particles of carbon or ash entering said gas-reclaiming chamber will be carried down by the waste water into said reservoir.

The several pipes may extend in any suitable directions to avoid obstacles and may be provided with any suitable cut-off or flow-regulating valves or devices not shown but broadly known to the art.

The free air pipe 12 preferably extends for some distance through a heated area, as closely parallel to said washing chamber 1 and over said furnace, whereby the heat from said chamber and furnace will tend to warm the free air passing through said free air pipe 12. It should be observed also that it is desirable that the pressures in said primary washing chamber and in said free air chamber shall be approximately the same.

In operation the unconsumed gas and soot and products of combustion pass from the breeching of the furnace into the washing chamber 1 being drawn thereinto by a draft or suction created by the cone sheet of water discharged by said nozzle against the walls of said washing chamber, and penetrate or mix with said water and flow therewith into said reclaiming chamber. Thence the water and heavier materials, and a minor portion of products of combustion and unconsumed gas carried by said water, flow downward into said reservoir on precipitation and flotation tank 5, from which said heavier materials are eventually drained or floated off; said minor portion of gas rises through the water in said reservoir into said gas dome and thence escapes through said waste pipe 13^a. Part of the lighter materials and the major part of the products of combustion and unconsumed gas are freed from said water in said reclamation chamber and enter said pipe 11 and are drawn into said furnace as aforesaid. At the same time air is drawn into said free air intake pipe by the draft induced by the conical sheet of water discharged by said nozzle therein, which air is incidentally washed by said water; said air and water being discharged from said intake pipe into said free air chamber. Thence the water flows from said free air chamber into said reservoir through the waste pipe 13^a, and the major part of the air flows from said free air chamber into said reclaimed gas pipe 11 and mixes with the air therein.

It will be observed that even when the flow of water from said pump is stopped, a relatively slow current of gas and air will continue to flow from the intake ends of said washing and free air chambers to the return pipe 11 and thence into said furnace; such flow being induced by the difference of temperatures between said intake ends and the discharge ends of the series of pipes and chambers. The flow of water is particularly desirable when fresh coal is put in the furnace and much soot and unconsumed gas is discharged therefrom.

While I have described my said invention as used in connection with a boiler heating furnace, it is obvious that it may be used in connection with other furnaces independent of boilers. I do not therefore intend to restrict my invention to use in connection with boiler heating furnaces.

It is further obvious that said structure may be modified in various particulars within the spirit and scope of certain of my claims.

What I claim is—

1. The combination of an elastic fluid washing chamber provided with an intake port for foul elastic fluid; a device within said chamber for washing said elastic fluid; a reclaiming chamber for the cleansed elastic fluid, said reclaiming chamber communicating with said washing chamber and being provided with a waste port for discharging the cleansing element and for discharging the substances washed from said elastic fluid; a conduit connected to said reclaiming chamber for conducting the cleansed elastic fluid therefrom; a free air intake pipe; an air washing device in said air pipe; a reclaiming chamber for the cleansed free air, said free air reclaiming chamber being provided with a waste port for discharging the air cleansing element and for discharging the impurities washed from such air, and a pipe communicating with said air reclaiming chamber and with said conduit for conducting air to said conduit.

2. The combination with a fuel burning furnace, of an elastic fluid washing chamber communicating with the breeching of said furnace and adapted to receive unconsumed gas and products of combustion therefrom; a device within said chamber for washing the gas received from said furnace; a reclaiming chamber for the cleansed gas, said reclaiming chamber communicating with said washing chamber and being provided with a waste port for discharging the cleansing element and for discharging the substances washed from said gas; a conduit connected to said reclaiming chamber for conducting the cleansed gas back to said furnace; an air intake conduit; a hydraulic draft inducing and air washing device in said air intake conduit; an air reclaiming chamber communicating with said air intake conduit and adapted to receive therefrom cleansed air and washing liquid, said air reclaiming chamber being provided with a waste port for discharging said liquid and substances washed from the air, and a pipe

communicating with said air reclaiming chamber and with said cleansed gas conduit for conducting air to said cleansed gas conduit.

3. The combination with a fuel burning furnace, of an elastic fluid washing chamber communicating with the breeching of said furnace and adapted to receive unconsumed gas and products of combustion therefrom; a hydraulic device within said chamber for washing the gas and for accelerating the draft in said chamber; a reclaiming chamber for the cleansed gas, said reclaiming chamber communicating with said washing chamber and being provided with a waste port for discharging the cleansing liquid and the substances washed from said gas; a conduit connected to said reclaiming chamber for conducting the cleansed gas therefrom back to the furnace; a reservoir, precipitation and flotation tank; a gas dome extending over and into a portion of the liquid in said reservoir; a pipe connected to said waste port and depending into said reservoir through said dome; means for diverting the current in said reservoir; said reservoir being provided with ports for discharging surface scum and excess liquid therefrom; an air intake conduit; a hydraulic draft inducing and air washing device in said air intake conduit; an air reclaiming chamber communicating with said air intake conduit and adapted to receive therefrom air and liquid; a liquid discharge port extending from said air reclaiming chamber into said reservoir; a pipe communicating with said air reclaiming chamber and with said cleansed gas conduit for conducting air to said cleansed gas conduit, and a waste gas discharge pipe extending from said dome to a suitable place of discharge into the atmosphere.

In testimony whereof, I hereunto affix my signature.

JOHN L. TORKELSON.