

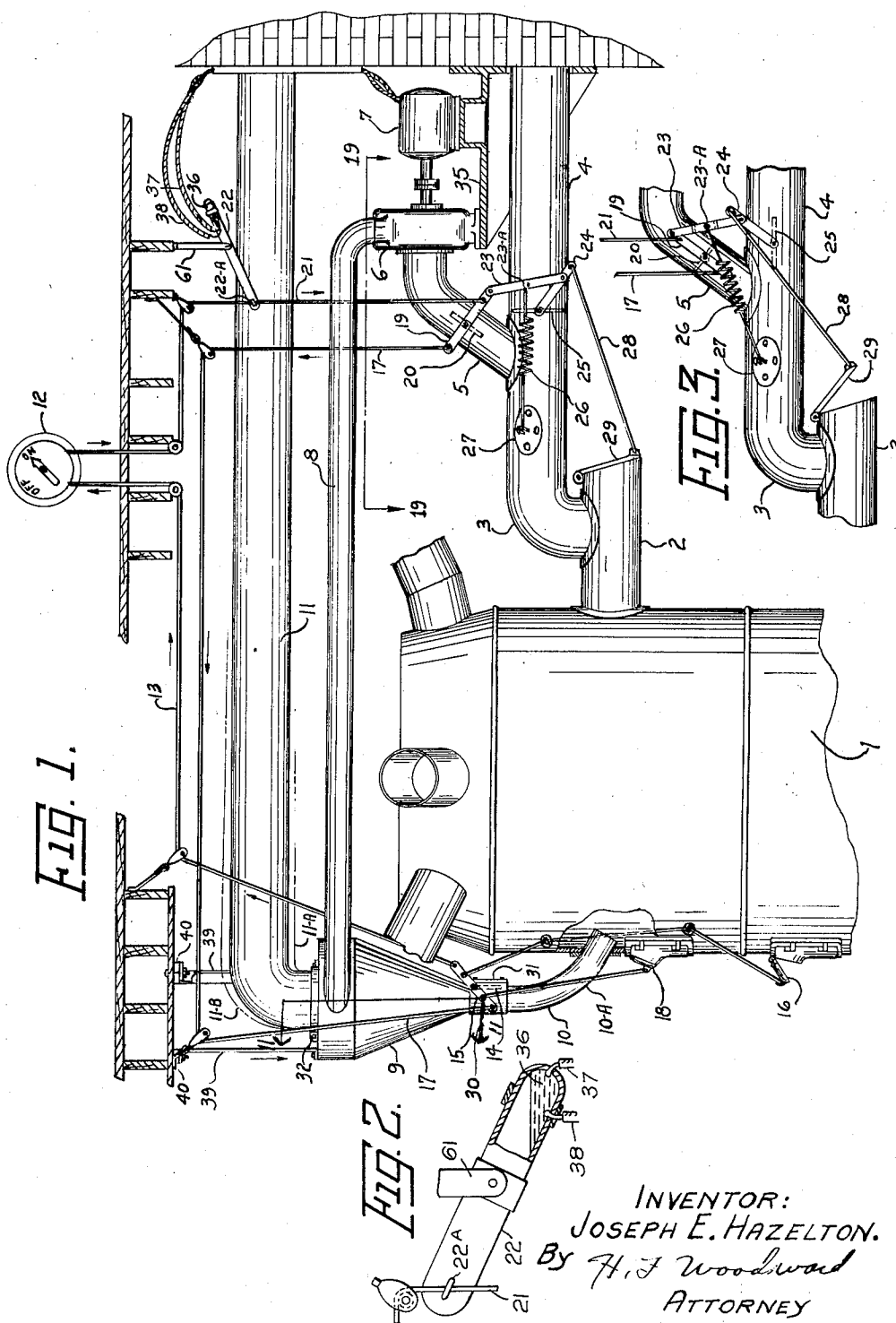
July 13, 1937.

J. E. HAZELTON

2,086,671

SPARK ELIMINATOR AND SMOKE CONSUMER

Filed Sept. 14, 1934



INVENTOR:
JOSEPH E. HAZELTON.
By *H. F. Woodward*
ATTORNEY

UNITED STATES PATENT OFFICE

2,086,671

SPARK ELIMINATOR AND SMOKE CONSUMER

Joseph E. Hazelton, Detroit, Mich., assignor of fifty-one per cent to Bernard Taylor, Detroit, Mich.

