No. 799,101. PATENTED SEPT. 12, 1905.

J. J. R. SMYTHE.

ORE FEEDING MECHANISM OF PNEUMATIC STAMP MILLS.

APPLICATION FILED MAY 31, 1904.

3 SHEETS—SHEET 1.

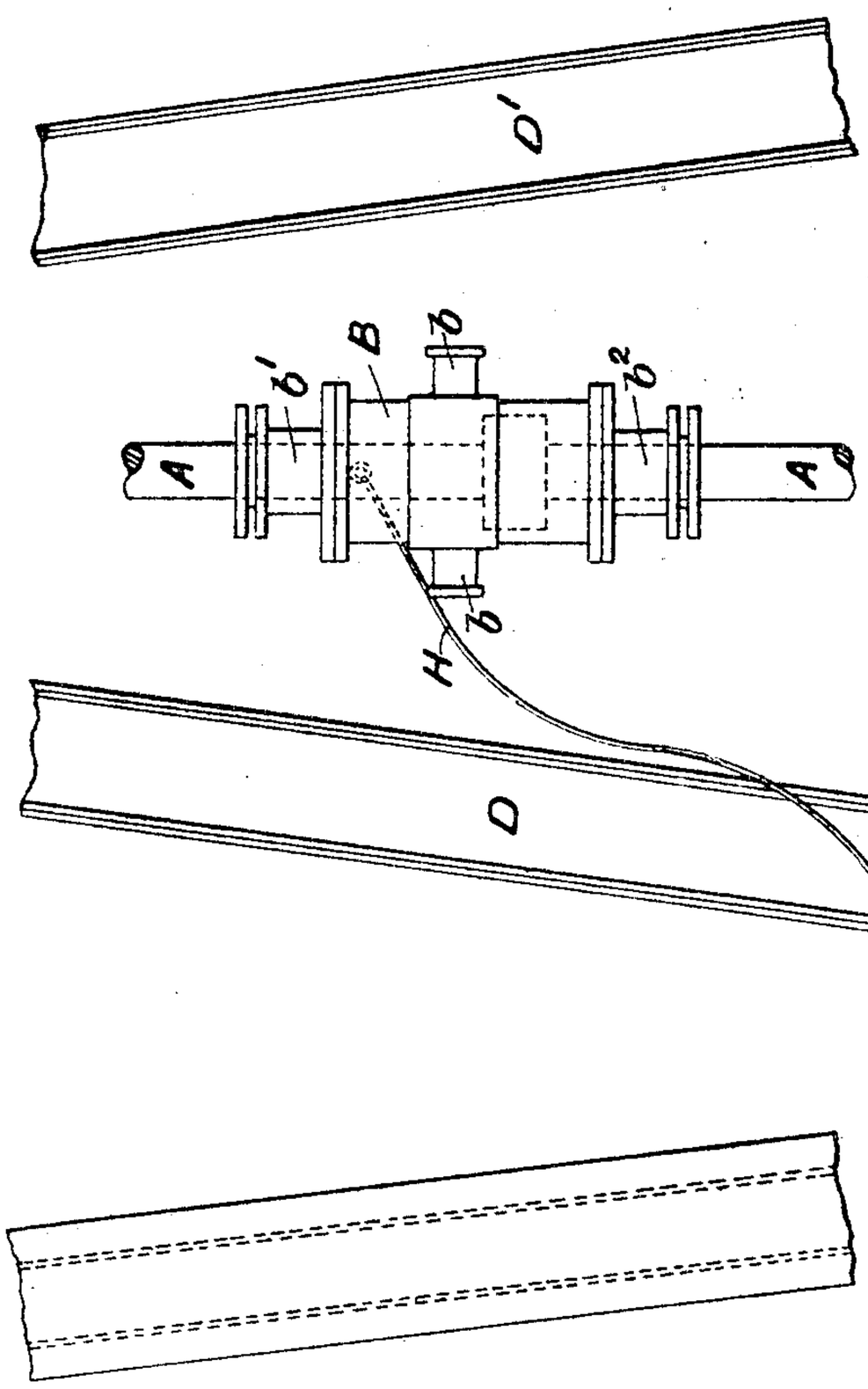

Fig. 2.

