(No Model.) 2 Sheets—Sheet 1.

W. F. BROWN.

STEAM ENGINE CYLINDER.

No. 403,642. Patented May 21, 1889.

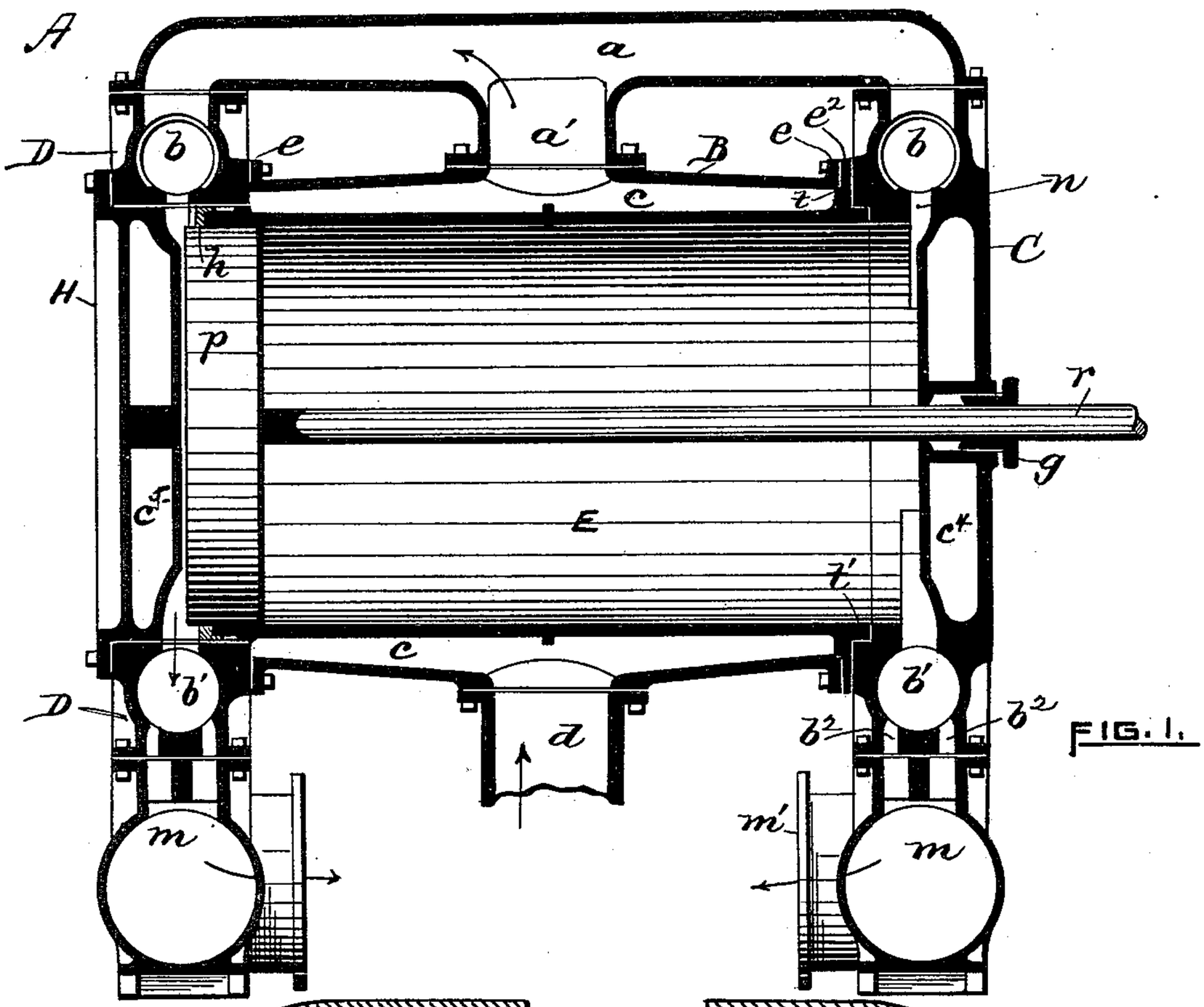

FIG. 1.

