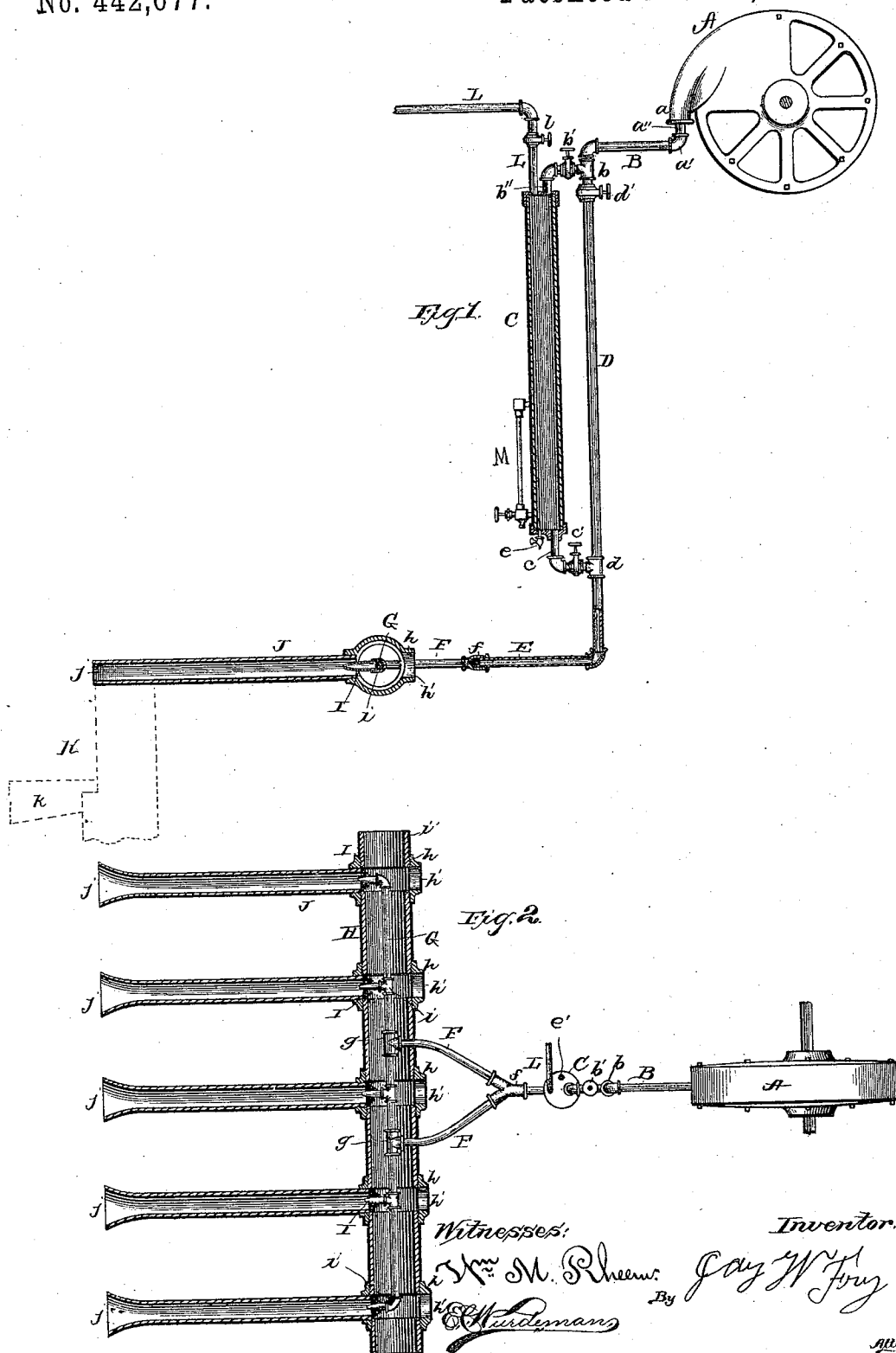


(No Model.)

J. W. FRY.
SMOKE CONSUMER OR BURNER.

No. 442,677.

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UNITED STATES PATENT OFFICE.