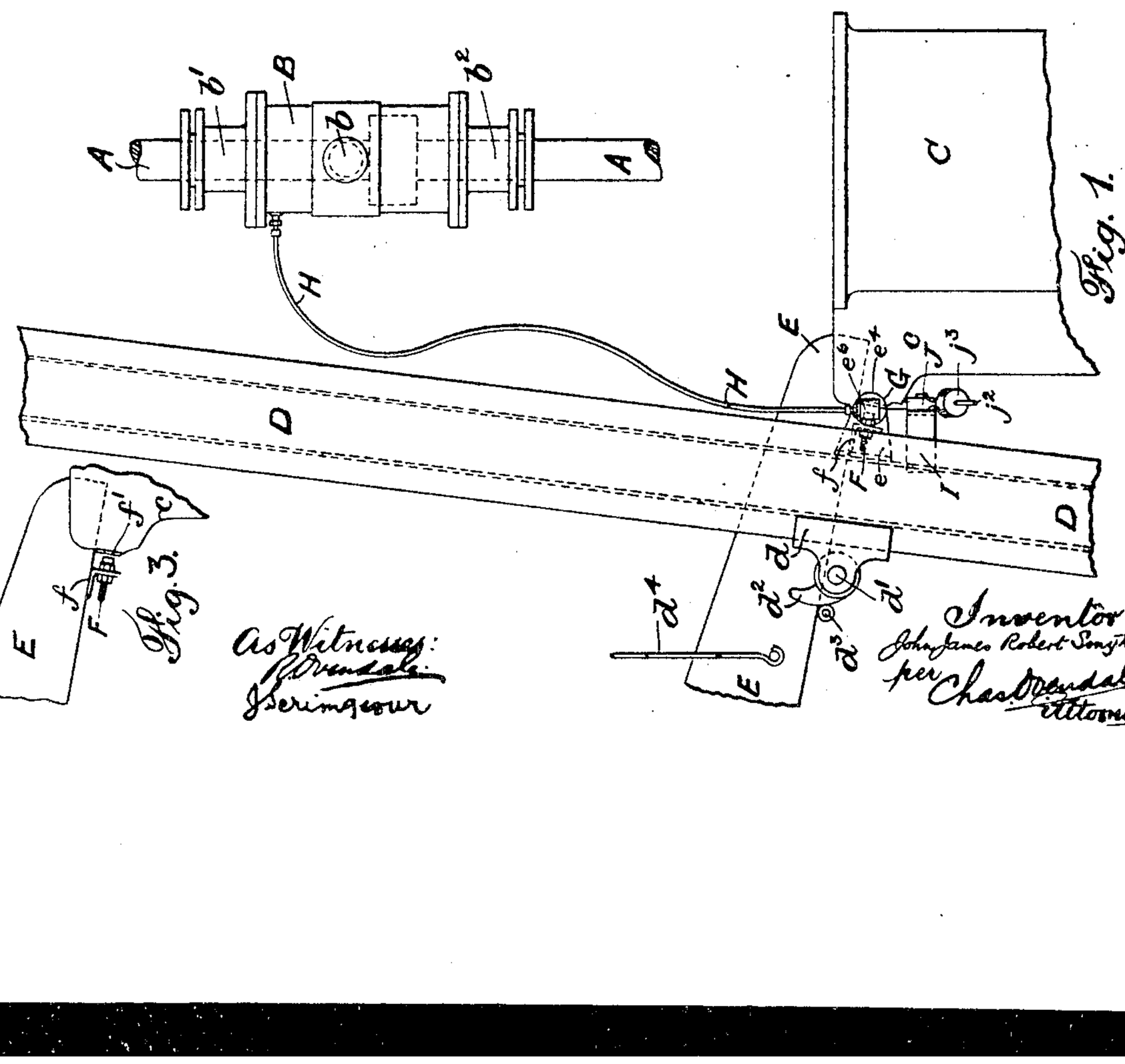

Fig. 1.

