No. 663,500. Patented Dec. 11, 1900.

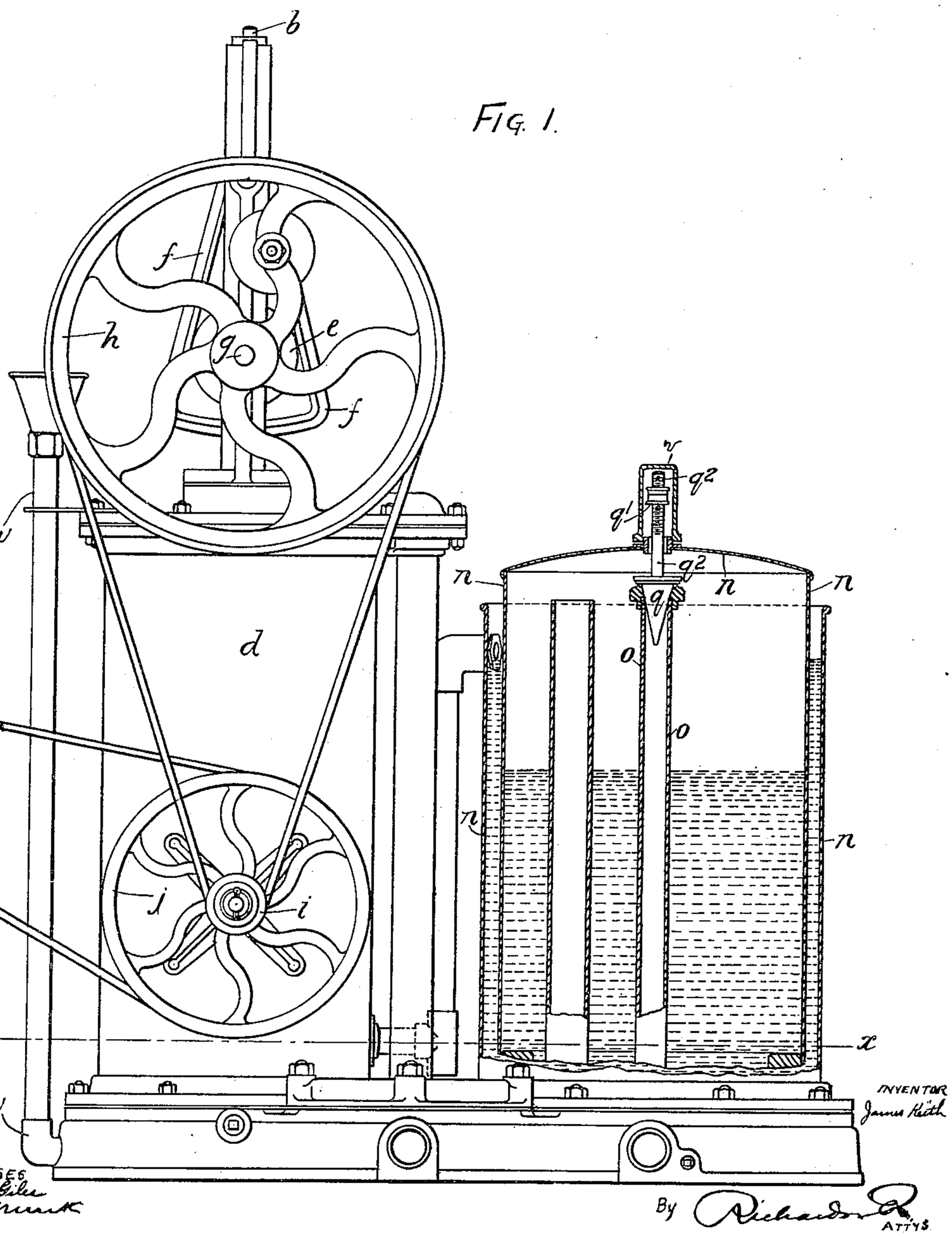
J. KEITH.

GAS OR AIR COMPRESSOR OR PUMP.

(Application filed Dec. 30, 1899.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1.



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(No Model.) 4 Sheets—Sheet 2.

