

(No Model.)

J. TODD.

PRESSURE HOIST FOR FURNACE DOORS.

No. 390,627.

Patented Oct. 2, 1888.

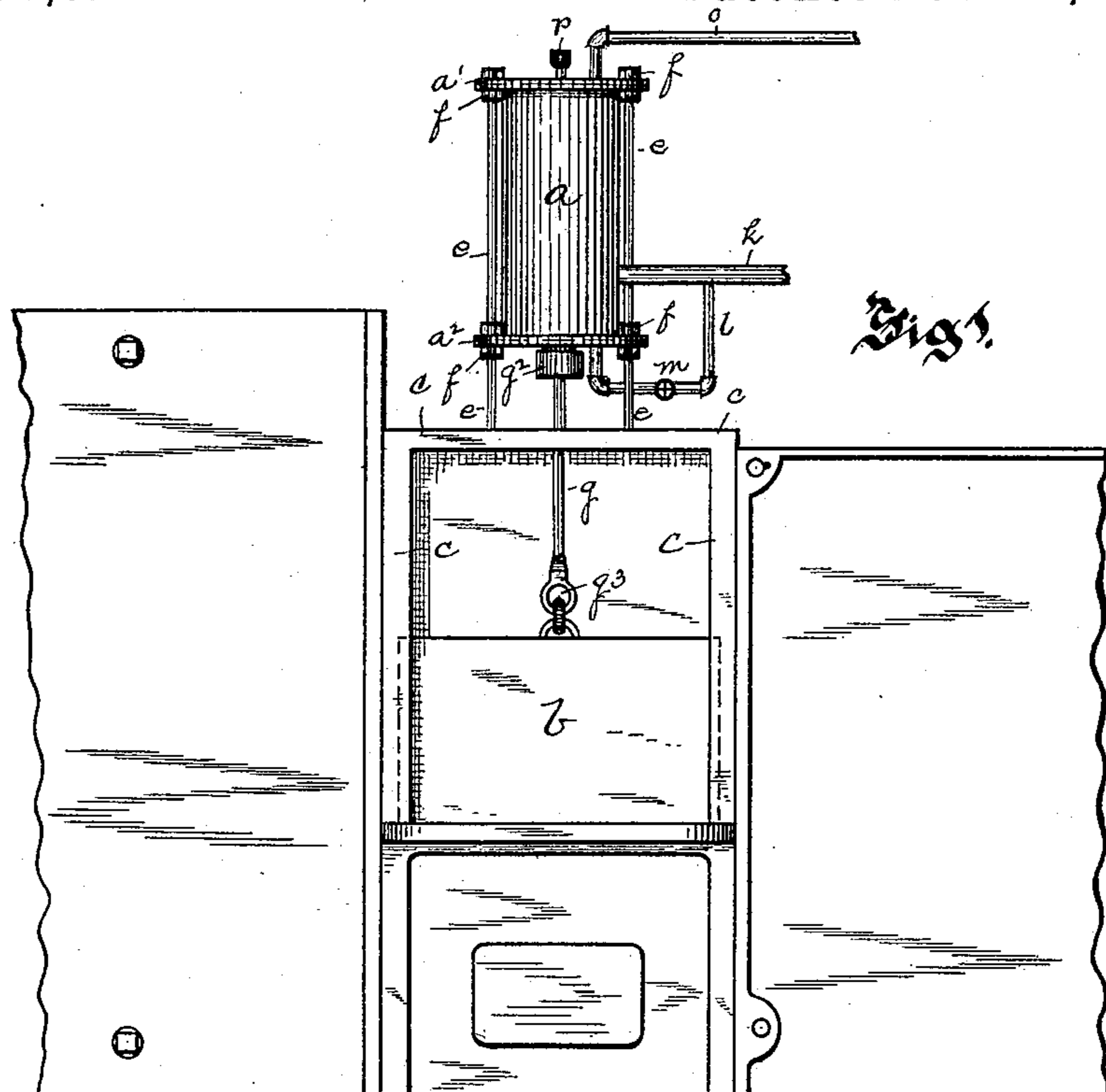


Fig. 1.

