C. H. KRAUSE.

ATMOSPHERIC STAMP.

APPLICATION FILED MAR. 8, 1905.

915,362. Patented Mar. 16, 1909.

3 SHEETS—SHEET 1.

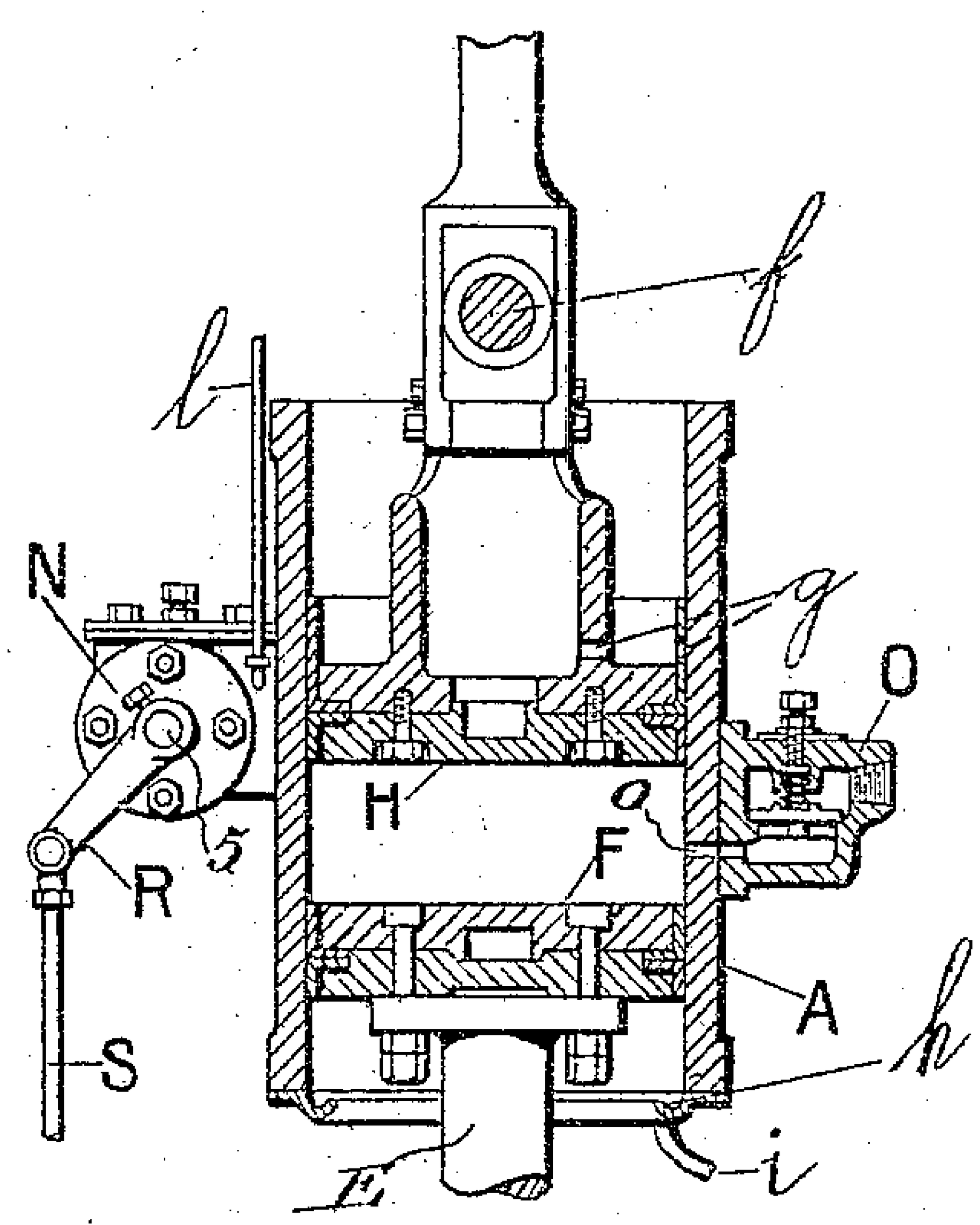