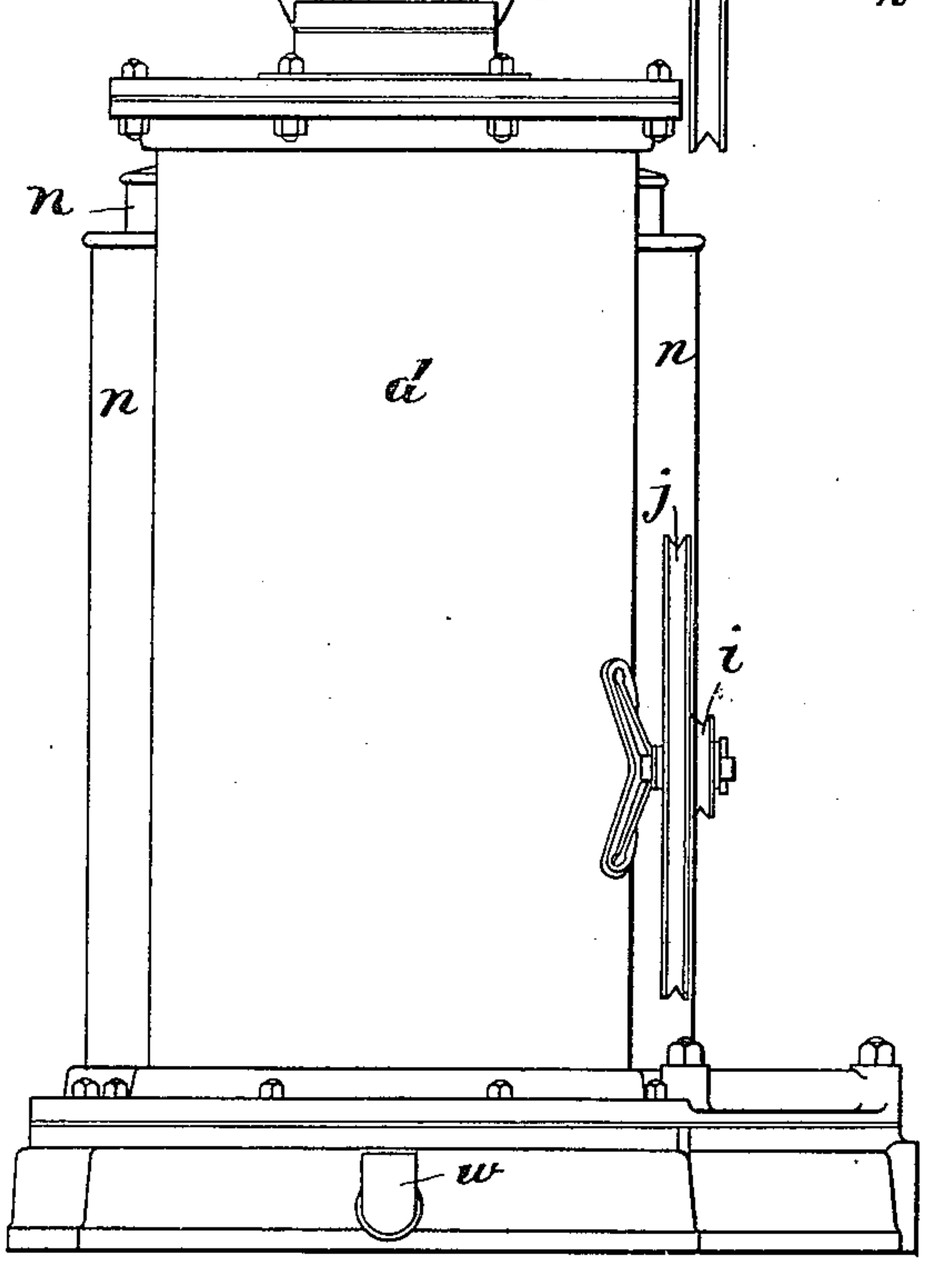

FIG. 2.