Fig. 3.

As Witnesses:
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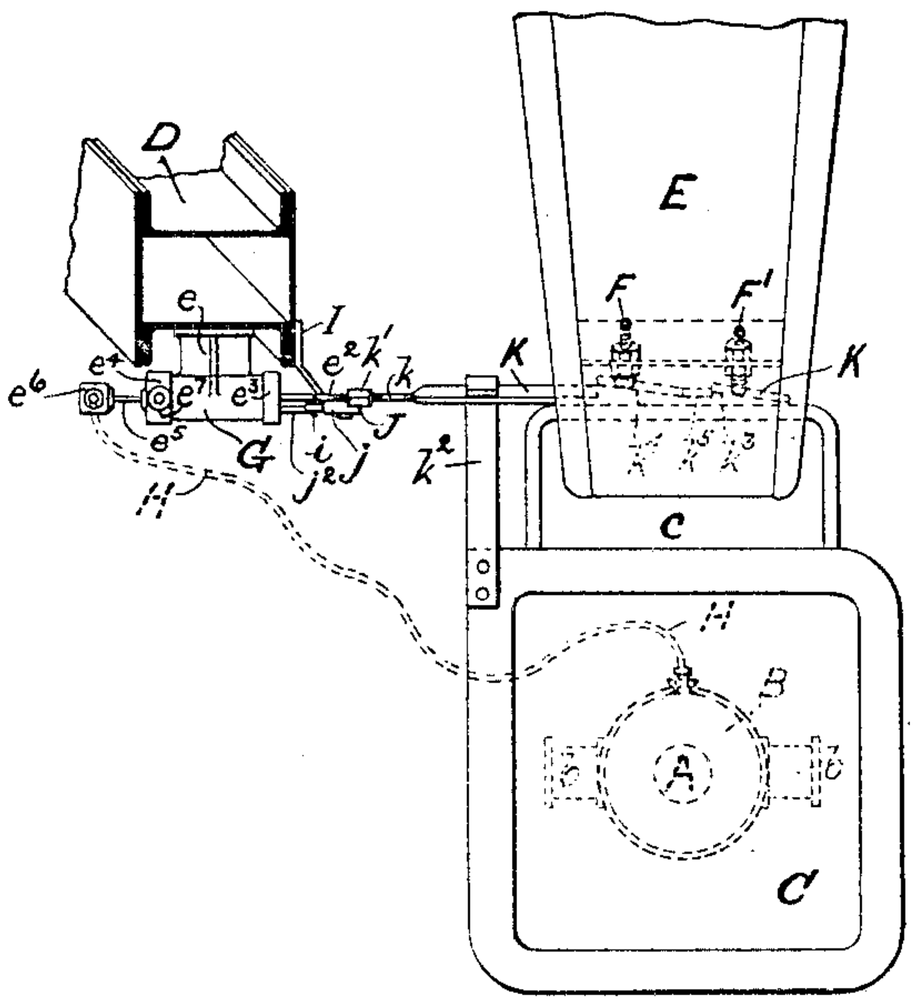
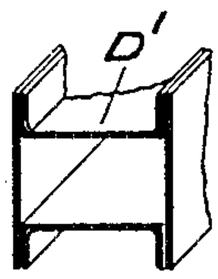


Fig. 4.



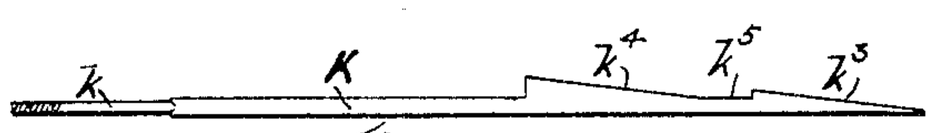


Fig. 5.

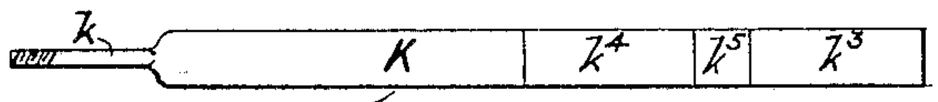


Fig. 6.

