No. 813,536. PATENTED FEB. 27, 1906.

M. THIER.

CYLINDER FOR INTERNAL COMBUSTION MOTORS AND THE LIKE.

APPLICATION FILED MAR. 28, 1904.

Fig. 1.

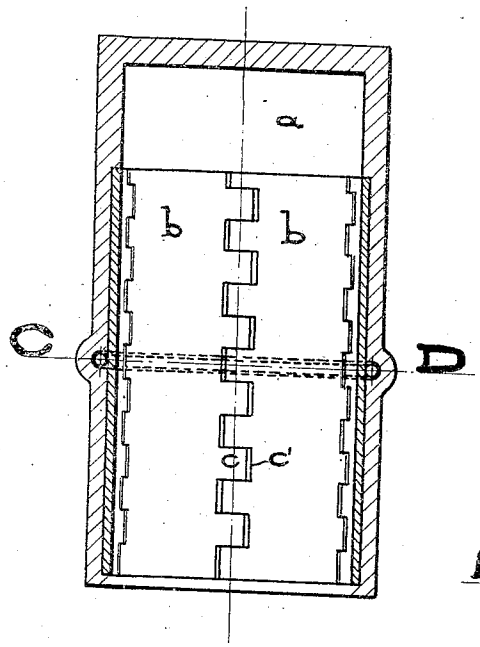


Fig. 4.

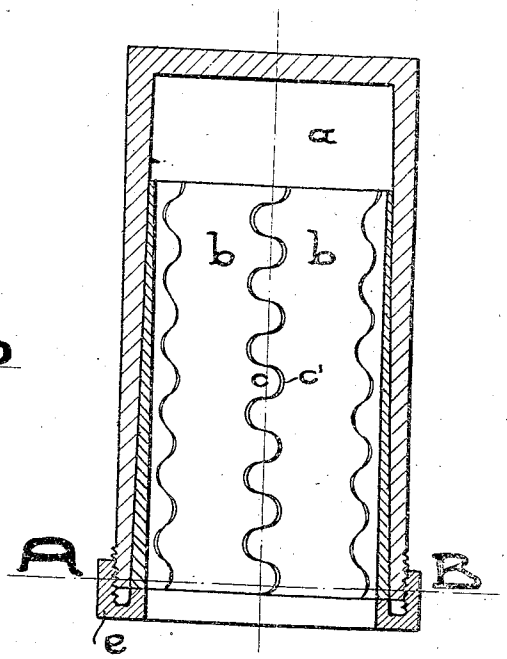
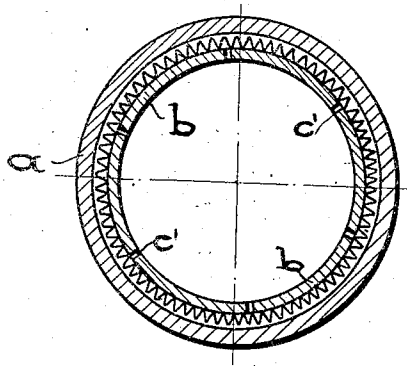
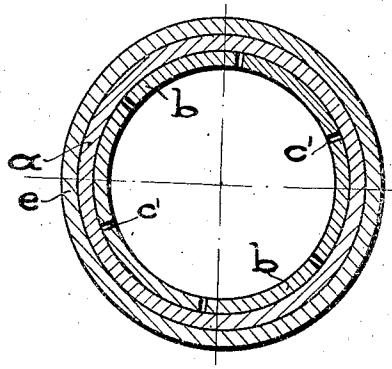


Fig. 3.



C-D

Fig. 2.



A-B

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UNITED STATES PATENT OFFICE.

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CYLINDER FOR INTERNAL-COMBUSTION MOTORS AND THE LIKE.

No. 813,536. Specification of Letters Patent. Patented Feb. 27, 1906.

Application filed March 28, 1904. Serial No. 200,448.

To all whom it may concern:

Be it known that I, MAX THIER, civil engineer, a subject of the King of Prussia, German Emperor, residing at No. 1 Dorotheenstrasse, Erfurt, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Cylinders for Internal-Combustion Motors and the Like, of which the following is a specification.