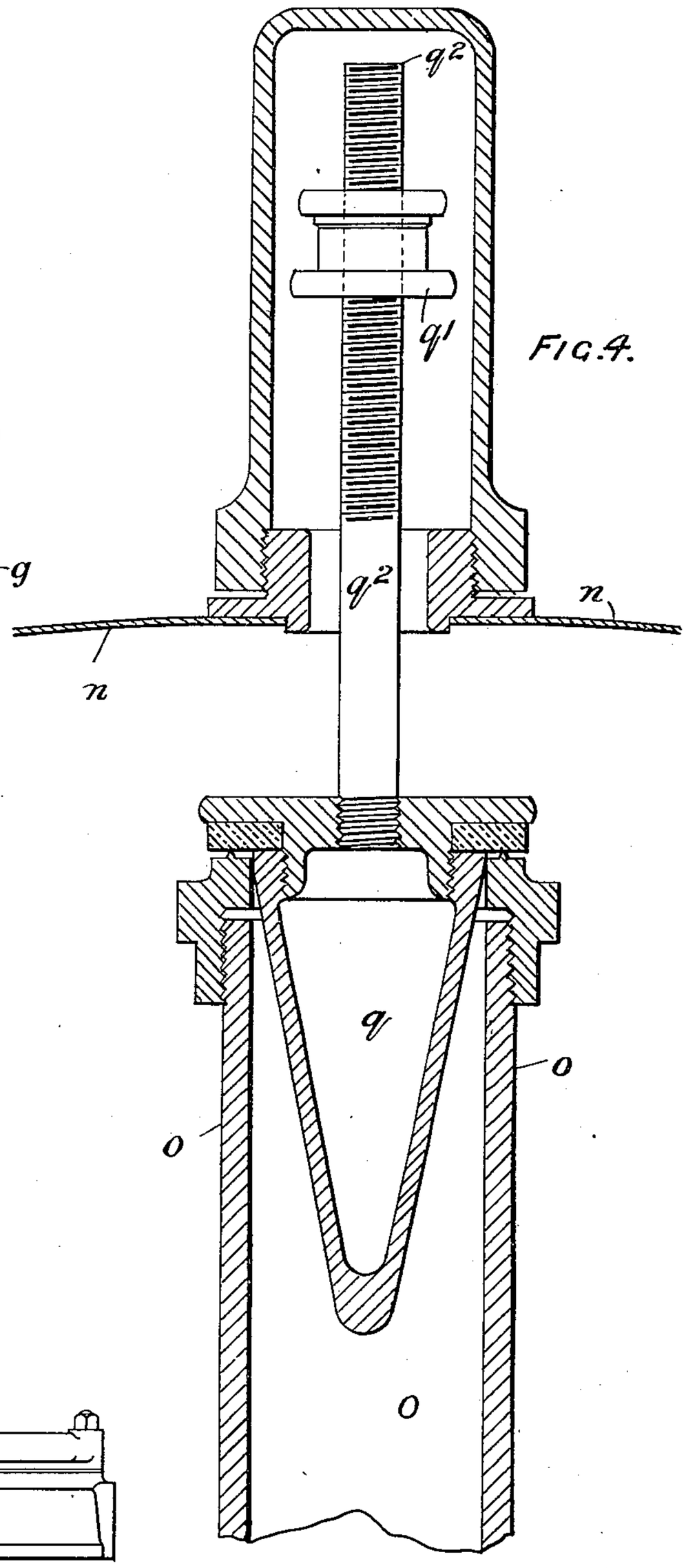

FIG. 4.

