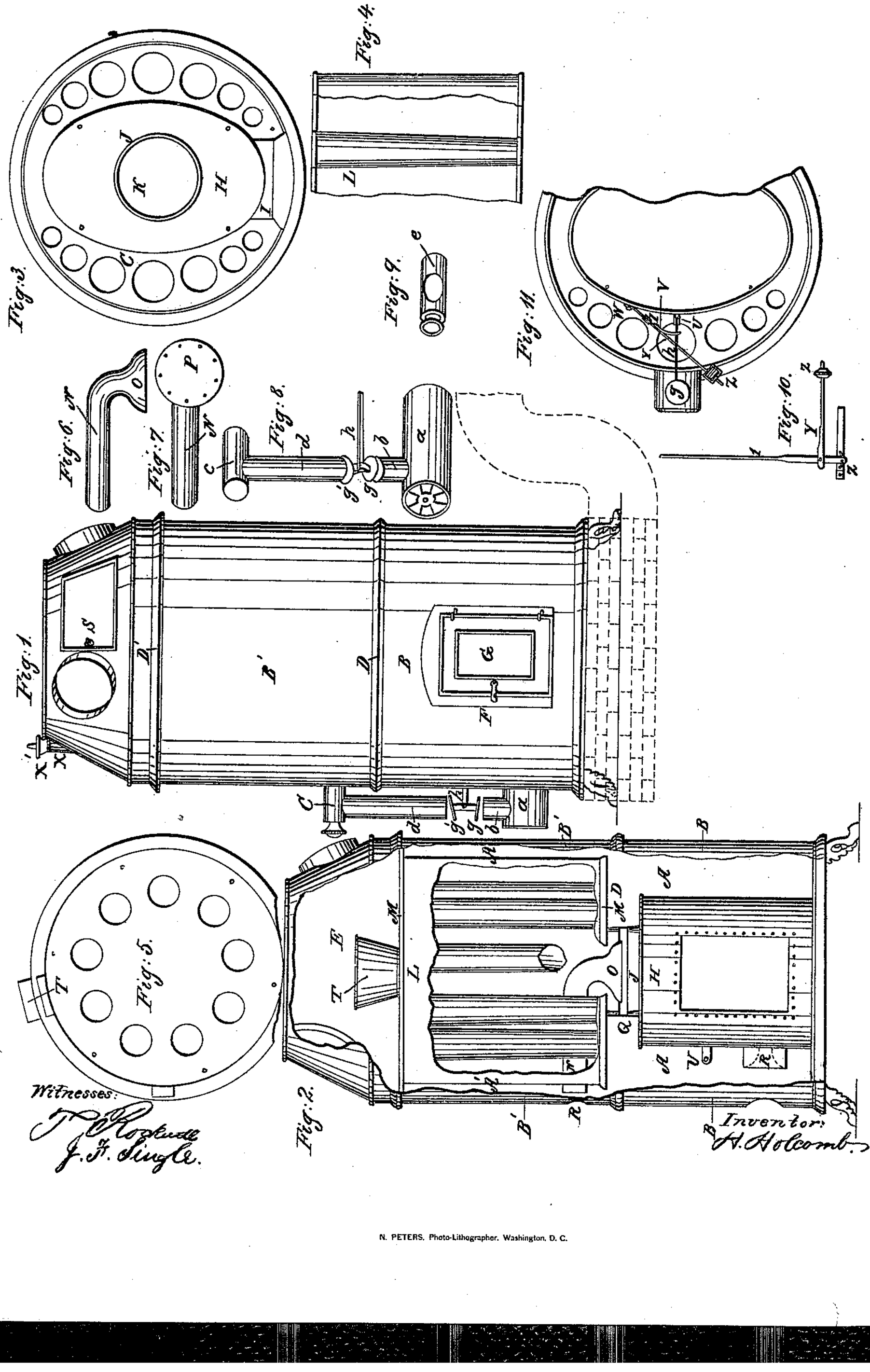
H. HOLCOMB.

Hot Air Furnace.

No. 41,007. Patented Dec. 22, 1863.



UNITED STATES PATENT OFFICE.

HENRY HOLCOMB, OF PAINESVILLE, OHIO.

IMPROVEMENT IN HOT-AIR FURNACES.

Specification forming part of Letters Patent No. **41,007**, dated December 22, 1863.

