June 11, 1940. J. H. MINOR 2,203,835

CARBON REMOVER

Filed Jan. 3, 1938 2 Sheets-Sheet 1

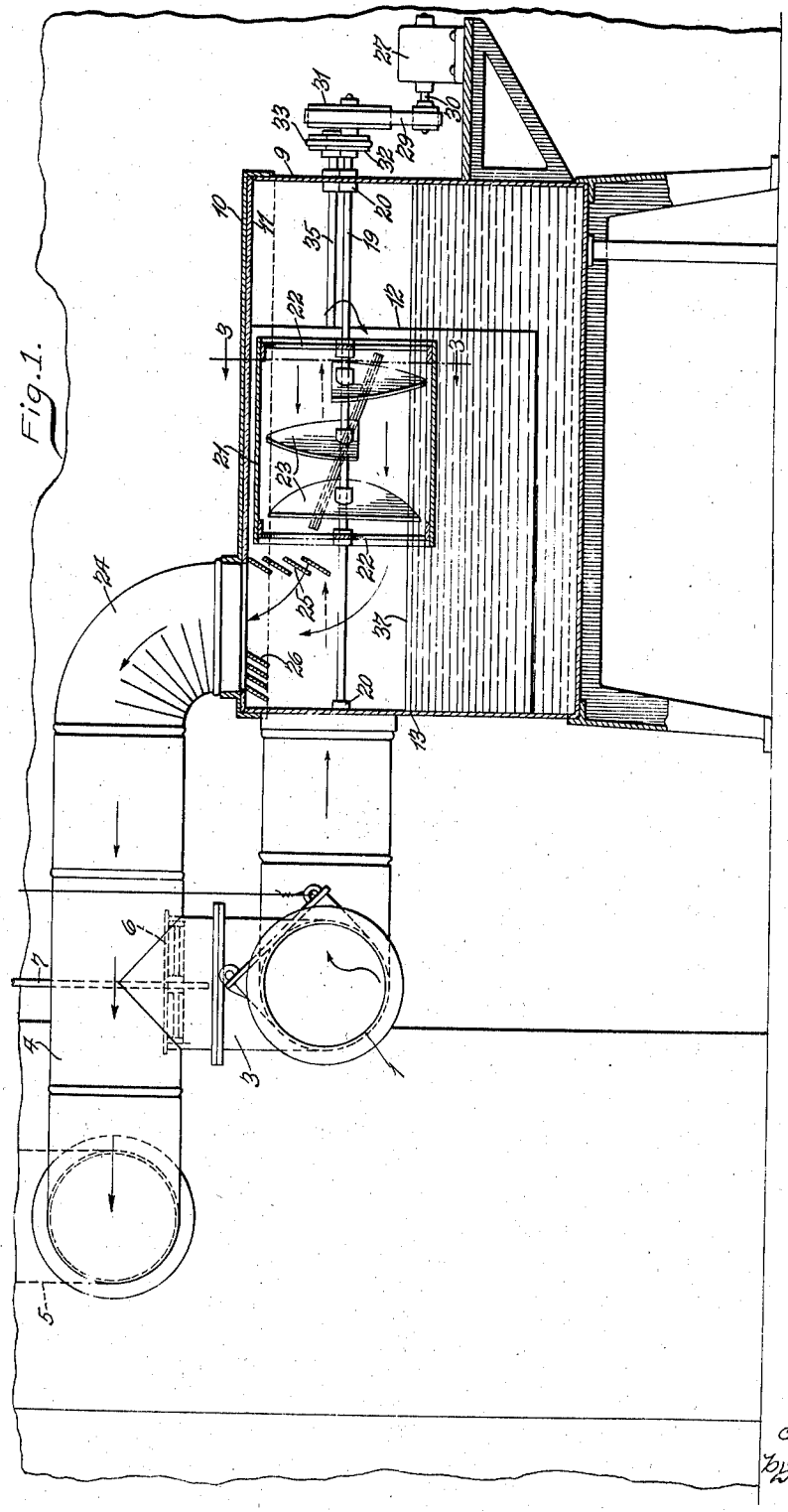


Fig. 1.

