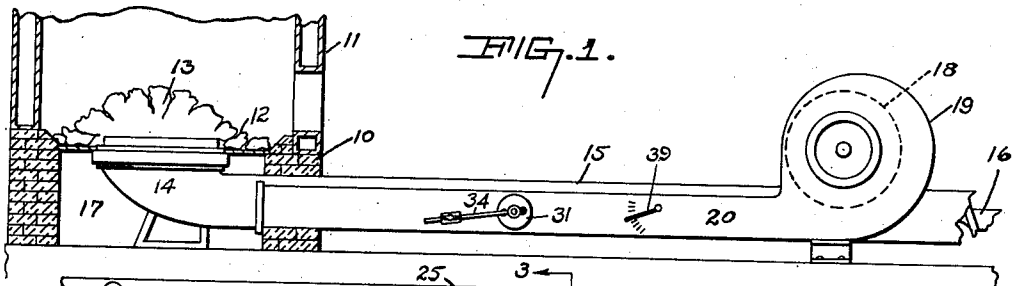
June 15, 1943. E. C. LUNDA ET AL 2,322,039

INERTIA STABILIZED VOLUMETER

Filed Jan. 7, 1941

FIG. 1.



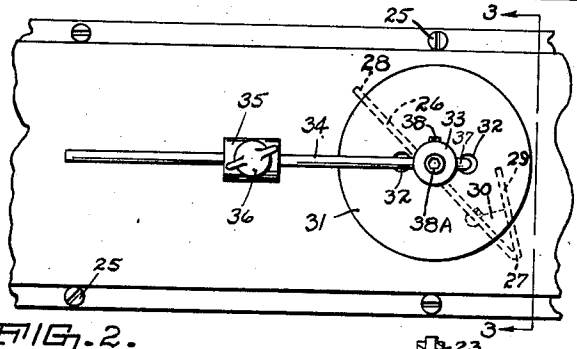


FIG. 2.

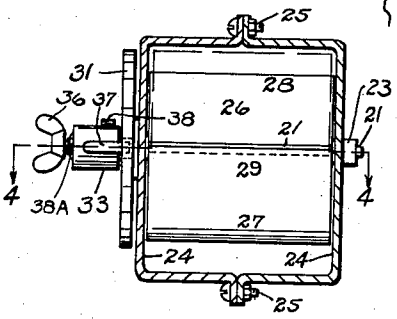


FIG. 3.

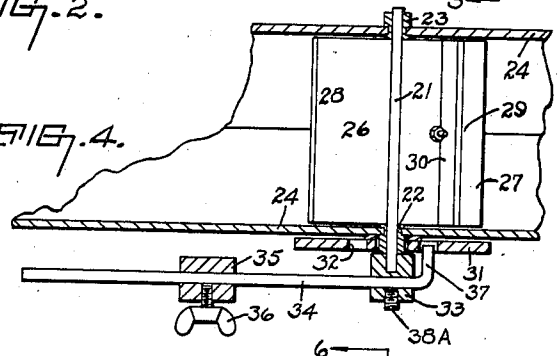


FIG. 4.

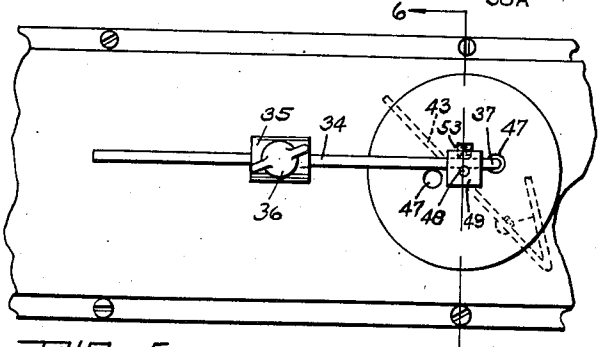


FIG. 5.

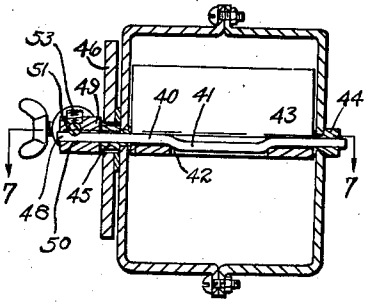


FIG. 6.

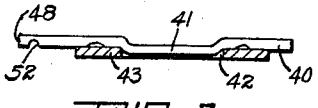


FIG. 7.