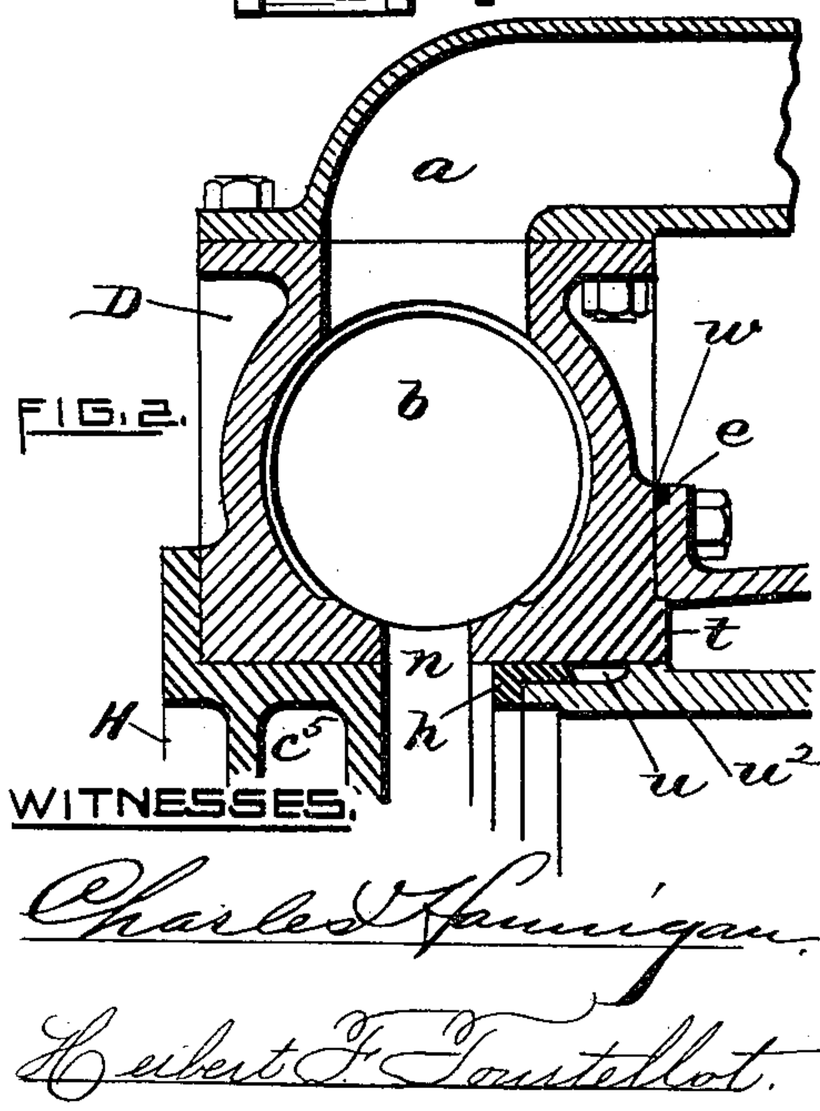

FIG. 2.

