No. 679,390. Patented July 30, 1901.

F. McCARTHY.

AUTOMATIC RELIEF VALVE.

(Application filed Feb. 23, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

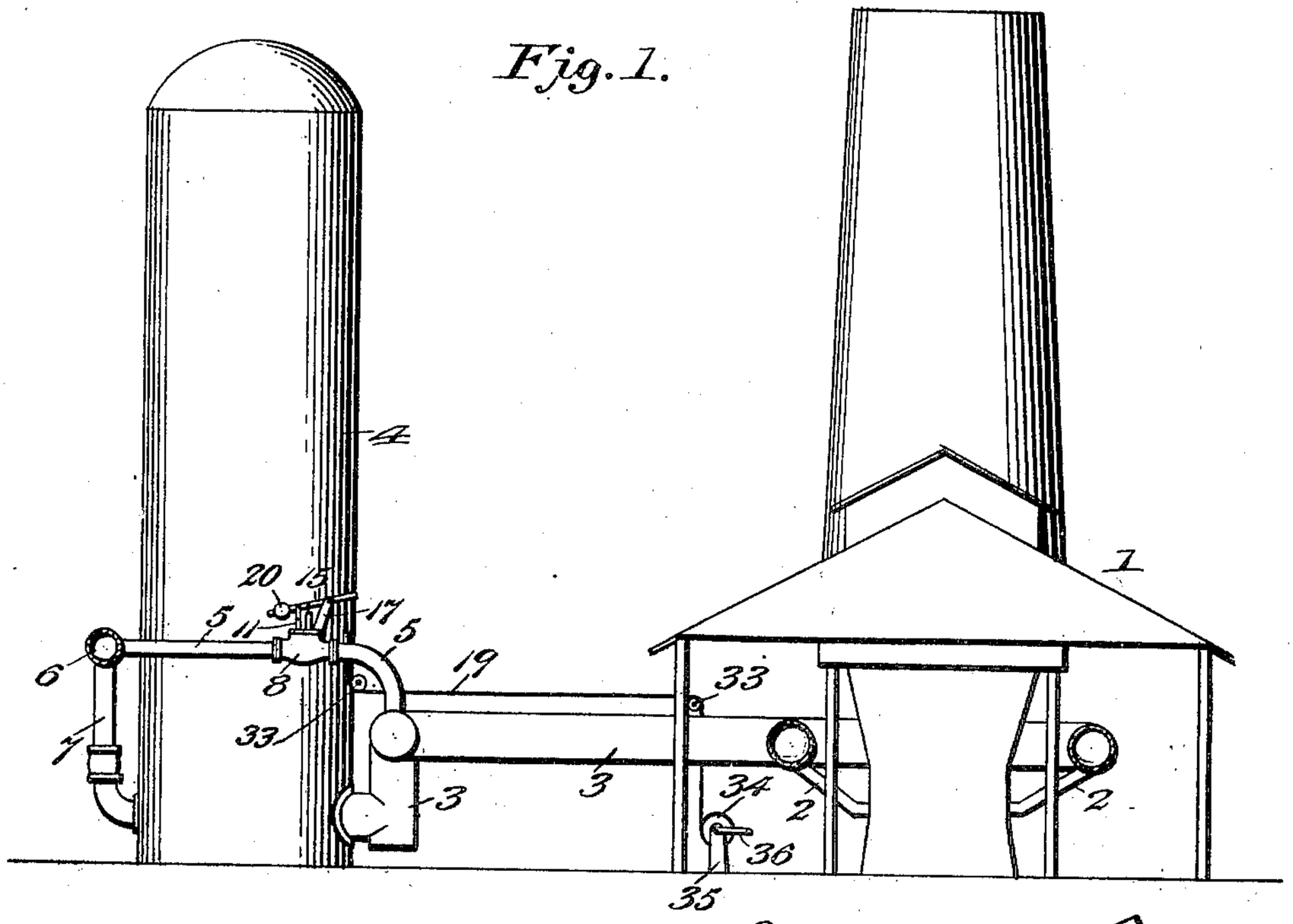

Fig. 2.

