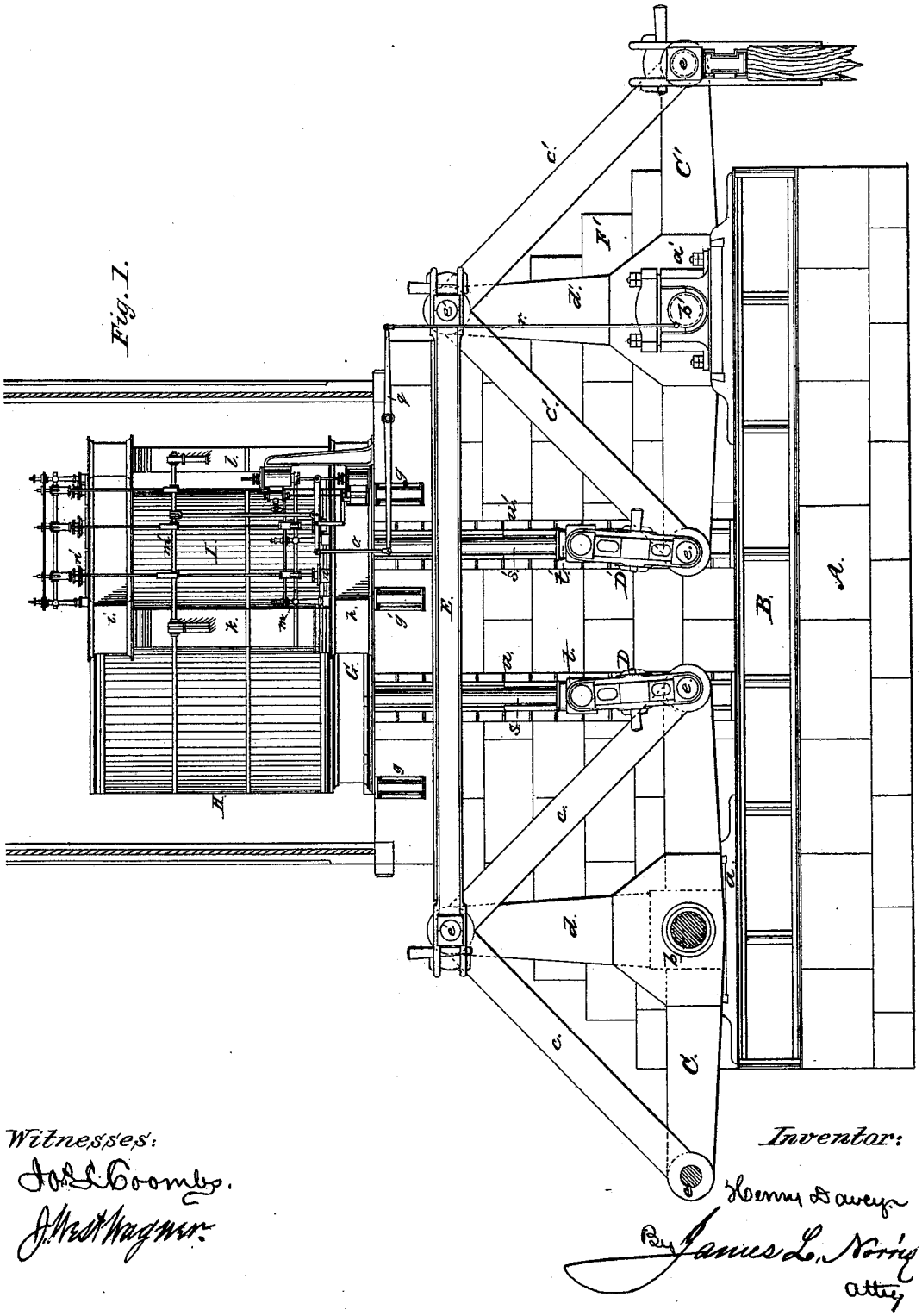
2 Sheets—Sheet 1.

H. DAVEY.

ENGINE FOR PUMPING AND COMPRESSING AIR. &c.