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UNITED STATES PATENT OFFICE

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INERTIA STABILIZED VOLUMETER

Edward C. Lunda and Reuben E. Wald, Portland, Oreg., assignors to Iron Fireman Manufacturing Company, Portland, Oreg.

Application January 7, 1941, Serial No. 373,468

5 Claims. (Cl. 137—152)

This invention relates generally to the stoker industry and particularly to an inertia stabilized volumeter for controlling the volume of air delivered by the stoker.

The main object of this invention is to construct a simple form of control mechanism whereby the quantity of air delivered by a stoker to a furnace may be stabilized or held to a fixed predetermined volume from which it will not deviate or fluctuate any appreciable or objectionable amount.

The second object is to construct a volumeter for the purpose described which will be extremely sensitive in the controlling action and not inclined to "hunt" or fluctuate in its controlling action and having means for dampening out or discouraging any such tendency by utilizing inertia to absorb the vibrational energy of the damper in order to bring it to rest at the desired controlling position.

The third object is to construct a damper of the class described in a manner to utilize inertia as the controlling principle of the mechanism eliminating, as far as possible, any frictional factor.

The fourth object is to construct an inertia stabilized volumeter by means of which an approximately constant flow of air may be delivered through the air duct of a stoker, regardless of any static variation at the discharge end of the duct within the range of the stoker fan.

These and other objects are accomplished in the manner set forth in the following specification as illustrated in the accompanying drawing, in which:

Fig. 1 is a fragmentary elevation showing a stoker air supply mechanism with our control mounted thereon and their relation to a furnace shown in vertical section.

Fig. 2 is a fragmentary front elevation of a portion of the air duct showing the exterior of our device.

Fig. 3 is a transverse section taken along the line 3—3 in Fig. 2.

Fig. 4 is a fragmentary section taken along the line 4—4 in Fig. 3.

Fig. 5 is a fragmentary section of an air duct showing an alternative form of the device.

Fig. 6 is a transverse section taken along the line 6—6 in Fig. 5.

Fig. 7 is a section taken along the line 7—7 in Fig. 6.

Referring to the drawing, there is shown a common form of furnace setting 10, upon which is mounted a boiler furnace 11, to whose burning surface 12, fuel 13 is supplied from the retort 14 through a coal feeding tube 15 by a coal conveying worm 16. Air is supplied to the plenum chamber 17 by the fan 18 within the casing 19. The fan 18 may be driven in any desired manner and operated continuously or intermittently, as required. The air duct 20 provides communication between the fan casing 19 and the plenum chamber 17. The usual indicating and banking dampers are not shown in detail since they form no part of the present invention.

Referring particularly to our invention, the same will be seen to include a horizontal damper shaft 21 which journals in the bushings 22 and 23, which are mounted in the sides 24 of the split air duct 20, the portions of which are joined by the bolts 25. The shaft 21 is free to rotate in the bushings 22 and 23.

Secured on the shaft 21, preferably by welding, is a control damper blade 26, whose lowermost end 27 is somewhat farther from the shaft 21 than is its uppermost end 28 and the end 27 is provided with the upturned wing 29 and an additional weight 30 to unbalance the damper blade 26 in a closing direction.

Mounted on the outerside of the bushing 22 and free to rock thereon, is an inertia disc 31 having one or more large holes 32 formed therein, the centers of which are equidistant from the axis of the shaft 21.

On the end of the shaft 21 secured by the set screw 33, is the hub 33 through which extends the radial rod 34 upon which is adjustably mounted the counterweight 35, whose position can be fixed by the set screw 36, the end 37 of the rod 34 is inturned and extends very loosely into one of the holes 32. The rod 34 is secured to the hub 33 by means of the set screw 38—A.

In the form of the device shown in Figs. 5, 6 and 7, the damper shaft 40 is provided with an offset intermediate portion 41 which occupies a slot 42 formed along the axis of the damper blade 43, the shaft 40 is preferably welded to the damper blade 43 and journals in the bushings 44 and 45, the latter of which has the inertia disc 46 freely mounted thereon. The disc 46 is provided with the large holes 47, into one of which extends the end 37 of the rod 34.

Mounted on the shaft end 48 is a block 49 having a hole 50 formed therein to receive the shaft end 48, and a second hole 51 formed therein, which partially intersects the hole 50 in order that the rod 34 may occupy the notch 52 formed in the end 48 of the shaft 40.

