(No Model.)

B. F. SILLIMAN.

GAS COMPRESSOR.

No. 527,081. Patented Oct. 9, 1894.

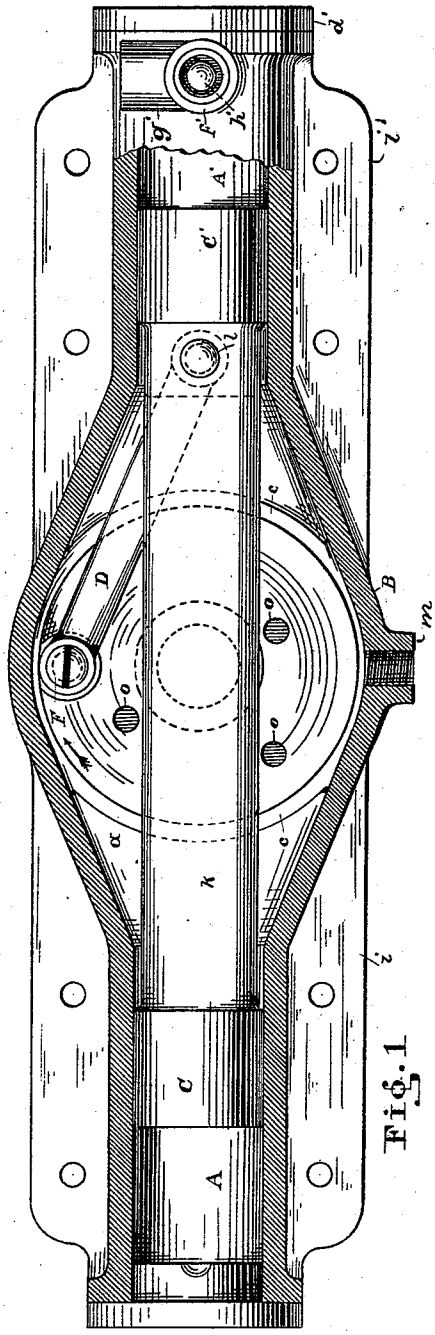

Fig. 1.

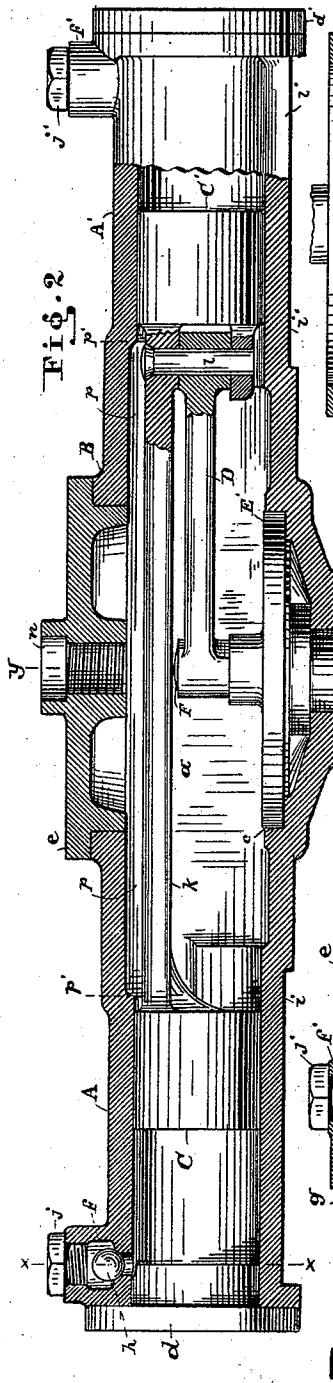

Fig. 2.

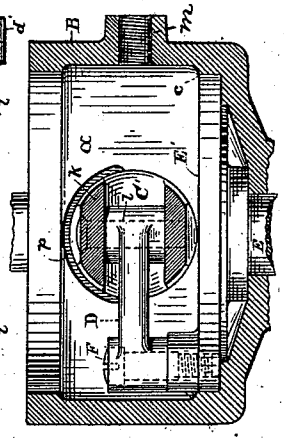

Fig. 4.

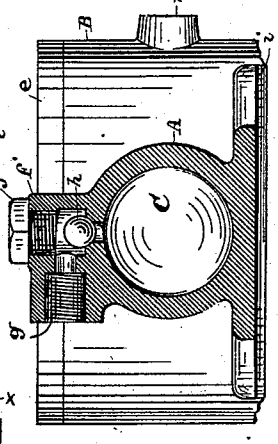

Fig. 3.

WITNESSES
R. F. Lagan'ke
John B. Boesel

INVENTOR
Benjamin F. Silliman
by B. F. Eibler Attorney

UNITED STATES PATENT OFFICE.

BENJAMIN F. SILLIMAN, OF CLEVELAND, OHIO.

GAS-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 527,081, dated October 9, 1894.

Application filed December 12, 1893. Serial No. 493,513. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. SILLIMAN, a citizen of the United States, and a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and Improved Gas-Compressor, of which the following is a specification.

My invention relates to improvements in twin cylinder gas compressors, in which the cylinders are arranged in alignment and having straight line coupled pistons applied in connection therewith.

The objects of my improvement are chiefly simplicity in construction, to provide for a proper and durable guidance of the operating parts, which in turn admit of an easy and thorough manner of lubrication while the lubricant also serves as a medium for attaining the gas under seal.

That the invention may be fully understood and seen, reference will be had to the following specification and the accompanying drawings, in which—

Figure 1 illustrates a part horizontal section and part plan view of said compressor. Fig. 2 is a vertical section, and part exterior view of same. Fig. 3 represents a vertical cross section on line *x x*, of Fig. 2, and Fig. 4 is a cross section on line *y y* of Fig. 2.