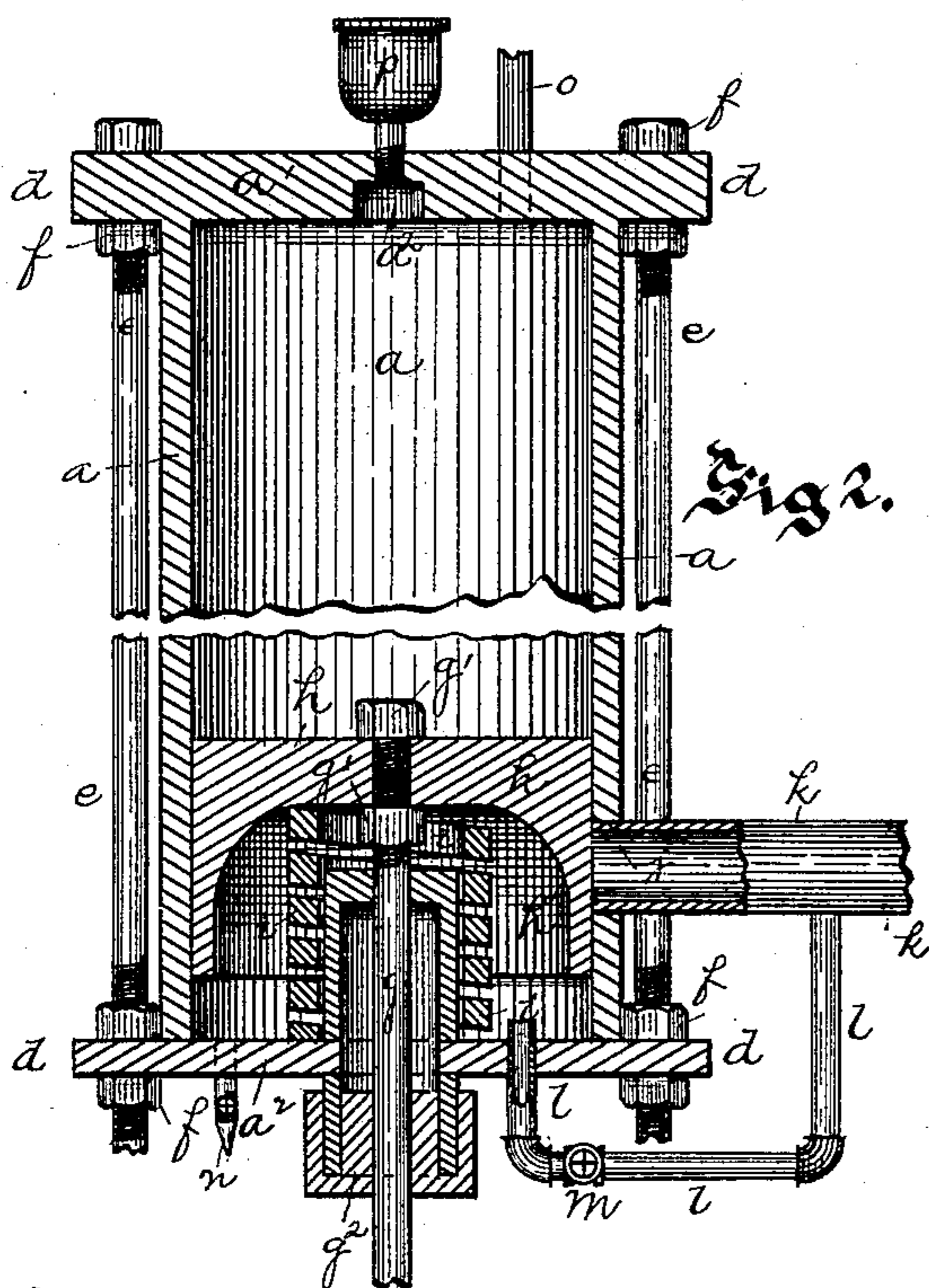


Fig. 2.