Inventor
Joseph H. Minor
by Rigney & Cassidy
His Attorneys.

June 11, 1940. J. H. MINOR 2,203,835

CARBON REMOVER

Filed Jan. 3, 1938 2 Sheets-Sheet 2

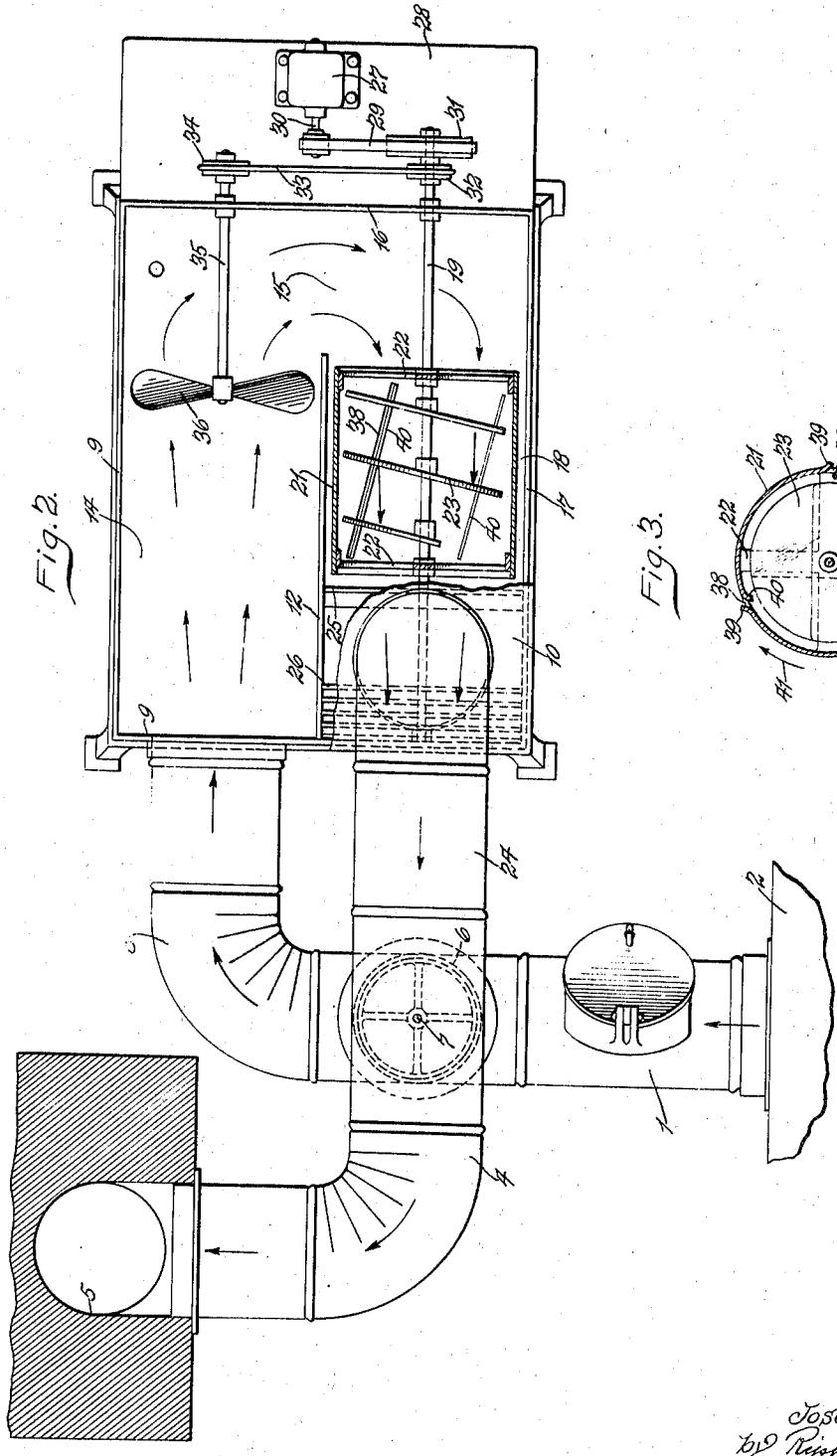


Fig. 2.