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ANDREW B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

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3 SHEETS—SHEET 3.

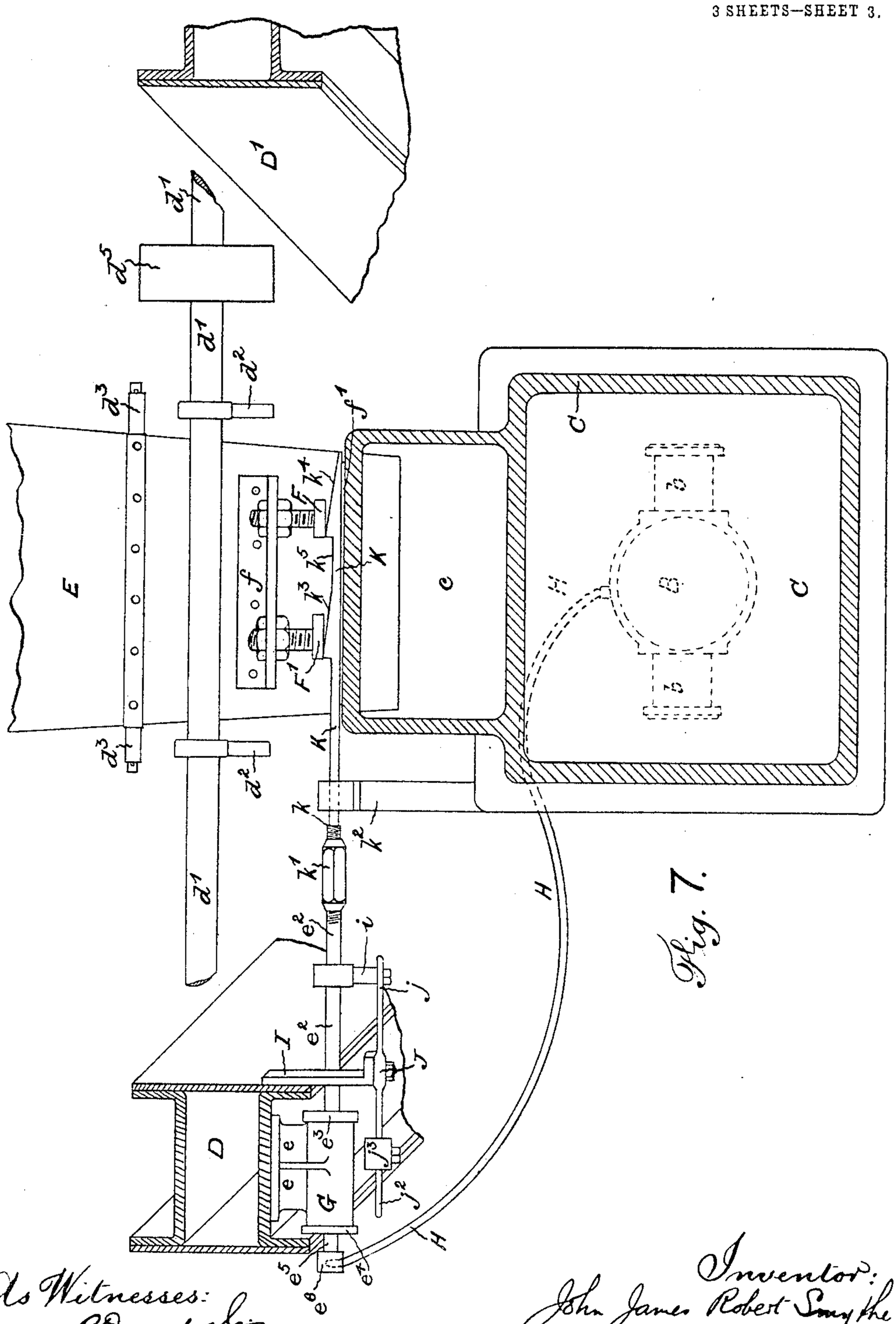

Fig. 7.

