(No Model.)

J. R. BENNETT.

ENGINE CYLINDER.

No. 564,269. Patented July 21, 1896.

Fig. 1.

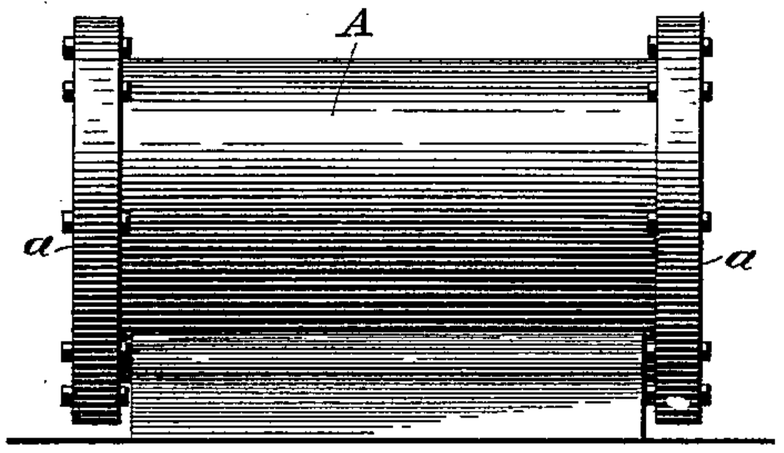


Fig. 2.

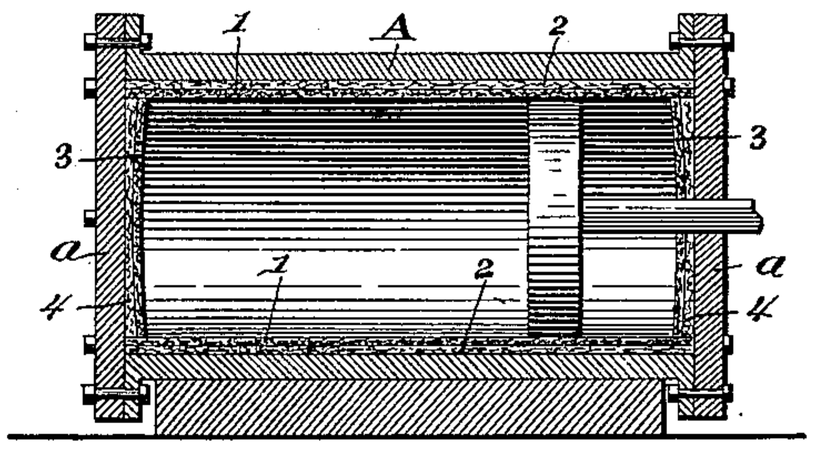
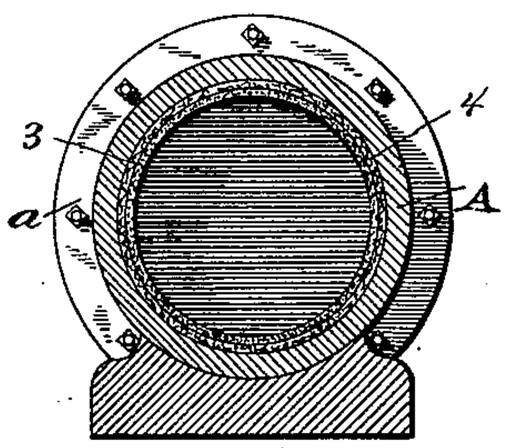


Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES R. BENNETT, OF PHILADELPHIA, PENNSYLVANIA.

ENGINE-CYLINDER.

SPECIFICATION forming part of Letters Patent No. 564,269, dated July 21, 1896.

Application filed November 3, 1893. Renewed December 24, 1895. Serial No. 573,197. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. BENNETT, a citizen of the United States, residing in the city of Philadelphia, Pennsylvania, have invented certain new and useful Improvements in Engine-Cylinders; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in engine or compression cylinders, and more particularly to that class in which the working fluid is vaporized liquid, more volatile than water, such as ammonia, bisulfid of carbon, and the like, and which destroys ordinary oleaginous lubricants. My invention is to overcome these difficulties; and to this end my invention consists, essentially, in the combination of an ordinary metallic cylinder and a lining for said cylinder composed of a compound of graphite and a binder not soluble in the working vapors to be used. A suitable compound for this purpose may consist of from four to ten parts, by weight, of finely-pulverized graphite to one of fiber, saturated with water and incorporated with each other and then molded into the form desired. The dried product in a rigid condition may be readily turned in an ordinary lathe and fitted to the metallic cylinder and then accurately bored for the piston. A lining of this material is self-lubricating, non-corrosive, and relatively tough and indestructible. Cylinders for compressing gases may be lined with this material to their advantage.

In order to prevent the loss of heat from the working vapor, I preferably use a packing of elastic or yielding non-conducting material consisting of asbestos fiber or hemp or a mixture of asbestos and hemp or powdered alum. This serves to support the lining and prevent breaking the same by reason of unequal radial expansion between the lining and the outer metallic cylinder.

In the drawings forming a part of this specification, Figure 1 is an elevation of an engine-cylinder. Fig. 2 is a longitudinal section of the same, showing my invention; and Fig. 3 is a transverse section showing the lining and packing arranged according to my invention.

A is an ordinary metallic engine-cylinder having the conventional cylinder-heads *a a*.

1 is the lining composed of graphite and a binding material, as fiber, and 2 is a packing, of asbestos or hemp or pulverized alum, interposed between the lining and outer cylinder. This packing serves to support the lining and to prevent transmission of heat.

3 3 are disks or plugs formed of the same material as the lining, connected with the cylinder-heads and projecting into the lining of the cylinder, as shown, so as to preserve a close joint between the cylinder-head and the lining, notwithstanding the difference of longitudinal expansion between the metallic cylinder and the lining.

By preference I use a compressible elastic packing 4 4 between the cylinder-heads and the disks.

Having now described my invention, what I claim is—

1. In a vapor-engine or a compression-cylinder, the combination of a metallic cylinder, an insoluble graphite compound lining and an interposed elastic or yielding non-conducting packing of the character described, substantially as described.

2. In a vapor-engine or a compression-cylinder having a lining whose expansion is less than that of the outer cylinder, the combination with such cylinder and lining, of disks or plugs to preserve tight joints between the head and lining, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

JAMES R. BENNETT.

Witnesses:

THEO. L. GATCHEL,

V. D. STOCKBRIDGE.