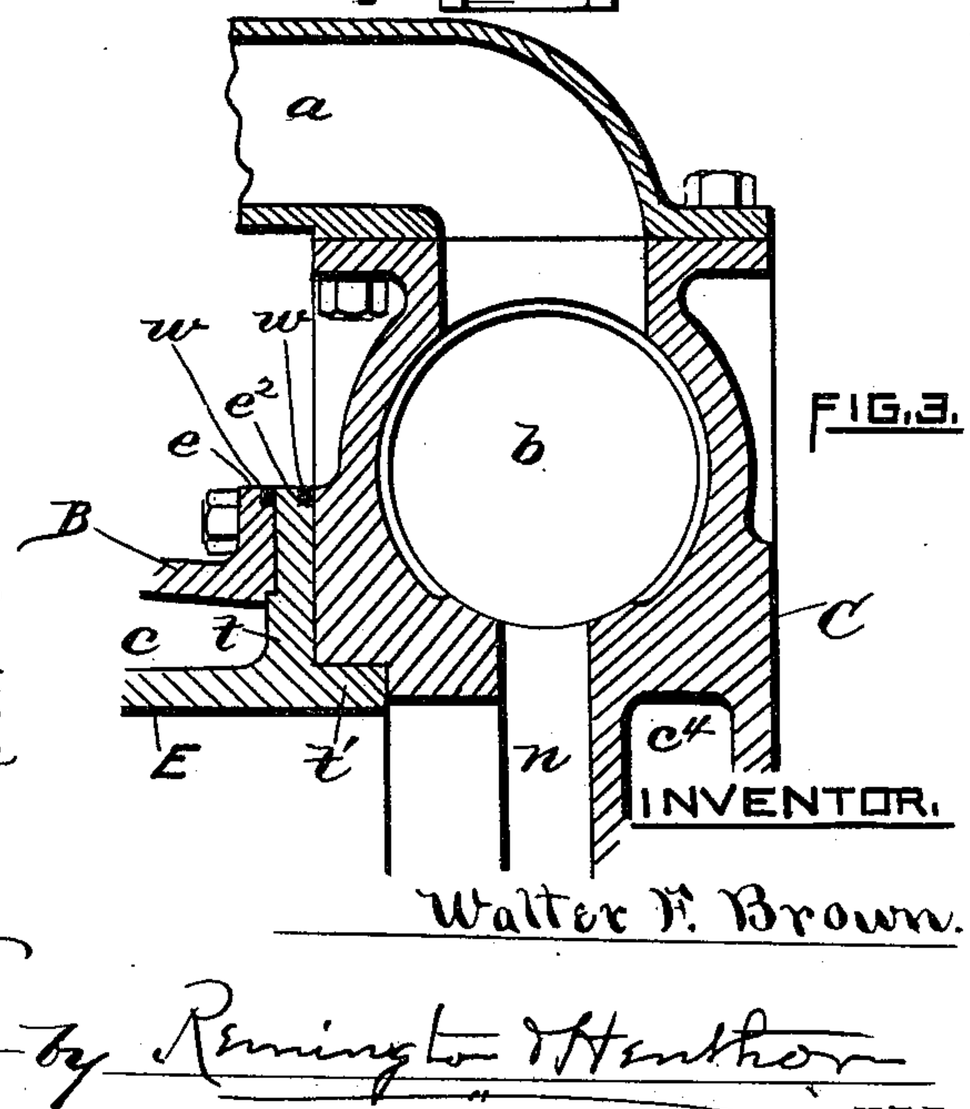

FIG. 3.

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by Remington & Hamilton
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(No Model.) 2 Sheets—Sheet 2.

W. F. BROWN.

STEAM ENGINE CYLINDER.

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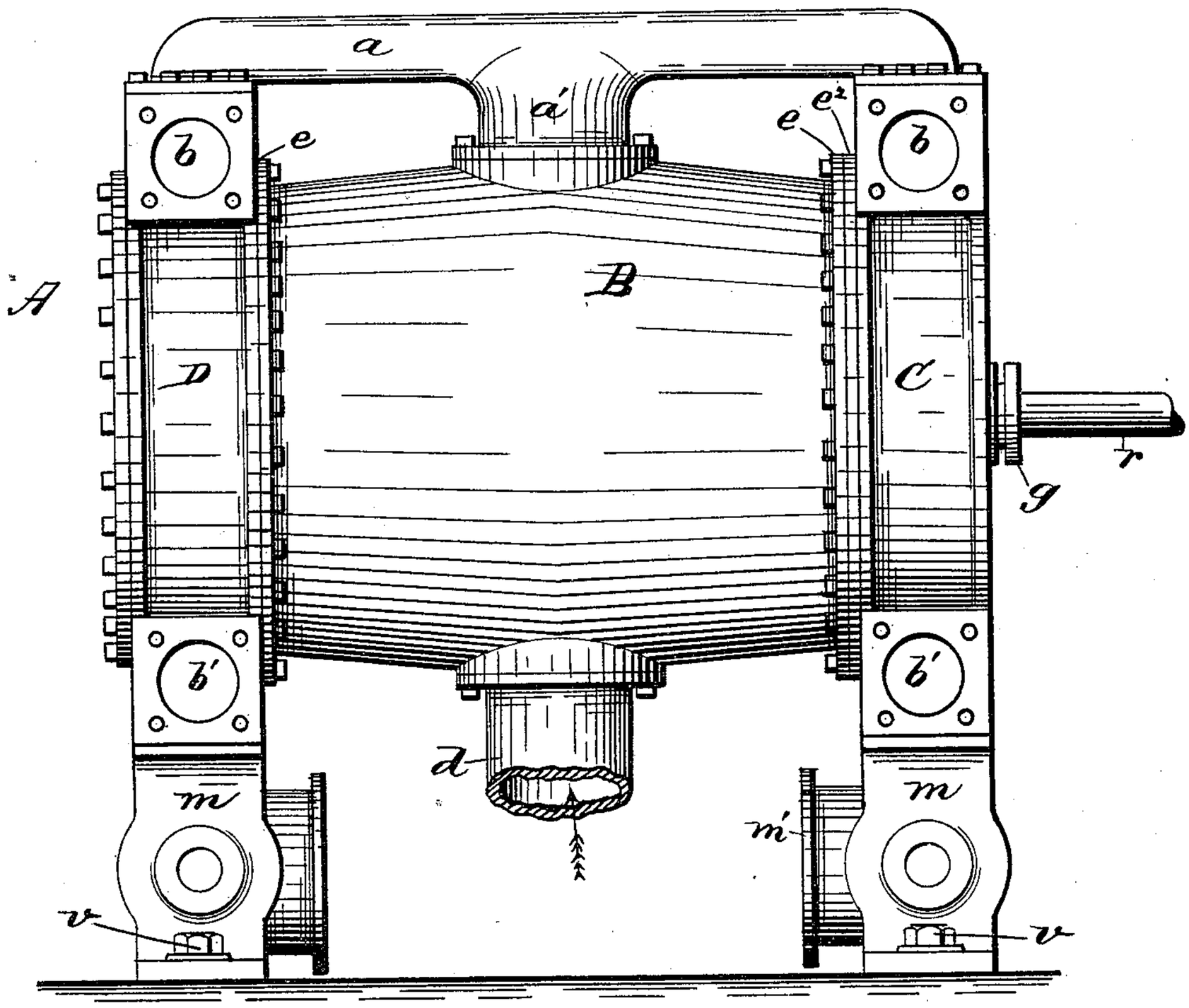