As Witnesses:
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J. Scrimgeour.

Inventor:
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his Attorney

ANDREW B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN JAMES ROBERT SMYTHE, OF JOHANNESBURG, TRANSVAAL.

ORE-FEEDING MECHANISM OF PNEUMATIC STAMP-MILLS.

No. 799,101. Specification of Letters Patent. Patented Sept. 12, 1905.

Application filed May 31, 1904. Serial No. 210,529.

To all whom it may concern:

Be it known that I, JOHN JAMES ROBERT SMYTHE, a subject of the King of England, residing at Johannesburg, Transvaal, have invented certain new and useful Improvements in Ore-Feeding Mechanism of Pneumatic Stamp-Mills, (for which I have made application for patent in the Transvaal, No. 155, filed April 13, 1904,) of which the following is a specification.

This invention relates to the ore-feeding mechanism of pneumatic stamp-mills, and is designed to provide means for automatically controlling or regulating the feed.

The mechanism now employed for feeding pneumatic stamp-mills is unsatisfactory in operation chiefly for the reason that the stamps are frequently overfed—that is to say, too much ore is passed into the mortar-box—which impairs the efficiency or crushing power of the stamps.

Now the present invention has for its object to obviate these defects by providing means for automatically regulating the feed or by insuring that only so much of the ore will be introduced into the mortar-box as can be satisfactorily dealt with, and thereby to increase the efficiency of the apparatus.

In the working of pneumatic stamps a cushion is formed between the piston on the stamp-stem and the reciprocating cylinder in which said piston works. When the stamp is not permitted to perform its normal stroke, which results when an excess of ore or pulp accumulates between the shoe and die, the cushion or air contained within the reciprocating cylinder at the top is placed under greatly-increased pressure. In accordance with the present invention I utilize this increased pressure or excess of cushion formed in the top of the pneumatic cylinder to operate a device which controls the travel or movement of the feed-chute. The controlling device comprises an air-cylinder and piston placed in communication with the top of the pneumatic cylinder, said piston operating a wedge or wedge-shaped piece interposed between the buffer or buffers and buffer-plate to restrict the movement of the feed-chute and a weighted lever, spring, or like contrivance which operates to return the parts to their normal positions when the increase of pressure is relieved and the stem is permitted to perform its normal stroke.

The invention will now be fully described by aid of the accompanying drawings, wherein sufficient of a stamp-mill is shown to clearly illustrate the application thereto of my invention.

Figure 1 is a side elevation showing the invention and those parts of the apparatus in conjunction with which it operates. Fig. 2 is a front elevation of the same. Fig. 3 shows the feed-chute and throat or feed-slot of the mortar-box and the buffer and buffer-plate with the wedge K removed. Fig. 4 is a sectional plan of the general arrangement, showing the reciprocating cylinder B and its connection with the cylinder G in dotted lines. Figs. 5 and 6 are plan and rear elevation, respectively, of the wedge drawn to an enlarged scale. Fig. 7 is a sectional view taken through the mortar-box and showing the mechanism from the under side.

In the drawings, A designates the stamp-stem, and B the reciprocating cylinder surrounding the piston formed or fitted on the stamp-stem.

b designates the trunnions which form the connection with the connecting-rods to the crank-shaft, and b' b^2 are the stuffing-boxes, fitted to each extremity of the cylinder B, through which the stamp-stem A works.

C is the mortar-box, and *c* the throat or feed-slot down which the ore falls into the box.

D D′ are two of the main members of the frame of the machine.

d is the bracket fixed on the member D of the frame, forming a bearing for the extremity of the shaft or spindle d', on which spindle are fixed the wipers or cams d^2 and the pulley d^5 for driving the spindle d'.

E represents the feed-chute or inclined plane down which the ore falls into the feed-slot *c* of the mortar-box C.

d^3 is the friction-roller, fixed to the bottom of the feed-chute E, which is engaged by the cam or wiper d^2 to move the feed-chute E in a rearward direction. The feed-chute E is hung by the hangers d^4.

