This invention relates to controlling devices, and particularly to a device adapted to be operatively related to the main steam line of a steam generator for controlling and regulating the position of dampers, draft devices or the like associated with the generator in the operation thereof.

One object of the present invention is to provide a novel construction and arrangement whereby draft devices or the like may be automatically controlled by the operation of novel means governed by changes in flow of steam in the main line of a steam generator.

More specifically, the present invention is intended to provide novel means for controlling the operation of a steam generator by and in accordance with the flow of steam therefrom resulting from the reduction and increase of pressure in the main outlets, due to the demand at these points, combined, respectively, with increased and reduced velocities of the steam passing through the main steam line as a result of such reduction and increase of pressure in the outlets.

Another object of the invention is to provide novel means for controlling the operation of a steam generator by the flow or volume of steam passing through the main steam line thereof regardless of the pressure of the steam in the generator.

Another object of the invention is to provide novel means for the operation of dampers or other draft devices, and which has a definite relation to the operation of such devices and to the amount of steam leaving the boiler for use at the main outlets of the steam line.

Another object of the invention is to provide novel means whereby the draft devices may be conveniently and efficiently connected to the control device regardless of their positions relative to the connection of the control device with the steam line of a generator.

A further object of the invention is to provide a novel valve construction in the main line of a steam generator and actuated by the volume or amount of steam passing therethrough, whereby dampers and other similar draft devices are opened and closed proportionately to the volume or amount of steam passing through said main line.

A still further object of the invention is to improve devices of the character described in sundry details hereinafter referred to and more particularly pointed out in the appended claim.

One embodiment of the present invention is shown for illustrative purposes in the accompanying drawings, in which:

- Fig. 1 is an elevational view of a steam generator, such as a furnace boiler, or the like, illustrating the application of my improved control device thereto.
- Fig. 2 is an enlarged vertical sectional view through the operating parts of the control device, and taken substantially as indicated by the line 2—2 of Fig. 3;
- Fig. 3 is a sectional view taken substantially as indicated by the line 3—3 of Fig. 2; and
- Fig. 4 is a sectional view taken as indicated by the line 4—4 of Fig. 2.

In Fig. 1 of the drawings, my improved control device is shown applied to a steam generator, indicated as a whole by the numeral 5, having a plurality of dampers or draft devices 6 and 7 associated therewith, the former being shown as positioned in a smoke pipe 8, and the latter as an ash pit door hingedly connected as indicated at 9 to the body of the generator 5.

The illustrative embodiment of the present invention as shown in the drawings comprises a casing or housing, indicated as a whole by the numeral 11, having an enlarged portion 12 intermediate its ends and having an inlet opening 13 adjacent one of its ends adapted to be connected by means of a pipe or conduit 14 to a steam dome of the generator 5, the said casing being provided also with an outlet opening 15 adjacent a side portion thereof and adapted to communicate with a pipe 16, which in conjunction with the housing 11 and pipe 14 constitutes a main steam line for conducting steam from the generator 5 to steam outlets for various purposes as, for example, the operation of steam engines or the like, and for use in heating systems or for other purposes.

For controlling the position of the dampers or draft devices 6 and 7 in accordance with the amount or volume of steam passing through the main line for consumption at the outlets thereof, and in order to maintain a definite and proper relationship between the consumption of steam at the outlets and the fuel consumed to generate additional steam, the housing 11 is provided on its interior with a sleeve, indicated as a whole by the numeral 17, having a reduced lower end portion positioned in the inlet opening and provided with an inlet port 18 formed therein communicating with the pipe 14 and having a plurality of annularly spaced vertically elongated outlet ports 19 formed in the wall portion of the sleeve for conducting steam, received on the in-
terior of the sleeve 17 from the pipe 14, to the outlet opening 15, and thence through the pipe 16 to the steam outlets of the main line.

The parts are shown in the illustrative embodiment as of substantially triangular form having a base portion 21 and vertically extending side portions 22 tapered or inclined toward each other and meeting to form the apex of the triangle adjacent the upper portion of a chamber 23 formed between the enlarged portion of the housing 11 and the outside of the sleeve 17, the total area of the outlet ports 19 being substantially equal to the cross-sectional area of the inlet port 18 formed in the lower end of the sleeve 17.

A simple formula for determining suitable dimensions of the outlet ports 19 may be noted here as follows: Three-fourths of the diameter of the inlet port 18 divided by the number of outlet ports 18 (in the present instance, there being four in number) equals the length of the base of each outlet port, after which the substantially uniform height of the ports 19 may be readily determined in order that the total area of the ports 19 will equal substantially the cross-sectional area of the inlet port 18 as above mentioned.

Sidely mounted in the sleeve 17 is a weighted piston, indicated as a whole by the numeral 24, and adapted to be actuated by the amount or volume of steam passing through the housing 11 in proportion to the reduction in pressure of the steam in the main outlets due to consumption for various purposes, the position of the piston 24 in the sleeve 17 being determined by the volume or amount of steam passing through the housing regardless of the steam pressure in the generator.

For providing a balanced condition of pressure on both sides of the piston 24, it will be noted that when the piston is in the position shown in Fig. 2 of the drawings, that steam may circulate around the sleeve 17 and through the outlet ports 19 to the upper side of the piston, and for preventing the formation of a pocket or compression head in the upper end of the sleeve when the upper side of the piston 24 is above the upper ends of the outlet ports 19, a portion of the sleeve 17 is spaced from the casing 11 as shown by a plurality of grooves 25 shown in the present instance, as formed in the outer surface of the sleeve and communicating with the interior thereof through a plurality of radially disposed notches 26 formed in the upper edge portion of the sleeve, thereby providing for a balanced condition of steam pressure on opposite sides of the piston 24 regardless of the position of the piston in the sleeve 17.