FIG. 7

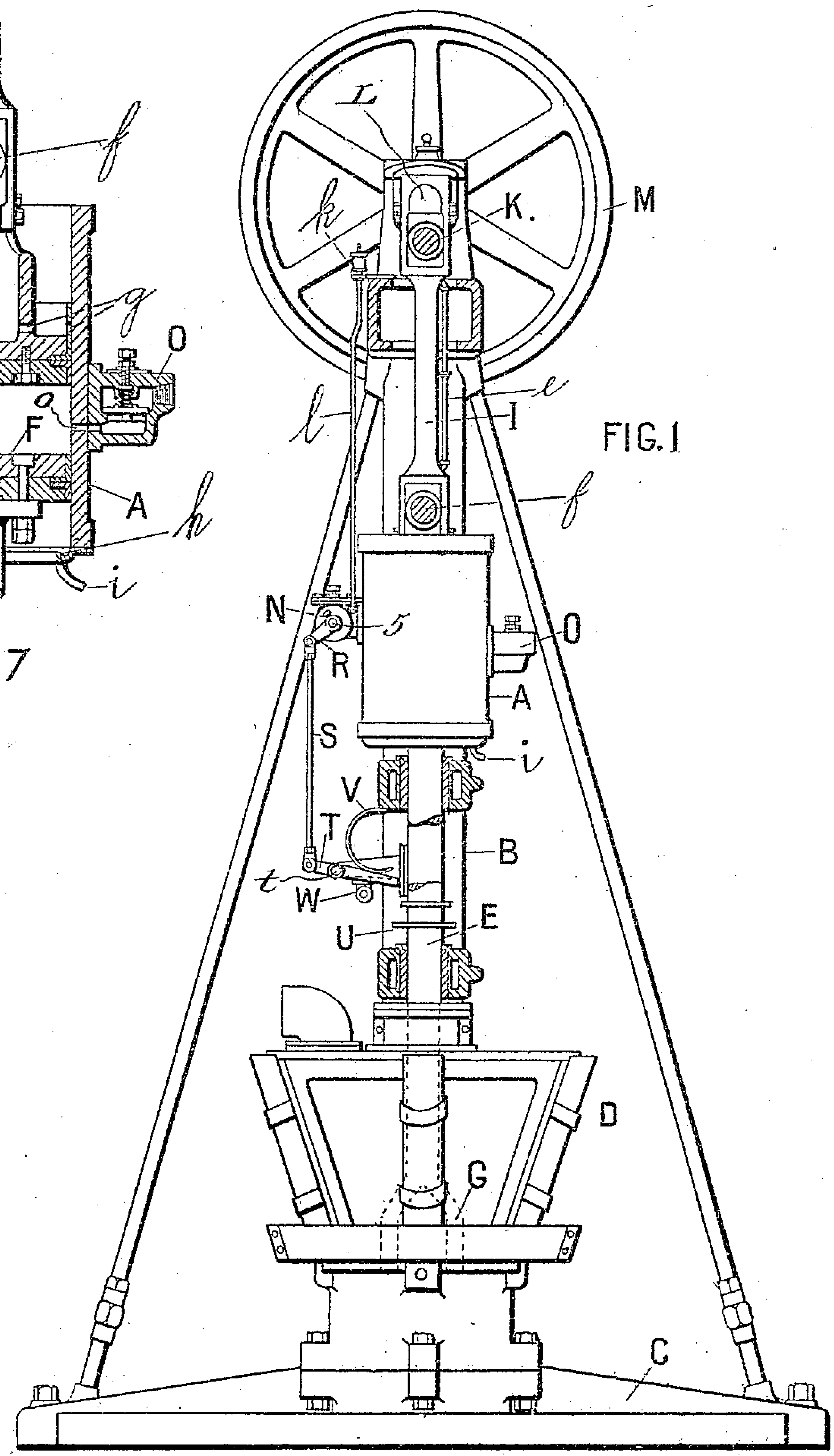

FIG. 1

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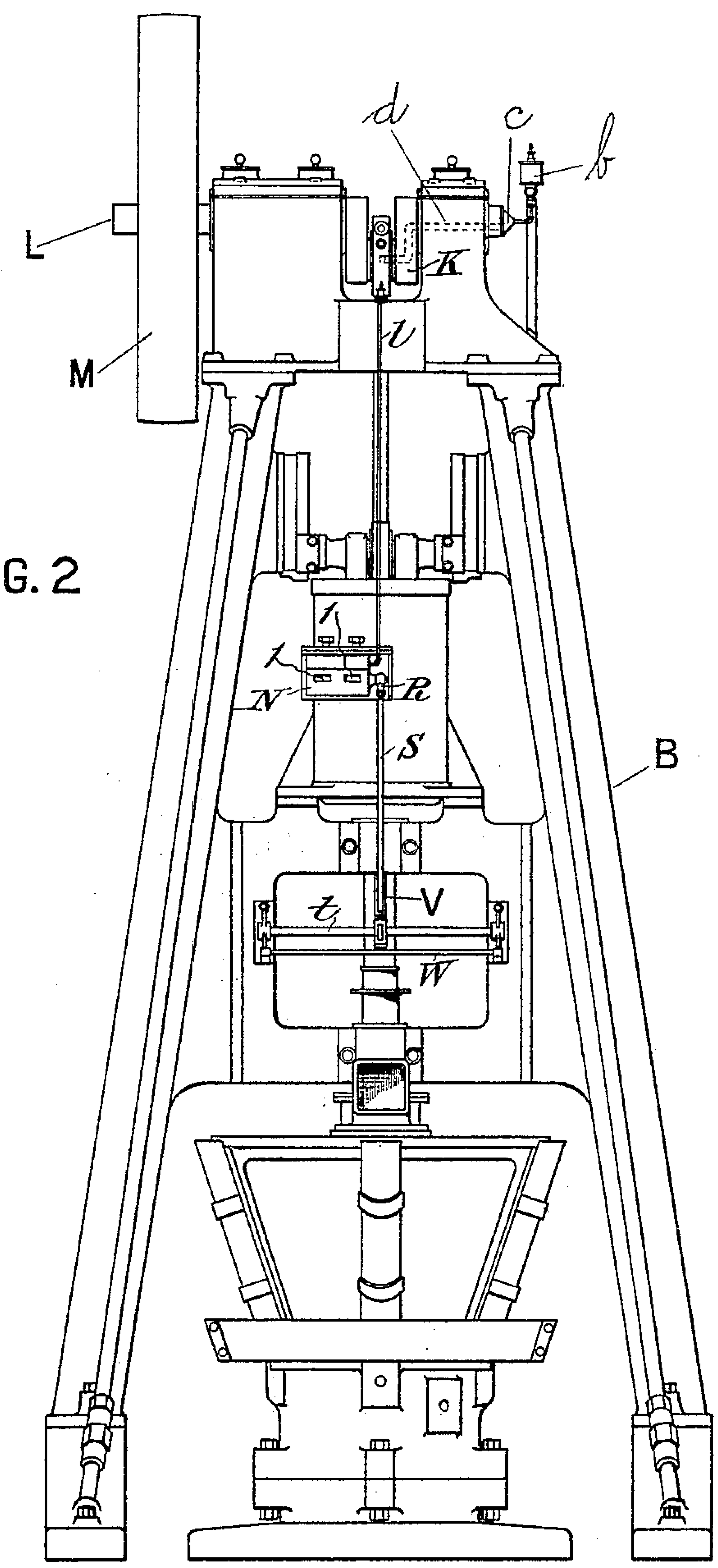
3 SHEETS—SHEET 2.