FIG. 4.

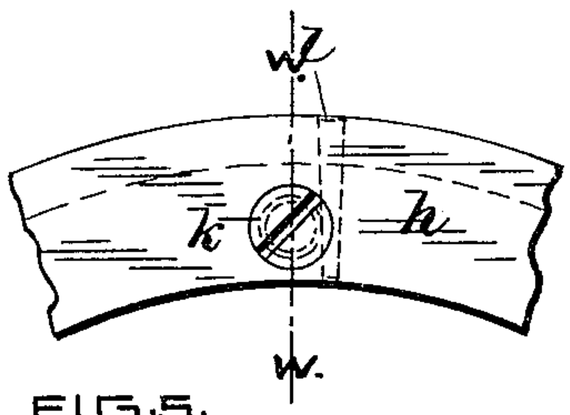

FIG. 5.

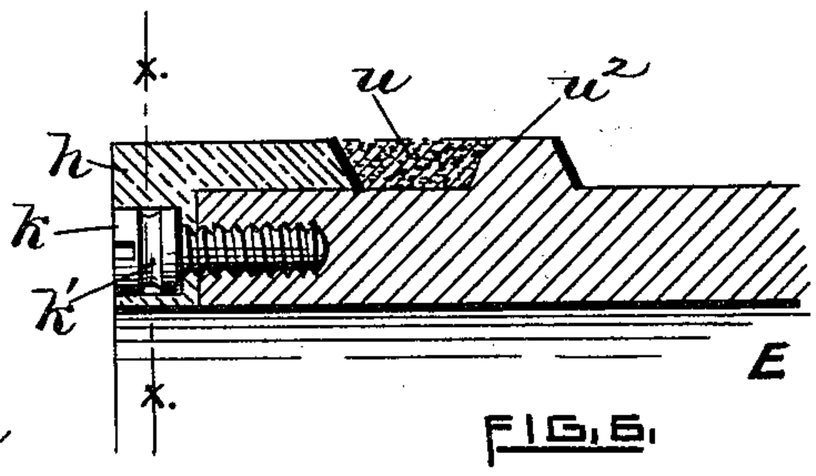

FIG. 6.

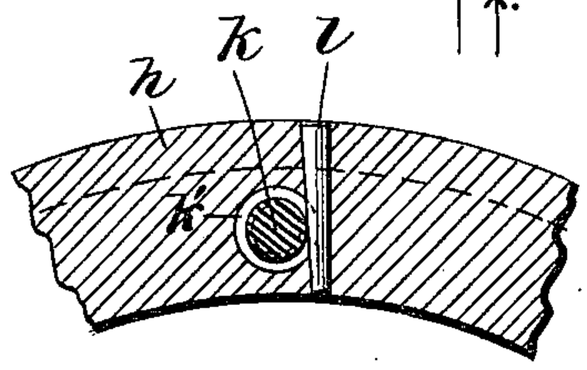

FIG. 7.