JAY W. FRY, OF LAKE FOREST, ILLINOIS.

SMOKE CONSUMER OR BURNER.

SPECIFICATION forming part of Letters Patent No. 442,677, dated December 16, 1890.

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To all whom it may concern:

Be it known that I, JAY W. FRY, a citizen of the United States, residing at Lake Forest, in the county of Cook and State of Illinois, have
5 invented certain new and useful Improvements in Smoke Consumers or Burners; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the
10 art to which it pertains to make and use the same, reference being had to the accompanying drawings, forming a part hereof, in which—

Figure 1 is a side elevation, partly in section, showing the apparatus applied to a furnace in one form. Fig. 2 is a top or plan view,
15 partly in section, of the apparatus.

It is the practice to construct smoke consumers or burners in which a jet or jets of
20 combined steam and air are projected over the fire, and such devices or apparatus have been constructed on various arrangements and plans; but in practice it has been found that none of these appliances perform the
25 work required in a satisfactory manner and so as to produce perfect results, and this is especially true in "fresh firing," as the new coal makes a greater amount of smoke than the steam or steam and air blast can dispose
30 of, the result being the emission of heavy black clouds of smoke from the chimney, and such emission will continue until the smoke produced becomes less in quantity and so that the blast will act thereon. The cause
35 for this is readily found in the fact that the blast is so much lighter than the fresh smoke that it cannot cut and break the smoke, and, furthermore, the natural tendency of the steam is to rise and seek to escape, so that
40 with a fresh firing the blast, instead of acting as a check and retainer of the smoke, is a means for insuring its discharge, as the blast will naturally seek an outlet and the smoke will follow. It is well known that
45 with a heavy and moist atmosphere smoke will be forced to the ground and cannot rise, owing to its being so much lighter than the moist atmosphere, and it is further known that heat is intensified by the application of
50 water, and heat is the best consumer of smoke.

The object of this invention is to utilize as

a smoke-consumer the effects of a moist atmosphere in holding the smoke in the fire-box and over the fire until the carbon in the smoke has been consumed for the smoke to
55 escape without the heavy black appearance, and a further object is to secure the benefits of wetting down the fire to increase the heat; and to these ends the nature of the invention consists in projecting over the fire a blast of
60 air charged with moisture, and in the several parts and combinations of parts hereinafter described, and pointed out in the claims as new.

In the drawings, A represents a blast-fan, 65 having a discharge *a*, as usual, and which may be of any well-known form of construction.

B is a pipe connected with the discharge *a* of the fan by an elbow-coupling *a'* and an
70 attaching-pipe *a''*, and also connected with a T-coupling *b* by an elbow-coupling, and attached to the coupling *b* is a shut-off valve *b'*, connected to a pipe *b''* by an elbow-coupling, which pipe *b''* leads into the water-res-
75 ervoir.

C is the water-reservoir, which reservoir, as shown, stands vertical, but could be placed horizontal, if desired. This reservoir C has a
80 discharge-pipe *c*, connected by an elbow-coupling with a shut-off valve *c'*, and is provided with a blow-off cock *e* and an air-vent *e'*.

D is a pipe connected with the T-coupling *b* and having a T-coupling *d* for attachment
85 of the shut-off valve *c'* and having a shut-off valve *d'*.

E is a pipe connected with the pipe D by an elbow-coupling.

F are two pipes connected with the pipe E
90 by a Y-coupling *f*.

G is a pipe formed, as shown, of a series of short sections connected together by T-couplings, and, as shown, two of these couplings
95 receive the pipes F, which couplings *g* are located on the pipe G at the proper points for the attachment of the pipes F—one on each side of the longitudinal center of the pipe G.

H is a tube in which is located the pipe G. This tube H is open at each end, and, as shown, is formed of a number of sections
100 connected together by couplings *h*, each of which has on the rear side an opening *h'* for the ad-

mission of air, and air also flows in at the open ends of the tube H.

