Dec. 17, 1935. H. A. BYRNS 2,025,015

PYROMETER DEVICE

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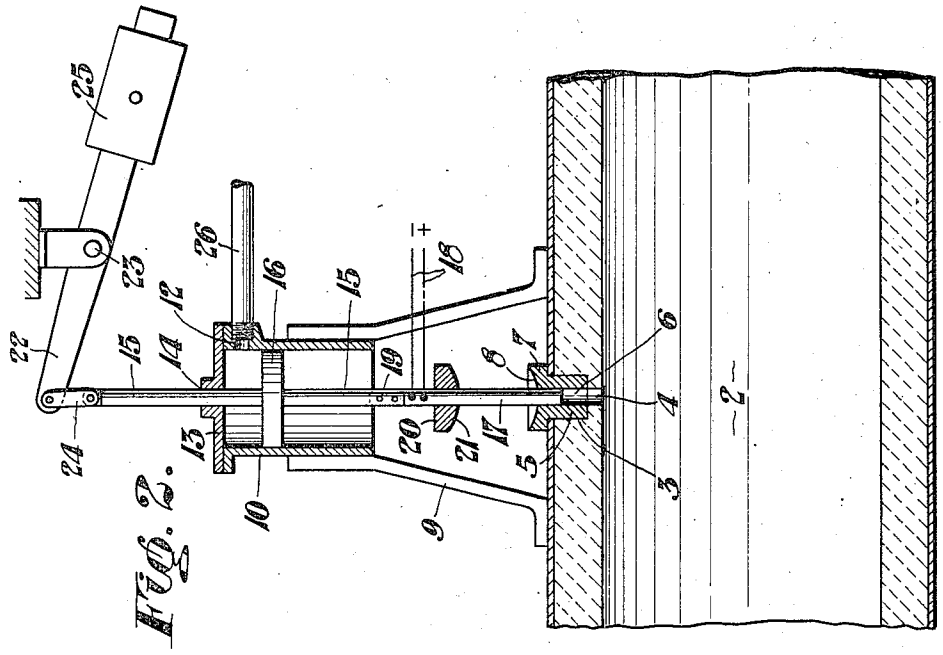


Fig. 2.

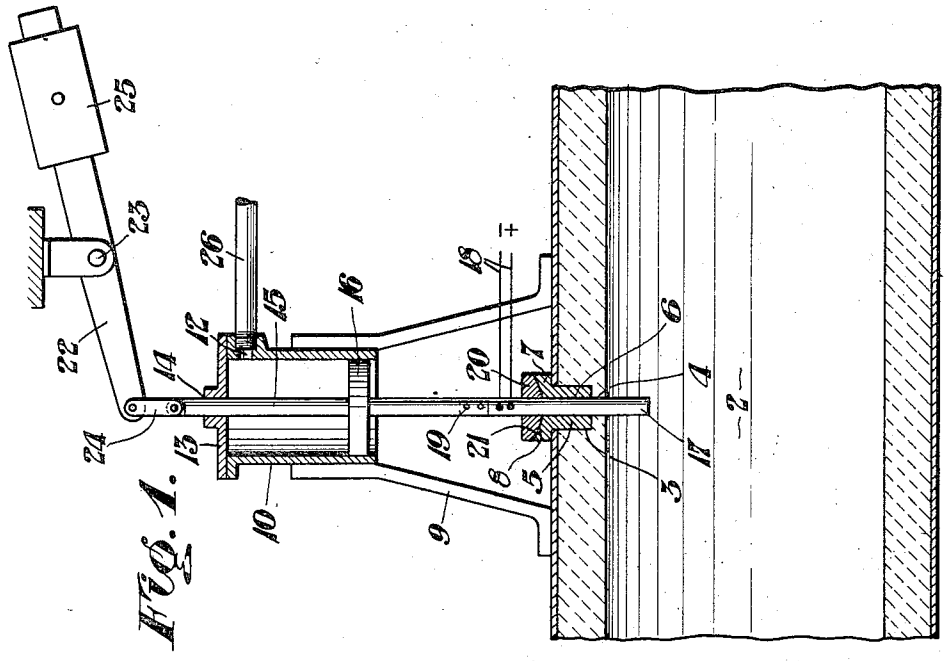


Fig. 1.

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PYROMETER DEVICE

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4 Claims. (Cl. 73—32)

This invention relates to a novel pyrometer device, and more particularly to such devices as are used on the air mains of blast furnaces, although not limited thereto.

In blast furnace practice, it becomes necessary, in stopping or "shutting down" for any period of time, to resort to an operation known as "drafting-back". This operation consists of reversing certain valves on certain of the air mains and hot-blast stoves that have previously conducted heated air at a high temperature into the furnace. Upon reversal, these valves operate in such manner that the main, and hot-blast stoves, serve during the "drafting-back" period to conduct the hot gas away from the inside of the furnace. The temperature of the gas being "drafted-back" is, of course, much higher than that of the air which was blown into the furnace before the reversal of the valves.

The conventional type of thermocouple ordinarily used to denote the temperature of the air entering the furnace will be destroyed if exposed for even a short period of time to the considerably higher temperature of the gas being "drafted back". Even if the thermocouple is only partially destroyed, instead of entirely so, it will give an incorrect reading, which might not be discovered for several hours, and during this period the control of the blast-furnace would be seriously impaired.

In order to prevent destruction of the thermocouple, whether partial or otherwise, it is customary to remove it from the air mains immediately prior to the "drafting-back" operation, and consequently replace it just prior to starting up. This may be done in one of a number of ways, all of which require mechanical manipulation. The mechanical expedients by which the thermocouples are installed or replaced in the air mains are often troublesome to handle, but however accomplished require the attention of an operator. Although such devices are decided improvements over permanently mounted thermocouples, they sometimes necessitate the presence of an operator in a more or less dangerous area, due to the extremely high temperature of the gases being "drafted back", which escape from the aperture at the time of the removal or replacement of the thermocouple.