The cylinders of internal-combustion motors and the like are at their inner surface exposed to a very great wear and tear, so that the cylinder easily loses its former circular shape. Generally, also, a new piston corresponding to the somewhat enlarged diameter of the cylinder must be provided. It has already been proposed to overcome the above-mentioned drawback by making the inner portion of the cylinder exchangeable by means of exchangeable pieces of tube the length of which corresponds to the length of the path of the piston; but as the inner portion of the cylinder is strongly heated by the explosions or the like and as the outer portion of the cylinder is exposed to the cooling action of the water, where a jacket is used, the differences between the outer diameter of the exchangeable tube and the inner diameter of the body portion of the cylinder become so great that the inserted cylinder is liable to be deformed and its exchange is made nearly impossible. In order to overcome also this drawback, I have devised the expedient illustrated in the accompanying drawings, in which—

Figure 1 shows a longitudinal section through a cylinder constructed according to my invention. Fig. 2 is a section in line A B of Fig. 1. Fig. 3 is a section in line C D of Fig. 1, and Fig. 4 is a longitudinal section through a modified form of construction.

Instead of making the lining of the cylinder in one piece, as heretofore, I make it of several pieces—say six—the longitudinal edges of which are either serrated, as in Fig. 1, or curved, as in Fig. 4, the arrangement being in either case such that there are single or separated projections and spaces between the same, the projections of one portion of the lining taking into the spaces or recesses at the edge of the neighboring portion, as shown.

In the form of construction shown in Figs. 1, 2, and 3 the lining *b* of the cylinder *a* has angular projections *c* and recesses *c'*; but the breadth of each portion of the lining is such that there remain small spaces between each of the projections *c* and of the opposite end of the recess wherein the projection takes—that is to say, these spaces exist after the piston has been inserted into the lining, when the bore of the cylinder, inasmuch as the stroke of the piston is concerned, is just filled out by the lining.

There may be special means provided for pressing the pieces of the lining *b* against the piston—for instance, springs such as *d*, Figs. 1 and 3, which are held in suitably-shaped grooves of the cylinder *a*. Of course also other means may be employed for thus keeping the portions of the lining in a constant contact with the piston. The small spaces left in the recesses *c'* serve for retaining the oil or other lubricant, so that the piston is always properly oiled; but the object of said small spaces is also to allow of the lining being increased in diameter when the interior surface of the same has been worn out. The portions of the lining can then be made to slightly approach one another and the proper contact of them with the piston may again be maintained by a spring or the like.

Instead of letting each portion of the lining have a uniform thickness throughout its own length I may make the portions wedge-shaped, as shown in Fig. 4. In this case the outer diameter of the lining increases in the direction from the closed end of the cylinder to the open end, and this end is embraced by a screw-threaded ring *e*, which is so shaped that the lining *b* can be pressed into the cylinder by means of this ring.

In the form of construction shown in Fig. 4 the projections *c* are curved; but the relative dimensions are also in this case chosen in such a way that there remain in the recesses *c'* small spaces adapted to receive a certain small quantity of the lubricant.

By constructing the lining in the manner shown in Fig. 4 there is no possibility of burned portions of the lubricant entering between the lining and the body portion of the cylinder, so that the contact between the parts *a* and *b* is always maintained, and the lining is thus cooled by the water contained in the jacket. (Not shown.)

Having now described my invention, what I desire to secure by Letters Patent of the United States is—

1. In a cylinder for internal-combustion engines and the like, the combination with the body portion of the cylinder, of an interior lining consisting of a plurality of paral-

lel parts, extending parallelly to the longitudinal axis of the cylinder and means adapted to prevent a relative displacement of one part of the lining with respect to another, for the purpose as described.

2. In a cylinder for internal-combustion engines and the like, the combination with the body portion of the cylinder, of an interior lining consisting of a plurality of parallel parts extending parallelly to the longitudinal axis of the cylinder, the longitudinal edges of each part having projections adapted to enter into corresponding recesses of the adjoining edge of the neighboring part, substantially and for the purpose as described.

3. In a cylinder for internal-combustion engines and the like, the combination with the body portion of the cylinder, of a lining consisting of a plurality of parallel parts, and means adapted to prevent a relative displacement of one part of the lining with respect to another, the thickness of each part of the lining increasing in the direction from the closed end of the cylinder to the open end, substantially and for the purpose as described.

4. In a cylinder for internal-combustion engines and the like, the combination with the body portion of the cylinder, of a lining consisting of a plurality of parallel parts, and means adapted to prevent a relative displacement of one part of the lining with respect to another, the thickness of each part of the lining increasing in the direction from the closed end of the cylinder to the open end, in such a manner, that the outer diameter of the lining increases correspondingly, the bore of the cylinder being correspondingly shaped, and means for forcing said lining into the cylinder, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

MAX THIER.

Witnesses:
FRANZ PETERS,
ERHARD WETZEL.