I are discharge-nozzles for the pipe G. The intermediate nozzles I are attached to the T-couplings *i*, which connect the pipe-sections together, and the end nozzles I are each attached to the end of the pipe G by an elbow-coupling *i'*. The pipe G, instead of being formed of sections, can be a single piece, in which case the couplings *g* and *i'* can be dispensed with and the pipes F attached by a stuffing-box or other suitable means, and the nozzles I screwed directly into the pipe G or into suitable bosses on such pipe, the ends of the pipe G being closed by caps or by plugs to insure the discharge from the pipe G through the nozzles I.

J are discharge blast tubes, one for each discharge-nozzle I, the nozzle just entering its discharge-tube, as shown in Fig. 2. A blast-tube is entered into each coupling *h* in the arrangement shown, and the discharge end of each tube J is flattened or spread so as to present a wide mouth *j*, by which the blast will be spread out over the fire. The tube H, instead of being formed in sections, can be a single piece, in which case the couplings *h* can be dispensed with and the openings *h'* formed in the body of the tube H, and the discharge blast-tubes J be entered into the tube direct or into bosses on the tube H, or otherwise attached in position to receive the discharge from the nozzles I.

K is a furnace, having grate-bars *k*, as usual, for the fire, and over and onto which the blast is to be projected from the blast-tubes J.

L is a water-supply pipe, leading from a tank or other source of supply into the water-reservoir C, and having a shut-off valve *l* to regulate the supply and the filling of the reservoir C.

The blast-fan, as shown, is located overhead and is to be driven in any well-known manner of driving such fans. The pipes B, D, E, and F form, in fact, a continuous pipe leading from the fan A to the discharge-pipe G for delivering the blast created by the fan to the pipe G, to be discharged therefrom through the nozzles I into the tubes J and over the fire, and the arrangement of pipes shown is only for the purpose of showing the connection with the overhead fan A and the discharge-pipe G; and it is to be understood that a single pipe in one piece or a single pipe of sections arranged differently from the sections B, D, E, and F can be used, so long as such pipe furnishes a communication between the fan and the discharge-pipe G, and the blast-fan A can be located on the floor or other support, and the supply-pipe therefrom to the pipe G and the water-reservoir C can be placed horizontal instead of perpendicular, with the proper connections therefor. The discharging blast-tubes J are made to project just through the wall of the furnace, and as many of these tubes and of the discharge-nozzles I are to be used as required for the size of the

furnace, a sufficient number being provided to supply the quantity of air and moisture to hold the smoke. The air from the fan A will pass into the pipe D when the valve *b'* is shut and the valve *d'* is open, and will be combined with water from the reservoir C, which flows into the pipe *d* when the valve *c'* is open, and the combined air and water will pass through the pipes E and F under pressure into the pipe G and be forcibly discharged in the form of spray through the nozzles I into the tube J, and be commingled in the tubes J with the air from the tube H, moistening such air, and this moist air will be projected and discharged over the fire from the tubes J, forming a heavy moist canopy which will effectually hold the smoke against rising and for the heat to consume all the carbon to an extent sufficient to prevent the emission of black smoke. The blast of air can be regulated by the valve *d'*, and the discharge of water from the reservoir can be governed by the valve *c'*, and if more pressure is wanted in the reservoir to give a more rapid flow of water from the reservoir it can be readily had by opening the valve *b'*. The heat of the furnace will produce a suction through the tubes J, which extends into the tube H, and this suction draws air from the outside into the tube H at the ends and through the openings *h'*, and this air will, by the suction in the tubes H and the discharge from the nozzles I, be drawn rapidly through the tubes J and in its passage be thoroughly moistened by the water-spray of the nozzles I, and this moistened air will be discharged at the mouths of the tubes J and be projected over the fire to act on the smoke, as above described. The moist air delivered over the fire forms in effect a heavy cloud by which the smoke will be caught and held in the fire-box of the furnace, and at the same time the moisture is not sufficient to quench the fire, but acts to intensify the heat, thereby increasing the combustion of the smoke. The tube H gives a constant supply of fresh air to support combustion, and, if desired, the openings *h'* of this tube H can be supplied with dampers to regulate the amount of air admitted to be charged with moisture, and the blast-tubes J are to be of a sufficient length to insure the charging of the air of the tube H with moisture before entering the furnace. The reservoir C can be supplied with a water-gage M, by means of which the stage of the water in the reservoir can be determined without any trouble, and the vent-opening *e'* can be dispensed with and the air vented in filling the reservoir by opening the valve *b'* and leaving the valve slightly open to insure a discharge from the reservoir into the tube D.

