March 15, 1927. 1,620,672

C. F. MILLER

AIR CONTROL MEANS FOR MECHANICAL STOKERS

Filed May 10, 1923

Fig. 1.

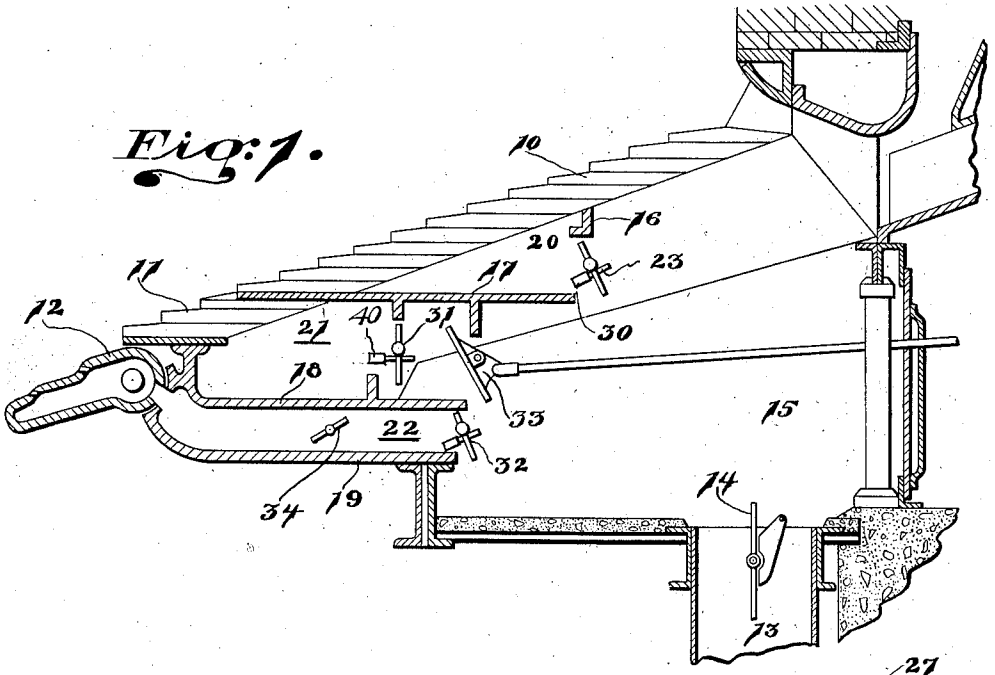



Fig. 2.

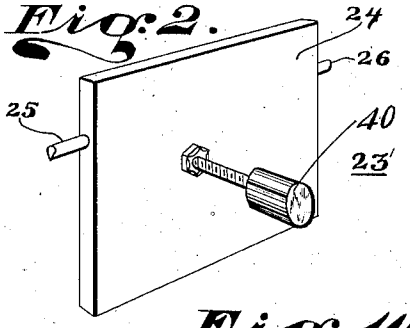



Fig. 3.

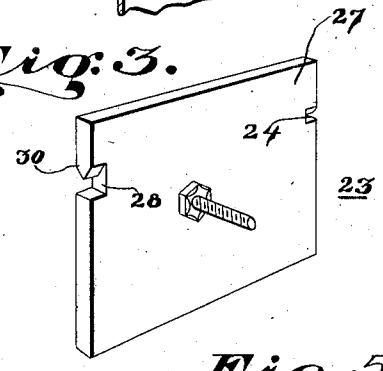



Fig. 4.

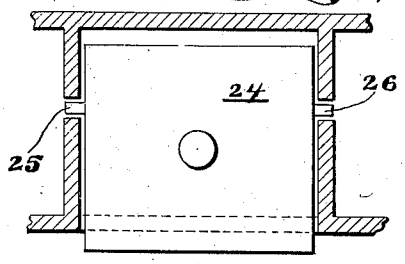
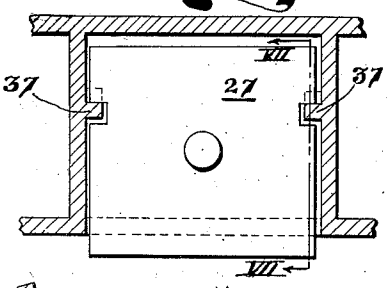



Fig. 5.