WITNESSES:
Ella L. Giles
Otto Munn

INVENTOR
James Keith
By Richards & Co
ATTORNEYS

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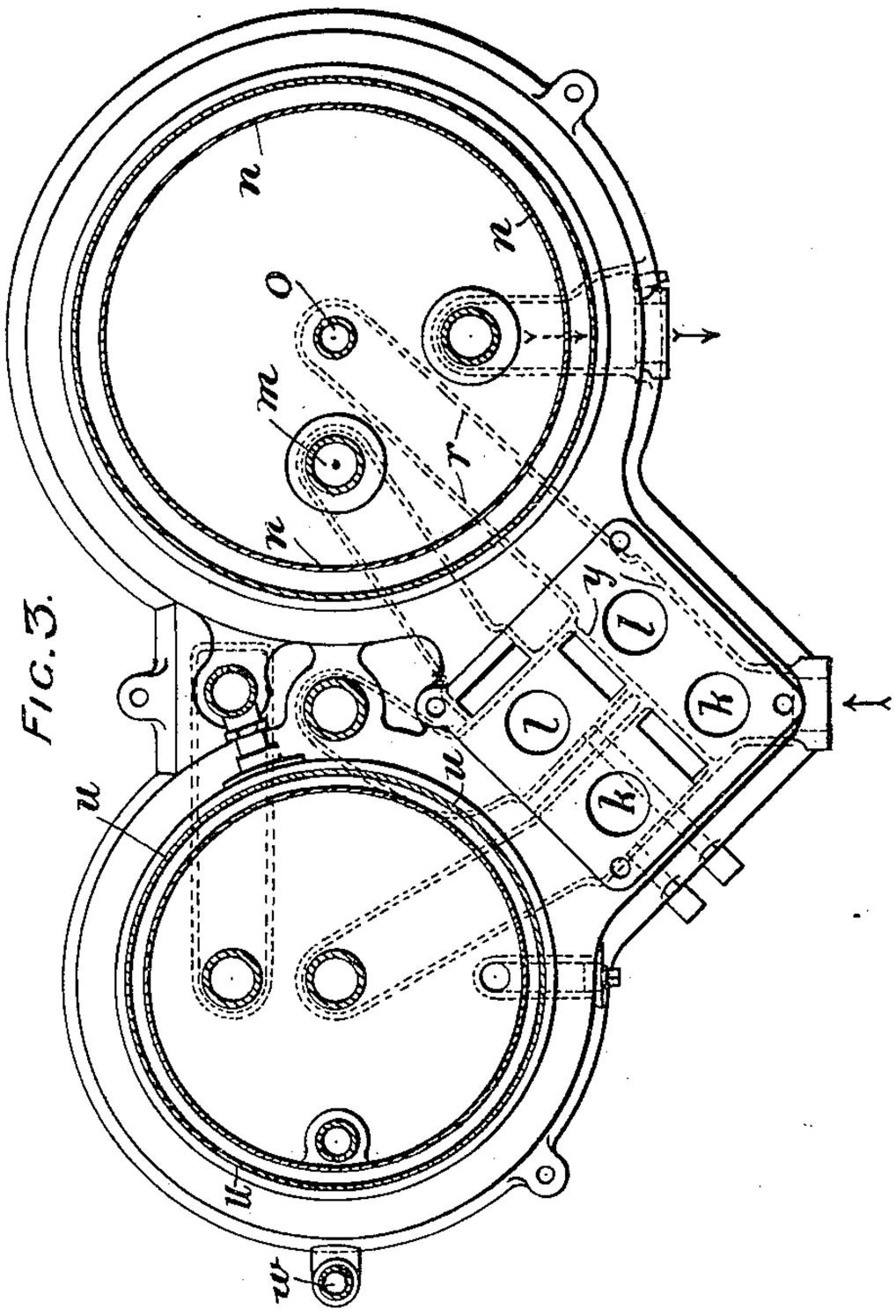
FIG. 3.



