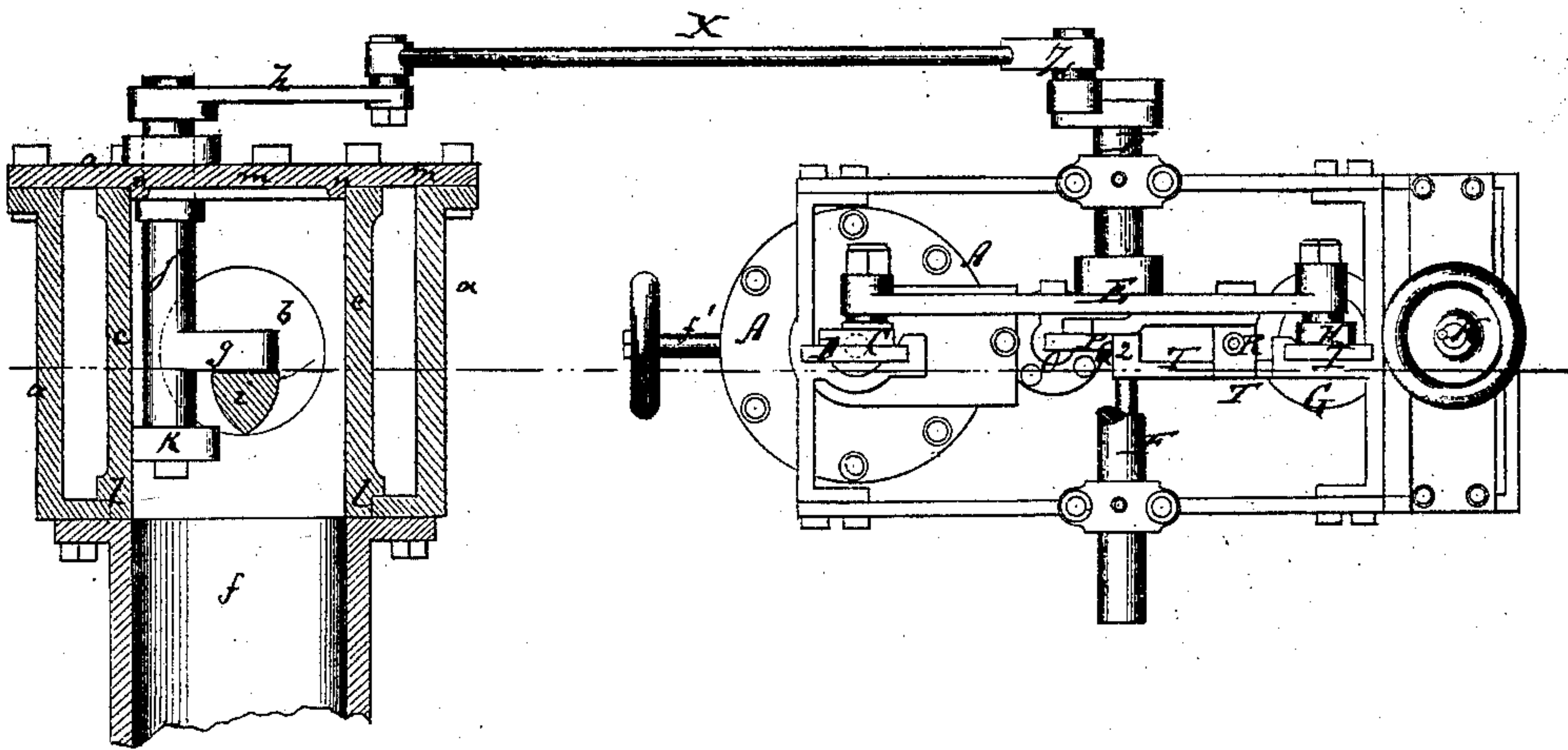