No. 186,119. Patented Jan. 9, 1877.

Fig. 1.



Witnesses:

Jos. L. Coombs.

J. Wesley Wagner.

Inventor:

Henry Davey

By James L. Norris

Atty

2 Sheets—Sheet 2.

H. DAVEY.

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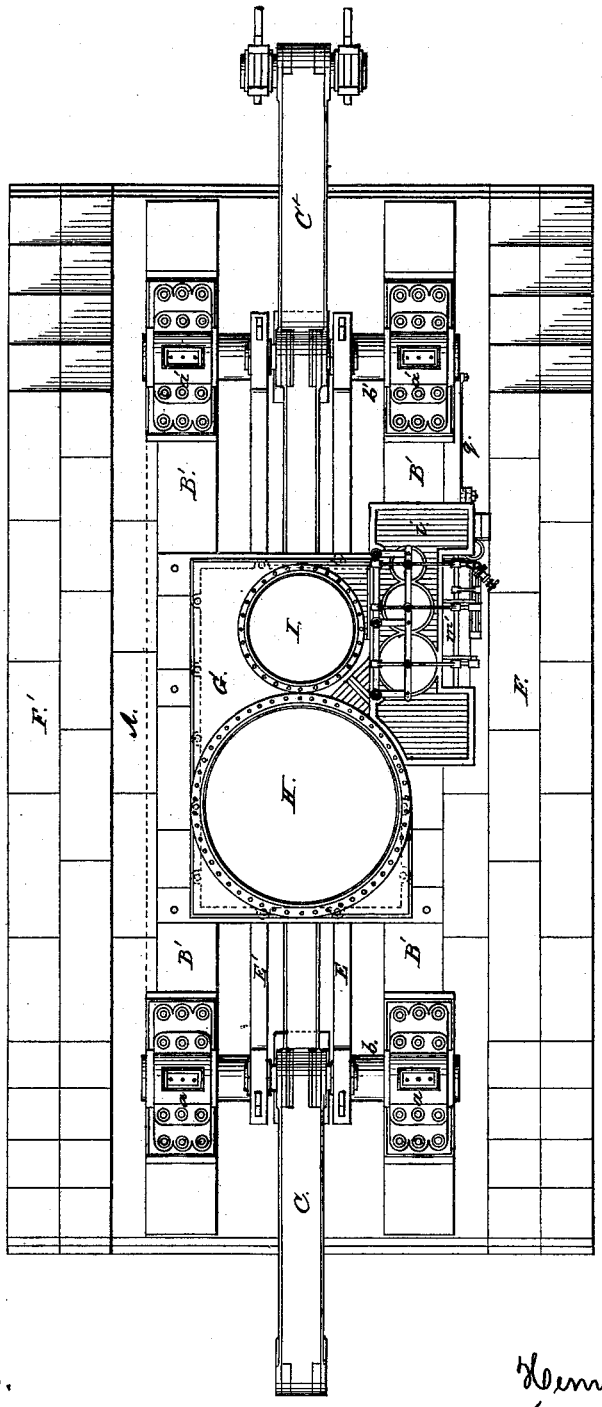

Fig. 2.

Witnesses:

Jos. L. Coombs.

J. West Wagner.

Inventor:

Henry Davey

By James L. Norris

Atty.

UNITED STATES PATENT OFFICE

HENRY DAVEY, OF LEEDS, ENGLAND.

IMPROVEMENT IN ENGINES FOR PUMPING AND COMPRESSING AIR, &c.

Specification forming part of Letters Patent No. **186,119**, dated January 9, 1877; application filed September 14, 1876.

To all whom it may concern:

Be it known that I, HENRY DAVEY, of Leeds, in the county of York, England, have invented certain new and useful Improvements in Means of Forcing and Compressing Air, Water, and other fluids, of which the following is a specification:

The invention consists of a pair of vertical compound engines, whose pistons are connected direct to a pair of bell-crank levers by connecting or drag links, and whose outer ends are attached to the pump-rods. The steam supplied to the cylinder of the air compressing or pumping engine passes from a high-pressure boiler into the high-pressure cylinder, and from this, after having performed its duty, to a low-pressure boiler, the steam of which is used for working the machinery. The steam thus acts in said engine with an effective pressure equal to the difference between the steam-pressure in the high-pressure boiler and that in the low-pressure boiler, and the whole of such steam is at the end of the stroke made available for duty at a lower pressure without any other loss than that due to radiation and leakage and condensation.