WITNESSES.

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UNITED STATES PATENT OFFICE.

WALTER F. BROWN, OF PROVIDENCE, RHODE ISLAND.

STEAM-ENGINE CYLINDER.

SPECIFICATION forming part of Letters Patent No. 403,642, dated May 21, 1889.

Application filed December 31, 1888. Serial No. 295,003. (No model.)

To all whom it may concern:

Be it known that I, WALTER F. BROWN, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Steam-Engine Cylinders; and I do hereby declare the following to be 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

In the construction of steam-engine cylinders—particularly the large or low-pressure cylinders of compound engines—it is of the utmost importance that the casting be sound and homogenous throughout. It frequently happens that, notwithstanding all the care and precaution taken in molding, casting, and cooling the cylinder, shrink-cracks or seams will be developed during the subsequent processes of cleaning, boring, turning, &c. These defects are often of such a serious nature as to necessitate the abandonment of the casting, thereby not only losing valuable time, but all the labor expended upon the casting, as well as the depreciation in the metal itself. The objections before stated are especially applicable to "steam-jacketed" cylinders—that is, cylinders provided with an external shell or cylinder, thereby forming an annular space between it and the shell or barrel of the cylinder proper. Within the annular space steam of suitable temperature is admitted and circulated to prevent as far as possible the steam from condensing within the cylinder, thus to a greater degree increasing the efficiency of the steam acting upon the piston. It is obvious that at the best it will be impossible to maintain both the inner and outer cylinders at the same temperature; therefore the two will expand and contract unequally. Such action of the steam occasionally produces a fracture of the outer or of the inner cylinder, or of both, while in use. In the event of its being the jacket-shell, in case the fracture cannot be repaired the jacket-steam must be shut off, thereby resulting in a reduced efficiency or economy. Another objection to a large cylinder when cast in one piece is that a heavy and expensive class of machine-tools must necessarily be employed in finishing it, while the cost of handling it is also increased.

The object I have in view is to so construct steam-engine cylinders that the defects or disadvantage before referred to, inherent in and resulting from said former methods of construction, will be entirely overcome, or at least reduced to a minimum. To that end I make the cylinders composite or in sections —that is to say, I make each end portion in one piece, the same being provided with the valve-chests proper. The center or intermediate section adapted to unite the said end sections consists of a plain cylinder or barrel, which is bored to receive the piston, and having a flange at one end by which it is secured to the corresponding end section, the other end section being counterbored to receive the opposite end of the barrel, the latter in turn being counterbored to receive a suitable packing, and is also provided with a large circular gland secured thereto. Now, in order to steam-jacket the cylinder, I provide another barrel or shell having its inner diameter somewhat greater than the outer diameter of the center barrel, which it incloses. The jacket-shell is provided with end flanges adapted to receive bolts which secure it to the end sections.

By reason of my improvement the actual cost of the cylinders is reduced—that is, when compared with cylinders formed of a single casting.

Another advantage resulting from my method of constructing steam-cylinders is that in case one of the sections become accidentally broken in use a new section may be made to replace it, thereby effecting a considerable saving in time and expense.

The construction of my improved cylinders is such that it is impossible for steam to leak from the jacket into the bore of the cylinder.

In the accompanying two sheets of drawings, Figure 1 represents a longitudinal sectional view taken through the center of my improved steam-cylinder. Fig. 2 is a similar view, enlarged, taken through the back steam-valve chest. Fig. 3 is a sectional view taken through the front valve-chest. Fig. 4, Sheet

2, is a side elevation of the cylinder, the same as drawn being that of the large or low-pressure cylinder of a compound engine. Fig. 5 is a front view of a portion of the interior packing-gland. Fig. 6 is a longitudinal sectional view taken on line *w w* of Fig. 5, and Fig. 7 is a transverse sectional view taken on line *x x* of Fig. 6.

Referring now to the drawings, A designates my improved or composite cylinder as a whole, the same as drawn representing the low-pressure steam-jacketed cylinder of a compound engine, the valves and valve-gear being omitted.

C indicates the front-end section, the same having a steam-valve chest, *b*, and an exhaust-valve chest, *b'*, and also having the front head, all cast in one piece. The head is hollow, as at c^4, and adapted to receive steam, thereby serving as a steam-jacket. The head is also provided with a stuffing-box and gland, *g*, as common, through which the piston-rod *r* passes.