To all whom it may concern:

Be it known that I, HENRY HOLCOMB, of Painesville, in the county of Lake and State of Ohio, have invented certain new and useful Improvements in Hot-Air Furnaces; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of the external appearance of my improved hot-air furnace; Fig. 2, an elevation of the same, with various parts removed, showing its internal construction and arrangement; Fig. 3 is a plan view of the base-plate of the said furnace, showing also the location of the fire-box; Fig. 4, an elevation of one of the flaring air channels or pipes, with portions of the drum and its upper and lower plates; Fig. 5, a plan view of the upper plate of the drum. Figs. 6, 7, 8, and 9 are details showing the construction of the several parts constituting the arrangement for supplying and controlling the air admitted to the fire-draft and smoke-deflector; Fig. 10, an elevation of the compensating arrangement attached to the expansion-rod for adjusting its expansion to the variations of heat within the furnace; Fig. 11, a plan view of the arrangement of the said details for the purpose stated.

The letters of reference marked thereon indicate similar parts in all the drawings.

The distinctive features of my improvements are, first, a double-valve arrangement, operated by a single expansion-rod, for controlling the current of air received through the two channels leading to the fire-chamber, one of which supplies air to the fire, the other for diffusing it among the gases as they ascend during the combustion of the fuel, both valves being so connected as to be mutually influenced by each other in supplying the air, as stated; second, the special construction and arrangement of a perforated deflector, for deflecting the gases or smoke, and at the same time supplying the air in jets to the gases as they are deflected, the said jets issuing from a series of holes, arranged in a circle, near the outer edge of said deflector, thereby meeting the gases on all sides as they are deflected, for the purpose of preventing all tendency to condensation and consequent "dripping;" third, the employment of a series of air tubes or pipes of gradually-increasing diameters, distributed within a heating-drum of separate construction from the other parts of the furnace, and connected with the fire-box by a tightly-fitting collar or neck; fourth, the application and use of a perforated tube, placed within the tube of the perforated deflector, before described, to operate as a "cut-off," which, in connection with the closing of the inlets of the fire-draft, constitutes the furnace air-tight; and, fifth, in the application and use of a compensating device connected with the expansion-rod, whereby its action on the double-valve arrangement, before mentioned, can be accurately adjusted to the variations of heat within the furnace by which the said expansion-rod is liable to be affected.

The following description will explain the construction of the several parts of my said improved furnace.

A A′, Fig. 2, is the upper and lower air-space, inclosed by the jackets B B′, Fig. 1. These jackets are of galvanized sheet-iron. The lower jacket rests on a perforated cast-iron base, C, Fig. 3. Said base is constructed as seen in the drawings. The upper jacket is sustained by a cast-iron double-flanged ring, D, Fig. 1. A similar ring, D′, also sustains the cap or covering of the hot-air reservoir E, Fig. 2.

F, Fig. 1, is an opening cut in jacket B, for the door G, said door being secured to the fire-box H, Fig. 3, by its frame, I, both being of cast-iron. The said fire-box, as will be seen in Figs. 2 and 3, is oval in form, and is secured to the base-plate C (which has a flange cast on it of corresponding shape) by the usual screw-rods. The shell of said fire-box is of heavy sheet-iron—its top being of cast-iron—having a neck, J, Fig. 2, around the aperture K, Fig. 3. The drum L, Fig. 2, a portion only of which is represented in the drawings, is also of sheet-iron. It is circular in form, and inclosed at the top and bottom with perforated cast-iron plates M and M′. The lower plate, M, has a neck and aperture similar to and of same diameter as that of the fire-box. The said drum incloses a series of flaring pipes, placed in a circle, as seen in Fig. 5, which represents the top plate, M′, of said drum. This is one form of placing the pipes; but a double row or series can be used, if desirable, by locating them opposite the spaces left by the first. The said pipes are all of sheet-iron,

and are formed with their sides gradually expanding toward their escape end. Fig. 4 exhibits one of said pipes as secured to the top and bottom plates. The several pipes are tightly held in place by means of the flanges cast around the perforations of the said plates. The rule for determining the "flare" of the pipes will of course depend on the capacity of the drum, degree of heat, and the number and size of such pipes. A drum of, say, thirty inches in diameter, and twenty-eight inches in height, and containing nine pipes, will require the inlet of the channels to be four inches, and the outlet five inches. In any case the apertures should not exceed seven inches at the inlet, and eight and one-half inches at the outlet—preferring rather to increase the number than the size of the pipes.

I will now proceed to describe the construction of the perforated deflector which I employ to deflect the gases, and at the same time to distribute the air thereto.