In the accompanying drawing, Figure 1 represents a compound vertical engine connected to the quadrants, and partly in section. Fig. 2 is a plan view of the same.

In the drawing, A represents the foundation, consisting of the base plate or frame B, arranged upon the main foundation A′. Upon the base-plate B B are firmly secured the pillow-blocks *a a′*, for the shafts *b b′* of the bell-crank lever C C′. The quadrants consist of double sets of triangular frames *c c′*, with central pieces *d d′*, and are provided at their junctions with short shafts or pins *e e*. To the inner ends of the bell-crank lever the double links or drag-links D D′, having suitable keys and gibs for tightening and setting them up, are attached. The links D D′ are also provided with the usual brasses at their outer ends. To the upper or central pins or shafts *e′ e′* are attached, on each side of the bell-crank lever C C′, the connecting-rods E E′, having the usual brasses, with straps and gibs and keys for setting them up in case of wear. To the outer ends of the bell-crank lever are connected the pump-rods by which the pumps on air-cylinders are operated. On each side of the bell-crank lever are built the side walls or foundations F F′, upon which the frame-work and the bed-plate G of the engine are secured. The frame-work consists of iron girders *g g′*, made in this instance of sheet and angle iron, although they may be of cast-iron or other suitable material, and extending from wall to wall, F F′, over the well or space occupied by the bell-crank lever with their attachments. Upon the bed-plate G are firmly secured the high and low pressure cylinders H and I. The high-pressure cylinder I has attached to it the steam-chests *h i*, connected by the side pipes *k l*. To the sides of the side pipes are attached the rock-shafts *m m′*, with suitable lifters and toes to operate the valves, the stuffing-boxes *n n′* of which are shown in Fig. 1. To the bed-plate G is also attached the differential valve-gear, secured to me in the patent dated September 7, 1875, and numbered 167,509, which is connected, by a suitable lever, *o*, to the rock-shaft *m′*, and by a pivoted lever, *q*, with connected levers to the starting rod or bar *r*, which extends down the lower bed-plate B B′, so as to be easily reached by the engineer. The piston-rods *s s′* of the engines are secured to the cross-heads *t t′*, which slide in suitable guides *u u′*, and said cross-heads are connected by their pins with the drag-links D D′, and by them to the inner ends of the quadrants C C′. By arranging the steam-chests at each end of the cylinder I, the passages are made very short, and having the double-beat valves in them, the steam is admitted direct to the low-pressure cylinder from the high-pressure cylinder, and the loss occasioned by the long passages usually employed, and from condensation, is nearly entirely obviated.

The operation and construction of the double beat valves and steam-passages will be more fully described in another application filed with this case.

The operation is as follows: The steam being admitted at the lower end of the high-pressure cylinder, its piston ascends in the cylinder I, and by its connections with the bell-crank lever C′ raises the inner end thereof and depresses the outer end with the pump-rod. Steam is at the same time admitted to

the upper end of cylinder H, when its piston, with its connections to the bell-crank lever C, descends and depresses the inner end of the bell-crank lever C and raises its outer end and the pump-rod attached thereto, and alternately each one in this manner, thus equaliz ing or balancing the pressures and strains on the different parts of the engine.

What I claim, and desire to secure by Letters Patent, is—

In combination with the piston-rods of a compound engine, the two bell-crank levers, secured together at the upper ends by means of a link, and attached at their inner ends to said piston-rods and at their outer ends to the piston-rods of the pump-cylinders, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand and seal in the presence of the subscribing witnesses.

HENRY DAVEY. [L. S.]

Witnesses:

WM. WARD,

CHAS. GILLIARD.