D designates the back-end section of the cylinder. This, also, is cast in one piece and is provided with steam and exhaust valve-chests, substantially as just stated with reference to the front section. The back section is bored out to receive the back head, H, the latter being hollow, as at c^5, and adapted to be steam-jacketed.

E indicates the cylinder-barrel proper, the same having an enlarged external flange, e^2, formed thereon at the front end. A short extension, *t'*, of the front end of the barrel is turned and centered into the counterbore of the front section, C, the opposite end of the barrel at the same time being fitted to the bore of the rear section, D. It will be seen that the back head is enlarged, its diameter being substantially the same as the outside diameter of the barrel, as clearly shown in Figs. 1, 2, and 3. The rear end of the barrel E is reduced in diameter somewhat, so as to provide a packing-chamber, *u*, (see Fig. 6, &c.,) an annular gland, *h*, being secured to the rear face of the barrel by screws *k*, the heads of which are each provided with a peripheral groove, *k'*, into which a taper pin, *l*, engages. By means of this arrangement the gland may be properly adjusted and the gland bolts or screws prevented from becoming accidentally loosened.

B indicates the outer shell or jacket-casing, the same having a flange, *e*, at each end thereof. The diameter of the shell is such that an annular space, *c*, is formed between its inner diameter and the outer diameter of the center barrel, E. The jacket is provided with inlet and outlet openings *d a'*, respectively. The jacket-flanges are counterbored to fit the circular projections *t*, thereby centering it thereon, the rear flange being centered upon the projection of the section D, and the front flange centered upon a similar projection formed on the flange e^2 of the barrel E, the whole being firmly secured together by bolts. While the flanges of the parts E and B are being faced off, I form in each a narrow exterior groove, *w*. The use to which the grooves are put is to receive each a copper-wire ring, which may be calked into the joints in case a leakage of steam is discovered.

The operation is as follows: Steam, which may be the exhaust from the high-pressure cylinder, passes into the jacket-space *c* through the medium of the inlet-passage *d*, and escapes from the jacket by means of the outlet *a'*, and from thence through the branch connection *a* into the valve-chests *b*, and finally into the cylinder E, *via* the ports *n*. The steam thus used is exhausted after expansion into the lower valve-chests, *b'*, from whence, through the exhaust-port b^2, (drawn double,) it passes freely into the corresponding hollow base, *m*, an outlet, *m'*, therefrom, together with pipes or connections, (not shown.) affording means for conducting the exhaust-steam to a suitable condenser, as common. The hollow bases *m*, I also utilize as "cylinder feet" or "legs," the same being provided with external flanges, through which the main holding-down bolts *v* pass.

By means of my improvement it will be seen that the barrel E may freely expand and contract without liability to fracture, provision being made in the rear section, D, for the packing end of the barrel to move endwise therein. As hereinbefore stated, by reason of the sectional character of the cylinder, the metal composing the several parts when cast is more homogeneous and uniform in thickness, and less apt to shrink in cooling.

I do not claim, broadly, a cylinder made up of sections and bolted together; but

What I do claim is—

1. A steam-jacketed cylinder made up of members or sections arranged and secured together, and having the cylinder-barrel, as E, free to expand and contract independently of the jacket-casing, and, further, having the free end of said barrel provided with a circumferential stuffing-box and gland, substantially as hereinbefore described and set forth.

2. The composite steam-jacketed cylinder hereinbefore described, consisting of the front and back end sections provided with steam and exhaust valve chests, the inner or cylinder barrel being secured to the said first end section and provided with a stuffing-box and gland fitted to expand and contract freely in the other end section, and the apertured jacket-section surrounding the inner barrel and secured to and intermediate of the end sections, all arranged and adapted for use substantially as set forth, and for the purpose specified.

3. In a steam-jacketed cylinder, the combination, with the front and back end sections, C D, having steam and exhaust chests formed therein and the jacket-casing B, uniting said sections, of the cylinder-barrel E, secured to the front section, C, and having the rear portion of the barrel fitted to move freely in a

longitudinal direction in the back-end section, and, further, having such free end of the barrel provided with a circumferential packing-box and gland, and means for adjustably securing the gland in position, substantially as shown and hereinbefore described, and for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

WALTER F. BROWN.

Witnesses:
CHARLES HANNIGAN,
GEO. H. REMINGTON.