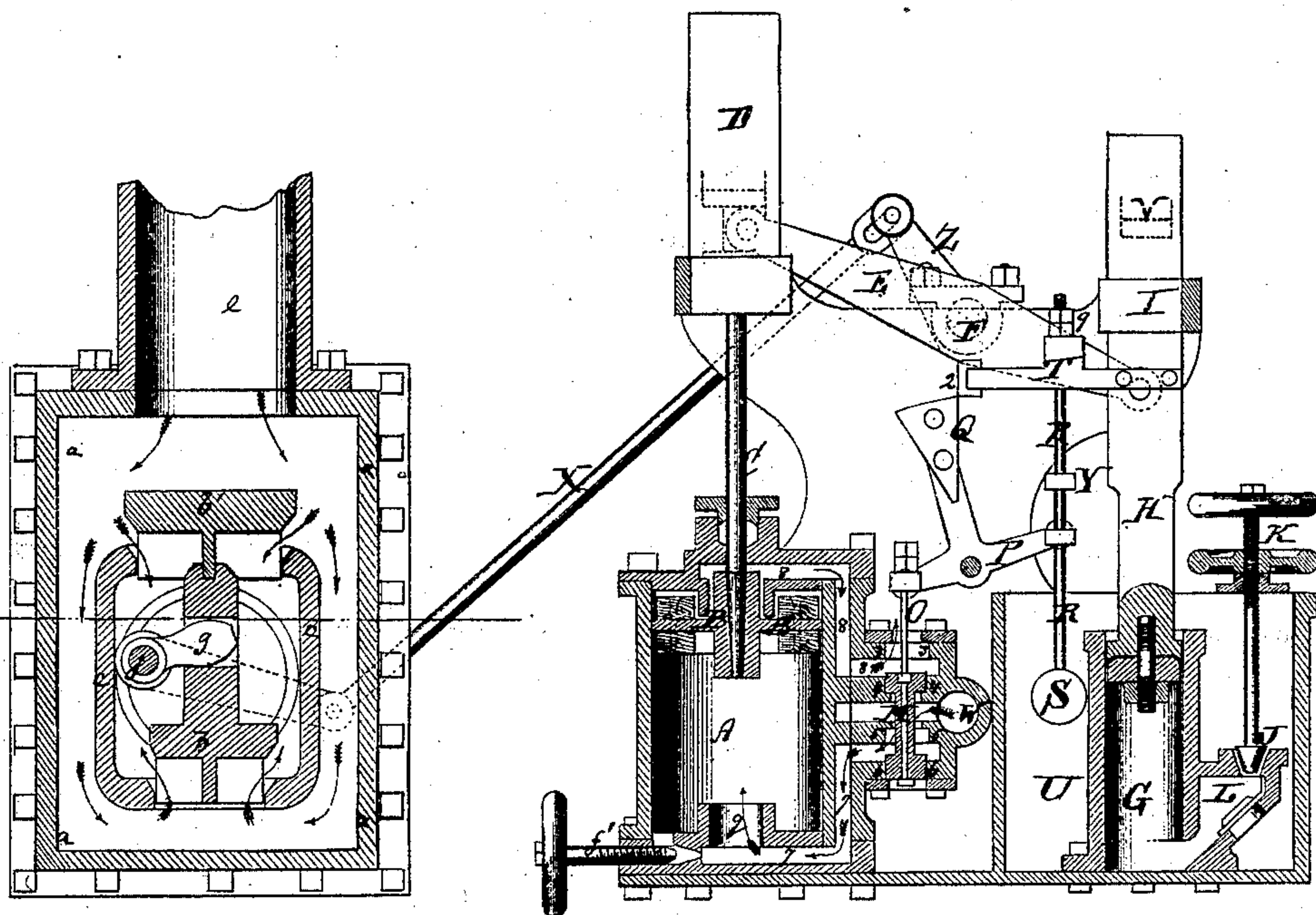