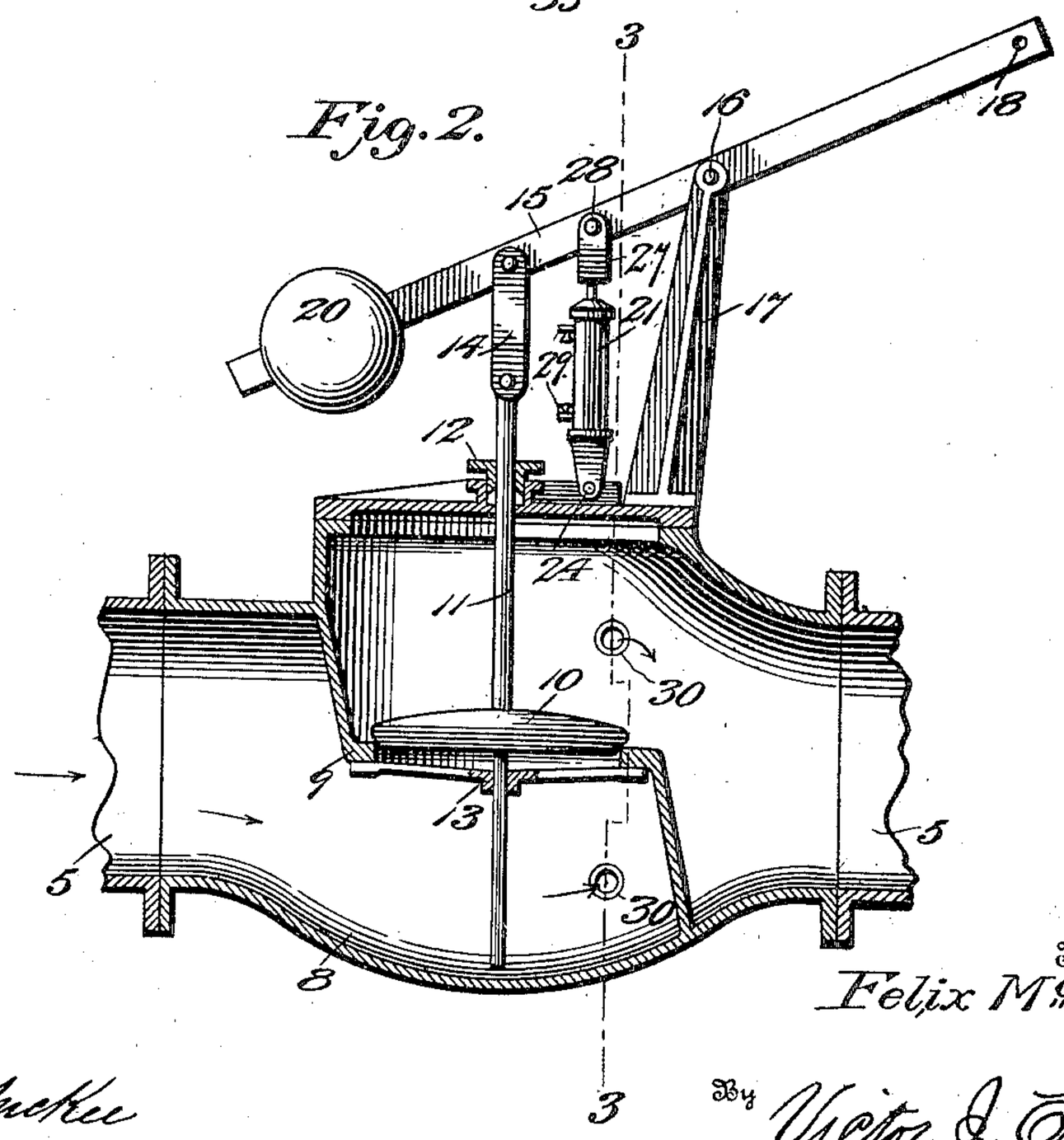

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Fig. 3.