Application September 14, 1934, Serial No. 744,060

1 Claim. (Cl. 110—120)

This invention relates to improvements in spark eliminator and smoke consumers which may be used upon home furnaces either steam, hot water or hot air, stationary steam boiler furnace, also boiler furnace of locomotives, traction engines, steamboats and the like.

The object of the invention is to provide a simple and practical apparatus of this character which will not only effectively prevent fires due to sparks from smoke stacks or chimneys but which will consume the smoke, save fuel, increase the draft and render the operation of the furnace otherwise more effective and economical.

Another object is to provide means for changing to the "straight draft" or exhaust to atmosphere direct; and to provide a single controlling lever by means of which the mechanism for effecting the above may be operated and adjusted.

Still another object is to supply the fire with an artificial draught, thereby eliminating smoke combustion in the furnace and also eliminating combustion chambers.

Still another object is to have the proper draught under any weather condition and in case of dry weather or high winds it is not necessary to shut down manufacturing plants due to flying sparks.

A further object is to provide a device for taking smoke from the chimney or stack and removing cinders, soot and other particles therefrom and delivering said cinders, soot and other particles above the furnace grates for reburning, thus eliminating fire hazards from sparks in furnaces which have automatic stokers.

The invention consists essentially of a fan or blower adapted to withdraw the smoke, cinders, soot and gasses from the outlet pipe through a suitable pipe and force said smoke etc. into a separator which separates the cinders, soot and gases from the lighter gases and air. All heavy particles as well as heavy gases are conveyed back to the furnace for reburning, while the lighter gases and air are conveyed to the smoke stack or chimney. The return of the heavier gases and soot to the furnace or the like is performed either automatically by thermostatic control or manually. It will be noted, with an apparatus of this nature, high smoke stacks are not necessary as the invention creates all the draught required.

Further and minor objects will more fully appear hereinafter, reference being had to the accompanying drawing which illustrates what I believe to be the best embodiment of the invention, in which:

installed on a furnace, namely, a hot air furnace.

Figure 2 is a detailed view on an enlarged scale of the mercury switch shown in Figure 1.

Figure 3 is a fragmentary view in side elevation of the exhaust pipe and the by-pass pipe leading to the blower as disclosed in Figure 1.

Referring to Figure 1, a furnace 1 is shown having the usual draught pipe 2 and elbow 3 which is connected to the outlet pipe 4. There is a pipe 5 having one of its ends connected to said pipe 4 and having the other end connected to a blower 6 which is driven by a motor 7. A pressure pipe 8 is attached at one end to the top of the blower 6, while the other end of pipe 8 is connected to the inlet side of separator 9. The separator 9 is of the usual centrifugal type separator which has three pipe connections; namely the incoming or recirculating pipe 8, pipe 10 which connects the bottom of the separator to the furnace, and escape pipe 11 is for carrying off the lighter gases to the chimney 4A.

Still referring to Figure 1, a system of cables, chains or the like is shown having a hand operated reel 12 or any other suitable actuating means such as a thermostatic control mechanism. The manually operated reel is shown at the "on" position and when it is turned to that position, cable 13 is pulled toward the reel, thereby opening damper 14 and draft door 16 through the medium of lever 15.

When reel 12 is turned to the "off" position, cable 13 is moved in the opposite direction as that indicated by the arrows. The lever 15 is thus radially actuated because it is connected at its center to the shaft of the damper 14 thereby closing the damper. As the inner end of lever 15 is being lowered by cable 13, a cable 17, which is attached to the outer end of lever 15, is pulled upwardly thereby operating the lever 19 mounted on the shaft of damper 20. There is another cable 17A attached near the outer end of lever 15 and which is adapted to open door 18, when the damper 14 is in closed position.

Another cable 21 is provided which is connected to one end of lever 19 and having the other end connected to reel 12. This cable is also used to operate a switch 22 which is a conventional type of mercury switch.

A link 23 connects levers 19 and 24 together. The link 23 is adapted to actuate lever 24 of the damper 25. A spring 26 is connected on one end to bracket 27 held in place on pipe 4 and connected on the other end to said link 23 through hole 23A. The link 23 travels radially when it is operated, because both levers 19 and 24 are the

Figure 1 shows a side elevation of the invention

same length. The levers 19 and 24 act as a snap-on and off mechanism and partially lock the whole system at either "on" or "off" position. The tension spring 25 is adapted to assist the levers 19 and 24 through the medium of the link 23 in opening and closing their respective dampers 20 and 25. Another cable 28 is provided and which is connected to the end of lever 24 and to the back draught door 29 so that door 29 will be opened and closed. All cables referred to above passing through pulleys as shown in order to avoid friction.