H. Davis,

Blast Furnace.

No. 113745.

Patented Apr. 18. 1871.



Witnesses:

Gustave Dietrich  
L. S. Mabee

Inventor:

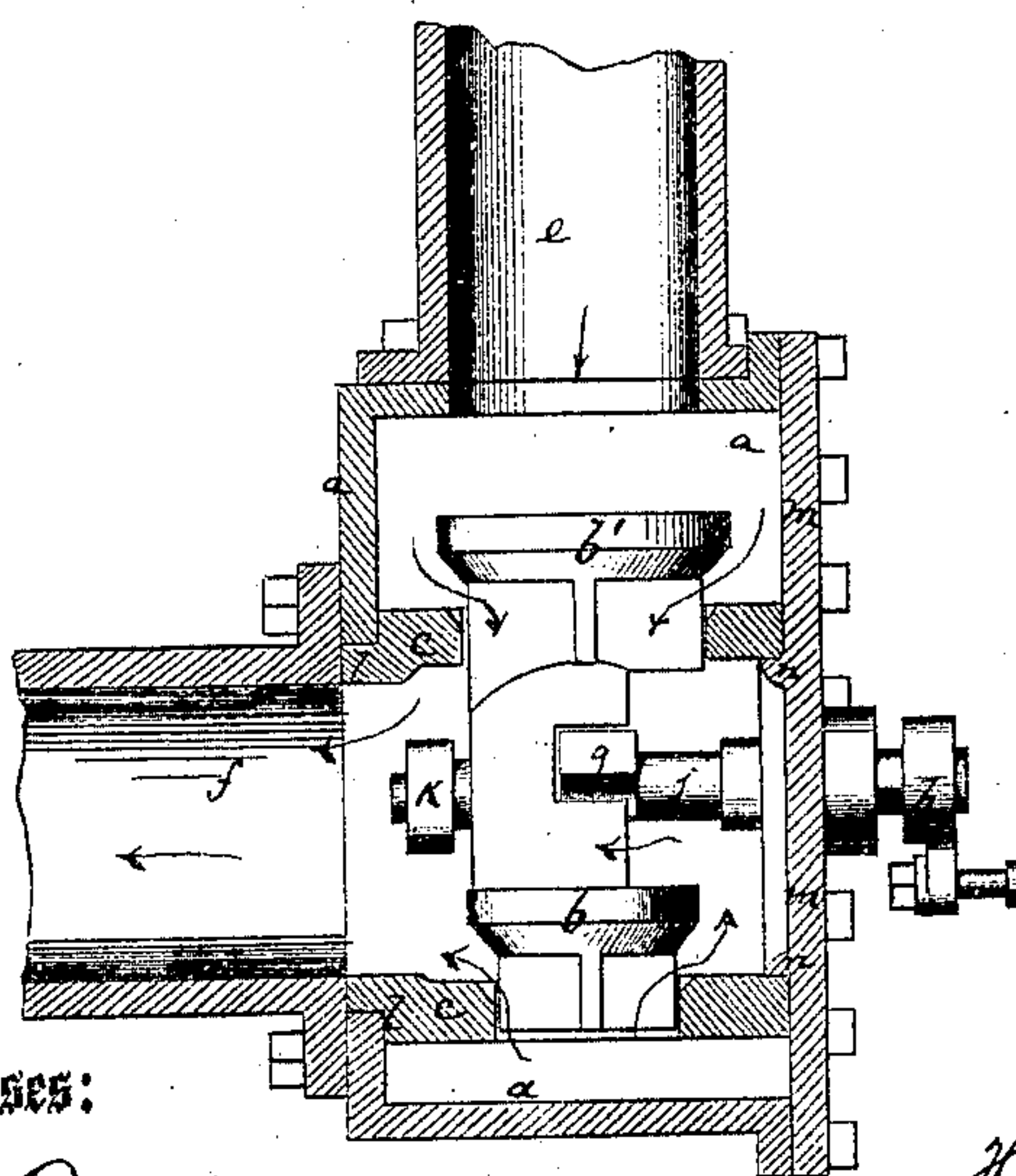
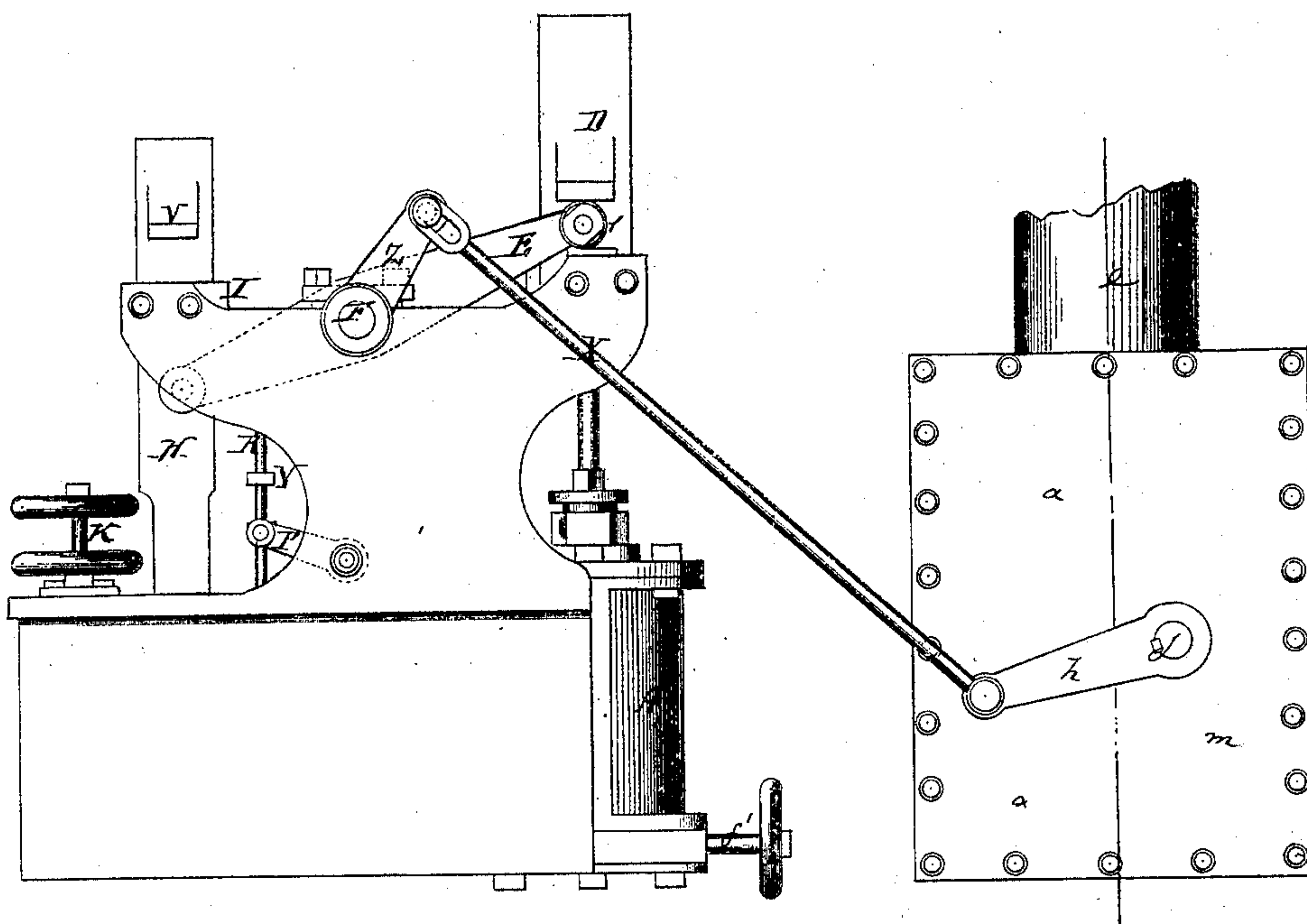
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*2. Sheets, Sheet 2.*