FIG. 2



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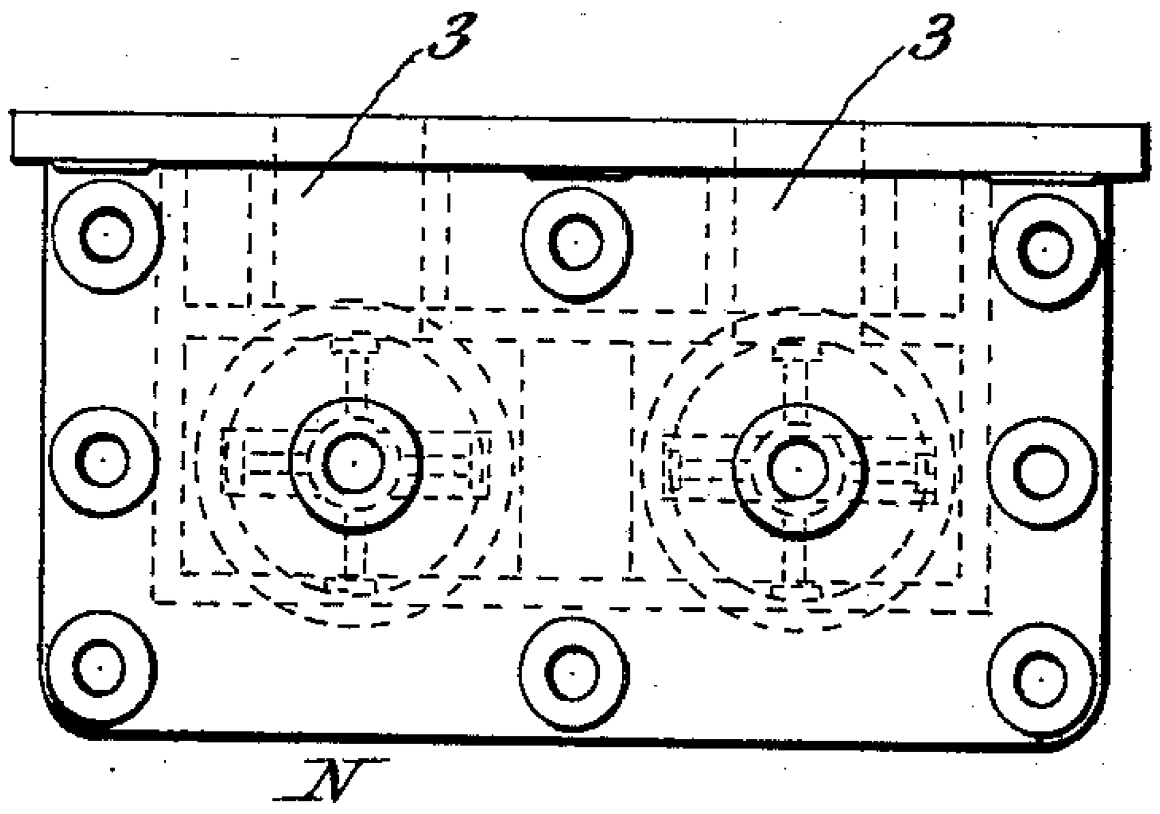


