A. S. CAMERON, dec'd.,

J. MATTHEWS, Executor.

Valve-Gear for Steam-Engines.

No. 213,435 **Patented Mar. 18, 1879**

Fig. 2.

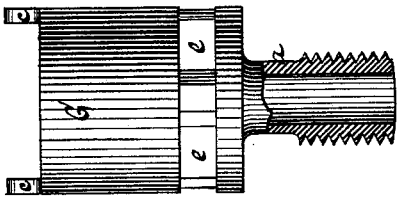


Fig. 3.

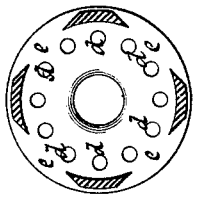
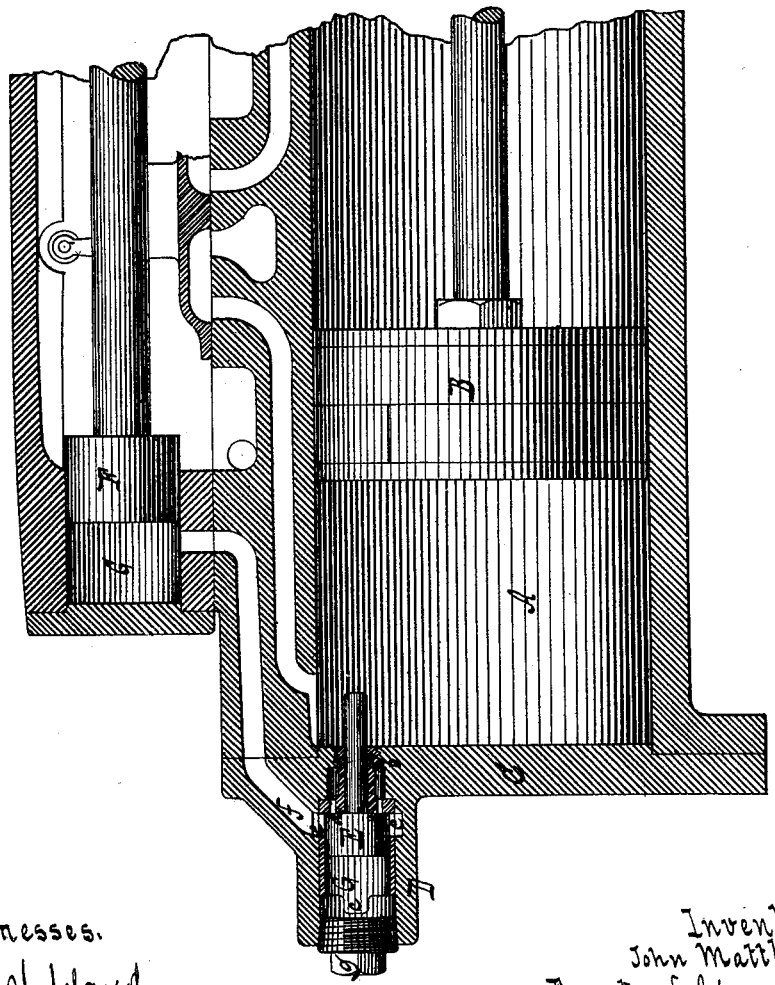


Fig. 1.



Witnesses.
Otto Hufeland
W. C. Hauff.

Inventor.
John Matthews
Executor of Adam S. Cameron
deceased
by
Van Santvoord & Hauff
his attys.

UNITED STATES PATENT OFFICE.

JOHN MATTHEWS, OF NEW YORK, N. Y., EXECUTOR OF ADAM S. CAMERON, DECEASED.

IMPROVEMENT IN VALVE-GEAR FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **213,435**, dated March 18, 1879; application filed September 11, 1878.

To all whom it may concern:

Be it known that ADAM S. CAMERON, deceased, late of the city, county, and State of New York, during his life-time did invent a new and useful Improvement in Valve-Gear for Steam-Engines; and I, JOHN MATTHEWS, of the city of New York aforesaid, executor of the last will and testament of the said ADAM S. CAMERON, do hereby declare the following to be a full, clear, and exact description of said improvement, reference being had to the accompanying drawings, in which—

Figure 1 represents a longitudinal vertical section. Fig. 2 is a side view of the removable lining detached. Fig. 3 is a transverse section of the same in the plane *x x*, Fig. 2.

Similar letters indicate corresponding parts.