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# UNITED STATES PATENT OFFICE.

HENRY DAVIES, OF NEWPORT, KENTUCKY.

## IMPROVEMENT IN CUT-OFFS FOR BLAST-FURNACES.

Specification forming part of Letters Patent No. 113,745, dated April 18, 1871.

*To all whom it may concern:*

Be it known that I, HENRY DAVIES, of Newport, in the county of Campbell and State of Kentucky, have invented a new and Improved Cut-Off for Blast-Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical longitudinal section of my invention. Fig. 2 is a plan view and partial horizontal section of the same. Fig. 3 is a side elevation of the same, and Fig. 4 a transverse section of the cut-off valve.

Similar letters of reference indicate corresponding parts.

This invention relates to a new mechanism for cutting off the blast for the purpose of letting down the stock in blast-furnaces; and it consists in a new arrangement of valves and an entirely original combination of machinery for regulating the motion of said valves, as hereinafter more fully described.

*a* is a valve-chamber; *b*, a double-beat valve; *c*, a double-valve seat; *e*, the pipe conveying the blast to the valve, and *f* the pipe conveying the blast to the tuyere of the furnace. *g* is the crank or lever for lifting and *h* the crank or lever for operating the same, both said cranks projecting from a shaft, *j*.

When the blast is driven into the valve-chamber *a*, it will enter the valve-box *c* at both bottom and top, as shown by the arrows in Fig. 1, and escape at *f* to the tuyere.

The lower valve, *b*, is a little smaller than the upper valve, *b'*, to allow its insertion in the valve-box; but both are cast in one piece, as shown in Fig. 4, a notch being cut in the connection for admitting the lever *g*.

The spindle *j* is cast in one piece with the lever *g*, and has a collar on the inner side of the valve-chamber, which is held against the face of the chamber by the pressure of the blast to prevent leakage.

When it is necessary to cut off the blast, I depress the lever *h* until the valve-faces come down upon their seats. The blast is then cut off from the pipe *f*, and will make its escape through a loaded valve fixed upon the blast-pipe at any convenient place, which, when a

hot blast is used, should always be between the blowing-machine and the heater.

The bracket *k* for supporting one end of the spindle *j*, is cast to the valve-box *c*. The chamber *a* has one removable face-plate, *m*, which is secured by bolts. The box *c* is inserted, and can be removed when this door or face-plate is off. A flange, *l*, on *c* keeps it in place against the pipe *f*, while a flange, *n*, on *m* holds the other end of the box. In this manner the valve, with its box *c* and spindle *j*, can be taken out for repairs when necessary without disturbing the connection-pipes.

The machine to be driven by the pressure of air from the blast is composed of a blast-cylinder, *A*, with its piston *B*, rod *C*, guide *D*, lever-beam *E*, shaft *F*, pump *G*, with its plunger *H*, guide *I*, escape-plug *J*, regulating-screw *K*, and inlet-valve *L*.

*M* is a spool-valve in the valve-chest *N*, and has by means of its projecting heads four faces, which fit against four corresponding seats, 3, 4, 5, and 6, in the valve-chest, but only against two at once. The valve *M* is in fact a double-beat valve, both in its raised and lowered position, and is operated by the rod *O*, lever *P*, rod *R*, weight *S*, and arm *T*.

The cistern *U* is to supply the pump *G* with water.

The lever-beam *E* is connected to the piston-rod *C* by means of a sliding block upon a wrist-pin in the lever fitting between two projections upon the guide *D*, as in Fig. 2. The pump end of the lever carries a small roller fitted also upon a wrist-pin. The roller serves to raise the plunger *H* by catching under a projection, *V*, thereon, the lever being free to move in the opposite direction, leaving the plunger up, as shown in the drawings. It will also be seen that the lever *P* has a projecting piece, *Q*, and the arm *T* has also a projection, 2.