N, Fig. 6, is a straight tube, bent at one end and terminating in an expanded or trumpet-shaped base, O, and closed with a concave plate, P, Fig. 7. Said plate is provided with a number of holes placed in a circle near its circumference. This deflector is placed inside the drum L, Fig. 2, so that its concave end is just below the neck of the bottom plate, M, its other end passing between two pipes and projecting from the side of the drum, forming a neck, R′, as shown. The drum, furnished as before stated, is placed in its position over the fire-box H, Fig. 2, and is secured thereon by means of a tight ring or collar, Q, (a section only of which is seen in the figure.) The fire-box is provided with an opening on one side, (indicated by the neck R) for admitting the air-draft to the fire. The passage of said neck is contracted as it enters the inside of the fire-box, as shown by the dotted lines. The cap of the hot-air reservoir, E, Fig. 2, is made conical, as shown in Fig. 1. It is of galvanized sheet-iron, and fits on the flange of the ring D′. Said cap is provided with two or more necks, to which the branching conductor-pipes are fitted, and also with a door, S, for supplying water to a vapor-pan, T.

Fig. 5, shows the aperture T′ in the drum L, which communicates with the chimney of the apartment through the jacket B′.

In Figs. 8 and 9 the double valve arrangement for regulating the supply of air to the smoke-deflector and fire-draft is fully shown. Its operation is automatic, as will be explained. *a*, Fig. 8, is a large tube, being of greater capacity than the others, as shown. *b* is a smaller one fastened to it at right angles. Above said tube *b* is another tube, *d*, in a vertical line with it. This is crossed at top with the tube *c*. *e*, Fig. 9, is a slide-tube, having a perforated lateral opening, *f*, which fits into tube *c*. *g g′* are two valves yoked to an arm or lever, *h*. *i* is a portion of an expansion-rod which connects with said arm. These last-described parts are connected with the heating-drum L, Fig. 2, by inserting the tubes *a* and *c* through the respective holes in the jackets B and B′, Fig. 1, fitting them on the necks of the fire-draft R and deflector R′, Fig. 2. The expansion-rod, as before mentioned, is attached to arm *h*, Fig. 8, and extends to the top of the furnace, and is supported in a suitable step, X, Fig. 1, on the conical cap, by means of a thumb-nut, X′. The arm or lever *h* is pivoted to the support U, Fig. 2, which projects from the side of the fire-box H. Another lever, V, Fig. 10, which is pivoted at W, Fig. 11, connects with said lever *h*, as shown in the drawing, Fig. 11.

Fig. 10 shows a compensating device to be attached to the expansion-rod, before referred to, for accurately adjusting its expansion to the varying temperature of the heat within the furnace, and consequent action on the lever V. Said device consists of a short rod, Y, pivoted at right angles to the expansion-rod *i*. The lever V, to which the said expansion-rod is attached, is provided with a slot, Z′. On the end of the said rod Y is an adjusting thumb nut, Z. The said rod Y is kept as short as it can be conveniently used, so that but little extent of expansion would take place.

I will now explain the mode of operating my improved hot-air furnace, as above described, and also the results secured by my said improvements.

After the fire is started and is well going the lower valve, *g′*, is adjusted to the lowest point by turning the thumb-nut X′. This point will of course depend on the temperature at which the apartment is desired to be warmed. When the said valve is so set the furnace is left to regulate itself by the automatic arrangement before explained. It will be proper to observe that the movement of the said lower valve will, by the expansion-rod, as before mentioned, necessarily affect that of the upper one—thus, when the heat from the more rapid combustion of the fuel is increased, the expansion-rod will close the valve of the lower draft-channel and correspondingly open the other, thereby admitting a greater flow of air through the perforated deflector. The air supplied by the said deflector is heated in its passage through its tube N, issuing in jets through the holes placed around its concave plate P, as stated. This hot air diffuses itself among the gases as they arise from the burning fuel, checking all tendency to condensation by "drying" them, thereby preventing the formation of pyroligneous acid and consequent annoyance of dripping. Sometimes it is expedient to raise the heat of the furnace in order to increase the warmth of the apartment, as on extreme cold days. In that case the extension rod is screwed up, so that the lower valve will always remain closed, and then admitting the air to the fire—as much as may be desired—through the register of the fire-draft tube. Again, it may be necessary to lower the heat of the furnace, so that a gentle heat shall pervade the apartment. The fire-