FIG. 3

FIG. 4

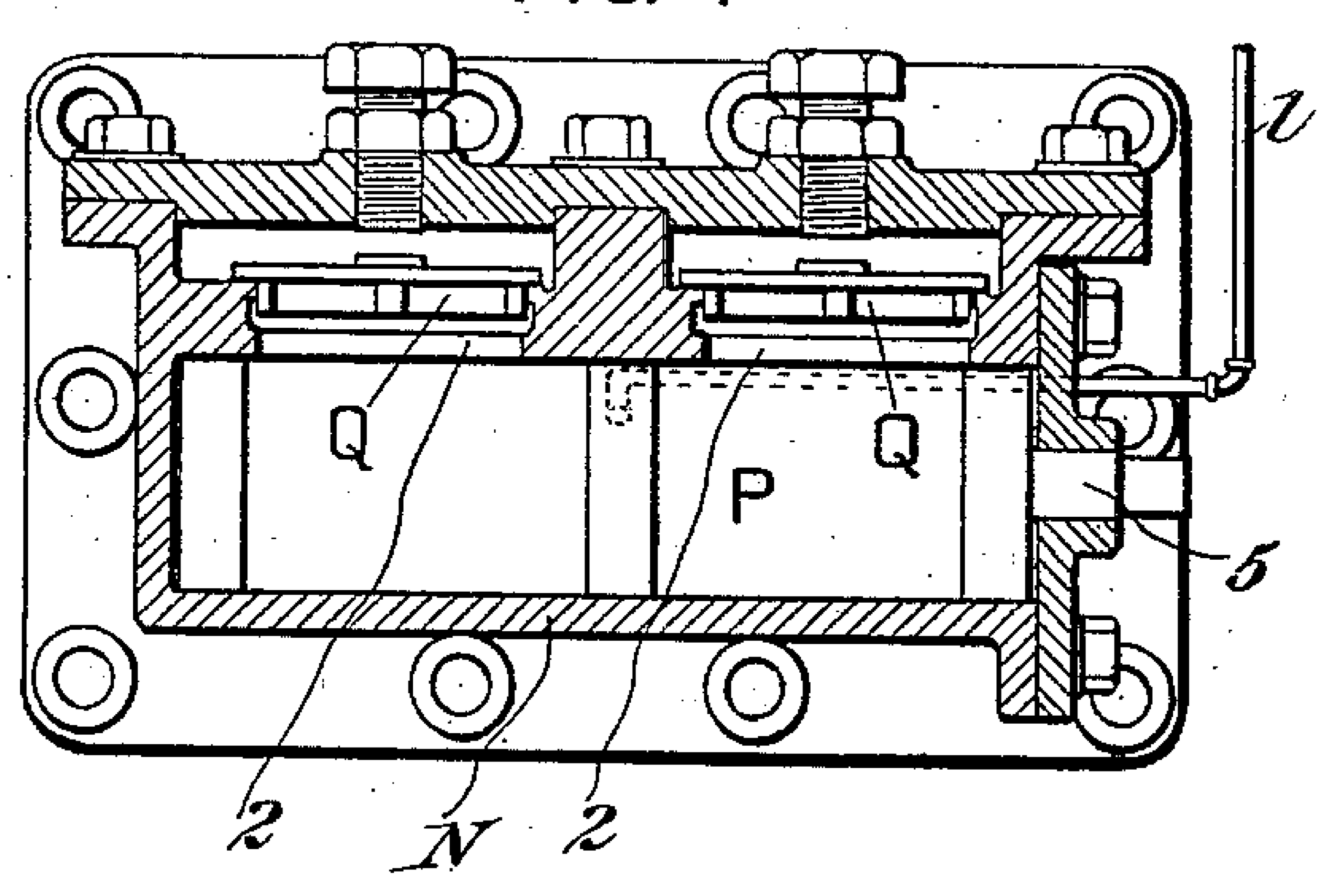


FIG. 5

