

S. B. SHUTTS & W. McHUGH.  
SAFETY DEVICE FOR BLAST FURNACES.  
APPLICATION FILED JULY 25, 1910.

1,013,961.

Patented Jan. 9, 1912.

2 SHEETS—SHEET 1.

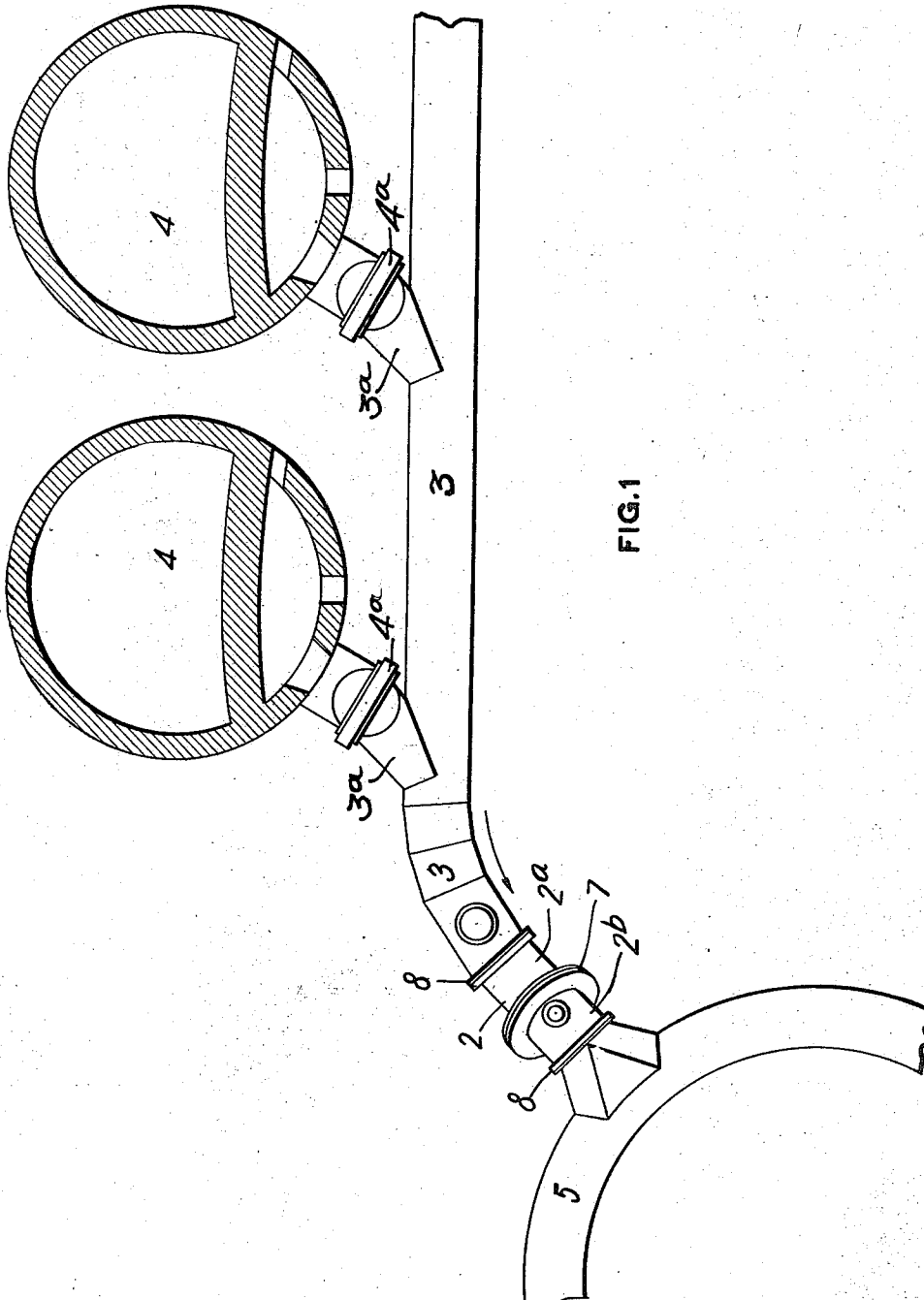


FIG. 1

WITNESSES

*Ed Little*  
*Chas. J. Ferman*

INVENTOR

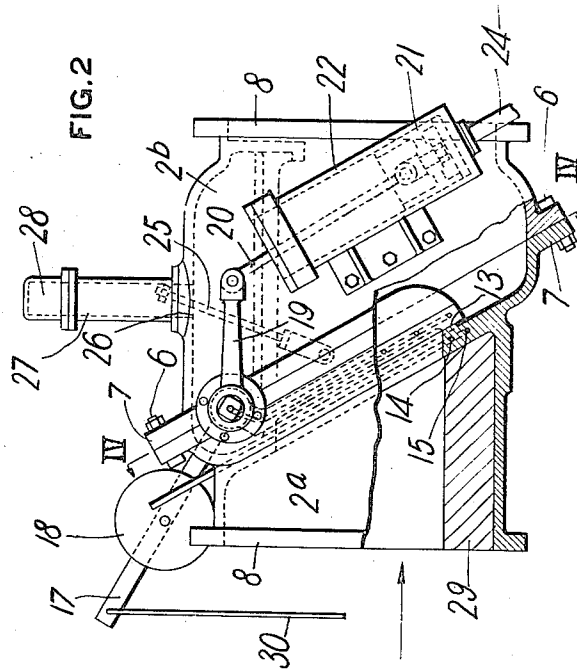