F F′ are the buffers, fixed by means of the angle-iron *f* to the bottom or under side of the feed-chute E, and f'' is the buffer-plate, fixed to the top of the mortar-box C at the back, which the buffers F F′ strike when the feed-chute E swings forward after being disengaged by the cams d^2. Each impact of the buffers F causes a quantity of the ore to slide down the inclined plane or feed-chute E and fall into the mortar-box.

The several parts above described do not

in themselves embody any feature of the present invention.

The cylinder G, which is employed for operating the mechainsm, is made of suitable dimensions and is preferably fixed to one of the main members of the frame of the machine at or about the level of the buffer-plate f' or the top of the throat or feed-slot c of the mortar-box C. In the drawings the cylinder G is shown constructed in one piece with a fixing e, by means of which it may be bolted or otherwise conveniently attached to the member D of the frame. In the cylinder G is fitted a piston e', adapted to reciprocate inside said cylinder. The piston-rod e^2 works through a cover e^3 on one end of the cylinder G. The other end of the cylinder G is fitted with a cover e^4, and in this cover e^4 is fixed a pipe e^5, which communicates with the interior of the cylinder G. On the outer extremity of the pipe e^5 is fitted a non-return valve e^6. The non-return valve e^6 is placed in communication with the top of the pneumatic cylinder B by means of a flexible pipe H. The flexible pipe H is sufficiently long to allow for the movement of the cylinder B. The valve e^6 allows the air from the top of the cylinder B when the pressure rises beyond a certain point to pass into the cylinder G, but not to return. The valve e^6 may be loaded by a spring or otherwise, so that the air will only pass into the cylinder G when it exceeds a certain pressure. On that end of the cylinder G in which the pipe e^5 is fitted is arranged a relief-valve e^7, controlled by means of a spring or otherwise.

To the member D of the frame is attached a bracket I, which supports a bell-crank lever J. The arm j of the bell-crank lever is formed with a slot j', which engages a pin or projection i, formed on the outer extremity of the piston-rod e^2. The other arm j^2 of the bell-crank lever J is fitted with an adjustable weight j^3.

Arranged parallel with the buffer-plate f' at the back of the mortar-box C is a wedge or wedge-shaped piece K. One end of the wedge is attached to the outer end of the piston-rod e^2. The outer extremity k of the wedge K, as shown, is formed with a screw-thread and the outer extremity of the piston-rod e^2 with an opposite thread, and the ends are connected by means of the screw-coupling k'. This construction permits of any desired adjustment of the wedge being readily effected. The wedge K is guided and supported in position at the back of the mortar-box or next the buffer-plate f'' by means of the bracket or guide k^2, which may be fixed on the top of the mortar-box, as shown, or in any other convenient position. The wedge K projects forward between the buffers F F′ and the buffer-plate f''. In Fig. 2 the wedge is shown in its inoperative position and in Fig. 4 in the operative position.

In the construction illustrated the feed-chute is shown fitted with two buffers F F′, and the wedge (shown in detail in Figs. 5 and 6) is constructed to operate in conjunction with both buffers. The wedge K is constructed with two inclines k^3 k^4 and with a short parallel strip k^5 between the inclines. When in the inoperative position, one of the buffers F F′ strikes on the parallel part k^5 of the wedge and the other buffer strikes directly on the buffer-plate f'. To insure that both buffers shall strike or operate simultaneously when the feed-chute swings forward, the buffer F is set back a distance equal to the thickness of the wedge K at the parallel part k^5. In the event of the feed-chute being provided with one buffer only the wedge K need only be constructed with one incline.

