(No Model.) 3 Sheets—Sheet 1.

T. FARNSWORTH.

GAS COMPRESSING PUMP.

No. 530,097. Patented Dec. 4, 1894.

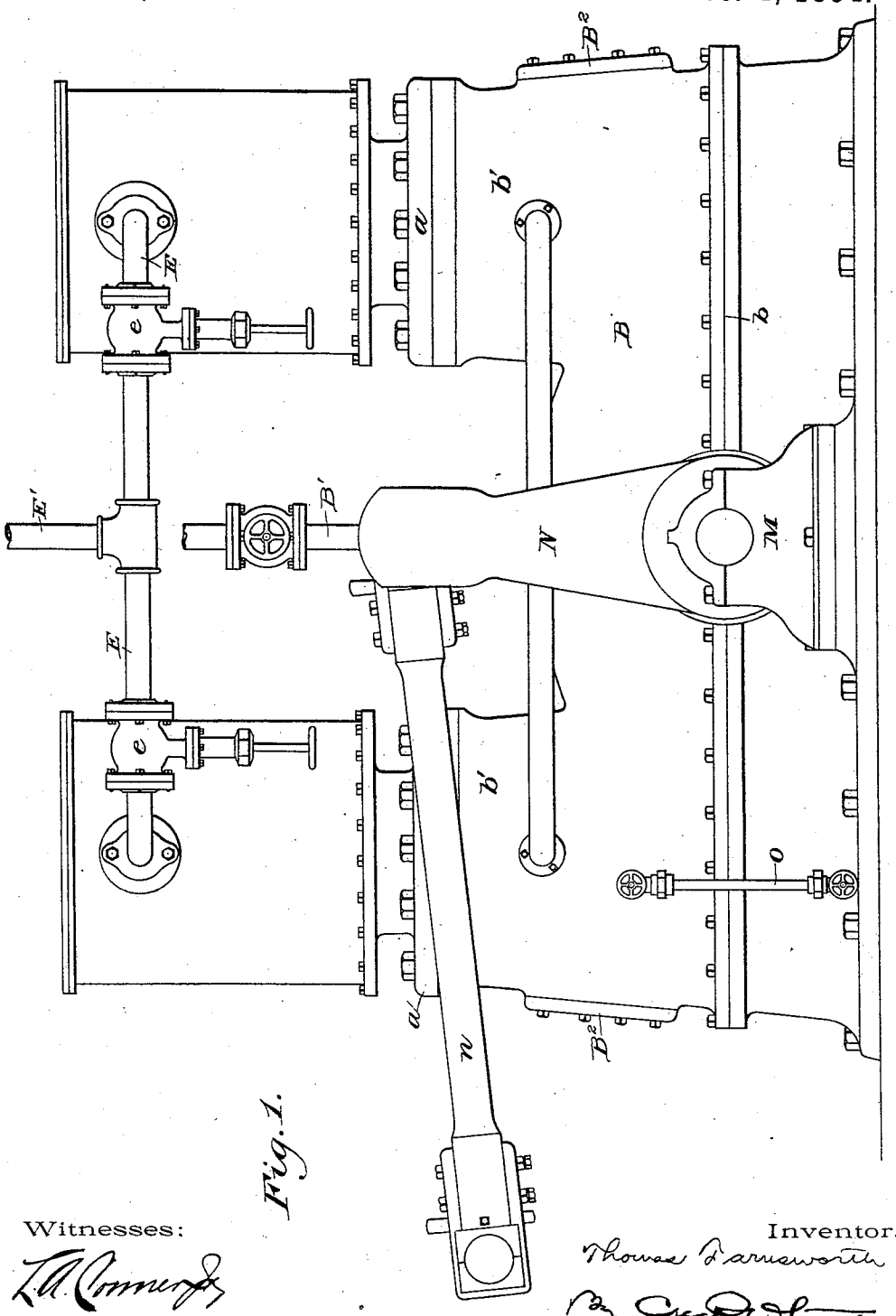


Fig. 1.

Witnesses:
T. A. Connolly
A. W. Kenaston.

Inventor.
Thomas Farnsworth
By Geo. P. Whittemore
Attorney.

(No Model.) 3 Sheets—Sheet 2.

T. FARNSWORTH.

GAS COMPRESSING PUMP.

No. 530,097. Patented Dec. 4, 1894.