Like letters of reference denote like parts in the drawings and specification.

The compressor above referred to consists substantially of the following parts, to wit: the combined structure of the cylinders A, A′ and the casing part B; the pistons C C′, link D, shaft E with disk or head E′ and wrist pin F.

The cylinders A A′ extend in opposite direction and alignment from out the casing B, that is, said cylinders are arranged in open relation with the casing B, which comprises the supply chamber *a*, stuffing box *b* and a suitable bearing *c* for the head of the shaft E. The extremities or terminals of said cylinders and casing are flanged and provided with removable heads *d d′* and *e*. Said heads may be secured in any suitable manner; also the stuffing box may be constructed in a modified form without departing from the nature of my invention. Arranged in close proximity to said heads *d d′* are the eduction valve receptacles *f f′* with branch outlets *g g′* adapted for connecting pipes therewith. See Figs. 1, 2 and 3. In preference balls are selected to serve as eduction valves *h h′* and cap screws *j j′* are employed for closing said receptacles and also determining the lift of said valves.

By means of the base flanges *i i′* the cylinders or compressor proper can be secured to any suitable foundation, frame or wall plates. It is essential however that the casing with stuffing box be retained in perpendicular position for reasons hereinafter set forth.

The pistons C C′ are coupled or united by means of the bar *k* see Figs. 1 and 2, and at or near the junction of said bar and piston C′ a pivotal connection with the link D is attained by means of the pin *l*, whereas the pin F affords a similar connection of the opposite end of said link and the disk E′ of the shaft E.

The disk E′ is guided in the circular bearing *c*, and for the shaft is provided the stuffing box *b*. The shaft may either be directly a part of the motor, or may indirectly be driven by motive power.

At *m* provision is made for attachment of an oil cup or similar apparatus for conveying suitable lubricants into the casing B, so that not only all the moving parts may be immersed or surrounded by lubricating substance or fluid, but also attaining the formation of a sealing medium, between and for the supply of gas in the chamber *a* and the stuffing box *b*.

In the drawings the head *e* is adapted for connection of the supply pipe. (See inlet *n*.) Said inlet however may be arranged in the side of the casing B (above the oil inlet) if so desired.

Depending upon the nature of the gas to be compressed, more or less lubricating fluid or substance may be injected into the casing B. If this compressor is used for compressing anhydrous ammonia, (which agent is used for refrigeration and the artificial production of ice,) then but a low level of lubricant is needed, owing to the cold state in which said gas enters and its very lubricating nature. To establish a seal for the gas to prevent coming in contact with the packing in the stuffing box is the only object in that instance. The disk E′ is perforated. See *o o* Fig. 1. Equilibrium in the pressures above and below the disk E′ is

thereby attained, and also a deposit of lubricant is rendered available for the shaft and stuffing box.

The rotation of the shaft E results in the reciprocation of the pistons C C′ by the means above stated. The withdrawal of either of the pistons toward the casing part permits the gas to enter one or the other of the cylinders, and it is while gas enters one cylinder, that the gas in the other cylinder (previously charged) becomes compressed to be so discharged through the valves *h h′* above referred to. In Figs. 1 and 2 the pistons are shown in mid position, and be it supposed that the shaft revolves in the direction as indicated by the arrow Fig. 1, then it is the piston C′, which is in the act of compressing the gas, which had entered partly during the previous stroke in opposite direction and at the beginning of the stroke now assumed. Compression is progressing until the pressure in the cylinder A′ exceeds that in the discharge pipes. The valve *h′* will then open and remain so until the gas is completely expelled; the pistons traveling in close proximity to the heads *d d′* to assure this. Before, while and after interchange of stroke takes place the piston C is in a position past the terminal *p′* of the cavity *p*. See Figs. 2 and 4. During that interval the cylinder A becomes charged with gas from the chamber *a* to be compressed on the return of the piston C the moment the latter has passed the line *p′*.

From the foregoing it can readily be seen, that either rotary or vibrating motion imparted to the shaft E results in the reciprocation of the pistons C C′, but in either instance the pistons must be forced close up to the heads to assure complete displacement of the compressed gas.

To leave space for an abundant supply of gas within the chamber *a*, and also to provide for a perfect seal of lubricants to guard against leaking of gas through the stuffing box it is essential that the cylinders should be so mounted as to enable the sealing medium even when at low level to completely maintain the head E′ in immersed condition. It is thus proper that perpendicular position be given to the shaft E for operation of the cylinders above described.

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

1. In a gas compressor having the cylinders arranged in alignment and in open relation with a casing constituting a supply chamber for both of said cylinders, the combination of the pistons C C′ united by a top bar and a shaft provided with a disk and link in operative connection with said pistons below said bar, the said disk being guided in a recess in the bottom of said casing, substantially as shown and for the purpose described.

2. In combination with the cylinders A A′, casing B, pistons C C′ and shaft E with disk E′ and the link D in operative connection with said pistons and said disk, the casing B provided with a stuffing box for said shaft, directly above which is a recessed bearing for said disk, substantially as shown and for the purpose described.

3. In a gas compressor of the class described, the disk of the operating shaft perforated and guided in a recess of the casing part thereof substantially as shown and for the purpose described.

4. In a gas compressor of the class described, the casing thereof having, in the interior upper side, recesses *p* for admission of gas, and a circular recess above its stuffing box in combination with a vertical operating shaft and disk guided in said box and recess, a link and pistons, united by a top bar, alternately establishing open relation of said recesses *p* and the compression cylinders, all constructed and arranged substantially as and for the purpose described.

BENJAMIN F. SILLIMAN.

Witnesses:
BERNHARD F. EIBLER,
GEORGE A. BOESEL.