The operation of the mechanism is as follows: The shaft d' is rotated through the medium of the driving-pulley d^5, and the cams or wipers d^2, being fixed to said shaft, as they rotate engage the friction-rollers d^3, fixed to the bottom of the feed-chute E, and move the chute E in a rearward direction on the hangers d^4. When the cams d^2 disengage said rollers d^3, the chute E then swings forward on the hangers d^4, and at the end of its forward stroke the buffers f f' strike simultaneously, the one on the buffer-plate f', fixed to the back of the mortar-box C, and the other on the parallel strip k^5 between the two inclined planes k^3 k^4 on the wedge K. The impact of the buffers causes a quantity of the ore to slide down the inclined feed-chute E and to fall over the bottom edge of the latter into the feed-slot c of the mortar-box C. When the stem A is not permitted to perform its normal downward stroke for the reason previously explained and the cylinder B is reciprocated, the pressure of the air bottled up in the top of the cylinder B is considerably higher than the maximum normal pressure. When this increased pressure is attained, the air passing along the pipe H through the non-return valve e^6 into the cylinder G momentarily closes the relief-valve e^7 and forces the piston e' forward on its outward stroke. This movement of the piston e' forces the wedge K forward between the buffers F F′ and buffer-plate f'' and by restricting the oscillating movement of the feed-chute E in a forward direction causes the buffers F F′ to strike against the inclined surfaces k^3 k^4 of the wedge K with less force, and so regulates the quantity of ore shaken off the feed-chute E into the feed-slot c of the mortar-box C. The weighted bell-crank lever J is adjusted so as to prevent the piston e' being moved forward by the maximum pressure reached on the normal stroke of the stem A. As previously explained, when the air at the increase pressure enters the cylinder G it momentarily closes the relief-valve e^7 and operates the

piston e'. The successive reciprocations of the cylinder B being so rapid, this pressure is practically maintained so long as the stem is not permitted to perform its normal stroke—that is to say, the relief-valve e^7 does not come sufficiently into operation to appreciably lower the pressure inside the cylinder G. The parts remain in their operative positions until the stem A has practically resumed its normal stroke and the highest pressure obtained in the top of the cylinder B falls to normal, whereupon the relief-valve e^7 is opened by the spring and allows the pressure to fall until the weighted lever returns the parts to their inoperative positions.

What I claim as my invention, and desire to protect by Letters Patent, is—

1. In ore-feeding mechanism for pneumatic stamp-mills the combination of a cylinder placed in communication with the top of the pneumatic cylinder, a piston working in said cylinder operated by an excess of pressure in the pneumatic cylinder, said piston operating means for controlling the feed, and means for controlling the feed.

2. In ore-feeding mechanism for pneumatic stamp-mills the combination with the pneumatic cylinder of an air-cylinder, a flexible pipe placing said cylinders in communication, a non-return valve fitted in said pipe, a relief-valve fitted to the cylinder, a piston fitted in said cylinder, and means, operated by said piston, for controlling or regulating the feed.

3. In ore-feeding mechanism for pneumatic stamp-mills the combination with the pneumatic cylinder of an air-cylinder, a pipe placing the two cylinders in communication, a non-return valve fitted to said pipe, a relief-valve fitted to said air-cylinder, a piston arranged in said cylinder, operating means for regulating the feed, means for regulating the feed and means for returning the several parts to their inoperative positions when the excess of pressure in the top of the pneumatic cylinder is relieved.

4. In ore-feeding mechanism for pneumatic stamp-mills the combination with an oscillating feed-chute of a wedge adapted to restrict the movement of said feed-chute, and means for operating said wedge by means of the increased pressure obtained in the pneumatic cylinder when the stamp is not permitted to perform its normal stroke, substantially as described.

5. In ore-feeding mechanism for pneumatic stamp-mills, the combination with the vibrating feed-chute of a wedge adapted to restrict the forward movement of said feed-chute and means for operating said wedge to restrict the movement of the chute to regulate the feed by means of the increased pressure obtained in the pneumatic cylinder when the stamp is not performing its normal stroke, and means for throwing the wedge out of operation when the normal pressure is again reached, substantially as described.