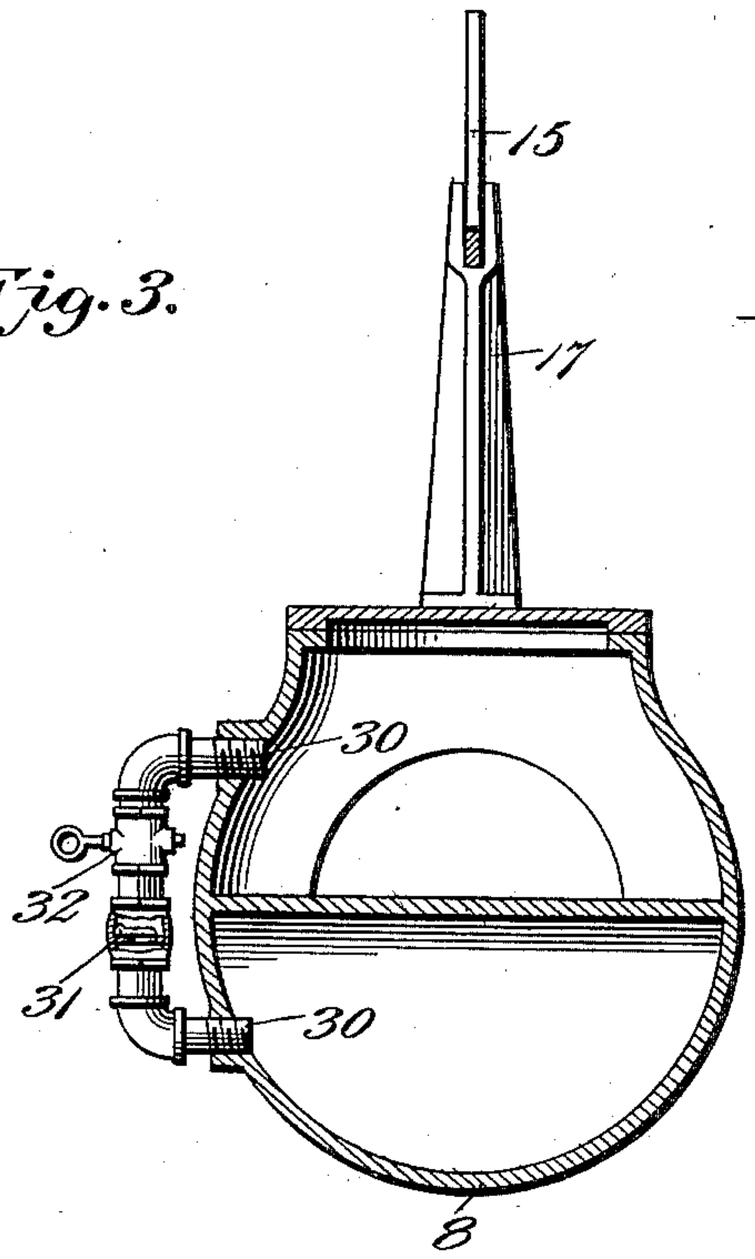


Fig. 4.