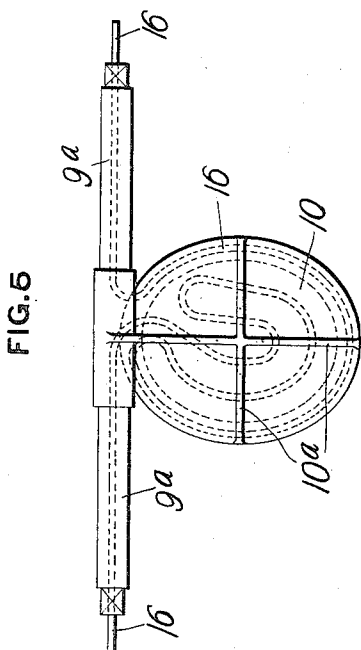
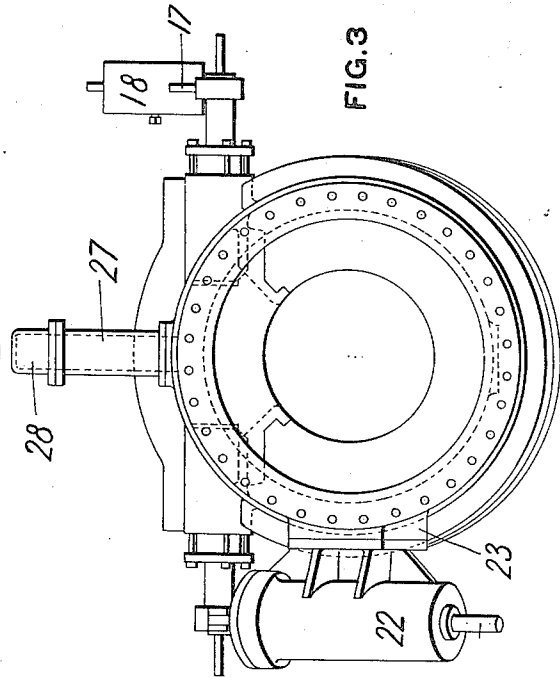
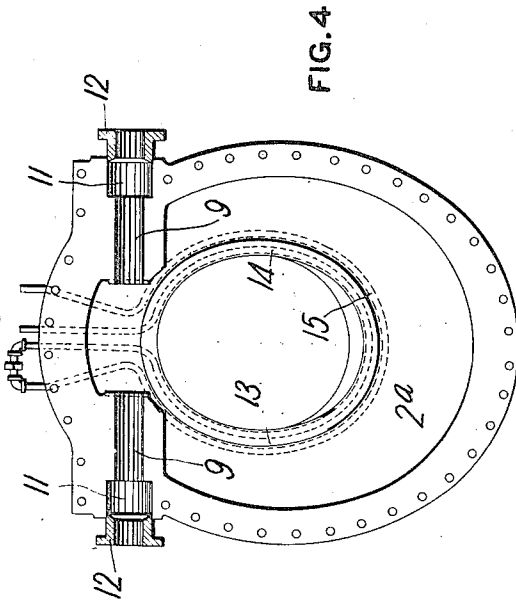
*S. B. Shutts*  
*W. McHugh*  
*by Kirtland, Beck & Fuller*  
*their Attorneys*

S. B. SHUTTS & W. McHUGH.  
SAFETY DEVICE FOR BLAST FURNACES.  
APPLICATION FILED JULY 25, 1910

1,013,961.

Patented Jan. 9, 1912.