6. In ore-feeding mechanism for pneumatic stamp-mills, the combination with the vibrating feed-chute of a wedge adapted to engage the feed-chute to restrict its forward movement, a cylinder placed in communication with the pneumatic cylinder at one extremity, a piston arranged in said cylinder connected with the wedge, said piston being operated by the increased pressure obtained in the pneumatic cylinder, a relief-valve fitted to said cylinder to permit the parts to return to their inoperative positions when the normal stroke of the stamp is attained, and means for returning the parts when the pressure is lowered by means of the relief-valve, substantially as described.

7. In ore-feeding mechanism for pneumatic stamp-mills, in combination, a vibrating feed-chute, a wedge adapted to engage said feed-chute to restrict its forward movement, a cylinder placed at one extremity in communication with the top of the pneumatic cylinder, a non-return valve interposed between the cylinders, a piston fitted in the cylinder, connected to the wedge, a relief-valve fitted to the cylinder and means for returning the parts to their inoperative positions, substantially as described.

8. In ore-feeding mechanism for pneumatic stamp-mills, in combination, an oscillating feed-chute, a wedge adapted to restrict the forward movement of said feed-chute, means for supporting said wedge, a cylinder, a pipe placing one end of said cylinder in communication with the pneumatic cylinder, a non-return valve fitted in the pipe between the cylinders, a relief-valve fitted to the cylinder, a piston and piston-rod arranged in the cylinder, means for connecting the piston-rod to the wedge, and a weighted lever for returning the several parts to their inoperative positions, substantially as described.

9. In ore-feeding mechanism for pneumatic stamp-mills, in combination, a vibrating feed-chute, a buffer fixed on the under side thereof, a wedge interposed between said buffer and the back of the mortar-box, the mortar-box, a bracket forming a support or guide for the wedge fixed to the mortar-box, a cylinder, a piston and piston-rod working in said cylinder, means for attaching the outer extremity of said piston-rod to the wedge, a pin or projection formed on the piston-rod, a weighted bell-crank lever adapted to engage a pin on the piston-rod for traversing the piston on its back stroke, a reciprocating pneumatic cylinder, a stamp-stem and piston fitted thereon working in said pneumatic cylinder, a pipe placing the top of said pneumatic cylinder in communication with the air-cylinder, a non-return valve arranged

in the pipe placing the two cylinders in communication, and a relief-valve fitted to said cylinder, substantially as described.

10. In ore-feeding mechanism for pneumatic stamp-mills, in combination an oscillating feed-chute, means for moving said feed-chute in a rearward direction, a plurality of buffers fixed on the under side of said chute adapted by impact to deliver a quantity of ore into the mortar-box, a mortar-box, a wedge formed with a plurality of inclines and with parallel parts between said inclines, a cylinder, a pipe placing said cylinder in communication with the pneumatic cylinder, a pneumatic cylinder and the stamp-stem and its piston working therein, a non-return valve on the pipe between the cylinders, a relief-valve fitted to the cylinder, a piston and piston-rod working in the cylinder, means for attaching the piston-rod to the wedge, and a weighted bell-crank lever arranged to return the parts to their inoperative positions, substantially as described.

11. In combination, the stamp-stem A, the reciprocating pneumatic cylinder B, the mortar-box C, the vibrating feed-chute E adapted to deliver the ore into the feed-slot *c* of the mortar-box C, means for moving the feed-chute E in a rearward direction, the buffers F F′ fixed on the under side of the feed-chute E and adapted by impact to deliver the ore into the mortar-box, the wedge K formed with the inclines k^3 k^4 and the flat or plane part k^5 between said inclines, the bracket k^2 for guiding and supporting the wedge K, the cylinder G, the pipe H placing the top of the pneumatic cylinder in communication with the cylinder G, the non-return valve e^6 between the cylinders, the relief-valve e^7, the piston e' and piston-rod e^2, means for connecting the ends of the piston-rod e^2 and wedge K, the pin or projection *i* on the piston-rod e^2, the arm *j* of the bell-crank lever J formed with a slot j' engaging the pin *i*, the arm j^2 of the lever J and the adjustable weight j^3 arranged thereon, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN JAMES ROBERT SMYTHE.

Witnesses:

CHAS. OVENDALE,

J. SCRIMGEOUR.