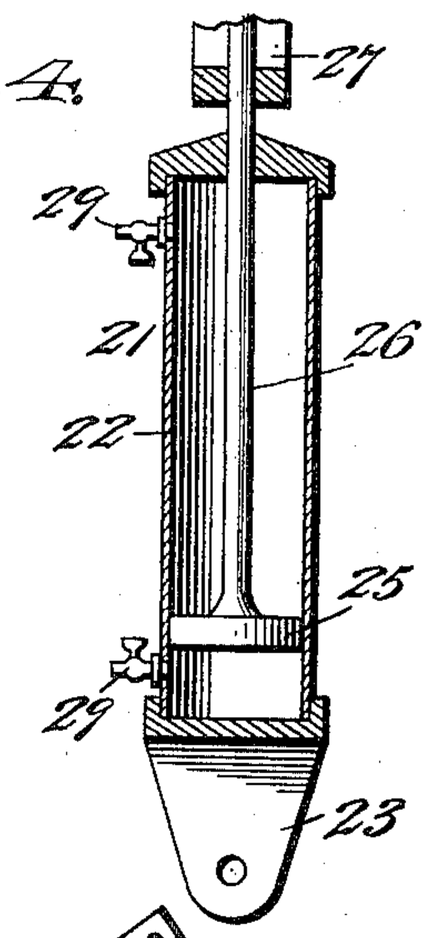
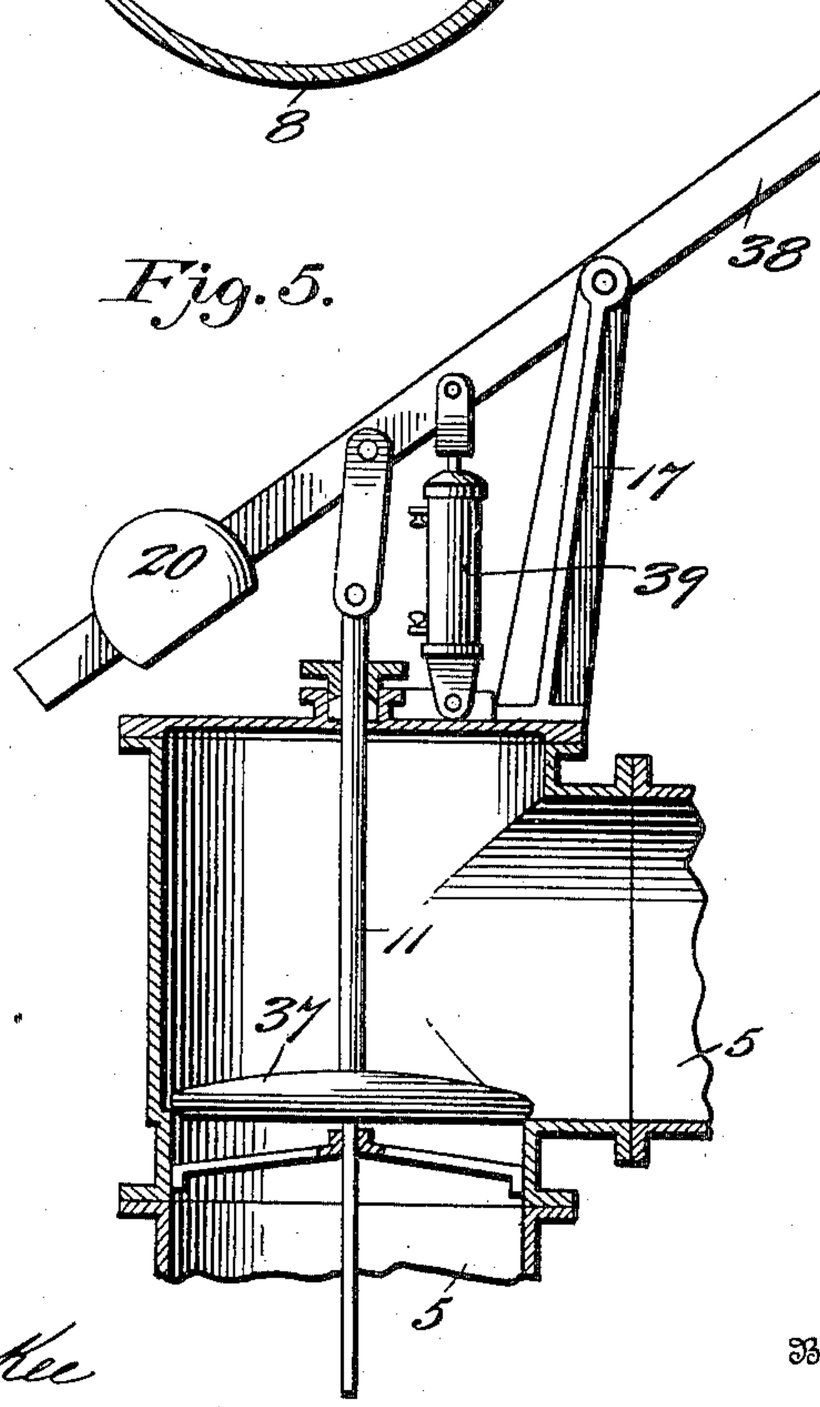


Fig. 5.



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UNITED STATES PATENT OFFICE.

FELIX McCARTHY, OF POTTSTOWN, PENNSYLVANIA.

AUTOMATIC RELIEF-VALVE.

SPECIFICATION forming part of Letters Patent No. 679,390, dated July 30, 1901.

Application filed February 23, 1901. Serial No. 48,570. (No model.)

To all whom it may concern:

Be it known that I, FELIX MCCARTHY, a citizen of the United States, residing at Pottstown, in the county of Montgomery and State of Pennsylvania, have invented new and useful Improvements in Automatic Relief-Valves, of which the following is a specification.