2 SHEETS—SHEET 2.



WITNESSES

*R. D. Little*  
*Chas. J. Odeman*

INVENTOR

*S. B. Shutts*  
*W. McHugh*  
*by L. H. B. & F. J. Feller*  
*their Attorneys*

# UNITED STATES PATENT OFFICE.

SAMUEL B. SHUTTS AND WILLIAM McHUGH, OF JOLIET, ILLINOIS.

## SAFETY DEVICE FOR BLAST-FURNACES.

1,013,961.

Specification of Letters Patent.

Patented Jan. 9, 1912.

Application filed July 25, 1910. Serial No. 573,727.

*To all whom it may concern:*

Be it known that we, SAMUEL B. SHUTTS and WILLIAM McHUGH, both of Joliet, in the county of Will and State of Illinois, have invented a new and useful Improvement in Safety Devices for Blast-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

Our invention relates to safety devices for blast furnaces, and more particularly relates to safety devices used in preventing the occurrence of explosions within the blast conduits of such furnaces and consequent delays in the operation of the furnaces, and damage to the furnace equipment.

One object of our invention is to provide improved means for preventing back flow of gases from the furnace to the hot blast stoves and blast mains connecting the stoves with the furnace.

Another object of this invention is to provide a safety device having improved means for moving and maintaining the apparatus in its operative positions, and for counterbalancing and equalizing the force of the closing and opening movement of the valve forming part of our improved apparatus.

A further object of our invention is to provide a safety device having means for securing the flap valve in its raised or open position and having improved means for cooling the valve and valve seat forming part of the apparatus.

Figure 1 is a top plan of a hot blast main leading from the hot blast stoves to a blast furnace, showing the valve forming our improved safety device as located relative to the hot blast stoves and the bustle pipe of the blast furnace. Fig. 2 is a detail side elevation on a larger scale, partly in section, showing the construction of the valve portion of the safety device forming this invention. Fig. 3 is an end elevation of the valve shown in Fig. 2. Fig. 4 is a sectional end elevation on the line IV—IV of Fig. 2 showing the arrangement of the stuffing boxes and glands for the hollow water-cooled shaft of our improved valve, and showing the location and arrangement of the water cooled pipes in the valve seat of the valve. Fig. 5 is a detail plan of the flap valve forming

part of this invention showing the arrangement of the water cooled pipes in place in the valve.

In the drawings, 2 designates the valve casing or valve body which as shown is located in the hot-blast main 3 leading from the hot-blast stoves 4 to the bustle pipe 5 of the blast furnace. While the valve is shown located adjacent to the junction of the hot blast main with the bustle pipe, this location in the hot blast main may be changed as desired. The usual hot blast valves 4<sup>a</sup> are provided on each branch pipe 3<sup>a</sup> leading from the stoves 4 into the hot blast main 3 to shut off each stove from the hot blast main.

The valve casing 2 is divided transversely on an oblique angle to the longitudinal axis of the casing, into two parts, 2<sup>a</sup>, 2<sup>b</sup>, these parts being secured together by bolts 6 extending through the flanges 7. The opposite ends of the casing are also provided with flanges 8 by which the valve is secured in place in the hot blast main, as is shown in Fig. 1. Registering half bearings 9 are provided in the flanges 7 for the stems or shafts 9<sup>a</sup> of the valve 10, and a stuffing box 11 and gland 12 is also provided to prevent leakage through the bearings 9.

One part 2<sup>a</sup> of the valve casing is provided with a valve seat 13 in which pipes 14 and 15 are cast in place, water being circulated through these pipes to cool the valve seat when the valve is in use. As shown, these pipes are coupled together on one end, the opposite ends of the pipes being connected, one to a source of supply, and the other to a suitable water overflow outlet, by this arrangement the water being circulated first through one and then the other of the pipes 14 and 15. The valve 10 is also provided with a water pipe 16 cast in place, one of its ends extending through each of the valve stems or shafts 9<sup>a</sup> for the purpose of cooling the valve. The valve 10 is also strengthened by means of ribs 10<sup>a</sup>. A counter-weight lever 17 is provided on one end of one of the shafts 9<sup>a</sup> to counter-balance the flap valve 10, a counter-weight 18 being adjustably mounted on the lever 17 for that purpose. On the end of the opposite shaft 9<sup>a</sup> is a lever 19, the outer end of which is connected by the rod 20 to the piston 21 or