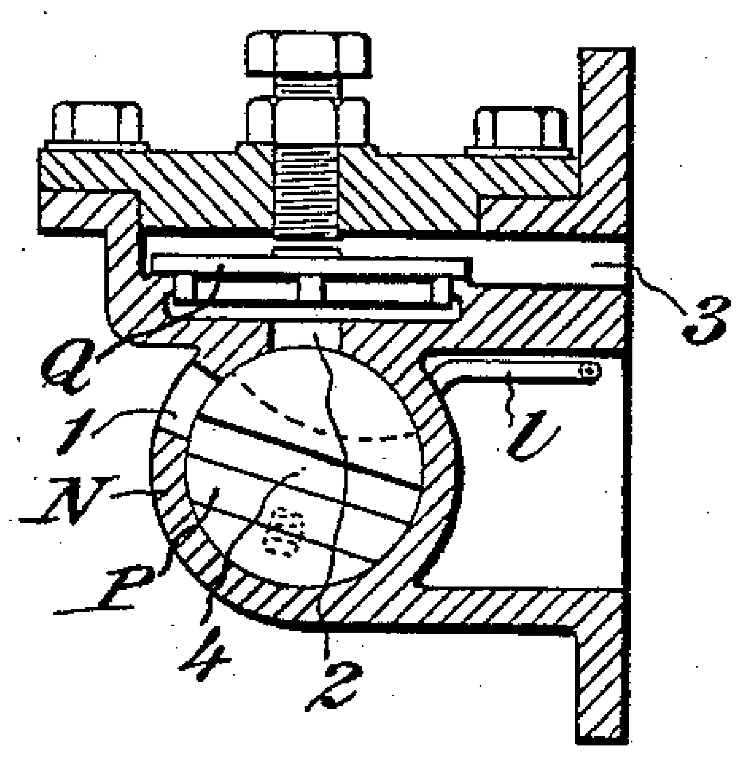
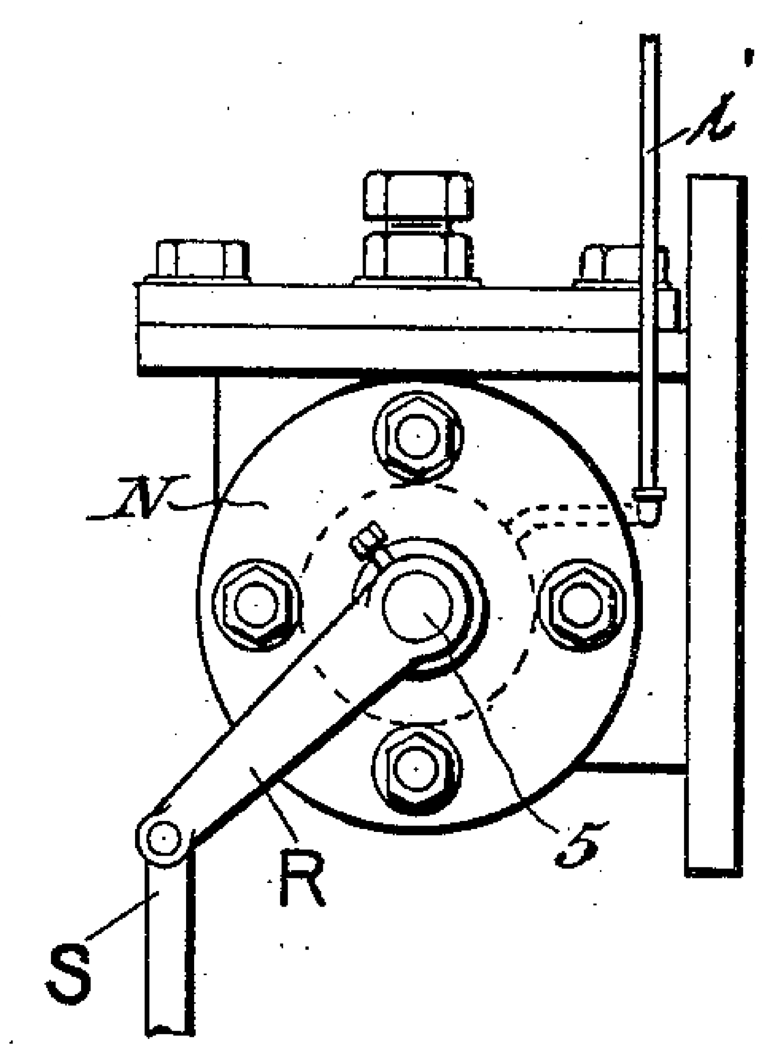