When the machine is in the position shown in Fig. 1, the air from the blowing-machine will enter the valve-chest *N* at *W*, following the direction of the arrows into the bottom of the cylinder *A*. The top of the piston *B* is open to the atmosphere by the channel 7. The plunger *H* has just been raised, and is resting on the water in the pump *G*, said water having been taken in through the valve *L*. When the valve *J* is slightly raised, the plunger *H* will descend slowly by its own weight, together



with the arm T and rod R, pressing the water out of the pump G through the opening at J until the collar Y upon the rod R strikes the lever P. The motion of the rod R will then be stopped, while that of H continues, so that the arm T will slide loose on R, the lever P being kept from moving by the projection 2, which at this stage is in front of Q. As soon as the plunger H reaches the bottom of the pump, the arm T will have been so far lowered that the projection 2 will be below Q. The weight S is then liberated, and will immediately swing the lever P and raise the valve M against the upper faces, 3 and 5. This motion of the lever P will also carry Q over 2, when the valve M will be raised. The air-pressure is, by the change of valve M, brought on top of the piston B, while the lower air-channel, 8, is opened to the atmosphere. The piston B will now move down and will elevate the plunger H and its arm T until the latter comes in contact with the lock-nut *g* on the rod R. Then said rod, together with its collar Y and weight S, will be raised again until they are at their full height, when the piece Q will be liberated from 2, and the valve M fall by its own weight, and the pressure is again under the piston B, which will be raised, leaving the plunger H again resting on the water, as before.

It will be seen that the heads of the cylinder A have hollow inward projections, and that the piston B has its central portion project on both sides, so that it will fit easily into the openings in top and bottom of cylinder. The channels 7 and 8 lead into these openings. The bottom of the cylinder B has a small aperture, *o*, leading into the channel 7. The aperture *o* may be stopped in part or altogether by means of a screw-plug, *f'*. When the piston descends, its lower central projection enters the hollow projection *g* and closes the port 7, separating that part of the same which has the opening *o* from the channel, and forming a cushion of air in the lower part of the cylinder, which will retard the final descent of the piston, keeping the projection 2 against Q. The machine is thereby nearly stationary, until the piston has forced the air-cushion out through the opening *o* into the channel 7. The air-cushion on the upper end of cylinder is simply to prevent the piston from striking the top.

The automatic machine is connected to the cut-off by the crank Z, rod X, and crank *h*. While the plunger H is going quietly down, the cut-off valve is open; but as soon as the plunger is down, the machine instantly closes, the cut-off pausing a little while the cushion

gets away through *o*, as before described, and then reopens the valve. In this way the cut-off can be set by the screw-plug J, so as to work at suitable intervals. It will also be seen that this cut-off can be put in the hot-blast pipe close to the furnace, where it will be very effective and quick, as there will be but a small amount of air between it and the tuyere, and the pressure being kept up between the pipes and the hot-blast, the blast will be at the tuyere again before the cinders can come back into the blow-pipe.

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

1. The double-beat valve *b*, arranged within the case *c*, and actuated by the crank *g*, to operate substantially as herein shown and described.

2. The pump-plunger H, provided with the projection V, so that it will be elevated by the beam E, but descend only by its own weight, substantially as specified.

3. The pump G, provided with the adjustable valve J, by which the discharge of water is regulated for allowing the descent of the plunger, as set forth.

4. The arm T, arranged on the pump-plunger, and provided with the projection 2 and loose rod R, to operate, by means of the attachments, substantially as herein shown and described.

5. The valve-lever P, balanced at one side by the weighted rod R, and at the other by the valve M, and provided with the projection Q, to operate substantially as herein shown and described.

6. The quadruple valve M, provided with double heads, to close on two pairs of seats and regulate the flow of air to both ends of the cylinder A, substantially as herein shown and described.

7. The lever P and projection Q, combined with arm T and projection 2, to operate substantially as herein shown and described.

8. The cylinder A, provided with an aperture, *o*, in its bottom, leading to the air-channel 7, substantially as described, for the purpose of constituting an air-cushion which will retard the operation, as specified.

9. The combination of the air-cylinder A and piston B with the valve M, pump G, and plunger H, all arranged to operate substantially as herein shown and described.

HENRY DAVIES.

Witnesses:

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ALBERT T. ROOT,  
JAMES C. ROOT.