draft register is therefore closed up and the fire draft valve closed down, keeping only the upper valve open, so that what air entered the fire-box would be above the fire. When there is but little fuel in the furnace, or little heat left therein from any cause, or when it is desired to keep the fire over night, the screw of the extension-rod is turned so as to leave the lower valve closed on the fire-draft tube, and the cut-off of the upper draft turned, so that no air reaches the inside of the fire box. Thus the heat left in the furnace can be retained and kept for a given time, and in case of keeping the fire over night it can easily be started on admitting the draft; or, again, it may be desirable at any time during the day or night to retain the heat, whatever its temperature, on the score of economy or otherwise, the lower valve is kept closed, and the cut-off of the upper draft and register of the fire-draft both turned, thus making the furnace air-tight. The expansion of the rod *i*, as is obvious, will be effected in proportion to the heat generated within the furnace, and would therefore be liable to be thrown beyond the points required to actuate the valves, in consequence of too much or too little expansion of said rod. The intention, therefore, of the before-mentioned compensating arrangement is to move or shift the connection of the said rod and lever-arm back or forward, as the case requires, and thus insure a more perfect working of the valves under all conditions of temperature to which the expansion-rod may be subjected. To make this more apparent, suppose the heat to be so low as to create but an imperceptible expansion, it follows, of course, the valves would be but little affected, or scarcely at all. Now, if the connection of the expansion rod with the lever arm be moved back by turning the thumb-nut the connection will be nearer the fulcrum, and therefore cause the slightest expansion to operate on the valves. On the other hand, if the heat be so great as to have a tendency to throw the expansion of the rod beyond a proper point, the thumb-nut is turned so as to throw the connection farther from the fulcrum, thereby producing a corresponding effect on the valves.

The particular construction of the air-channels of the drum—that is to say, forming them so that a gradual widening is preserved toward the escape end—prevents all obstruction to the passage of the heated air caused by its expansion by providing increased room for the increased volume as it is formed in its passage, so that the current of heated air passes on easily and smoothly. Channels having straight or cylindrical sides would cause pressure and consequent obstruction to the passage of the air through them.

The perforated deflector, as above described, can be used with or without the expansion-rod arrangement; but by connecting it with the said arrangement its action is made automatic and in unison therewith, thus preventing the necessity of personal attendance in regulating the supply of air thereto. The combination of the said perforated deflector with the fire-draft, by means of the said expansion-rod arrangement, embodies, however, a distinct result. Thus, in proportion as air is admitted to the fire-draft air is by means of the said double-valve arrangement admitted to the deflector to supply the increased volume of gases, and vice versa, so that there will always be a tendency to equilibrium.

In setting up the furnace it can be placed on the floor of the cellar or room, and elevated therefrom by the legs, as shown in Fig. 1. This plan allows the cold air to be drawn from near the surface of the floor; but the air can be drawn from other and distant sources, such as from outside the external walls of the building by providing the proper channels placed through the said walls. In the latter case it will be necessary to construct a foundation of stone or brick on which to place the furnace, and to conduct the air thereto by means of suitable pipe, as shown by the dotted lines in Fig. 1.

I do not claim the specific construction of tapering tubes for the admission of cold air to a furnace-chamber, as this feature appears to have been adopted in the inverted cone A in the patent of William Ennis, dated March 29, 1853. Neither do I claim the use of a series of such tapering pipes when employed in the manner claimed in the patent of Greene and Ivers, of January 6, 1857, where such a series of air-heating pipes is used, in combination with another series of tapering pipes designed for the admission of smoke.

Having fully described my said improvements, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The double or twin valve arrangement, actuated by a single expansion-rod, the said arrangement consisting of the expansion-rod *i*, levers *h* and V, twin valves *g* and *g'*, and thumb nut X', in combination with the tubes *a*, *b*, *c*, and *d*, perforated slide-tube or cut-off *e*, and perforated deflector and fire-draft, as described, and for the purposes set forth.

2. The perforated concave deflector, constructed and operating substantially as described, and for the purposes stated.

3. The perforated slide-tube *e*, or its equivalent, operating in combination with the valve *g* and register of tube *a*, as and for the purpose stated.

4. The application and use of a compensating device for regulating the action of the expansion-rod on the twin valves, the said device consisting of the short rod Y, slot Z', and thumb-nut Z, connected with and operating said expansion-rod in the manner and for the purpose stated.

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Witnesses:
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J. F. SINGLE.