FIG. 6



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THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES H. KRAUSE, OF KEWEENAW BAY, MICHIGAN.

ATMOSPHERIC STAMP.

No. 915,362. Specification of Letters Patent. Patented March 16, 1909.

Application filed March 8, 1905. Serial No. 248,951.

To all whom it may concern:

Be it known that I, CHARLES H. KRAUSE, a citizen of the United States, residing at Keweenaw Bay, in the county of Baraga and State of Michigan, have invented certain new and useful Improvements in Atmospheric Stamps, of which the following is a specification.

The invention relates to atmospheric stamps and the object of the invention is to improve the stamp mills of my patents, 414,910, November 12, 1889, and 678,300, July 9, 1901.

Referring to the accompanying drawings,—Figure 1 is a vertical section, partly in elevation, of the stamp mill, Fig. 2 is an elevation at right angles to Fig. 1, Fig. 3 is an enlarged plan view of the inlet valve casing, Fig. 4 is an enlarged vertical section of the inlet valve casing looking in the same direction as in the case of Fig. 2, Fig. 5 is an enlarged vertical section of the inlet valve casing looking in the same direction as in the case of Fig. 1, and with the oscillating valve in closed position, Fig. 6 is an enlarged end elevation of the inlet valve casing looking in the same direction as in the cases of Figs. 1 and 5, and Fig. 7 is an enlarged vertical section of the cylinder looking in the same direction as in the case of Fig. 1.

The cylinder A is vertically fixed in the frame B. Directly in line with the cylinder and bolted to the base C is the mortar D. A stamp shaft B is guided vertically in the frame B and has at its upper end an atmospheric piston F and at its lower end a shoe G operating in the mortar D. A second piston H reciprocates in the upper end of the cylinder A, which cylinder is open at both ends as shown in Fig. 7. A connecting rod I communicates motion to the upper piston H from a crank K on the main shaft L which carries a pulley M receiving power in any convenient way. To one side of the cylinder A is bolted the air inlet valve casing N and to the other side, the exhaust valve casing O. The exhaust valve is an ordinary adjustable spring pressure release valve. The outlet *o* from the cylinder A to the exhaust valve casing O, is located below the upper end of the stroke of the atmospheric piston F.