a cylinder 22 which is permanently secured in place on the bracket 23 on the side of the valve casing 2<sup>n</sup>. The cylinder 22 is connected by the pipe 24 with the furnace cold blast main or other source of fluid pressure supply so as to hold the valve 10 open and prevent its flapping in the casing by reason of fluctuations in the pressure of the hot blast. A rod or arm 25 is pivotally secured by one end to the valve 10, the other end of this rod extending outwardly through an opening 26 in the side of the valve casing 2. The opening 26 is provided with a hood or shield 27 having a removable cap 28 on its outer end, the purpose of this rod 25 and hood 27 being that of moving into and securing the valve 10 in its open position when found necessary or desirable, as in cases where the hot blast is shut off temporarily for any reason, or in case of damage to the parts of the valve. A refractory lining 29 is built within the casing 2 before the assembled valve has been placed in position in the hot blast main of the furnace.

A cable or other flexible connection 30 is attached to the end of the counter-weight arm 17 so that when the blast is taken off the furnace in making repairs or for other reasons, such as require or make it necessary to draw the gases from the furnace back into the hot blast main and into the stoves, by securing the cable to a suitable hook or other fastening, the valve is held in its open position so as to permit a free flow of gases from the furnace to the stoves through the hot blast main.

In the operation of our improved safety device, the valve is open and the hot blast is passing through the valve to the furnace in the direction indicated by the arrows. The fluid pressure supplied to the cylinder through the pipe will hold the valve in its open position so as to prevent flapping of the valve within the casing by reason of variations in the pressure in the hot blast main.

When for any reason the pressure of the hot blast is lessened or reduced, as, for example, during the casting operations of the furnace, the valve will gradually approach its seat and, when the blast is entirely shut off from the furnace, the valve will rest against its seat in a closed position, the closing movement being in the direction so that a backward rush of gases from the furnace through the hot blast main cannot pass the valve, in this way preventing the gases entering the stoves and cold blast main, and causing a possible explosion resulting in wrecking the blast mains or stoves. Should an accident occur, such as, for example, the breaking of a valve stem, the cap 28 is removed from the valve casing and the valve is then drawn backwardly and secured in its open position by means of the rod 25 so

as to not obstruct the blast and interfere with the operation of the furnace until a suitable time has arrived in the operation of the furnace permitting the making of repairs so as to again put the valve into working order.

The advantages of our invention will be apparent to those skilled in the art.

By the use of our improved safety device the occurrence of explosions in the blast mains and the stoves is prevented.

The improved construction of the valve facilitates its continued operation and greatly increases its life.

The apparatus is simple and is easily kept in repair.

Modifications in the construction and arrangement of the parts may be made without departing from our invention, within the scope of the claims.

We claim:—

1. In a safety device for blast furnaces the combination with the furnace hot blast main and hot blast valves to shut off the furnace stoves from the hot blast main, of a check valve in said main between the furnace and the stoves and arranged to close and prevent backward flow and escape of gases from the furnace.

2. In a safety device for blast furnaces the combination with the furnace hot blast main and hot blast valves to shut off the main from the furnace stoves, of a flap valve in said main between the furnace and stoves arranged to close and prevent escape of gases from the furnace, and means connected with said flap valve arranged to hold the valve in open position.

3. In a safety device for blast furnaces, the combination with the furnace stoves and the hot blast main connecting the furnace and furnace stoves of a water cooled check valve having a water cooled seat located and arranged in said hot blast main to prevent backward flow of gases from the furnace into the hot blast main.

4. In a safety device for blast furnaces, the combination with the furnace stoves, the hot blast main and stove valves on said main of a check valve on said hot blast main located and arranged to close and prevent passage of gases through the main from the furnace and a fluid pressure cylinder to open and hold the check valve in its open position when the blast is on the furnace.

5. In a safety device for blast furnaces, the combination with the furnace stoves, the hot blast main and stove valves on said main of a check valve on said hot blast main located and arranged to close and prevent passage of gases through the main from the furnace, a counterweight for the valve and a cylinder on the valve arranged to cushion and hold the valve in its open position.

6. In a safety device for blast furnaces,

the combination with the furnace stoves and  
a hot blast main having valved connections  
to said stoves and terminating in a bustle  
pipe surrounding the furnace, of a valve in  
5 said hot blast main between the bustle pipe  
and stove valves arranged to close and pre-  
vent backward flow of gases from the fur-  
nace into the hot blast main.

In testimony whereof, we have hereunto  
set our hands.

SAMUEL B. SHUTTS.  
WILLIAM McHUGH.

Witnesses:

IRVING SHUTTS,  
PETER SHUTTS.

Co