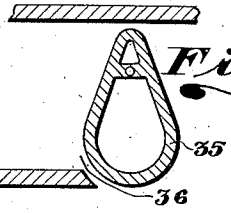




Fig. 6.




Fig. 7.

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# UNITED STATES PATENT OFFICE.

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## AIR-CONTROL MEANS FOR MECHANICAL STOKERS.

Application filed May 10, 1923. Serial No. 638,129.

My invention relates to air control means for mechanical stokers and it has for its object to provide apparatus of the character designated which shall be effective to automatically restrict the air supply to all or to any portion of the fuel bed of a stoker upon a tendency for the passage of an excessive amount of air through the fuel bed or through a portion thereof.

In the accompanying drawing, Fig. 1 is a side view, in section, of a mechanical stoker of the forced-draft, underfeed type, illustrating one form of my invention, dampers being diagrammatically represented; Figs. 2 and 3 are perspective views of two types of damper plates adapted to be operated in the stoker of Fig. 1; Figs. 4 and 5 are front views, partially in section and partially in elevation, showing the method of installation of the damper plates shown in Figs. 2 and 3 respectively; Fig. 6 is a side view, in section, of a modified form of damper plate adapted to give a stream line effect; and Fig. 7 is a detailed sectional view taken on line VII—VII of Fig. 5 illustrating the adjusting means employed in the dampers of Figs. 2 and 3.

In the operation of mechanical stokers, it frequently happens that the fuel bed becomes so thin at a given point as to admit an excessive amount of air therethrough, resulting in extremely rapid combustion and the actual formation of a hole through the fire. This is an extremely undesirable effect, inasmuch as it robs air from the remainder of the fuel bed, overloads the air supply means in a forced-draft stoker, and produces dilution of the flue gases.

In accordance with the present invention, I preferably form the air supplying tuyères in a mechanical stoker into a plurality of groups, each with its own air supply duct, and I then place in each duct a swinging apron or damper which normally affords but little opposition to the air flow, but the arrangement is such that, when the velocity of air flow tends to exceed a predetermined amount, said damper moves to largely or wholly cut off the air flow through the associated duct. By this means, if a hole is burned through the fuel bed, the resultant rapid flow of air through the duct supplying said portion of the fuel bed operates the automatic damper or dampers associated therewith and prevents the excessive flow of air through the hole.

Referring to the drawing for a more detailed understanding of my invention, I show the tuyères of a mechanical stoker of the forced draft underfeed type at 10 in Fig. 1. Below and to the rear of these tuyères is an extension grate 11 followed by a live dump grate 12, all of usual and well-known type.

Air is supplied to the stoker through a main duct 13 from any suitable source under the control of a manually operated damper 14, and passes into a plenum chamber 15. Suitable diaphragms 16, 17, 18 and 19 form ducts 20, 21 and 22, the duct 20 supplying the lower portion of the main tuyères, the duct 21 supplying the extension grate 11, and the duct 22 supplying the dump grate 12. Mounted in the entrance to the duct 20 is a swinging damper 23, illustrated more in detail in Figs. 2–5 inclusive. In the form shown in Fig. 2, a plate 24 is provided with outwardly extending arms 25 and 26 having knife edges on their lower side as indicated, the arms 25 and 26 being somewhat above the center of gravity of the plate 24. As shown in Fig. 4, the plate 24 is mounted in the opening into a duct with the arms 25 and 26 resting in suitable openings in the walls of the duct so that said plate is free to swing therein.

Inasmuch as considerable difficulty would be encountered in installing or removing the plate 24 from an assembled stoker, I prefer to employ the damper shown in Fig. 3 in which a plate 27 is provided with notches 28 and 29 in the edges thereof, said notches being shaped to a knife edge in their upper surface as shown at 30 to form a knife edge support. By referring to Fig. 5, it will be noted that the plate 27 is merely hung in arc-shaped lugs 37 extending from the side walls of the duct to be controlled, it being obvious that a damper plate of this form may be readily inserted into, or removed from, an assembled stoker.