The switch referred to above is operated by cable 21. Cable 21 is attached to the pivoted arm 22 of the mercury switch, and whenever the cable is moved up or down, the switch arm 22 is also moved up or down. The arm 22 is pivoted to a bracket 61. The mercury bulb 36 is securely fastened to the free end of the arm 22. Wires 37 and 38 indicate the electric circuit. The circuit is closed when cable 21 pulls the arm 22 down, and the circuit is opened when cable 21 moves the arm 22 upwardly.

Pipe 10 has a bend 10A, and because of this bend, it is necessary for the pipe to be cleaned out. There is a housing 30 provided for the damper 14, and the housing 30 has an aperture 30A opening into the pipe 10. A cover 31 is normally secured by screws 41 over the aperture 30A, but it may be removed so that a brush can be inserted into the pipe 10 to push the accumulated dirt into the furnace 1.

The gas outlet pipe 11 is adjustable, that is, up and down, as shown by dotted lines 11A and 11B. The pipe 11 is held in its adjusted positions by a split collar 34. The collar 34 is secured to the pipe 11 by a bolt 32 and nut 33 as shown in Figure 12. The adjustment of pipe 11 is essential to the operation of separation, when installing the system or when installing a new blower or motor. When the pressure of a blower is determined the pipe 11 is inserted to the proper working depth and locked for the proper separation of the heavy particles from the lighter gases.

It will be noted that in order to eliminate vibrations and undue noise, the motor 7 and blower 6 are mounted on a common base 35 secured on the chimney wall. The base 35 straddling the outgoing pipe 4 in order to be low enough to accommodate the required height of pipes to and from the separator. The separator also being noiseless due to bars 39 being mounted on said separator and having resilient pads 40 between the contacting foot and the ceiling.

The operation of the invention is very simple, when heat is required, the reel is turned to the "on" direction pulling cables in the direction shown by arrows, opening lower draught door 16, closing door 18, opening damper 14, opening damper 20, closing damper 25 and back draught door 29. At the same time cable 21 pulls down lever 22 which closes the electric circuit to motor 7 which in turn rotates blower 6. The outgoing smoke, cinders etc., are pulled by the suction of said blower 6 and due to damper 25 and draught

door 29 being closed as well as damper 20 being open, said outgoing smoke etc. are forced at high pressure into separator 9 through pipe 8. The soot is forced centrifugally inside of the separator at a high rate of speed, the heavy particles cling to the wall by centrifugal force while going down, whereas, the lighter gases being too light to follow the heavier particles, escape through pipe 11 into chimney, while said heavy particles fall through the separator down into pipe 10 and into fire box of furnace to be burned.

When the amount of heat is sufficient, the reel or automatic mechanism is reversed, closing draught door 16, opening door 18, closing damper 14, closing damper 20, opening damper 25 and opening draught door 29 thereby letting the gases escape through pipe 4 in the manner of the ordinary type of furnace. When the reel is turned to "off" position, cable 13 through the medium of lever 15 pulls cable 17 up, and cable 17 pulls up cable 21 through the medium of lever 19 which moves arm 22 up, when arm 22 is moved up, the circuit 37—38 is opened thereby stopping the motor 7.

From the above description of the invention it will be noted that the heavy particles mentioned are unburned material which would otherwise be wasted if not collected and reburned by the invention.

Having thus described my invention, what I claim as new is:

The combination with a furnace including a fire box provided with a smoke pipe, a by-pass pipe, and a blower having motor operating means being connected to the smoke pipe by the by-pass pipe, the said smoke and by-pass pipes having damper means therein and the said damper means being connected together, a recirculating pipe being connected to the outlet side of the said blower, a separator being connected to the other end of the recirculating pipe, the said separator having a return pipe connected to its lower end and leading to the fire box, the said return pipe having damper means therein, a second smoke pipe connected to the top side of the separator for the escape of the lighter gases, a control device embodying a rotatable reel, a cable trained over the reel and being connected to one end of the return pipe damper means, a second cable trained over the reel and being connected to one end of the by-pass damper means, and the second mentioned cable having a switch means attached thereto, a third cable being trained over pulleys and being connected to an end of the return pipe damper means, and the said third cable also being connected to an end of the by-pass pipe damper means, the said control device adapted for opening both the return pipe damper means, and the by-pass damper means while at the same time closing the smoke pipe damper means, and the said switch means adapted to be closed simultaneously with the opening of the by-pass damper means thereby starting the motor operating means for the said blower.

JOSEPH E. HAZELTON.