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Ella L. Giles
Otto Munn

INVENTOR
James Keith
BY Richards & Co
ATTORNEYS

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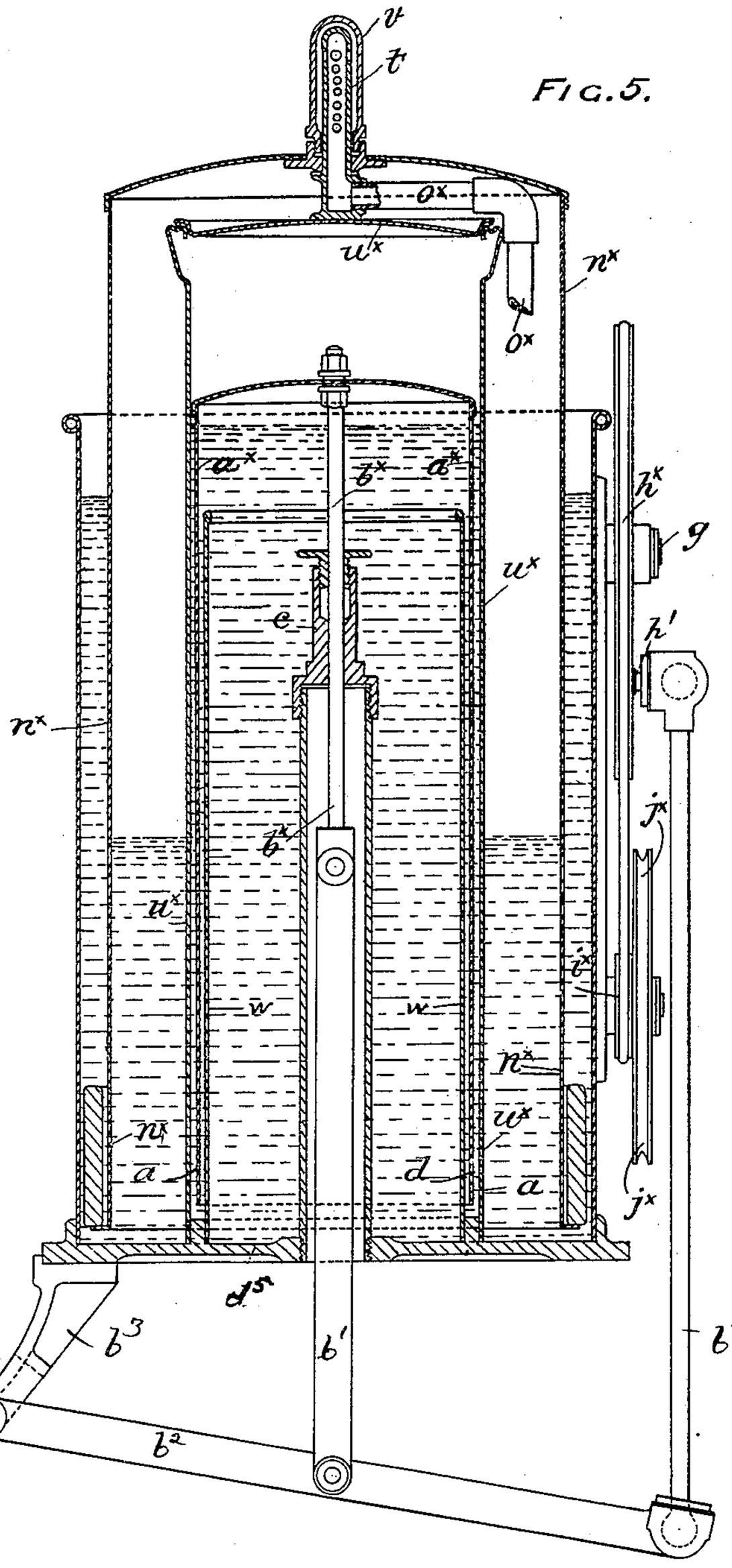
FIG. 5.



WITNESSES:
Ella L. Giles
Oldmixon

INVENTOR
James Keith
BY Richardson & Co
ATTORNEYS

UNITED STATES PATENT OFFICE.

JAMES KEITH, OF LONDON, ENGLAND.

GAS OR AIR COMPRESSOR OR PUMP.

SPECIFICATION forming part of Letters Patent No. 663,500, dated December 11, 1900.

Application filed December 30, 1899. Serial No. 742,104. (No model.)

To all whom it may concern:

Be it known that I, JAMES KEITH, a citizen of the United Kingdom of Great Britain and Ireland, residing at 27 Farringdon avenue, London, England, have invented certain new and useful Improvements in Gas or Air Compressors or Pumps, (which were patented in Great Britain on the 5th day of June, 1899, No. 11,593,) of which the following is a specification.

This invention relates to gas or air compressors or pumps of the kind described in my pending applications for United States Patents, Serial Nos. 677,365 and 701,954; and it has for its object to provide means for operating the pumping-bell of such apparatus from a rotary motor or running shaft in cases in which an automatically-controlled hydraulic or like motor cannot be conveniently applied.

The invention is illustrated by the accompanying drawings.

Figure 1 is an elevation, partly in section, of a compressor or pump driven by belt-gearing; Fig. 2, an elevation of the same at right angles to Fig. 1; and Fig. 3, a horizontal section on the line $x\ x$, Fig. 1. Fig. 4 is a detail on a larger scale showing one form of the pressure-regulating valve. Fig. 5 is a modified form in which the gas-holder surrounds the pumping-bell and in which the pump-plunger is arranged to be underdriven.

In carrying out the invention I fit the pumping-bell within its cylinder d in the manner shown and described in my United States application Serial No. 677,365 and provide said pumping-bell with a piston-rod b, which passes upward, as shown at Figs. 1 and 2, through a gland c or water seal in the casing d of the apparatus and connect thereto a crank-disk e and connecting-rod f or eccentric or like device on a shaft g, which is driven by belts and pulleys $h\ i\ j$ or other gearing or is driven directly from a motor or shaft having a rotary motion, the result being to obtain an easy-working rectilinear motion on the compressor-plunger from the circular motion of the driving power. The driving power applied to the compressor may be obtained from a running power-shaft, a gas-engine, a hot-air motor, an electric motor, or even clockwork or any other kind of mechanism giving a rotary motion.