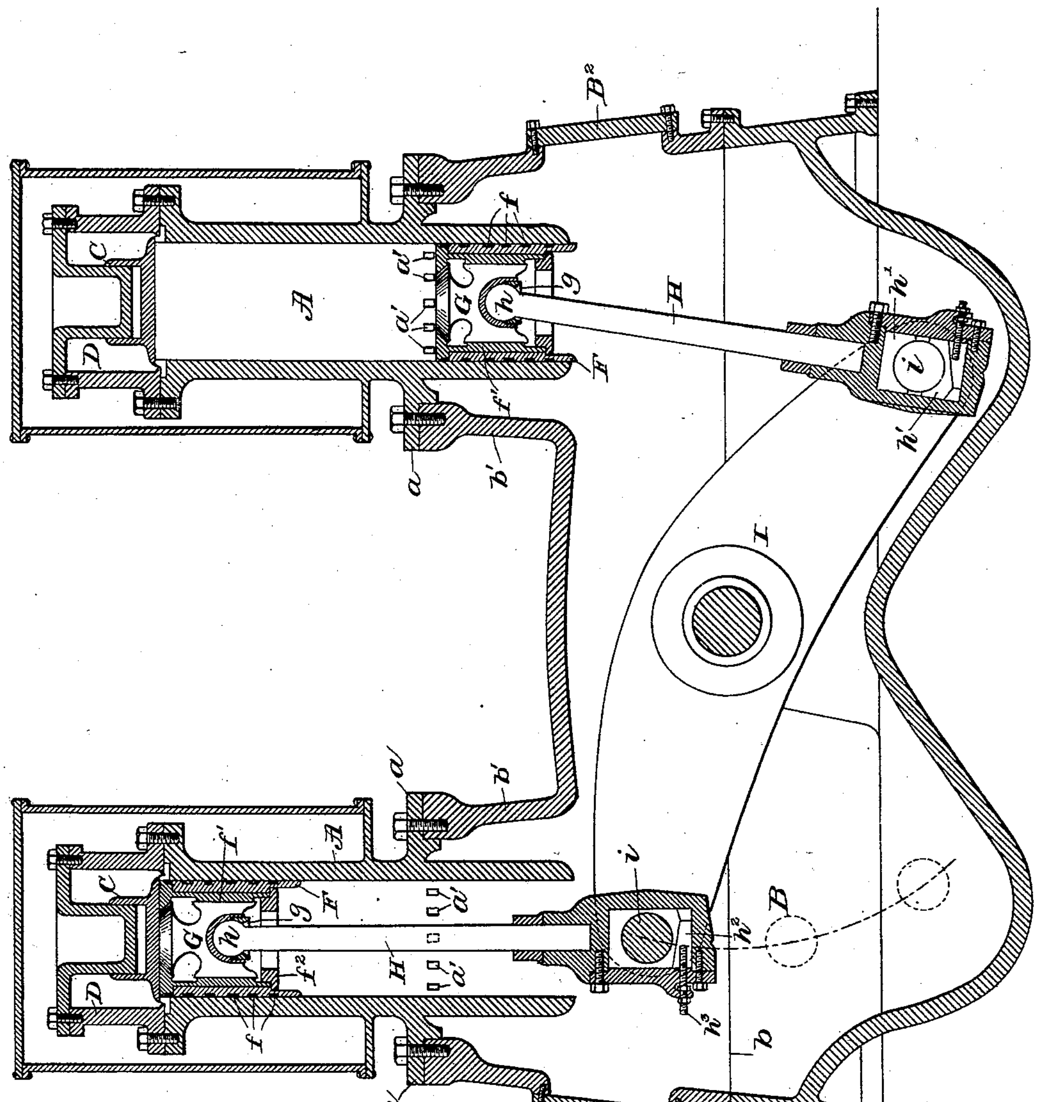


Fig. 2.

Witnesses
[illegible]
[illegible]