In blast-furnaces a series of stoves is employed for each furnace, the series usually comprising three or four stoves, which are used to heat the air that is blown by the engine before it passes into the furnace. These stoves are heated from the gas produced by the furnace, and the gas is made from the fuel employed in melting the ore. When there are three stoves used, two are on gas and one on air. The stoves become so hot from the gas that it very often runs the heat of the air up to 1,400° or 1,500° before it reaches the furnace. When the furnace is cold, all of this heat is required. At other times when the furnace is hot only 900° or 1,000° of heat are necessary. In order to regulate the heat, a by-pass is used. This by-pass runs from the cold-blast pipe to the hot-blast pipe and is supposed to be large enough to pass all the air delivered by the engine. This by-pass is provided with a gate-valve, and when all the heat is required this valve is closed. If it is desired to cut down the heat, say, 200°, the valve is opened slightly; but it would have to be wide open in order to allow all of the air blown by the engine to pass. With this style of valve, if a stove-tender should close off one stove before he gets the other connected to the furnace, which has happened many times, he is liable to wreck the engine by suddenly stopping it, filling the twyer-pipes and other connections with cinder, thus causing a long stoppage and involving considerable expense. The stoves are ordinarily changed every hour from gas to air and from air to gas in their respective turns, and if a stove-tender should make a mistake of the kind above referred to it would involve considerable trouble, expense, and loss of time and property.

It is the object of the present invention to provide an automatic relief-valve, so that in case the stove-tender should make a mistake of the nature referred to no damage will be done, as the valve will automatically fly open and air will pass to the furnace through the by-pass until the mistake is discovered. In connection with the relief-valve means are employed for enabling the stove-tender to adjust the valve for producing any desired degree of heat, and the operating mechanism is so arranged that no matter what the position of the valve may be said valve can readily fly open in case a mistake is made by the stove-tender in shutting off all of the stoves. When the valve flies open, the full area of the valve-opening is given, so that the engine may keep on at full speed just as though the air were passing through the stoves before entering the furnace.

With the above and other objects in view the invention consists in the novel construction, combination, and arrangement hereinafter fully described, illustrated, and claimed.

In the accompanying drawings, Figure 1 is a view in elevation of a blast-furnace, showing one of a series of stoves and an automatic relief-valve connected with a by-pass, together with the operating means for said valve. Fig. 2 is an enlarged detail vertical section through the by-pass, showing the relief-valve and connections. Fig. 3 is a cross-section taken on the line 3 3 of Fig. 2. Fig. 4 is a detail longitudinal section through the dash-pot. Fig. 5 is a detail sectional view of the valve as it appears when located in an elbow at the junction of the pipes.

Similar numerals of reference designate corresponding parts in all figures of the drawings.

Referring to the drawings, 1 designates a blast-furnace of the usual type now in common use, 2 the twyer-pipes, and 3 the hot-air-blast pipe communicating with the twyer-pipes.

4 represents one of the stoves for heating the air preparatory to its passage into the blast-furnace. The hot-air-blast pipe 3 communicates with the stove 4, as shown in Fig. 1, and also has in communication therewith a by-pass 5, one end of which connects with the hot-blast pipe 3 and the opposite end with the cold-blast pipe 6, which has a branch pipe 7 leading into the stove 4, as shown in Fig. 1.

At any suitable point in the by-pass 5 is

arranged the valve-casing 8 of the automatic relief-valve. Said casing contains the valve-seat 9, upon which the valve 10 normally rests. The valve 10 is provided with a stem 11, which passes through a stuffing-box 12 in the top of the casing and also through a guide 13, arranged beneath the valve and connected with the valve-seat. At its upper end the valve-stem has connected thereto one end of the link 14, the opposite end of which is connected to a valve-closing lever 15. This lever is fulcrumed at 16, intermediate its ends on a fulcrum-standard 17, extending upward from the top of the valve-casing 8. One end of said lever is provided with an opening 18 to receive an operating-cable connection 19, while the opposite end of the lever is provided with a weight 20, which serves to hold the valve against its seat.

