T. A. HENDERSON.

Reciprocating Steam-Engine.

No. 202,171. Patented April 9, 1878.

Fig. 1

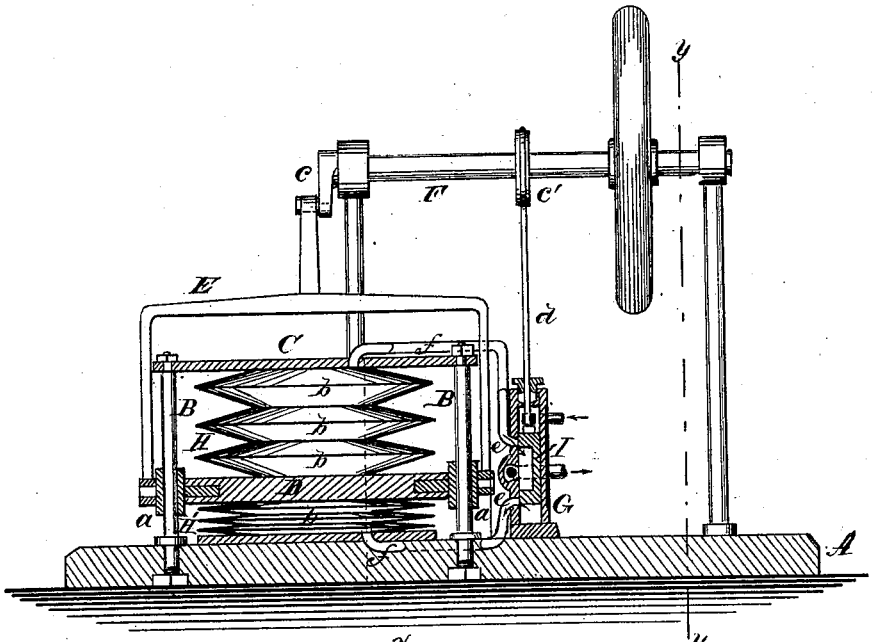
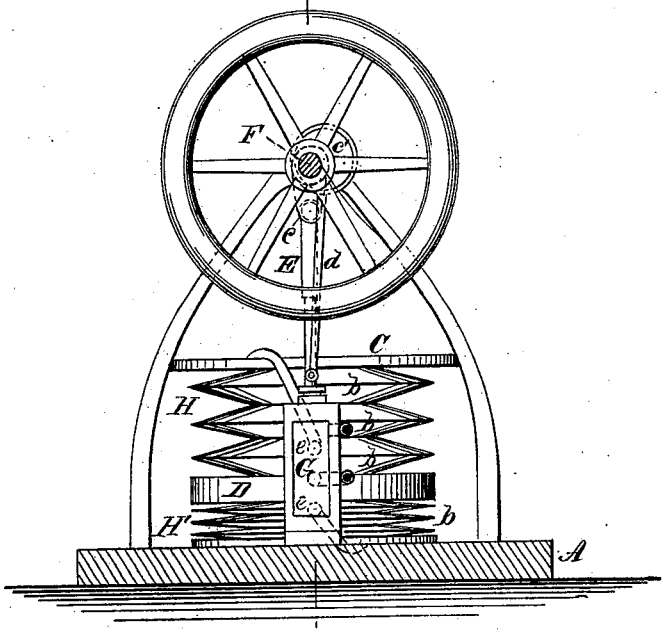


Fig. 2



WITNESSES:

C. Neveux

E. Sedgwick

INVENTOR:

T. A. Henderson

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. HENDERSON, OF NATCHEZ, MISSISSIPPI.

IMPROVEMENT IN RECIPROCATING STEAM-ENGINES.

Specification forming part of Letters Patent No. **202,171**, dated April 9, 1878; application filed December 29, 1877.

To all whom it may concern:

Be it known that I, THOMAS A. HENDERSON, of Natchez, in the county of Adams and State of Mississippi, have invented a new and Improved Engine, of which the following is a specification:

Figure 1 is a side elevation, partly in section, taken on line *x x* in Fig. 2. Fig. 2 is a transverse section taken in line *y y* in Fig. 1.

Similar letters of reference indicate corresponding parts.

This invention relates to that class of engines in which the function of the steam-cylinder is performed by a bellows-shaped expansible and collapsible vessel; and it consists in the combination and arrangement, with two such vessels, of a slide-valve and connecting and operating mechanism, whereby a comparatively simple and inexpensive engine is produced.

Referring to the drawing, A is a bed-piece, from which the standards B project vertically. A head, C, is secured to the top of the standards, and is parallel to the bed-piece A. A movable head, D, is placed between the head C and the bed A, and is provided with guides *a*, which move upon the standards B. Between the movable head D and the head C, and between the bed A and head D, are placed centrally-apertured flexible disks *b*, which are connected together at their peripheries in pairs, and the pairs are connected together around the central aperture of the disks, so that the disks in each series are connected alternately at their peripheries and inner edges, forming bellows-like vessels H H′.

The lower disk of the lower series is secured to the bed A, or to a plate attached to the bed, and the upper disk of this series is attached to the movable head D, and similarly the lower disk of the upper series is attached to the movable head D, and the upper disk of the said series is secured to the head C.

A forked connecting-rod, E, connects guides *a* of the head D with the crank *c* on the shaft F.

A steam-chest, G, which is placed near the cylinder, contains a slide-valve, I, of the usual description, which is moved by the eccentric *c′* on the shaft F through the eccentric-rod *d*.

The steam-ports *e* are connected, by means of pipes *f*, with the stationary heads of the upper and lower series of disks, being in communication with the space between the disks, so that as steam is admitted by the valve at opposite sides of the movable head D the said head will be reciprocated, and this motion being communicated to the crank by the connecting-rod E, the shaft F is rotated.

The steam is exhausted from the space between the disks by the slide-valve, which acts in the same manner as the slide-valve of an ordinary steam-engine.

In an engine of this construction the full power of the steam is realized, as none of it is consumed by friction, and the steam cannot escape without doing work. Packing and stuffing boxes are avoided, and economy in construction and maintenance is secured.

I am aware that bellows-shaped expansible and collapsible vessels have heretofore been used in a steam-engine, but am not aware that such have ever been arranged and combined with a slide-valve and its operating mechanism, as shown.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The engine herein described, consisting, essentially, of the bellows-shaped vessels H H′, movable head D, fixed head C, bed-piece A, standards B, pipes *f*, and slide-valve I, all constructed, arranged, and operating substantially as specified.

2. The combination of the vessels H H′, movable head D, fixed head C, bed-piece A, standards B, guides *a*, pipes *f*, slide-valve I, eccentric *c′*, shaft F, crank *c*, and forked connecting-rod E, all constructed, arranged, and operating as and for the purpose specified.

THOMAS ALEXANDER HENDERSON.

Witnesses:

GEO. W. KOONTZ,

T. H. WICKLIFFE.