R. BOGARDUS.

COMPOUND ENGINE.

No. 184,951. Patented Dec. 5, 1876.

Fig. 2.

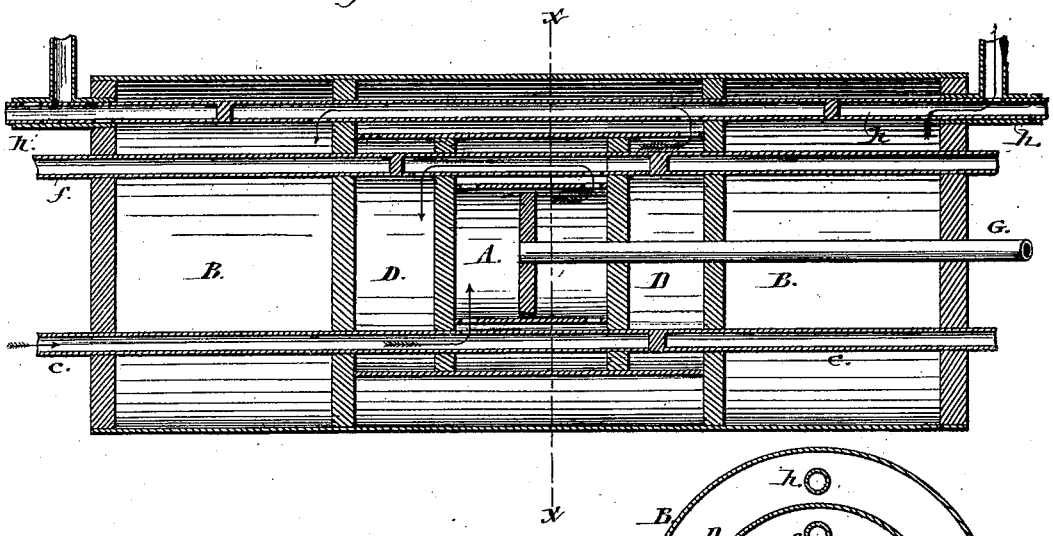
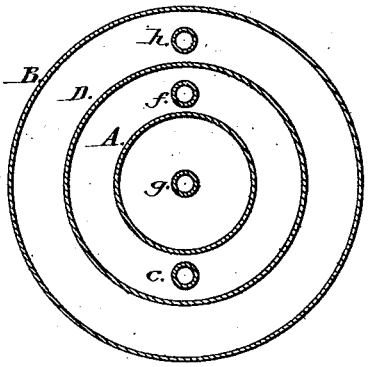


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

ROBERT BOGARDUS, OF ROME, NEW YORK.

IMPROVEMENT IN COMPOUND ENGINES.

Specification forming part of Letters Patent No. **184,951**, dated December 5, 1876; application filed January 22, 1876.

To all whom it may concern:

Be it known that I, ROBERT BOGARDUS, of Rome, State of New York, have invented a Compound Engine or Mechanical Movement, of which the following is a specification:

My invention has for its object a more perfect utilization of the motive force or power of steam, air, or other expansive fluids.

This movement consists of a system of cylinders, or their equivalents, arranged as shown in drawings.

A is constructed internally as a common steam-cylinder. It is provided with a piston, C, and rod G. Externally it is fitted as a piston to the cylinder B. A is provided with a hollow piston-rod, through which the rod G passes. A can also have a piston-rod pass out of the opposite head of cylinder B, either or both of which can be used for the purposes hereafter described.

The cylinder-piston A is provided with two longitudinal cuts or grooves in its outer surface. They are each a trifle longer than the stroke of the piston, and communicate with ports of cylinder A only at one end of grooves, the other groove communicating with the opposite port. These grooves are the means of supply and exhaust for cylinder A. Midway in cylinder B are orifices connecting with these grooves. There are passages connecting with these orifices, and with opposite ports of cylinder B, also with source of supply through the four-way valve-boxes. There are two of these valve-boxes. The valves are connected, so that they balance. Their movements are simultaneous and in opposite directions—that is, as one set of ports are closed, the corresponding ones are opened. These valves are actuated by mechanical means.

The cylinder B is provided with an exhaust independent of those through the four-way valve-box. This independent exhaust is either stopped off and opened by the piston A or with suitable valves and gear.

In this system it is intended to work or use steam or any elastic fluid, full force or pressure, in the cylinder A and against the piston C. Then its property of expansion is utilized in B against the piston A in the first part of the return stroke.

In this system the expansive property of the fluid is first used to overcome the resistance; then the direct push or initial force completes the stroke or semi-revolution of the crank.

When A has performed the functions of piston for cylinder B, and has moved its full throw, it is in that position held rigid while piston C is moving through its cylinder. A is then released and again performs its duty as piston. Thus its functions alternate. A is held in position and released by suitable mechanical means attached to its piston rod or rods, or to the cylinder-piston A direct.

This system of cylinder-pistons can be increased, if practicable. Necessary packing, means of lubricating, pet-cocks, &c., are provided.

Its operations are as follows: Suppose A, on one side of C, to be charged with the fluid of initial pressure. As the valves are actuated so as to bring a similar pressure on the opposite end of C, communication with cylinder B and cylinder A will be opened, and expansion will move the piston A. C and rod G will be carried with it. When piston A has performed its travel an exhaust-port is opened, letting the expansive fluid that moved it escape. At this point A is held firm, as already described. As the steam resistance is now removed from C, this piston will be moved to the opposite end of cylinder A, thus completing the semi-revolution of the crank. The valves are now changed, the piston A is released, and a similar action in the opposite direction is produced, which becomes alternate.

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

1. In a movement that is actuated by the mechanical properties of fluids, the combination of one cylinder and two pistons—viz., the cylinder-piston A and piston C, so that C moves with A when A acts as piston, and through A when A performs the function of cylinder, substantially as and for the purposes set forth.

2. The combining of cylinder B, cylinder-piston A, piston C, and rod G, so arranged that the piston-rod G will be produced a distance equal to the sum of the travel of all the pistons in the system, substantially as described.

3. The four-way valve-box, arranged in combination with cylinder-piston A and cylinder B, to operate substantially as described.

4. The arrangement, in a system of cylinders and pistons, of the means, substantially as described, for actuating one piston only at a time, each piston, after it is moved its throw, remaining stationary as to its cylinder until all the pistons reach the end of their strokes.

ROBERT BOGARDUS.

Witnesses:
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