Inventor
Thomas Farnsworth,
By [illegible]
Attorney

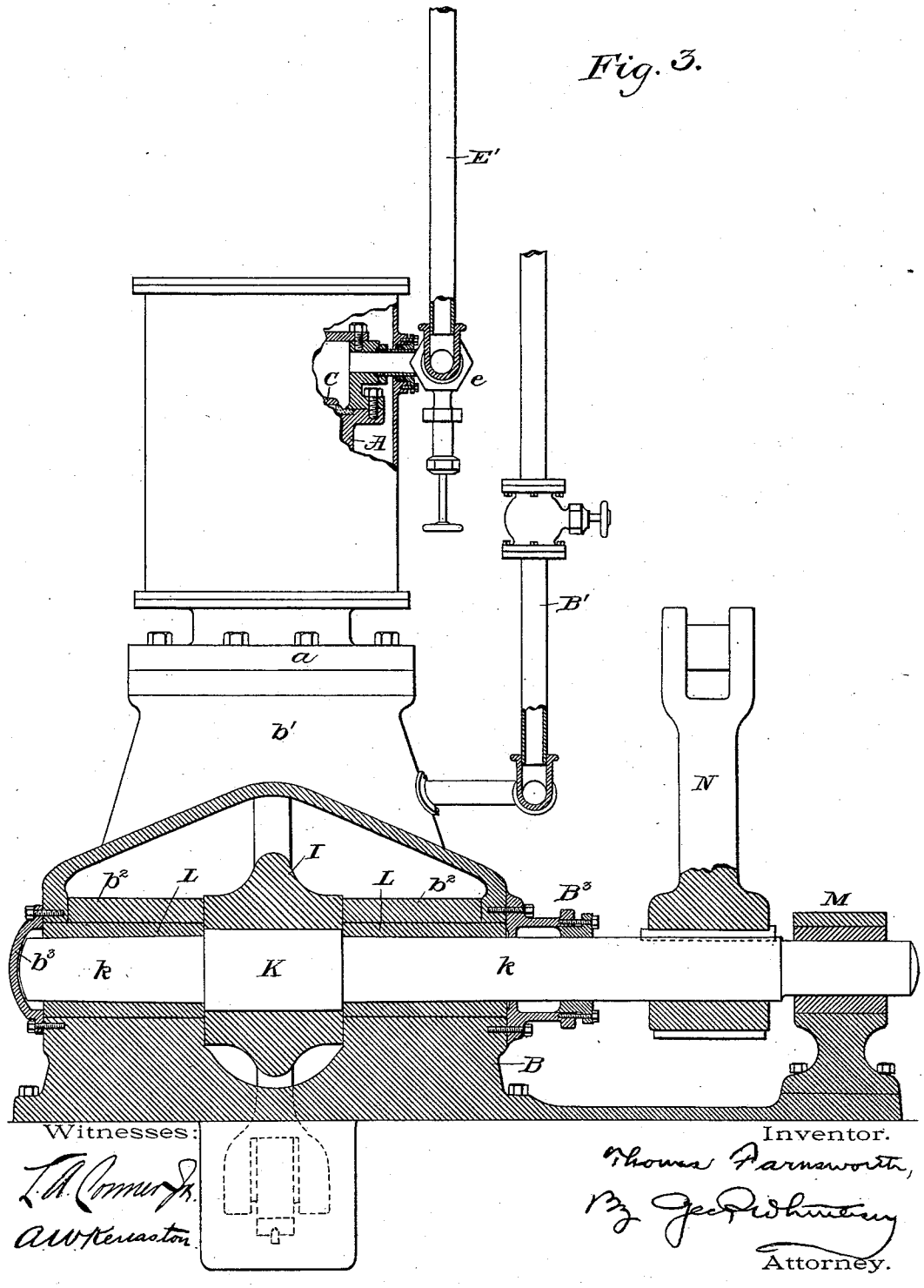
(No Model.) 3 Sheets—Sheet 3.

T. FARNSWORTH.

GAS COMPRESSING PUMP.

No. 530,097. Patented Dec. 4, 1894.

Fig. 3.



Witnesses:
T. A. Connor Jr.
A. W. Kenaston

Inventor.
Thomas Farnsworth,
By Jos. P. Whittemore
Attorney.

UNITED STATES PATENT OFFICE.

THOMAS FARNSWORTH, OF SAN ANTONIO, TEXAS.

GAS-COMPRESSING PUMP.

SPECIFICATION forming part of Letters Patent No. 530,097, dated December 4, 1894.

Application filed February 26, 1894. Serial No. 501,484. (No model.)

To all whom it may concern:

Be it known that I, THOMAS FARNSWORTH, a citizen of the United States, residing at San Antonio, in the county of Bexar and State of Texas, have invented certain new and useful Improvements in Gas-Compressing Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to pumps for exhausting and compressing gases, and has especial reference to the pumps used in mechanical refrigeration and ice making.

The object of my invention is to reduce the height of a vertical machine, to facilitate access to the parts and relieve the foundation of strains; to reduce to a minimum the angularity of the connecting rod during the latter part of the stroke, and to improve various details of construction, as hereinafter set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a double cylinder compressor embodying my improvements. Fig. 2 is a vertical section thereof, and Fig. 3 is a cross section on the axis of the rock shaft.

The cylinders A A are open at each end and are supported by flanges *a* on a suitable base B, consisting of preferably two parts united by a packed joint *b* on a horizontal plane. The upper portion of the base has two necks *b'* in which the cylinders are received, their lower ends depending into the base, as shown. The joint between the neck *b'* and the flange *a* is packed, so that the base forms a gas tight chamber. A pipe B', provided with a suitable stop valve, connects the base with the evaporating coils. The lower portion of the base is preferably in one piece, to form a reservoir for lubricating oil. At B^2 are covers to hand holes for giving access to the bearings of the connecting rods. In each cylinder, just below the flange *a* are one or more ports *a'*. The upper end of each cylinder is closed by a check valve C, which cuts off the cylinder from a chamber D from which proceeds a discharge pipe E having a stop valve *e* and connecting with a common pipe E', running to the condenser.