Fig. 3.

Inventor
Joseph H. Minor
by Rippey & Cassidy
His Attorneys.

Patented June 11, 1940 2,203,835

UNITED STATES PATENT OFFICE

2,203,835

CARBON REMOVER

Joseph H. Minor, University City, Mo., assignor of one-half to Wayne K. Bromley, St. Louis, Mo.

Application January 3, 1938, Serial No. 183,017

6 Claims. (Cl. 261—22)

This invention relates to carbon removers, and has special reference to devices for removing carbon, etc., from smoke and products of combustion passing from a furnace to a flue for discharge to atmosphere.

An object of the invention is to provide a construction, combination and arrangement of parts adapted to be assembled in cooperative connection with a furnace and the discharge outlet therefrom for the products of combustion, and including flues or passages for the smoke and the fumes and the products of combustion, and mechanism assembled and operative therein for removing some or all of the carbon particles from the products of combustion by agitation of a liquid, and thereby separating the carbon from the fumes and remaining products of combustion and retaining the carbon particles while the lighter smoke or the like is discharged through and from the flue.

Another object of the invention is to provide an improved apparatus or mechanism that may be constructed and assembled within the limits of permissible cost for detaching objectionable carbon particles or the like from the volatile products of combustion, and retaining the same so that, when the lighter products of combustion are discharged from the flue or chimney, a comparatively small or minimum amount of objectionable carbon particles are carried therewith.

Other objects and advantages of the invention will appear from the following description, reference being made to the annexed drawings, in which—

Fig. 1 is a view partly in vertical section illustrating a preferred embodiment of the invention.

Fig. 2 is a combined plan and horizontal sectional view of the same embodiment of the invention that is illustrated in Fig. 1.

Fig. 3 is a vertical cross-sectional view on the line 3—3 of Fig. 1.

In the embodiment of the invention shown, the flue or pipe 1 opens from the furnace 2 and constitutes an outlet or conduit for the lighter and volatile products of combustion. This flue or pipe 1 has a branch 3 opening into a flue or pipe 4 leading directly to and discharging into a flue or chimney 5 that opens to the outside for the discharge of smoke and entrained substances in the usual manner.

A damper or valve device 6 controlled by a manually operated connection 7 is movable to and from position to open and to close communication from the branch 3 into the flue or pipe 4. Thus, when the damper or valve device 6 is open, the smoke and other lighter products of combustion can pass directly from the furnace through the pipe 1 and the branch 3 into the pipe 4 and thence into and through the pipe 5 for discharge into the outer atmosphere, as usual.

As shown, the branch 3 opens upwardly into the upper side of the pipe 4. A pipe 8 extends in continuation of the pipe 1 beyond the branch 3 and opens into a housing 9 which is provided with a removable and replaceable lid or cover 10 having on its inner side a packing or sealing lining 11 to prevent escape or leakage of the smoke and fumes, etc., from the housing 9. The housing 9 has therein a partition 12 extending from the rear wall 13 of said housing and from the lid lining 11 downwardly a considerable distance to provide a passage 14.

The partition 12 also provides a passage 15 between the outer end of said partition and the outer wall 16 of the housing 9. The partition 12 cooperates with a wall 17 of the housing 9 to provide a space 18 through which a shaft 19 extends longitudinally. The shaft 19 is journalled in bearings 20 supported by the end walls 16 and 13 of the housing 9. A cylinder 21 is attached to the shaft 19 within the space 18 by means of open frames 22. A series of segmental marine propeller blades 23 are attached to the rotary shaft 19 within the cylinder 21 for simultaneous rotation with said cylinder by the shaft 19. The number of these propeller blades may be varied as desired.

From the inner end of the housing 9, a pipe 24 opens, said pipe constituting merely an extension of the pipe 4. Two series of baffles 25 and 26 extend across the space 18 below the opening from said space into the pipe 24.