Located between the fulcrum-standard 17 and the weight 20 of the lever is a dash-pot 21, comprising a cylinder 22, having a lug 23 at its lower end, which is pivotally connected to the top of the valve-casing, as shown at 24. Within the cylinder 22 is a reciprocatory piston-head 25, provided with a rod 26, passing through the outer end of the cylinder, where it is provided with a coupling-yoke 27, which is pivotally connected to the valve-closing lever at 28. The cylinder of the dash-pot is also provided at its opposite ends with petcocks 29, having small openings to allow the air to escape slowly from the cylinder 22 as the piston-head moves lengthwise thereof.

The construction last hereinabove described is resorted to in order to prevent the valve from knocking out the head of the valve-casing. The valve cannot travel any faster than the petcocks will allow the air to escape from the dash-pot, and it is therefore impossible for the valve to strike with great force against the head of the casing and fracture it. The importance of this feature will be understood when it is considered that valves for the purpose described are extremely heavy, often weighing considerably over a ton.

The relief-valve is also provided with a subsidiary by-pass 30, the ends of which communicate with the valve-casing 8 respectively at opposite sides of the valve, as shown in Figs. 1 and 3. Said subsidiary by-pass has arranged therein a check-valve 31 and also a gate-valve 32, as shown in Fig. 3, the gate-valve being shown as arranged above the check-valve. By this arrangement, when the large or main valve 10 is closed, the cold air passes through the subsidiary by-pass in order to keep the large valve from getting too hot from the hot blast coming back to the valve when closed. When the engine stops for any cause, the check-valve closes automatically to keep the gases from going into the cold-blast pipe. Otherwise there would be great danger of explosion and the destruction of the pipes.

The cable connection 19 extends around suitable guiding-sheaves 33 and is wound upon a drum 34, mounted in a suitable stand 35 and provided with an operating-crank 36, by turning which the cable 19 may be wound upon or unwound from the drum for opening the valve 10 to any desired extent.

The valve illustrated in Fig. 5 is the same in principle and construction as that shown in Fig. 2, but is adapted for location in an elbow or at the junction of two pipes forming the by-pass. Said last-named valve (indicated at 37) is connected with an operating-lever 38, having associated therewith a dash-pot 39, mounted on the top of the valve-casing, and said lever is adapted to be operated by a cable connection the same as that previously described as applied to the lever 15.

It will now be seen that it makes no difference what position the automatic relief-valve may be in, if the stove-tender should make a mistake and close off all the stoves the valve will fly open and relieve the engine, while the furnace will get all the air through the mixing-pipe until the stove-tender finds out his mistake.

The device not only obviates considerable annoyance and trouble, but saves considerable expense and loss due to the destruction of a part of the plant and the loss of time incident thereto.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An automatic relief-valve comprising a valve-casing, a valve-seat within the casing, a valve on said seat, a valve-stem, extending through the casing, a weighted lever connected with said stem outside of the casing, a fulcrum-standard for said lever mounted on the casing, a dash-pot mounted at the top of the casing and pivotally connected thereto and to the lever, and a by-pass communicating with said casing at opposite sides of the valve and provided with a check-valve.

2. An automatic relief-valve comprising a valve-casing, a valve therein, a valve-stem extending through the casing, a weighted lever connected to said stem outside of the casing, a fulcrum-standard for said lever mounted on the casing, a dash-pot connected with the lever and casing and provided at opposite ends with petcocks, and a by-pass communicating with said casing at opposite sides of the valve and provided with a check-valve.

3. An automatic relief-valve comprising a valve-casing, a valve within the casing, a valve-stem extending through the casing, a weighted lever connected to said stem outside of the casing, a fulcrum-standard for said lever mounted on the casing, a dash-pot mounted at the top of the casing and connected with the lever, and a by-pass communicating with said casing at opposite sides of the valve and itself provided with a check-valve.

4. An automatic relief-valve comprising a valve-casing, a valve therein, a valve-stem extending through the casing, a weighted lever connected to said stem outside of the casing, a fulcrum-standard for said lever mounted on the casing, a dash-pot connected to the top of the casing and also connected with said lever, a by-pass communicating with the casing at opposite sides of the valve, and a check-valve and a gate-valve mounted within the by-pass.

In testimony whereof I affix my signature in presence of two witnesses.

FELIX McCARTHY.

Witnesses:
EDGAR M. FRIDY,
HARRY F. HALLMAN.