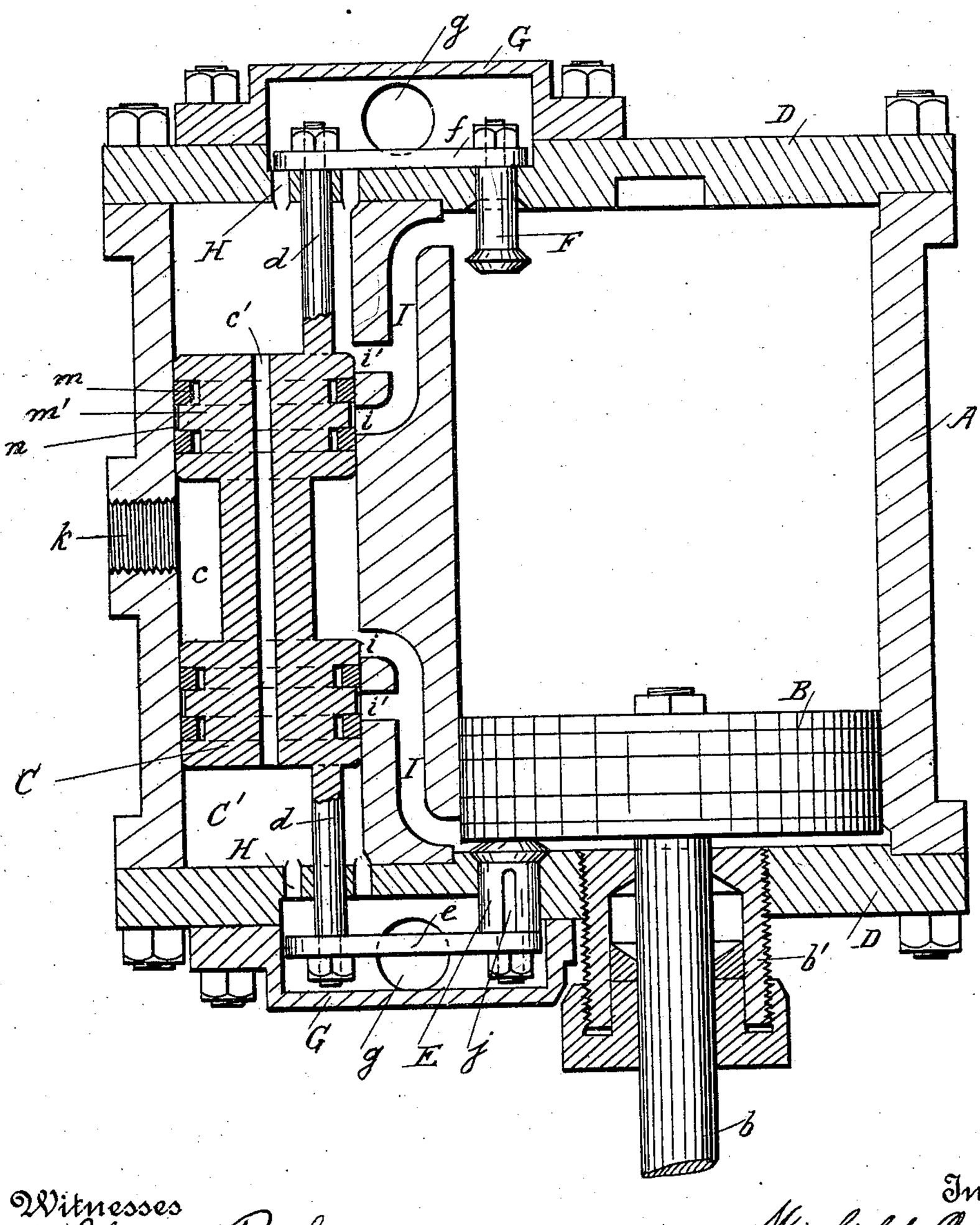
(No Model.)

# W. O. GUNCKEL.

## DIRECT ACTING ENGINE.

No. 574,415. Patented Jan. 5, 1897.




Witnesses
J. Spragg Poole
Frank L. Grigny

Inventor
Winfield O. Gunckel.

By Attorney Herbert W. Jenner.

# UNITED STATES PATENT OFFICE.

WINFIELD O. GUNCKEL, OF TERRE HAUTE, INDIANA.

## DIRECT-ACTING ENGINE.

SPECIFICATION forming part of Letters Patent No. 574,415, dated January 5, 1897.

Application filed March 18, 1896. Serial No. 583,769. (No model.)

*To all whom it may concern:*

Be it known that I, WINFIELD O. GUNCKEL, a citizen of the United States, residing at Terre Haute, in the county of Vigo and State of Indiana, have invented certain new and useful Improvements in Direct-Acting Engines; 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.