In each cylinder is a piston F, tubular in shape, and provided with a number of packing rings *f*. The upper end of the piston forms a seat for an upwardly closing valve G, which slides on vertical guides *f'* on the inside of the piston. A ring f^2 screwed into the lower end of the piston limits the play of the valve. A socket is formed in the under side of the valve to receive the ball *h* on the upper end of the connecting rod H, the ball being confined in the socket in any suitable manner, as by a gland *g*. The lower end of the rod H is provided with brasses *h'* for connecting it with a wrist pin *i* on a rocker I. The brasses can be adjusted by a wedge h^2 and screw h^3.

The rocker I is keyed to a shaft K, journaled in bearings b^2 integral with the lower portion of the base. The rocker has a working fit between the inner faces of these bearings, which are bored out cylindrically, and are lined with bushings L turned to an outside fit in the bearings and bored out to suit the long and preferably taper journals *k* on the shaft K. A gas tight cover b^3 incloses one end of the shaft. The other end passes through a stuffing box B^3 and is supported in an outboard pillow block M. The axis of the shaft lies preferably in the plane of the joint *b* between the upper and lower portions of the base. Fastened to the shaft outside the base is a rock arm N, to which may be attached a rod *n* for connecting it with an engine or other motor.

The wrist pins *i* and shaft K are not in line with each other, but the shaft stands above the line joining the pins, so that each pin is distant from the shaft more than half the distance between the axes of the cylinders A. The proportions are such that when a piston is at the bottom of its cylinder, as at the right of Fig. 2, the angularity of the rod is the greatest; but when the piston has made half its up stroke, the pin *i* intersects the axis of the cylinder, and the rod co-incides with said axis. The continued upward movement of the rocker arm swings the rod slightly outward for the next quarter of the stroke, but during the last quarter the rod again approaches a central position, which it reaches at the end of the stroke, as seen at the left

of Fig. 2. The dotted lines in this figure show the paths of the pins *i*. It thus appears that during the latter half of the stroke, when the resistance of the gas in the cylinder is greatest, the angularity of the rod is least, thus reducing to a minimum the wear and strain. It also appears that the line joining the center of the wrist pin and the axis of the shaft does not stand at right angles to the axis of the cylinder until three-quarters of the stroke has been made.

In operation, the downward movement of the rod H first draws down the valve G from its seat in the upper end of the piston. When the lower end of the valve strikes the ring f^2, the piston is carried downward, the gas in the base passing into the cylinder past the open valve G. On arriving at the bottom of its stroke, the piston uncovers the ports a', which permit the gas to enter the cylinder freely and insure a full charge at evaporating pressure. The upward movement of the rocker arm first closes the valve G and then carries up the piston, compressing the gas in the cylinder until it equals the pressure in the condenser, when the check valve C opens, and the gas passes into the condenser, where it is liquefied. The construction of the piston is such that there is perfect freedom from restraint, avoiding unequal wear, and insuring prompt and correct action. The ball joints, guides in the pistons, pins and shaft bearings are all lubricated by the oil in the lower portion of the base, which is preferably carried at the height of the center of the shaft K, but may be varied to suit. The level of the oil is shown by a gage O. At each stroke, the descending rocker arm throws up a spray which amply lubricates the parts not immersed in the oil.

It will be seen that all the parts have large bearing surfaces, and that their movement is comparatively small, so that friction and wear are reduced to a minimum. The machine stands low and firm on its foundation. The stuffing-box B^3 is easily kept tight, since it is exposed only to the low evaporating pressure in the base.

In a former patent, No. 395,044, I have shown, described and claimed the construction of the piston, with its valve and ball socket.

What I now claim, and desire to secure by Letters Patent, is—

1. In a single-acting gas-compressing pump, the combination with two parallel cylinders, and their pistons, of a rocker, and rods connecting the ends of said rocker with the pistons, said rocker being pivoted between the axes of said cylinders and at a point nearer to the pistons than a horizontal plane intersecting the wrist pins on the ends of the rockers, said rods co-inciding with the axes of the cylinders when the pins stand in said horizontal plane, substantially as described.

2. In a single acting gas compressing pump, the combination with a pump cylinder, of a piston, a connecting rod, and a rocker arm for actuating said rod pivoted on an axis so located that the line joining the end of the rod and said axis is at right angles to the axis of the cylinder when the piston has completed the greater part of its stroke, substantially as described.

3. In a gas compressing pump, the combination with a pump cylinder, of a piston, a connecting rod, and a rocker pivoted at one side of the cylinder, so that at the middle and completion of the stroke the connecting rod co-incides with the axis of the cylinder, substantially as described.

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

THOMAS FARNSWORTH.

Witnesses:
JAS. SCHUEHLE,
ROBT. T. TALIAFERRO.