(No Model.) 2 Sheets—Sheet 1.

H. C. SERGEANT.

COMPOUND COMPRESSOR FOR AIR OR OTHER GASEOUS BODIES.

No. 456,165. Patented July 21, 1891.

Fig. 2.

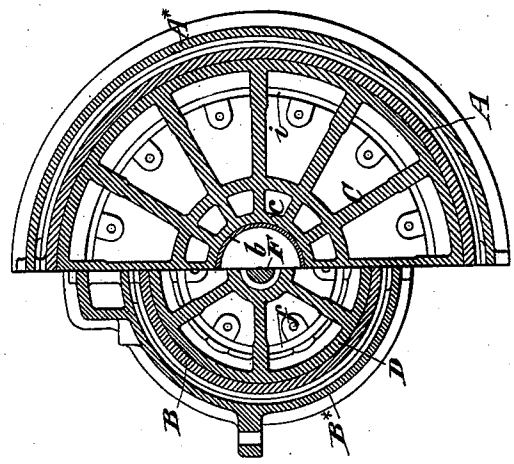
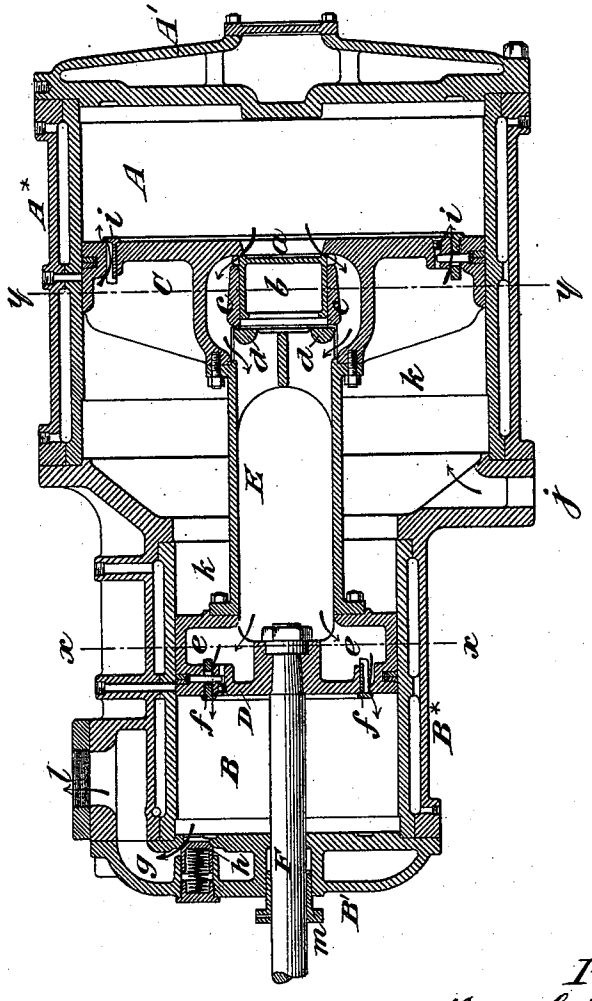


Fig. 1



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K. E. Pembleton

Inventor:-
Henry C. Sergeant
by attorneys
Brown & Seward

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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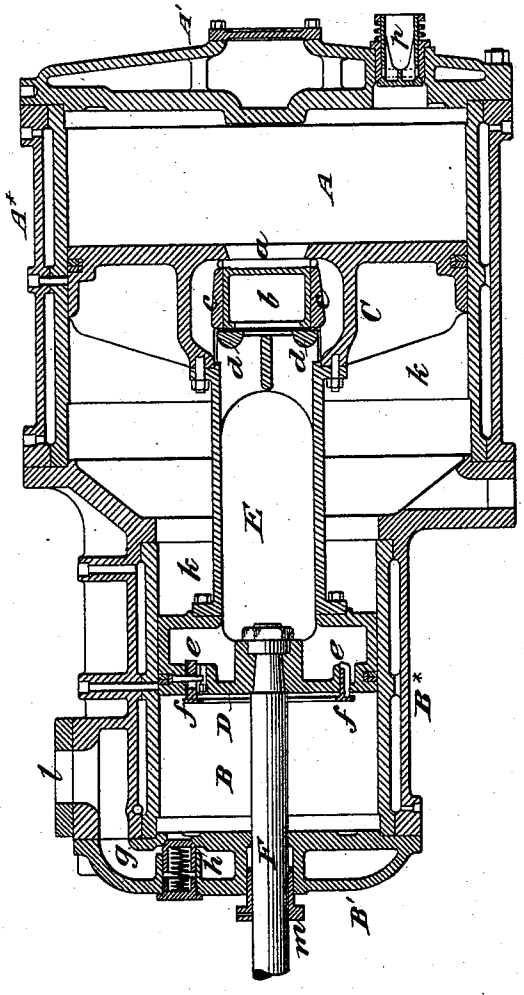


Fig. 3.

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UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF NEW YORK, N. Y., ASSIGNOR TO THE INGERSOLL-SERGEANT DRILL COMPANY, OF SAME PLACE.

COMPOUND COMPRESSOR FOR AIR OR OTHER GASEOUS BODIES.

SPECIFICATION forming part of Letters Patent No. 456,165, dated July 21, 1891.

Application filed September 17, 1890. Serial No. 365,261. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SERGEANT, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Compound Compressors for Air and other Gaseous or Aeriform Bodies, of which the following is a specification, reference being had to the accompanying drawings.

The object of this invention is to simplify the construction and increase the efficiency of compound compressors and to afford facility for examination and repair of the interior parts thereof.