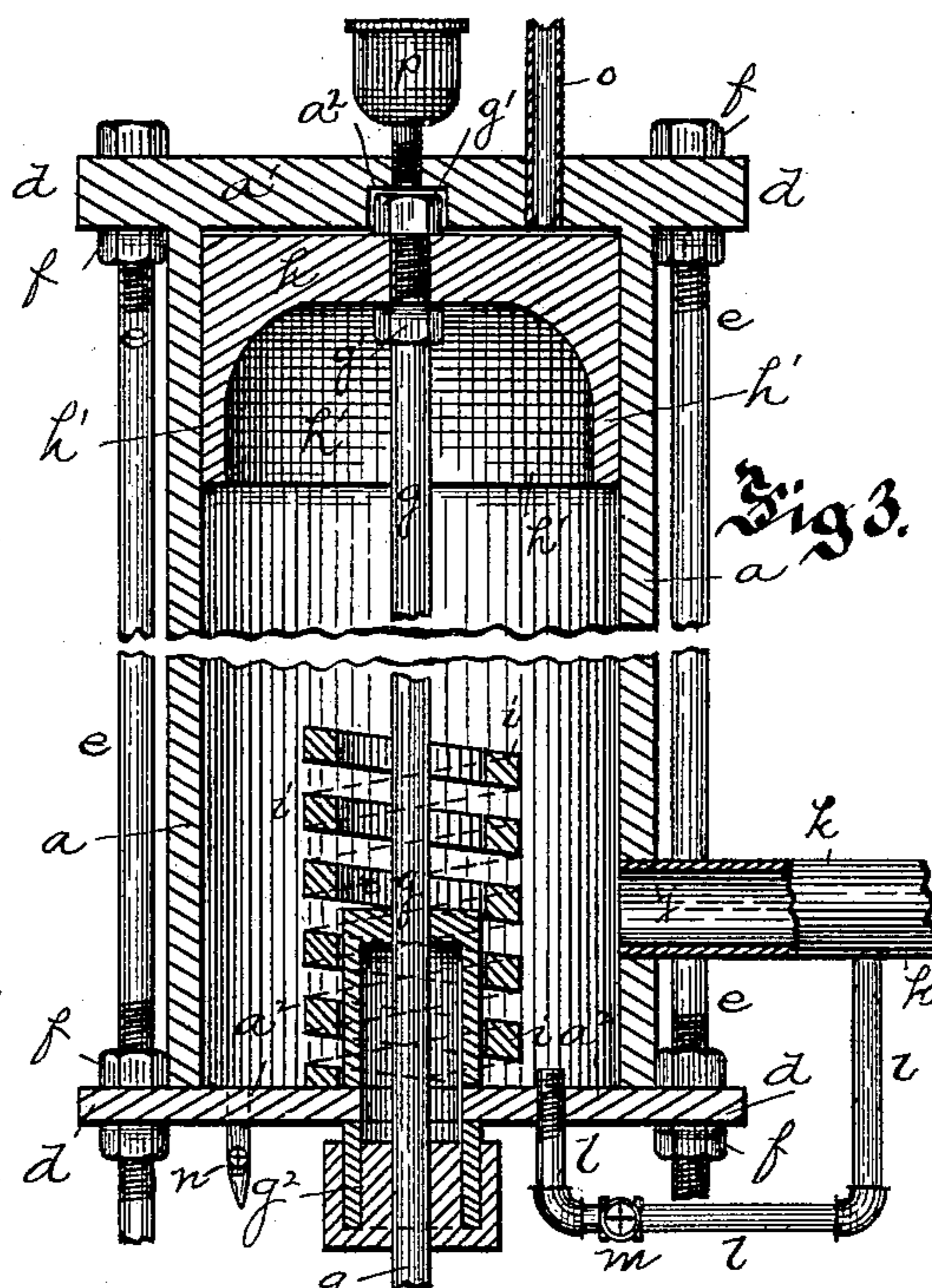


Fig. 3.

Witnesses:
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JAMES TODD, OF ALLEGHENY, PENNSYLVANIA, ASSIGNOR OF ONE-HALF
TO GEORGE W. D. FERRIS, OF SAME PLACE.

PRESSURE-HOIST FOR FURNACE-DOORS.

SPECIFICATION forming part of Letters Patent No. 390,627, dated October 2, 1888.

Application filed December 27, 1887. Serial No. 259,195. (No model.)