An electric or other type of motor 27 mounted on a shelf 28 is operative to rotate the shaft 19 by a driving connection 29 from the motor shaft 30 to a pulley 31 attached to said shaft 19. As shown, the shaft 19 has thereon a pulley 32 connected by a belt 33 with a pulley 34 attached to the outer end of a shaft 35 rotatively supported by the wall 16 and extending into the passage 14. A fan or propeller 36 is attached to the shaft 35 within the passage 14.

When the furnace is operating, it is desirable to remove from the smoke and fumes the soot and carbon that would otherwise be discharged with the smoke and fumes through the flue or chimney 5. In order to separate or remove the soot and carbon from the smoke and fumes, the motor 27 is operated and the damper or valve device 6 is closed. The result of this adjustment

and the operation of the motor 27 causes the fan or propeller 36 to create a suction through the pipe 8 and through the passage 14, and thence through the space 15. The simultaneous operation of the marine propeller device 23 with the fan or propeller 36 impels the products of combustion into and through the cylinder 21. The housing 9 contains a quantity of liquid up to about the line 37.

As clearly shown in Fig. 1, the lower portion of the cylinder 21 is immersed in said liquid and the lower edges of all of the propeller blades 23 will operate through the upper portion of the liquid which fills the lower portion of said cylinder 21. The cylinder 21 is formed with a series of elongated oblique slots 38, the rear edges 39 of said slots being inclined outwardly and the inner edges 40 of said slots being inclined inwardly (Fig. 3). Thus, when the cylinder 21 is rotated rapidly in a clockwise direction, as indicated by the arrows 41 (Fig. 3), the outwardly inclined walls or flanges 39 of the slots 38 will scoop a considerable amount of the liquid into the cylinder 21 and raise the level of the liquid in said cylinder considerably above the level of the liquid outside of the cylinder. The propeller blades 23 perform the double function of impelling the flow of the products of combustion through the cylinder and of agitating the liquid within the cylinder so that all of the products of combustion passing through said cylinder is subjectd to the washing action of the liquid. Preferably, a liquid is used that will attach itself to the soot and carbon particles entrained with the flowing products of combustion, and thereby detach, separate and remove said soot and carbon particles from the gases and fumes and other volatile products of combustion. These soot and carbon particles being saturated by this fluid, will be retained in the fluid while the remaining and volatile products of combustion pass into the pipe 24 and thence through the pipe 4 into, through and from the flue or chimney 5. The baffles 25 and 26 effectively prevent the discharge of any substantial amount of liquid into the pipe 24, and also cooperate with the device 23 to effect a settling of the soot and carbon particles into the body of liquid 37.

This device has been used and operated with a high degree of satisfaction ain detaching and removing soot and carbon particles from the products of combustion of bituminous fuel coal and the like, with the result that the products of combustion discharged from the chimney or flue 5 are of light color and are substantially free from soot and carbon particles that would otherwise be discharged therewith. The device may be assembled in connection with many or all standard types of furnaces at economical and permissible cost and, therefore, meets a compelling and existing need and requirement in communities in which it is necessary to use bituminous coal and the like as fuel.

When it is desired to operate the furnace to pass the smoke, etc. directly from the pipe 1 into and through the pipe 4 and the chimney or flue 5, it is only necessary to stop the motor 27, and thereby the fan or propeller 36 and the device comprising the blades 23, and to open the damper or valve 6. The suction through the chimney or flue 5 and the pipe 4 will draw the products of combustion from the pipe 1 through the branch pipe 3, thence into and through the pipe 4 and the flue or chimney 5. This may be done at the proper time after the furnace has been charged with a new or additional supply of fuel. But the damper or valve 6 should be closed and the device for removing carbon and soot should be operated during the time that the furnace is being charged with coal and for an appropriate time thereafter.