I will first describe the invention in detail, with reference to the drawings, and afterward point out its novelty in claims.

Figure 1 represents a central longitudinal section of a compressor embodying my invention. Fig. 2 is a transverse sectional view, of which one half is taken in the line *x x* of Fig. 1 and the other half in the line *y y* thereof. Fig. 3 represents a central longitudinal section of a compressor illustrating a modification of that shown in Fig. 1.

Referring first to Figs. 1 and 2, A and B are the two compressor-cylinders, of unequal size, arranged end to end, in free communication with each other at their inner or adjacent ends and closed, respectively, at their outer ends by heads A′ B′, both of which may be removable. These cylinders are represented as surrounded by water-jackets A* B*.

C D are the pistons fitted, respectively, to the cylinders A and B.

E is a tube forming a connection between the pistons C D and a communication through them. The piston C has a central opening *a*, around which is the seat for a valve *b*, which serves to open and close communication between the outer portion of the cylinder A and the tube E. A cylindrical guide *c* is provided for this valve within the piston C, and a guard *d*, to limit the opening of the said valve, is provided within the end of the tube E. The piston D is hollow and its internal cavity *e* is in free communication with the tube E. The said piston is fitted with the valve *f*, which opens into the outer portion of the cylinder B to permit the outlet of air from the piston and from the tube E into the said portion of the cylinder. This valve may be of any suitable kind, but is represented as of the annular kind which constitutes part of the subject-matter of my United States Letters Patent No. 422,255, dated February 25, 1890. The piston C in this example of the invention is furnished with a valve *i*, which may be of any suitable kind, but is represented as of the same kind as that hereinbefore described in the piston D, the said valve *i* opening toward the outer portion of the cylinder A, and in this case the inlet for the air to be compressed is at *j* and communicates directly with the space *k*, formed within the two cylinders between the pistons C D. The cylinder-head B′, which is hollow to form an air-chamber *g*, is fitted with as many valves *h* as may be necessary for the exit of the compressed air from the cylinder B, the said air passing through said chamber to the outlet *l*. The two pistons connected by the tube E have the piston-rod F, by which they are operated, directly connected with the piston D, and this rod passes through a stuffing-box *m* in the head B′ of the smaller cylinder. This arrangement of the piston-rod F affords facility for the easy removal of both pistons, as by disconnecting the rod F from the motor and removing the head A′ of the larger cylinder the two pistons and their rod are permitted to be drawn out together through the larger cylinder.

The operation of this compressor is as follows: While the pistons are moving to the right—that is to say, the larger piston moving toward the outer end of its cylinder and the smaller one moving from the outer end of its cylinder—the valves *i* and *h* are closed and the valves *b* and *f* are open, and fresh air is then entering by the inlet *j* to the space *k* between the pistons, and the air between the larger piston C and the outer end of its cylinder A is being compressed therein and forced out therefrom through the opening of the valve *b*, through the tube E, the cavity *e* of the piston D, and the opening of the valve *f* into the smaller cylinder B. During the stroke in the opposite direction the valves *f* and *b* are closed and those *i* and *h* are open, and the air in the cylinder B is further compressed to the high pressure and forced out

therefrom through the opening *l*, and at the same time the space between the larger piston C and the outer end of its cylinder is receiving through the opening of the valve *i* fresh air from the space *k* between the two pistons, which space is always open to the atmosphere or source of supply of the air or other body to be compressed.

In the example of my invention represented in Fig. 3 there is precisely the same provision for communication through the pistons between the cylinders A and B by means of the tube E as in the first-described example. The only difference between this example and the first-described example is that in this the fresh air to be compressed, instead of being admitted to the space *k* between the pistons and passing through the piston C, is admitted to the cylinder through the valves *p* in the head A′ thereof, and the valve *i* or any valve in the larger piston for forming communication between the portion of the cylinder on opposite sides of it is dispensed with.

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

1. The combination, in a compressor, with two single-acting cylinders of unequal caliber arranged in line with each other and open to each other at their inner ends and pistons in said cylinders, of a tube connecting said pistons and having communication through them for the passage of air from the outer portion of the larger cylinder to the outer portion of the smaller cylinder, substantially as herein set forth.

2. The combination, in a compound compressor, with two single-acting cylinders of unequal caliber arranged in line with each other and pistons in said cylinders, of a tube connecting said pistons, constituting a communication through said pistons between the two cylinders and having its inlet in the larger piston and its outlet in the smaller one, and valves for said inlet and outlet, substantially as herein described.

3. The combination of the two single-acting cylinders of unequal caliber arranged in line with each other, two pistons which work in said cylinders and the smaller of which is hollow, a tube connecting said pistons and forming a communication through the larger piston into the cavity of the hollow smaller one, a valve in the larger piston at the entrance to the tube, and a valve in the cavity of the hollow smaller piston, substantially as herein set forth.

4. The combination, with the two single-acting cylinders of unequal caliber arranged in line with each other, open to each other at their inner ends and closed at their outer ends, and pistons in said cylinders, of a tube connecting and forming communication through said pistons, a valve between said tube and the larger piston, a valve in the larger piston for communicating through it with the parts of its cylinder on each side of it, and a valve in the smaller piston for communication between the connecting-tube and the smaller cylinder, all substantially as and for the purpose herein described.

5. The combination, in a compound compressor, with two single-acting cylinders arranged in line with each other, open to each other at their inner ends and closed at their outer ends, the larger one having a removable head, and connected pistons in said cylinders, of a piston-rod projecting through the head of the smaller cylinder for the purpose of driving the two pistons, substantially as herein described.

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