To all whom it may concern:

Be it known that I, JAMES TODD, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and
5 useful Improvement in Pressure-Hoists for Furnace-Doors; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to a pressure-hoist for
10 furnace-doors and other similar uses, such as lifting of heavy sliding doors, sluice or lock gates, &c.

Heretofore the doors of furnaces have been
15 lifted by hand by means of a counterpoised lever mounted over the door and attached thereto with a chain. With very heavy doors—such as are employed on open-hearth and large heating-furnaces—this method of hoisting the
20 doors is very unsatisfactory, as the doors weigh from one thousand to eighteen hundred pounds, and the labor required is very great, and at the same time the door is lifted so slowly as to subject the workman to the great heat of the interior of the furnace for a considerable
25 space of time.

The object of my invention is to provide a
device for hoisting these doors which can be operated quickly and will not cause the door
30 to strike against its ledge with any substantial shock when the door is lowered.

To these ends my invention consists in
mounting over the furnace-door a fluid-pressure cylinder and connecting the piston of the
35 same to said door, so that the same may be raised or lowered, the cylinder having two ports at the lower end thereof, one of which is smaller than the other, a common supply-pipe for said ports, and the piston fitting
40 within said cylinder and adapted to close the larger of said ports when in its lowest position and form a steam-space above the lower cylinder-head, whereby the piston can be raised and its downward stroke cushioned by simply
45 turning a valve in said supply-pipe; and the invention also consists in combining with said cylinder and piston a spring between the piston and the lower cylinder-head to assist the operation of the device; and the invention further consists in certain other improvements,

all of which will be more fully hereinafter set forth.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying
55 drawings, in which—

Figure 1 shows a view of the door of a furnace with my invention applied thereto. Fig. 2 is a vertical section of my improved pressure-hoist, showing the position of the parts when the piston is lowered; and Fig. 3 is a similar
60 section showing the position of the parts when the piston is raised.

Like letters refer to like parts in each of the figures of the drawings.

In employing my improved pressure-hoist
65 for the purpose of operating a furnace-door, a cylinder, *a*, of the proper proportions and the construction hereinafter described, is mounted above the door *b* on the guide-frame *c* of the
70 latter or other suitable portion of the furnace. The manner of mounting this cylinder preferred by me consists in providing each head of the cylinder *a* with an ear, *d*, on each side, through which pass rods or bolts *e*, which are
75 secured at their lower ends to the frame *c*, the cylinder being supported at the proper height on these rods by nuts *f* above and below the ears *d*. The cylinder is thus supported at a proper height above the furnace-door to give the necessary movement of the door to uncover the opening in the furnace.

Within the cylinder *a* is a piston, *h*, which has preferably formed on its inner and lower side an annular flange, *h'*, for the purpose
80 hereinafter explained, the piston-rod *g* being secured to the piston by nuts *g'* *g'* above and below the same, and the head *a'* of cylinder being countersunk at *a''* to provide for the upper nut *g'*. Surrounding the piston-rod *g* at the lower end of the cylinder is a coiled
90 spring, *i*, which extends up into the cylinder, and is compressed by the piston *h* when the latter is at its lowest position, the purpose of the spring being to assist the operation of starting the piston *h* upward when it is desired to hoist and also cushion its downward stroke, as hereinafter explained. The piston
95 *g* passes through the stuffing-box *g''* in the

lower head, a^2 , of the cylinder a , and is attached by a link, g^3 , to the furnace door or gate to be raised.

For the purpose of supplying the fluid pressure to the cylinder to operate the same, a port or opening, j , is provided in one side of the cylinder a little above the lower cylinder-head, which port has connected to it a supply-pipe, k , which has on its outer end a three-way cock that connects it to the fluid-pressure supply and the leakage-pipe, the pipe k serving both as an inlet for the steam, compressed air, or hydraulic pressure, and also for the exhaust of the same, as hereinafter explained. The distance of this inlet or port j above the bottom of the cylinder is such that when the piston h is at its lowest position the flange h' , or the rim of the piston when no flange is employed, will extend over the port j and close the same, as indicated in Fig. 2.