The pump, as shown at Fig. 3, has suitable inlet and discharge valves $k\ l$, such as are applied in the apparatus described in the applications above referred to, and it discharges by a stand-pipe m into a holder n, loaded to the desired pressure. Inside and preferably in the center of this holder, as shown at Fig. 2, is another stand-pipe o, the lower end of which is connected to the suction side y of the pump by a passage r, and this pipe o has a tapered valve q on the top opening upward, so as to give a gradually-increasing opening over a considerable length of stroke. This valve q is so arranged that after the holder n rises a certain height over its normal height it engages with an adjustable tappet q' on the valve-rod q^2, as shown particularly at Fig. 4, and the higher the holder rises the larger the valve-opening becomes, and consequently the excess portion of the gas is sucked down the stand-pipe o because of the connection between said stand-pipe and the suction side of the pump. The upper end of the valve-rod q^2 is surrounded by a tube v, closed at its upper end and fitted gas-tight upon the holder n.

The apparatus is provided with suitable arrangements for filling the water seals, such as the filling-pipe w, and means, such as described in the applications referred to, for keeping them all connected with a large body of water in the holder n and its outer cylinder n', so that evaporation has little effect on them, or it may be arranged with other devices for preventing evaporation of the water or with a ball-cock to keep the seals automatically filled.

Referring to Fig. 5, the holder in this case is, as described in my United States application Serial No. 701,954, arranged outside the cylinder d of the pumping-bell $a^\times$, the inner cylinder w being arranged in both modifications described herein as shown and described in both applications above referred to. The piston-rod $b^\times$ of the pumping-bell a is carried downward through a gland c and connected by a rod b' to a lever b^2, pivoted on a bracket b^3, secured on the sole d^5 of the apparatus. The lever b^2 is connected to a

rod or pitman b^4, in turn connected to a stud h' on the face of the pulley $h^\times$.

Instead of the tapered valve q, described in reference to Figs. 1, 2, and 3, a perforated tube t, closed at its upper end, may be secured either upon the pump-cylinder d when the holder $n^\times$ is placed as shown at Fig. 5, or to the stand-pipe o in place of the valve q used when the holder is separate from the pump, as shown at Figs. 1, 2, and 3, the perforated tube t being taken through a gland forming one end of a closed tube v, secured upon the outer surface of the gas-holder $n^\times$, the result of the bell rising under excess of pressure being the same as already described with reference to the valve q. There is still another stand-pipe s inside the holder n, which is connected to the delivery end of the apparatus and through which the gas is drawn off to the burners as required.

When the apparatus is used for compressing gas or compressing and mixing gas and air for incandescent lighting or like purposes, the pump is run at a practically constant speed, sufficient for the supply of gas to the maximum number of lights required, and if the supply of the compressed gas exceeds the demand the gas-holder of the apparatus rises and by raising the valve q allows a portion of the high-pressure gas to escape to the suction side of the pump, while if all the burners are shut off the gas is merely circulated through the apparatus by this means.

In general regulation of the gearing or driving power is not required; but in special cases the loaded gas-holder u may be connected to the power-supply for the motor, so that when the holder u rises to its full height it may practically cut off the supply of gas or other power for the heating of a hot-air motor or otherwise reduce the power of the driver, and consequently the speed of the compressor itself, and when the said holder u again returns to its normal level it may in like manner turn on the said supplies of power and increase the speed of the apparatus, the whole being thus made in this way partially self-governing. The same kind of special driving-gear from the rotary to the reciprocating motion (with a modified governing device) may also be employed for working air or gas or other pumps having packed piston-cylinders for compression, for the raising or serving of liquids, or for other purposes.

Having now described the invention, what I claim, and desire to secure by Letters Patent, is—

In combination, with a gas-holder having a movable bell and a delivery-outlet, a continuously-operating forcing-pump connected with said gas-holder, a pipe placing said holder in communication with the suction side of the pump, a valve for said pipe, and means operated by the abnormal rise of the bell for opening said valve, substantially as described.

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

JAMES KEITH.

Witnesses:

WALLACE FAIRWEATHER,

JNO. ARMSTRONG, Junr.