I am aware that the invention may be varied as widely as equivalent limits will permit without departure from the nature and principle thereof. Without restricting myself unessentially, I claim:

1. In a device of the character described, a housing adapted to contain a body of liquid that will saturate soot and carbon particles usually discharged from a coal burning furnace and having inlet and outlet openings near one end, a partition in said housing extending downwardly below the normal level of the liquid therein between said openings and dividing said housing into two laterally disposed spaces communicating with said openings respectively and also communicating with each other at the end of the housing beyond said openings, a shaft extending longitudinally into the space that communicates with said outlet opening, a cylinder attached to said shaft for rotation thereby in said last named space and having an open end toward said outlet opening, means in connection with said cylinder for directing liquid into the cylinder during rotation thereof, and devices attached to said shaft within said housing for saturating and removing and separating soot and carbon particles from the remaining lighter products of combustion passing through said cylinder.

2. In a device of the character described, a housing adapted to contain a body of liquid to saturate soot and carbon particles entrained with the products of combustion passing from a furnace and having inlet and outlet openings, a partition extending downwardly below the normal level of the liquid and dividing the inside of said housing into two side by side spaces communicating with said openings respectively and also communicating with each other, a shaft extending into the space that communicates with said outlet opening, a cylinder attached to said shaft in said last named space, means for rotating said shaft and said cylinder, means in connection with said cylinder for raising the level of the liquid in the cylinder above the level of the liquid outside of the cylinder when said cylinder is rotated, and devices attached to said shaft within said cylinder for saturating and removing and separating soot and carbon particles from the remaining lighter products of combustion during rotation of said cylinder and said devices.

3. In a device of the character described, a housing adapted to contain a body of liquid to saturate soot and carbon particles entrained with products of combustion and having an outlet opening, a shaft extending into said housing, a cylinder attached to said shaft and having slots in the wall thereof and also having open ends one of which is toward said outlet opening, propeller devices attached to said shaft within said cylinder for agitating said liquid and products of combustion and saturating and removing and separating soot and carbon particles from the remaining lighter products of combustion, inclined scoop devices at the sides of said slots between the ends of said cylinder for delivering liquid into said cylinder, and mechanism for rotating said cylinder and said devices.

4. In a device of the character described, a housing adapted to contain a body of liquid to saturate soot and carbon particles entrained with

products of combustion and having an outlet opening, an approximately horizontal rotary shaft extending into said housing at a distance from said outlet opening, a cylinder attached to said shaft and extending below the normal level of the liquid in said housing and having elongated slots and also having open ends one of which is toward said outlet opening for the passage of products of combustion, devices attached to said shaft within said cylinder for agitating said liquid and the products of combustion and causing the liquid to remove and separate soot and carbon particles from the remaining lighter products of combustion, outwardly extended portions at the sides of said slots for positively directing liquid through said slots into said cylinder when said cylinder is rotated, and mechanism for rotating said cylinder and said devices.

5. In a device of the character described, a housing having an inlet opening and also having an outlet opening and adapted to contain a body of liquid to saturate soot and carbon particles carried by products of combustion passing through said housing toward said outlet opening, a cylinder having elongated slots in the wall thereof and having open ends one of which is toward said outlet opening, agitating devices within said cylinder for agitating the products of combustion and the liquid in said cylinder to cause said liquid to separate soot and carbon particles from the remaining lighter products of combustion, outwardly extended portions in connection with said cylinder at the sides of said slots for positively directing liquid into said cylinder when said cylinder is rotated, means in said housing forming an angular passage from said inlet opening to said cylinder, a device in said passage for accelerating the movementof products of combustion therethrough toward said cylinder, and mechanism for simultaneously rotating said cylinder and said agitating devices and operating said last named device.

6. In a device of the character described, a housing adapted to contain a body of liquid to saturate soot and carbon particles entrained with products of combustion and having an outlet opening, a cylinder in said housing having liquid inlet openings and having open ends for the passage of the products of combustion therethrough toward said outlet opening and having its lower portion arranged to extend into the liquid contained in said housing, devices within said cylinder for agitating said liquid and the products of combustion and causing the liquid to remove and separate soot and carbon particles from the remaining lighter products of combustion passing through said cylinder toward said outlet opening, mechanism for simultaneously rotating said cylinder and said devices, and inclined flanges in connection with said cylinder at the sides of said liquid inlet openings positively preventing centrifugal force from lowering the liquid within the cylinder below the level of the liquid outside of the cylinder within said housing when said cylinder is rotated.

JOSEPH H. MINOR