W. CORLISS.

Steam-Cylinders.

No. 134,362. Patented Dec. 31, 1872.

Fig. 2.

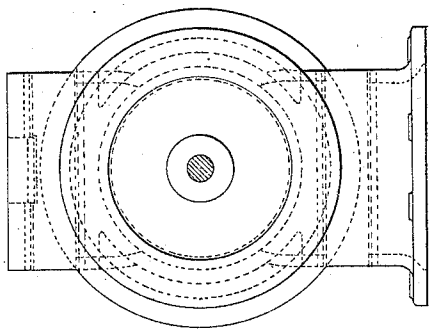
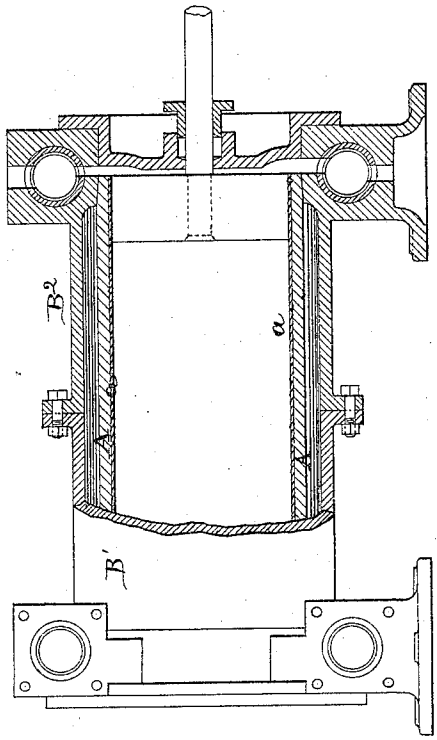


Fig. 1.



Witnesses:
M. H. Doolittle,
Wm. H. Rowe

Inventor:
William Corliss
by his attorney F. L. Slason

UNITED STATES PATENT OFFICE.

WILLIAM CORLISS, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN STEAM-CYLINDERS.

Specification forming part of Letters Patent No. **134,362**, dated December 31, 1872.

To all whom it may concern:

Be it known that I, WILLIAM CORLISS, of Providence, Rhode Island, have invented a certain Improvement in the Manufacture of Steam-Cylinders, of which the following is a specification:

The improvement relates to the method of manufacturing. I harden the interior after the cylinder is formed. The importance of a hard interior has been long recognized, and efforts have been made to attain the same by cast-iron on chills. Such means to attain the desired end differ substantially from my process in that the hardening is effected while the cylinder is being formed. It involves difficulties which my invention completely overcomes.

The following is a description of what I consider the best means of carrying out the invention.

I form a bushing or thin hollow cylindrical lining, adapted to be secured in the interior of an ordinary soft cast-iron cylinder. This bushing is either altogether steel hardened only on its inner surface by jetting water or oil from a suitable pipe in the interior; or it is formed of steel on the extreme inner surface alone, the remainder being soft iron. In either case it is first formed in the complete shape, and is afterward hardened on the inner surface while the outside remains relatively soft and tough.

If, in the operation of hardening, the surface becomes warped or distorted in any manner, the proper mathematically-exact form may be given to the interior afterward by suitable grinding processes. It is important, however, that the material be shaped as exactly as possible to the proper form and size before the hardening operation.

The accompanying drawing forms a part of this specification, and shows my improved cylinder as completed.

Figure 1 is a side view, partly in section, and Fig. 2 is an end view.

Similar letters of reference show like parts in each.

A *a* represent the bushing, the part A being the soft portion, and the part *a* being the hard portion. Ordinarily the line between the hard and the soft parts will not be visible to the eye, because both are one and the same piece of metal, with little difference of color. B^1 B^2 are parts of a surrounding and inclosing cylinder, which, in this case, is formed separately.

I claim as my invention—

The within-described process or method of manufacture of steam-cylinders, the cylinder being formed into shape while in a soft state, and afterward hardened on the interior surface, leaving the outer parts relatively soft, as herein specified.

In testimony whereof I have hereunto set my hand this 11th day of May, 1872, in the presence of two subscribing witnesses.

WILLIAM CORLISS.

Witnesses:

WM. C. DEY,

ARNOLD HÖRMANN.