This invention relates to direct-acting engines suitable for operating air compressors or pumps; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

The drawing shows a longitudinal section through the cylinder of an engine constructed according to this invention.

A is the cylinder, and B is the piston, provided with a piston-rod *b*, which slides in a stuffing-box *b'* of approved construction.

C is a cylindrical valve for distributing the steam. This valve slides in the valve-cylinder C', and both valve and piston are furnished with packing-rings of approved construction.

The middle portion of the valve C is provided with an annular groove *c*, and *c'* is a small hole extending longitudinally through the valve to place the ends of the valve-cylinder in equilibrium and to permit condensed steam to drain from the upper parts of the cylinder to the lower.

D are the heads of the cylinders A and C'. The valve C has two similar stems *d*, which project through holes in the cylinder-heads.

E is an inwardly-opening tappet-valve seated in the lower head D, and *e* is an arm which rigidly secures the valve E to the lower stem *d*.

F is an inwardly-opening tappet-valve seated in the upper head D, and *f* is an arm which rigidly secures the valve F to the upper stem *d*.

G are hollow caps secured to the heads D over the arms *e* and *f*. These caps are provided with exhaust pipes or openings *g*, which may be connected together, if desired.

H are openings or passages in the heads D between the ends of the valve-cylinder and the interior of the hollow caps G.

I are the steam and exhaust passages leading from the valve-cylinder to the cylinder A. Each passage has a port *i* for steam and a port *i'* for exhaust leading from the valve-cylinder. Two ports *i* and *i'* are furnished in order to diminish the travel of the valve.

The lower tappet-valve E is larger in area than the upper tappet-valve, and is provided with one or more small grooves *j* on its stem, so that when the valve E is raised slightly the pressure is relieved through the groove *j* and condensed steam is driven out of the lower part of the cylinder.

The valve-cylinder C' is provided with an opening or pipe *k*, opposite the groove *c* of the valve, for the inlet of steam.

When the parts are in the positions shown in the drawing, the steam enters the lower end of the cylinder A by way of the opening *k*, groove *c*, port *i*, and lower passage I. The steam in the upper end of the cylinder A passes to the exhaust-opening by way of the upper passage I, port *i'*, and openings H.

The piston is propelled upward and strikes the tappet-valve F, causes its closure, and raises the cylindrical valve C, thereby opening the tappet-valve E and exhausting the steam from the lower end of the cylinder through the lower passage I, port *i'*, and openings H. The valves E and F take no part in the distribution of the steam, but act as valves when pressed on their seats, and operate to keep the ends of the cylinder A steam-tight. It is not necessary that the valves be pressed onto their seats by the piston, as the usual compression and preadmission at the ends of the strokes of the piston can complete the closure of these valves.

The valve E is made of larger area than the valve F, so that it may the more readily be closed by the pressure of steam in the cylinder. The engine will start when the valve C is in a central position, because, although both ports *i* are covered, the valve has no lap over these ports and steam will leak through them until there is sufficient pressure to move the larger valve E and thereby admit more steam to the lower end of the cylinder.

Each end of the valve C is preferably provided with two packing-rings *m*, and the rib *m'* between these rings is smaller in diameter than the ribs on the other sides of the said rings. This forms a small steam-space *n*,

which is filled with steam from the port *i'* when steam is admitted to the port *i*. This insures the proper working of the valve.

What I claim is—

1. In a direct-acting engine, the combination, with a steam-cylinder, and its piston; of a cylindrical valve provided with a steam-distributing groove and a longitudinal hole *c'*, a valve-cylinder provided with a steam-inlet, and passages communicating with the said cylinder; inwardly-opening tappet-valves of unequal area arranged at the ends of the steam-cylinder, and connections arranged between the said tappet-valves and the said cylindrical valve, whereby the cylindrical valve is operated positively at the ends of the strokes of the piston, substantially as set forth.

2. In a direct-acting engine, the combination, with a steam-cylinder, and its piston; of a cylindrical valve provided with a steam-distributing groove and a longitudinal hole *c'*, a cylinder for the said valve to slide in provided with a steam-inlet communicating with the said groove, and passages arranged between the two said cylinders; inwardly-opening tappet-valves of unequal area at the ends of the cylinder, said tappet-valves being rigidly secured to the said cylindrical valve, and the lower tappet-valve being provided with a groove *j*; and hollow caps secured to the end of the cylinders and provided with exhaust-openings and connected with the ends of the valve-cylinder, substantially as set forth.

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

WINFIELD O. GUNCKEL.

Witnesses:
JOHN A. CARSON,
JOHN J. CLEARY.