A set screw 53 in the block 49 clamps the rod 34 in position, when used as shown in Figs. 5 and 6.

In this form of device, the rod **34** serves as a key to prevent the removal or turning of the block **49** with relation to the shaft **40**, while the set screw **53** prevents the rod **34** from changing its position with relation to the block **49**.

The operation of the two forms of the device is identical, therefore, only the operation of the forms shown in Figs. 2, 3, and 4 will be explained.

Assuming that fuel **13** is being delivered to the combustion by the worm **16** and that a predetermined volume of air is required from the fan **18**, in order to properly burn this fuel as delivered, it is first necessary to move the counterweight **35** along the rod **34** to a position corresponding with the desired volume as indicated on the indicating damper arm **39**, that is: if 100 cubic feet of air is to be delivered through the duct **20** per minute, the weight **35** must be moved to a point along the rod **34** where it will so unbalance the damper blade **26** as to cause it to close if more than 100 cubic feet of air pass the blade **26** per minute and open if less than this amount is passing through the duct **20**.

If now, as is commonly the case, there are fluctuations in the air flow caused by variations in the fan speed or resistance offered by the fuel bed, then there will occur an unstable or vibrating condition at the damper blade **26**. With our device, this unstable condition is first discouraged and then overcome by reason of the fact that when the end **37** of the rod **34** is moved by the damper blade **26**, the disc **31** remains at rest because it is independently supported by the bushing **22** and will not move until the end **37** engages one side of the hole **32**, for it must first overcome the inertia of the disc **31**, possibly causing it to move so that the backward movement of the blade **26** must not only overcome the inertia of rest but also the inertia of movement, until all of the vibrating action is dampened out, until the blade **26** is at rest or floats within the limits of clearance between the end **37** and the hole **32**.

It can be seen from the foregoing that by an exceedingly simple contrivance, in which friction plays the least possible part, the volume of air delivered by a stoker may be held substantially constant.

While we have thus illustrated and described our invention, it must be understood that we do not intend to limit ourselves to the precise form shown herein, but we do intend to cover all such forms and modifications thereof as fall fairly within the appended claims.

We claim.

1. An inertia stabilized volumeter having in combination an air duct, a shaft rockably mounted in said duct, an unbalanced damper blade mounted on said shaft when in said duct and adapted to close under increasing air flow, a counterweighted arm attached to said shaft tending to balance said blade and an inertia disc having a loose driving connection to said arm, said disc being supported for movement independently of said arm.

2. The combination of an air duct with a balanced damper blade mounted in said duct and adapted to close under increasing air flow, and a movable inertia element loosely coupled with said blade, the looseness in said coupling permitting said blade to fluctuate limited amounts before transmitting motion to said inertia element, said inertia element being supported for movement independently of said blade.

3. In an inertia stabilized volumeter the combination of an air duct, a horizontal shaft rockably mounted within said duct, an unbalanced blade secured to said shaft, a counterbalancing arm attached to said shaft, a rockable inertia disc mounted independently of said shaft and a driving connection between said disc and shaft characterized by having sufficient lost motion therebetween to permit said shaft to rock a predetermined amount without imparting a driving action to said inertia disc.

4. In a device of the class described, the combination of an air duct, a horizontal shaft rockably mounted across said duct, an unbalanced damper blade mounted on said shaft tending to close said duct under increasing air flow, a counterbalance for said shaft adapted to urge said blade toward an open position, and an inertia disc concentric with said shaft mounted thereon having a loose driving connection between said shaft and disc whereby a slight fluctuation of said damper will not effect said disc, but larger movements of said damper will produce corresponding movements of said disc.

5. In a device of the class described, the combination of a horizontal shaft, bearings for supporting said shaft, a damper blade secured to said shaft between said bearings, an inertia disc rockably mounted on one of said bearings independently of said shaft and concentric with said shaft, and having an enlarged opening formed therein and a counterweighted arm attached to said shaft having an inturned end of less diameter than is the opening in said disc, said inturned end extending into said opening, whereby slight fluctuations of said blade will not be imparted to said disc, but fluctuations over a predetermined value will cause the end of said arm to overcome the inertia of said disc and move same in one direction, while a reverse fluctuation will cause said arm to move said disc in an opposite direction.

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