Reverting to Fig. 1, it will be noted that the damper 23 is so mounted in the opening into the duct 20 that normally there is an extended opening 30 between the lower edge thereof and the right-hand end of the diaphragm 17, thus permitting free entrance of air into the duct 20. However, should a

hole burn through the fuel bed over the lower tuyères of the group 10, the excessive rate of air flow from the plenum chamber 15 through the duct 20 would cause the damper 23 to swing in a clockwise direction, largely closing off the passage 30 and restricting the air supply to the tuyères in question.

A similar damper 31 is mounted to operate upon the air passing through the duct 21 to the extension grate 11 and still another damper 32 is effective to operate upon the air passing through the duct 22 to the dump grate 12. I also show a manually operated damper 33 for further controlling the air supply to the duct 21 and an additional manually controlled damper 34 for adjusting the air flow in the duct 22.

It is desirable that the critical operating point of the automatic dampers thus described should be susceptible of adjustment and accordingly I may provide a bolt 34, as shown more clearly in Fig. 7, this bolt projecting through the central portion of the damper plate; and being threaded throughout substantially its entire length with suitable lock nuts on opposite sides of the damper plate, the bolt being provided with a weighted head 40. Obviously by longitudinal adjustment of this bolt, the center of gravity of the damper assembly may be adjusted in a direction transverse to the plane of the plate, thus causing the damper plate to assume an oblique position of rest, such as that indicated in Fig. 7. By the use of this adjustment on the damper 23 of Fig. 1, the opening 30 may be increased or decreased, together with the critical air velocity to which the damper will swing to restrict the air flow.

Inasmuch as the air supply may be to some extent impeded by reason of the eddies formed around the edge of a flat plate, I may desire to employ a damper member of the form shown at 35 in Fig. 6, the cross section being oval-snaped with the end having a small radius of curvature projecting upwardly. The air passage 36 provided thereunder is of such configuration as to establish little or no eddying effect but, nevertheless, upon the attainment of a predetermined high air velocity, the damper 35 will swing to restrict the air supply as in the foregoing cases.

While I have shown my invention as applied to but a portion of the tuyères in an underfeed stoker of the forced-draft type, it will be obvious that it is not so limited but that I may apply it with equal effectiveness to any other type of stoker, and upon either forced-draft or natural draft.

While I have not shown automatic air control to the upper tuyères 10 because of the thickness and greenness of the fire at this point with attendant small liability to burning through, it will further be obvious that I may, if desired, subdivide the entire fuel bed into tuyère groups, each with its appropriate air supply duct and automatic air control means.

What I claim is:—

1. In a stoker embodying a plurality of groups of tuyères, each group having an air supply duct thereto, swinging dampers mounted in said ducts and adapted to restrict air flow therethrough when the air velocity tends to exceed a predetermined amount, and means for laterally altering the position of the center of gravity of each swinging damper assembly, whereby the critical operating points of said assemblies may be altered with respect to each other.

2. In a stoker embodying a plurality of groups of tuyères, each group having an air supply duct thereto, swinging dampers respectively mounted in said ducts and adapted to restrict air flow therethrough when the air velocity tends to exceed a predetermined amount, an elongated member mounted on each of the dampers and transversely to the axis thereof, and means permitting longitudinal adjustment of said members whereby the location of the centers of gravity of said damper assemblies and the critical operating points of said dampers are altered with respect to each other.

3. The combination with a forced-draft stoker embodying a plurality of groups of tuyères, each group with its separate air supply duct, of means for establishing a predetermined relation of air pressures at the respective tuyère groups, and means for restricting the air flow in at least one of the ducts when the air velocity tends to exceed a given pre-determined velocity.

4. The combination with a forced-draft stoker embodying a plurality of groups of tuyères, each group with its separate air supply duct, of means for establishing a predetermined relation of air pressures at the respective tuyère groups, and means for restricting the air flow in any one of said ducts when the air velocity in said duct tends to exceed a pre-determined maximum velocity established for said duct.

5. The combination with a forced-draft stoker embodying a plurality of groups of tuyères, each group with its separate air supply duct, of means for establishing a predetermined relation of air pressures at the respective tuyère groups, means for restricting the air flow in each of said ducts when the air velocity in said duct tends to exceed a pre-determined maximum velocity established for said duct, and means for altering the critical operating velocity in each duct.

In testimony whereof, I have hereunto subscribed my name this 7th day of May, 1923.

CHARLES F. MILLER.