In operating the apparatus I prefer to employ steam or compressed air, as hydraulic pressure works too slowly to be satisfactory. In order to raise the piston h after it has reached its lowest position and closed the port j , a small pipe, l , extends from the supply-pipe k to the head a^2 of the cylinder a , passing through the same and preferably extending up into the cylinder to prevent the condensed water from running into this pipe. A small cock or valve, m , is provided in this pipe for the purpose of opening or closing the same and varying the area for the passage of the steam.

Whatever condensed water may be formed in the lower part of the cylinder below the piston is drawn off by a blow-off cock, n , in the lower cylinder-head, while any leakage of steam past the piston in the upper part of the cylinder can escape through the pipe o , attached to the upper cylinder-head, a' . There is also attached to this upper cylinder-head an oil-cup, p , to supply the lubricant for the piston in the cylinder.

The operation of the hoist is as follows: When the door or other object to be lifted is at its lowest point, the piston h is at the lower end of cylinder a and its flange h' has closed the port j for the steam, and the spring i is compressed between the lower surface of the piston and the lower cylinder-head by the weight of the door or other object to which the piston-rod g is attached, as shown in Fig. 2. If now it is desired to lift or raise the door, &c., the three-way cock in the supply-pipe k is turned so that steam flows through said pipe and passes into the cylinder below the piston through the small pipe l , the valve m being open, which steam presses against said piston, slowly forcing it upward to uncover the port j to admit the full head of steam, the compressed spring i materially assisting this operation. This gives a gradually-increasing speed to the initial movement of the piston, which avoids imparting any jar to the object attached to the lower end of

said piston. As soon as the piston has been raised sufficiently to uncover the port j , then the piston, and with it the door or other object attached to the lower end of the piston, is quickly raised to the desired height by the full head of steam, where it will remain as long as the steam, air, or hydraulic pressure is continued in the cylinder. As soon as it is desired to lower the door, the three-way cock is turned so that the supply-pipe k is no longer connected with the steam or air supply, but with an exhaust-pipe. Then the weight of the door or other object immediately causes the piston h to descend, forcing out the exhaust-steam through the pipe k until the port j is closed, when the steam can more slowly escape through the smaller pipe, l . As the area of the passage for the exhaust-steam through this pipe l is small, the steam can escape only at a slow rate of speed, and hence the latter movement of the piston and the object attached to it is checked and it descends quite gently. This cushioning of the latter end of the stroke of the piston is also aided by the spring i , which is compressed during this part of the stroke.

The spring i is not absolutely essential to my improved hoist, as the steam-pipe l can alone serve to give the initial start to the piston and also check its movement when the steam is exhausted from the cylinder; but its use materially assists the foregoing operation.

By the use of my improved hoist furnace-doors and other objects may be quickly and easily raised by simply turning on the fluid-pressure in the supply-pipe, and when it is desired to lower the object it can be done without dropping the same on its seat with such a shock that it will soon be destroyed.

Having now described my invention, what I claim is—

1. In a pressure-hoist, the combination of a cylinder having two ports at the lower end thereof, one of which is smaller than the other, a common supply-pipe for said ports, and a cup-shaped piston fitting within said cylinder and closing the larger of said ports when at its lowest position, substantially as and for the purpose set forth.

2. In a pressure-hoist, the combination of a cylinder having two ports at the lower part thereof, one of which is smaller than the other, a common supply-pipe for said ports, a cup-shaped piston fitting within said cylinder, and a spring interposed between said piston and the lower cylinder-head, substantially as and for the purpose set forth.

3. In a steam-hoist, the combination of the cylinder a , having the port j near the lower end thereof, a pipe, l , extending up into said cylinder, a common supply-pipe, k , for said port j and pipe l , and a cup-shaped piston, h , fitting within said cylinder and closing the port j when in its lowest position, substantially as and for the purpose set forth.

4. In combination with a metallurgic or

like furnace and its vertically-moving door, a pressure-cylinder secured to the body of the furnace and having the furnace-door suspended from its piston-rod and adapted to be
5 raised thereby, said cylinder having a port therein near the base, which is first closed by the piston, and a smaller port below the same, substantially as and for the purposes set forth.

In testimony whereof I, the said JAMES TODD, have hereunto set my hand.

JAMES TODD.

Witnesses:

N. S. STOCKWELL,
J. N. COOKE.