In the inlet valve casing N are three valves, see Fig. 4. One of these is a positively actuated oscillating valve P which admits atmospheric air to the cylinder A past two check valves Q, Q. Ports 1, 1, see Figs 2 and 5, admit the atmospheric air to the casing of the oscillating valve P; and ports 2, 2, see Figs. 4 and 5, admit the atmospheric air from the casing of the oscillating valve P to the chambers of the check valves Q; while ports 3, 3, see Figs 3 and 5, permit the air to pass from the chambers of the check valves Q to the cylinder A. The ports in the cylinder A itself, which connect with the ports 3, 3, of the valve casing N of course are not shown in Fig. 7 because the section there taken is a central one and these two ports are located on opposite sides of the plane of that section.

The oscillating valve P has a diametric groove 4 formed at one of its ends, see Fig. 5, and within this groove is inserted the **T**-shaped end of the operating valve stem 5. The stem 5 has angularly adjustably bolted thereto an arm R and a link S connects the end of the arm R and one end of a rock arm T on the rock shaft *t* mounted at its extremities in bearings on the frame, see Fig. 2. The other end of the rock arm T, see Fig. 1 is actuated in one direction by a tappet U on the stamp shaft E and in the opposite direction by the spring V until it comes in contact with the stop W mounted on the frame.

The arm R is clamped to the stem of the oscillating valve P in such a way and is of such weight that in case of breakage of the valve gear or accidental disconnection, the oscillating valve P will open the inlet wide, and air having free access to the cylinder A, the vacuum cannot form and the stamp shaft E will remain inactive in its lowermost position. Nor can the charge of air between the pistons become, in that event, too small to cause damage which might otherwise ensue if the valve P remained closed. Such structure therefore provides a safety means operating by gravity upon breakage or disconnection of the valve gear.

The operation is as follows:—Power is communicated to the mill through the pulley N. The upper piston H is thus caused to vertically reciprocate in the cylinder A. The atmospheric piston F in the lower end of cylinder A is caused to follow the upper piston H in its upward stroke by reason of atmospheric pressure upward on its lower surface, this air under pressure having free access through the open lower end of cylinder A. Near the end of the upward stroke the tappet U actuates the rock arm T and through it, the link S, the arm R, and the valve stem 5, it actuates the oscillating valve P, thus effecting admission of atmospheric air past the check valves Q and into cylinder A between the pistons F, H, to take the place of any air that may have been exhausted on the preceding downward stroke. The pressure on the lower atmospheric piston F is thus balanced. The check valves Q, Q, now automatically close by gravity and the atmospheric piston F normally ceases its upward motion nearly as soon as the upper piston H. In other words, the atmospheric piston F lags behind the upper piston H to a slight degree. The atmospheric piston F ascends by momentum for a considerable portion of its stroke and during the latter part of its motion, moves faster than the upper piston H, having gained velocity while the upper piston has been losing its velocity by reason of the crank's nearing the upper end of its cycle. By reason of this fact the volume of air is so reduced between the pistons and its pressure increased sufficiently to give the required pressure for the blow by the shoe G in the mortar D. The atmospheric piston F, having received an impetus upward, is not arrested in its upward motion until met by pressure created by the down coming upper piston H. By the increased pressure of air between the pistons, the atmospheric piston F is now accelerated to such an extent that it reaches its lowermost position at about the time the upper piston H reaches the lower end of its stroke, as this latter piston has been retarded as its crank nears its lower dead center. The combined force of gravity and compressed air thus effects the necessary crushing of material in the mortar D. The air compression is great at the beginning of the down stroke and is unaffected by the exhaust valve until the atmospheric piston F uncovers the port *o* leading to this valve. It will be seen that by this means the possibility of the escape of any of the high initial pressure of air through the exhaust valve is avoided.

Should there be an uncrushable piece of material in the mortar D, or the amount of material be too great, the excess of air under pressure between the pistons is automatically exhausted through the adjustable spring valve in the exhaust valve casing O. Such exhaust of course takes place only after the piston F uncovers the exhaust port. The location of the exhaust port *o* also makes it possible to adjust the load of the spring sufficiently low to correspond to the maximum pressure within the cylinder after the piston F uncovers the exhaust port *o*. If it were not located as low on the cylinder A as indicated, it would not be possible to attain high enough initial pressure of air between the pistons for the down stroke because the air under pressure would escape past the spring loaded valve in the exhaust valve casing O.