It is one of the objects of the present invention to provide a novel pyrometer device for air mains, and particularly those associated with blast-furnaces, which will operate in such manner as to automatically remove the thermocouple upon a substantial drop in the temperature of the air immediately prior to the drafting-back operation.

Another object is to provide a device of the class described which may be easily and cheaply manufactured and installed on existing types of air mains, and one which at the same time is not easily susceptible to a breakdown.

These and other objects will be apparent after referring to the drawing, in which:

Figure 1 is a sectional elevation of the device of the invention, as used in connection with the air main of a conventional blast-furnace.

Figure 2 is a view similar to Figure 1 but disclosing the device in another stage of operation.

Referring more particularly to the drawing, the numeral 2 designates an air main, or bustle pipe, through which a hot blast of air is directed into the furnace. The air main is provided with a recess 3 extending partially toward the interior thereof. This recess 3 is in communication with the interior of the air main, or bustle pipe, 2 through an aperture 4 of substantially smaller diameter. A bushing 5 is disposed in the recess 3 and provided with an aperture 6 which is of substantially the same diameter as the aperture 4 in the main. The bushing 5 is provided on its portion which is remote from the interior of the gas main 2 with a shoulder 7, whose upper surface is concaved, as at 8.

A support 9 is connected to the outside of the air main 2 and carries a cylinder 10, the bore of which is disposed immediately over the aperture 6 in the bushing 5. This cylinder 10 is provided adjacent its upper end with an aperture 12, and a conventional cylinder head 13, which is centrally apertured, as at 14. A shaft 15 is disposed to extend through the cylinder 10 and the aperture 12 and its head 13 carries on its mid-portion a conventional piston 16.

A conventional thermocouple 17 is slidably disposed in the aperture 6 of the bushing 5, the aperture 4 communicating with the recess 3 in the pipe 2. The thermocouple is provided with the usual lead wires 18, which extend to a suitable junction. The end of the thermocouple 17 which is on the exterior of the air main is connected, as at 19, to the lower end of the shaft 15.

A plug 20 is secured to the thermocouple 17 adjacent its upper end and is provided on its lower surface with a convexity 21 which is adapted to seat in the concavity 8 in the shoulder 7 of the bushing 5.

A lever 22 is suitably pivoted, as at 23, immediately adjacent the air main, or bustle pipe, 2. One end of the lever 22 is pivotally connected,

by means of a link 24, to the upper end of the shaft 15 on which the piston 16 is mounted. The other end of the shaft 22 is provided with a suitable counterweight 25, which serves to normally bias the shaft 15 in such manner as to position the piston 16 adjacent the cylinder head 13. A suitable pipe 26 is connected to communicate with the aperture 12 in the cylinder 10 on one of its ends, and on the other of its ends to the same source of supply as the air main 2.

When the blast-furnace (not shown) is normally operating, the air main 2 will be directing heated air thereto, and the pressure will be substantially the same as in the pipe 26, resulting in the forcing of the piston 16 downwardly to position the thermocouple 17 in the main. If for any reason the blast-furnace is stopped or shut down, there will be a zero pressure in the gas main 2, and likewise a zero pressure in the pipe 26, thus permitting the counterweight 25 to rock the lever 22 in such manner as to raise the shaft 15 and the thermocouple 17.

With the thermocouple 17 withdrawn from the interior of the air main 2, the "drafting-back" of the highly heated gases may be accomplished without its being injured.

Upon the starting up of the blast-furnace, and the introduction of hot blast under pressure, the piston 16 will be forced downwardly to position the thermocouple 17 in its operative position. When in this position, the convexity 21 of the plug 20 acts as an effective seal with the concavity 8 in the shoulder 7 of the bushing 5 to prevent the escape of air.

While I have shown and described one specific embodiment of my invention, it will be understood that I do not wish to be limited exactly thereto, since various modifications may be made without departing from the scope of my invention, as defined by the following claims.

I claim:

1. A pyrometric device for air mains and the like, comprising a thermocouple constructed and arranged for insertion into and withdrawal from said air main, and automatically operating means for withdrawing said thermocouple upon a substantial drop in the pressure of the air.

2. A pyrometric device for air mains and the like comprising a thermocouple constructed and arranged for insertion into and withdrawal from said air main, automatically operating means for withdrawing said thermocouple upon a substantial drop in the pressure of the air, and means for returning said thermocouple upon an increase of said pressure to normal.

3. A pyrometric device for air mains and the like comprising a thermocouple constructed and arranged for insertion into and withdrawal from said air main, a support disposed on the outside of said main, a cylinder mounted on said support with its bore in substantial alinement with said thermocouple, a piston and piston-rod in said cylinder, a connection between one end of said piston-rod and said thermocouple, means for normally biasing said piston-rod to effect the withdrawal of said thermocouple from said air main, and means dependent upon the pressure of the air in said air mains to offset said biasing means and position said thermocouple therein.

4. A pyrometric device for air mains and the like comprising a thermocouple constructed and arranged for insertion into and withdrawal from said air main, a bushing between said air main and said thermocouple, a plug carried by said thermocouple for sealing the outer end of said bushing, a support disposed adjacent said bushing, a cylinder carried by said support, a piston and piston-rod carried in said cylinder, a connection between one end of said piston-rod and said thermocouple, a pipe connecting the interior of said cylinder with the source of supply of said air main, and means for normally biasing said piston-rod to effect the withdrawal of said thermocouple.

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