This invention relates to an improvement on a valve-gear for steam-engines described in the patent granted to the late A. S. CAMERON, October 3, 1865, No. 58,218, Reissue No. 7,420, dated December 12, 1876; and which consisted, essentially, in the combination, with a steam-cylinder, with the piston working therein, and with a valve-controlling piston, of two independent valves adapted to be operated by the direct action of the piston, said independent valves being made to work in valve-chambers which are either cast solid with the cylinder-heads, or which are made of separate castings attached to the cylinder-heads, as described in Letters Patent granted to the late A. S. CAMERON, February 17, 1874, No. 147,478.

In the manufacture of this valve-gear it was found that the operation of casting the valve-chambers for said independent valves was attended with considerable difficulty; and, furthermore, said valve-chambers, when worn, had to be replaced by new ones, creating considerable expense.

These disadvantages have been obviated by this present invention, which consists in the combination, with the valve-chambers containing the independent valves, of removable linings provided with screw-shanks or other suitable devices for securing the same firmly in position, and with projecting lugs or other equivalent devices for facilitating their removal, so that when said linings are secured in position they cover up any blow-holes or other defects existing in the bodies of the valve-chambers, and if said linings become worn they can be readily removed and replaced by new ones with comparatively little trouble or expense.

In the drawings, the letter A designates a steam-cylinder, in which is fitted the main piston B. Each of the heads C of this steam-cylinder is provided with a valve-chamber, D, which is either cast solid with the corresponding head, or cast separate from the same and secured thereto by screw-bolts or other suitable means, as described in the Patent No. 147,478, above mentioned. Into the valve-chambers D are fitted puppet-valves E, the stems of which project through the cylinder-heads into the steam-cylinder, so that whenever the main piston strikes one of said stems the equilibrium of the auxiliary piston F in the steam-chest is disturbed and the steam is changed, as fully described in Patent No. 50,218 and Reissue No. 7,420, before mentioned.

Each of the valve-chambers D is bored out to receive a lining, G, which is cast of phosphor-bronze, steel, or any other suitable material, and made to fit nicely the bore of its chamber. Said lining is bored out to receive the valve E, and from its inner end projects a shank, *a*, which is bored out to admit and guide the stem of the valve. On the shank *a* is cut a screw-thread, to engage with a corresponding thread cut into a cavity, *b*, in the cylinder-head, and from the outer edge of the lining project lugs *c*, so that by applying a suitable wrench to these lugs the shank of the lining can be screwed into the cavity *b*, thereby securing said lining firmly in position. If desired, however, any other suitable means may be employed to fasten the lining in the valve-chamber. The bottom of the lining is perforated with a number of holes, *d*, and in the side of said lining are a series of segmental slots, *e*, through which the valve-chamber communicates with the port *f*. The outer end of the valve-chamber is closed by a screw-plug, *g*, or by a suitable cover, which may be secured in position by two or more screws. By this lining blow-holes or other defects occurring in the body of the valve-chamber are covered, and if the lining wears out it can be

readily removed and replaced by another without disturbing the valve-chamber or the cylinder-head.

The holes *d* in the lining communicate with a chamber, *g*, in the cylinder-head, from which chamber leads a channel to the exhaust *h*. The valve is seated inside and outside of the holes *d*, so that it closes down tight, and as soon as said valve is forced out by the action of the piston B the auxiliary cylinder G is brought in connection with the exhaust, and the steam is changed before the piston strikes the cylinder-head.

I am aware that steam-cylinders and valve-cylinders have been provided with a lining; and as such, broadly, is not this invention, it is hereby disclaimed.

What is claimed as new, and desired to be secured by Letters Patent, is—

1. A valve-chamber formed on or attached to the head of a steam-piston cylinder, and provided with a removable interior lining, upon which moves a tappet-valve, constructed and arranged substantially as and for the purpose described.

2. The combination, with a valve-chamber formed on or attached to the head of a steam-piston cylinder, of an interior lining provided with a screw-shank adapted to a screw-threaded opening in the head of the steam-cylinder, substantially as and for the purpose described.

3. The combination, with the puppet-valve E, of a lining forming the seat for said valve, and provided with holes *d*, which communicate through a chamber, *g*, with the exhaust, substantially as and for the purpose set forth.

In testimony whereof the said JOHN MATTHEWS hereunto sets his hand and seal this 30th day of August, 1878.

JOHN MATTHEWS. [L. S.]

Witnesses:
E. MATTHEWS,
M. ECKSTEIN.