When the mill is first started and before the stamp has made its full travel of stroke, the exhaust valve will exhaust air by reason of the increased pressure of air between the pistons. Also when the operation of the stamp is interfered with in such a way that the pressure in cylinder A becomes greater than the load of the spring on the valve in the exhaust valve casing O, the exhaust of air past this valve at once relieves the increased pressure within the cylinder as before stated. Little or no air is exhausted from the cylinder when the stamp is operating under normal conditions. Normally, only that due to leakage is admitted to the cylinder through the inlet valves. The air cushion between the pistons removes the possibility of any shock to the upper driving mechanism of this stamp.

The system of oiling provided includes a sight-feed oiler *b*, see Fig. 2, supported from the frame B, and feeding oil into a conical receiver *c* at the end of the main shaft L. The shaft L and crank K are provided with an oil passage *d* and the oil flows on by centrifugal force to the crank pin bearing. A pipe connection *e* carries the oil from this point to the wrist pin *f*, see Fig. 1, where it trickles down to the upper piston H. It passes through holes *g*, see Fig. 7, in the piston H and after lubricating the cylinder A, it is caught in the annular oil ring *h*, from whence it is carried away through drain *i* to be used again after filtering.

The oscillating inlet valve P is lubricated by oil from an oil cup *k*, see Fig. 1, located on the frame D and connected to the valve chamber by the pipe *l*, see Figs. 1, 2, 4, 5, 6, and 7, which carries the oil to the middle of the valve P by leading through the valve casing N, see especially Figs. 4 and 5. The oil then feeds to both ends of the two ported valve P, (see in dotted line Fig. 5), and is carried up to the check valves Q, Q, by the current of air passing intermittently to the cylinder A.

In accordance with the provision of the patent statutes the principles of operation of this invention have been described, together with the apparatus which is now considered to represent the best embodiment thereof; but it is desired to be understood that the apparatus shown is merely illustrative and that the invention can be carried out by other means.

It is claimed and desired to secure by Letters Patent,—

1. In an atmospheric stamp the combination of a cylinder, a mechanically operated piston and an atmospheric piston in the cylinder, a pestle connected to the atmospheric piston, an inlet and an exhaust for the cylinder, an oscillating valve and a check valve controlling the inlet port, means for mechanically operating the oscillating valve, and an adjustable check valve controlling

the exhaust port, the exhaust port leading from the cylinder near the end of the stroke of the atmospheric piston during which the atmospheric piston leads, whereby during the first part of such stroke the air under pressure between the pistons may be retained and raised to a high pressure to insure a heavy blow by the pestle.

2. In an atmospheric stamp the combination of a cylinder, a mechanically operated piston and an atmospheric piston in the cylinder, a pestle connected to the atmospheric piston, an inlet and an exhaust port for the cylinder, a valve controlling each port, and means for mechanically operating the valve controlling the inlet port, the means being adapted to open the inlet valve by gravity in case of breakage or disconnecting of the valve operating means.

3. In an atmospheric stamp the combination of a cylinder, a mechanically operated piston and an atmospheric piston in the cylinder, an inlet and an exhaust port for the cylinder, an oscillating valve and a check valve controlling the inlet port, an adjustable check valve controlling the exhaust port, and means for mechanically operating the oscillating valve, the means being adapted to open the valve by gravity in case of breakage or disconnecting of the valve operating parts.

4. In an atmospheric stamp the combination of a cylinder, a mechanically operated piston and an atmospheric piston in the cylinder, a pestle shaft connected to the atmospheric piston, a pestle on the shaft, an inlet and an exhaust port for the cylinder, an oscillating valve and a check valve controlling the inlet port, means actuated from the pestle shaft for operating the oscillating valve, said means being adapted to open the valve by gravity in case of breakage or disconnecting of the valve operating parts, and an adjustable check valve controlling the exhaust port, the exhaust port leading from the cylinder near the end of the stroke of the atmospheric piston during which the atmospheric piston leads, whereby during the first part of such stroke the air under pressure between the pistons may be retained and raised to a high pressure to insure a heavy blow by the pestle.

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

CHARLES H. KRAUSE.

Witnesses:

JOHN G. STONE,

JAMES D. LOONEY.