Mounted on the piston 24 and extending outwardly therefrom through a stuffing box 27 mounted on a bonnet 28 secured to the upper end of the housing 11 is a rod or stem 29 having a cross-head 31 secured thereto adjacent the upper end thereof, the outer end portions 32 of the cross-head being positioned in vertically disposed slots 33 formed in upright guide frames 34, the said guide frames being mounted on a ring-like base portion 35 rotatably mounted in a recess 36 formed in the bonnet 28, the said ring-like base having a flange 37 extending above the upper end of the recess 36 and adapted to be engaged by the heads 38 of binding or clamping screws 39 mounted in the bonnet for securing the guide frames and base in various positions of angular adjustment with respect to the housing 11 and steam line 16.

Rotatably mounted on the upright guide frames 34 is a shaft 41 having a sleeve 42 mounted rigidly thereon in a plane extending substantially through the stem 29 and perpendicular to the cross-arm 32, the sleeve 42 being connected, in the present instance, to the cross-arm 31 by means of a flexible connector or cable 43 in a manner to rotate the shaft 41 when the stem 29 is raised by the movements of the piston 24 within the sleeve 17.

Mounted preferably adjacent the respective outer ends of the shaft 41 in a manner to rotate therewith are a pair of sheaves 44 and 45, the sheave 44 having a flexible connector or cable 46 connected thereto adjacent one of its ends as indicated at 47, the opposite end of the cable 46 being connected to the smoke pipe damper as illustrated in Fig. 1, while the sheave 45 is provided with a flexible connector or cable 48 secured at one of its ends to the sheave 45 and at its opposite end to the draft device 49, the draft device 49, in the present instance, as the ash pit door of the furnace boiler. The arrangement of the structure above described is such that, as pressure is reduced at the main outlets due to the consumption of steam for various purposes, the volume of steam entering the main line through the housing 11 to replace the steam consumed will cause the piston 24 to rise within the sleeve 17 a distance in proportion to the steam passing through the housing, and due to the connection between the piston 24 and shaft 41 through the medium of the stem 29, cross-head 31, cable 43 and sheave 42, the shaft 41 and sheaves 44 and 45 will be rotated in a counterclockwise direction as indicated by the arrow A (Fig. 2), thereby opening the damper 6 in the smoke pipe 8 and the ash pit door 7 adjacent the bottom of the furnace boiler to provide sufficient draft for the consumption of fuel to provide additional steam to replace that which has passed through the main outlets, the weight of the piston 24 being such that the normal position of the parts may be restored. Between the piston 24 and shaft 41 the main steam outlets have been supplied, it being understood that the normal tendency of the draft device 6 and 7 is to remain, yieldingly, in closed condition.

For steadying the movements of the piston 24 within the sleeve 17 under sudden changes of pressure in the main outlets and the velocity of the steam through the housing 11 due to sudden changes of load, the cross-head 31 is operatively connected through a rocker arm 49 with a dash pot, indicated as a whole by the numeral 51, positioned at the opposite side of the stem 29 from the sheave 42, the dash pot being pivotally mounted at 52 on a support 53 secured to the ring-like base 35 by means of a bolt 54. The rocker arm 49 as shown, in the present instance, comprises a tubular portion 55 pivotally connected at 56 to an upright 57 mounted on the support 53, the rocker arm 49 having a portion 58 sidely mounted in the portion 55 and pivotally connected at 59 to the cross-head 31, the opposite end of the rocker arm 49 being connected with a dash pot piston 61 having vents or passages 62 formed therein to provide leakage from one side to another of the movements thereof in the dash pot 51.

To prevent the flow of steam in the opposite direction from the line 18, through the housing 11 and into the pipe 14, due to back pressure in
the main steam line 16, the reduced portion of the sleeve 17 is provided with a valve seat 63 surrounding the inlet port 16 and adapted to receive a valve head 54 formed on the underside of the piston 24 as clearly shown in Fig. 2 of the drawings.

It will be observed from the foregoing description that the present invention provides a novel construction and arrangement for automatically controlling the position of draft devices through the operation of novel means governed by changes in pressure in the main outlets combined with changes in velocity of the steam through the housing 11 due to such changes in pressure at the outlets, and that the operation of the device is such as to provide sufficient draft for the consumption of fuel to supply sufficient steam at all times to meet the demand of the load at the main outlets.

Obviously, the present invention is not limited to the precise construction and arrangement shown and described, as the same may be variously modified. Moreover, all the features of the invention need not be used conjointly, as the same may be used to advantage in variously different combinations and sub-combinations.

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

A device of the class described comprising a casing having a chamber and an outlet opening formed therein communicating with a steam line, a bonnet secured to one end of said casing, a sleeve removably mounted in the casing and having an inlet port adjacent one of its ends adapted to communicate with a source of steam supply, a valve seat surrounding said inlet port, said sleeve having a plurality of elongated tapered outlet ports having their widest ends adjacent the lower portion thereof and communicating with the interior of said sleeve and with said chamber and outlet opening, a piston slidably mounted in said sleeve and having a stem extending outwardly through said bonnet, a portion of said sleeve adjacent the upper end thereof having a plurality of grooves formed on its outer side communicating with said chamber to permit the passage of steam between said sleeve and casing from one side of said piston to the opposite side thereof, a valve head on said piston engageable with said valve seat, and means mounted on said bonnet adapted to be connected to a draft device and operatively connected to said stem for controlling the position of the draft device in accordance with the position of said piston in said sleeve as determined by the amount of steam passing through said casing to said steam line.

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