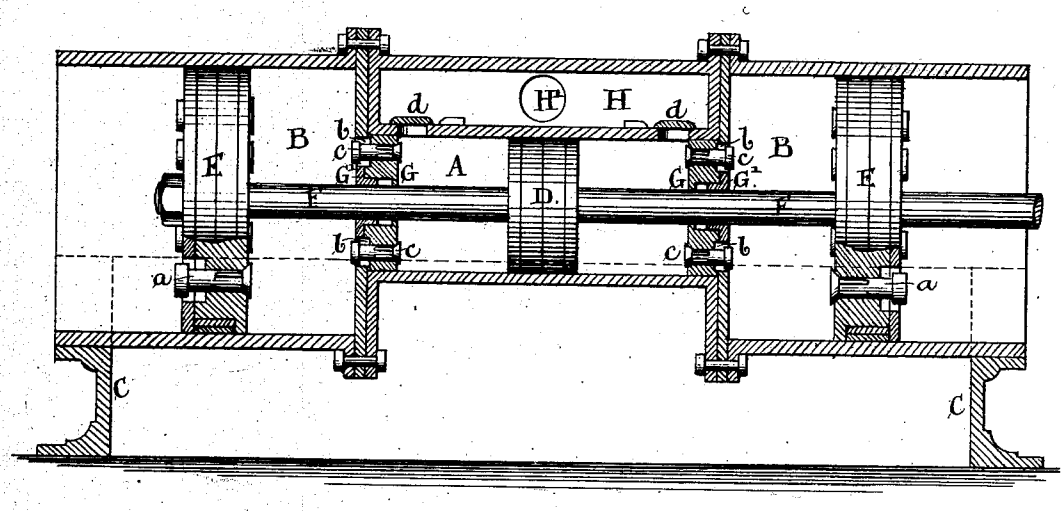
(No Model.)

J. R. CUSHIER.
Air Compressor.

No. 236,992. **Patented Jan. 25, 1881.**



Witnesses:-
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UNITED STATES PATENT OFFICE.

JOHN R. CUSHIER, OF BELLPORT, NEW YORK.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 236,992, dated January 25, 1881.

Application filed July 20, 1880. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. CUSHIER, of Bellport, in the county of Suffolk and State of New York, have invented a certain new and useful Improvement in Air-Compressors, of which the following is a specification.

My invention relates to the class of air-compressors in which the air is partially compressed in one cylinder and is thence passed to a second cylinder, in which the final compression is performed.

The object of my invention is to simplify the construction of such compressors, and to reduce as much as possible the waste space and clearance in the valves and valve-passages, which often seriously impairs the efficiency of air-compressors.

My invention consists in the combination, in an air-compressor, of two single-acting end cylinders and pistons of equal diameter, the cylinders having open outer ends, a double-acting intermediate cylinder and piston smaller in diameter than said end cylinders and pistons, a common piston-rod, an inlet-valve or valves in each of the larger single-acting end pistons, a valve or valves for the passage of air from each end cylinder to the smaller intermediate cylinder, and a discharge-valve for each end of said smaller cylinder.

The accompanying drawing represents a longitudinal section through a compressor embodying my invention.

No operating mechanism is here shown, as such mechanism constitutes no part of my invention; but a steam-cylinder, or power applied through a shaft and gearing may be used to operate the compressor.

A designates the smaller cylinder, placed intermediately between two larger cylinders, B, and in line therewith. All these cylinders are represented as secured to a common bed-plate, C, which may be of any construction.

D designates the piston of the smaller cylinder A, and E designates the pistons of the larger cylinders B, all of which pistons are fixed upon a common rod, F, or separate rods placed in line and joined together.

The cylinders are separated by heads G, which are preferably common to both cylinders; but, if desirable, the adjacent ends of the cylinders might have separate heads. The construction here shown is, however, preferable, because any leakage of air which may take place through the stuffing-boxes G′ will not escape into the atmosphere.

The end cylinders, B, are single-acting and open at their outer ends, and their pistons E are provided with suitable inlet-valves, *a*, communicating with the atmosphere. The end cylinders are connected with the intermediate cylinder by passages or conduits *b*, in the heads, separating said cylinders, which are provided with suitable valves *c*, intermediate between the two cylinders.

Where the cylinders are close together and each head is common to two cylinders, as here shown, these pipes or conduits *b* consist, simply, of passages or ports; but if the cylinders were separate and each provided with a head at their adjacent ends, pipes would be substituted. The passages, pipes, or conduits, however, in any case, will pass through the head, and the valves *c* afford a direct communication between the larger and smaller cylinders throughout their entire length.

The intermediate cylinder, A, is provided with suitable discharge-valves *d*, through which air passes to an air-chest, H, provided with a discharge-pipe, H′.

It will be observed that the pistons E alternately force air into the cylinder A, thereby compressing it to a degree proportionate to the difference in size between the cylinders, and at each stroke the piston D forces air into the air-chest H, still farther compressing it.

Although I have represented the pistons E as provided with a number of valves, *a*, and have shown two valves, *c*, in each head G, it is obvious that, if desirable, a single valve, *a*, in each piston E, and a single valve, *c*, in each head G, might suffice, in which case my compressor would have only six valves, and consequently very little waste space in the valve ports and passages.

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

In an air-compressor, the combination of two single-acting end cylinders of equal diameter, and having open outer ends and two pistons

therefor, a double-acting intermediate cylinder and piston, smaller in diameter than said end cylinders and pistons, a common piston-rod, an inlet valve or valves in each of the single-acting end pistons, a valve or valves for the passage of air from each end cylinder to the smaller intermediate cylinder, and a discharge-valve for each end of said smaller cylinder, substantially as and for the purpose specified.

J. R. CUSHIER.

Witnesses:
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FREDK. THORNHILL.