The apparatus is very simple, and can be applied to furnaces without any trouble, as all that is necessary is to insert the tubes J through the furnace-wall in proper position to project a blast of moistened air over the fire, and in use the apparatus will be found

efficient as a means for consuming the smoke and in case a blast of air only is wanted it can be had by simply closing the valves *b'* and *c'*, when the air alone will pass from the fan to the discharge-pipe G and be projected over the fire.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a smoke-consumer, of a blast-fan, an air-pipe leading from the fan, a water-reservoir communicating with the air-pipe, a discharge-pipe communicating with the air-pipe, an air-tube surrounding the discharge-pipe, and discharge blast-tubes from the air-tube into the furnace, substantially as and for the purposes specified.

2. The combination, in a smoke-consumer, of an air-blast pipe, a water-reservoir communicating with the air-blast pipe, a discharge-pipe receiving a supply of air and water from the air-blast pipe, an air-tube surrounding the discharge-pipe, and blast-tubes from the air-tube into the furnace, substantially as and for the purposes specified.

3. The combination, in a smoke-consumer, of a discharge-pipe for a water-spray, an air-pipe surrounding the discharge-pipe, and blast-tubes from the air-tube into the furnace for discharging moisture over the fire, substantially as and for the purposes specified.

4. The combination, in a smoke-consumer, of a discharge-pipe for a water-spray, an air-tube surrounding the discharge-pipe and open at the ends, and blast-tubes from the air-tube into the furnace for discharging moist air over the fire, substantially as and for the purposes specified.

5. The combination, in a smoke-consumer, of a discharge-pipe for a water-spray, an air-pipe surrounding the discharge-pipe and open at the ends and having openings through its wall for the admission of air for discharging moist air over the fire, substantially as and for the purposes specified.

6. The combination, in a smoke-consumer, of a water-spray, an air-pipe, and discharging blast-tubes leading from the air-pipe to a fire-box above the grate-bars and receiving the water-spray and air for commingling the same in the blast-tubes and discharging moist air

into the fire-box above the grate-bars over the fire, substantially as and for the purposes specified.

7. The combination, in a smoke-consumer, of a pipe for discharging a water-spray, an air-tube with open ends and openings in its wall, and discharge-tubes for the spray and air for projecting moist air over the fire, substantially as and for the purposes specified.

8. The combination, in a smoke-consumer, of a water-spray, discharge-pipe, and air-blast tubes leading into a furnace above the grate-bars for projecting moist air over the fire in the fire-box above the grate-bars, substantially as and for the purposes specified.

9. The combination, in a smoke-consumer, of an air-blast pipe, a water-reservoir communicating with the air-pipe, and a discharge-pipe receiving air and water from the air-pipe, leading from the air-pipe into the fire-box above the grate-bars, and discharging a water-spray, substantially as and for the purposes specified.

10. The combination, in a smoke-consumer, of the blast-fan A, an air-pipe leading from the fan A, the water-reservoir C, communicating with the air-pipe, the discharge-pipe G, the air-tube H, and blast-tubes J, substantially as and for the purposes specified.

11. The combination, in a smoke-consumer, of a blast-pipe, a water-reservoir C, communicating with the blast-pipe, the discharge-pipe G, the air-tube H, and the blast-tubes J, for projecting a spray of moist air over a fire, substantially as and for the purposes specified.

12. The combination, in a smoke-consumer, of the water-discharge pipe G, the air-tube H, and the blast-tubes J, for projecting moist air over the fire, substantially as and for the purposes specified.

13. The combination, in a smoke-consumer, of the water-reservoir C, the discharge-pipe G, the air-tube H, and the blast-tubes J, for spraying water into an air-blast and projecting moist air over a fire, substantially as and for the purposes specified.

JAY W. FRY.

Witnesses:

O. W. BOND,
WM. M. RHEEMS.