No. 700,241. Patented May 20, 1902.

W. J. ROBB.

INTERNAL COMBUSTION ENGINE.

(Application filed Dec. 30, 1901.)

(No Model.) 2 Sheets—Sheet 1.

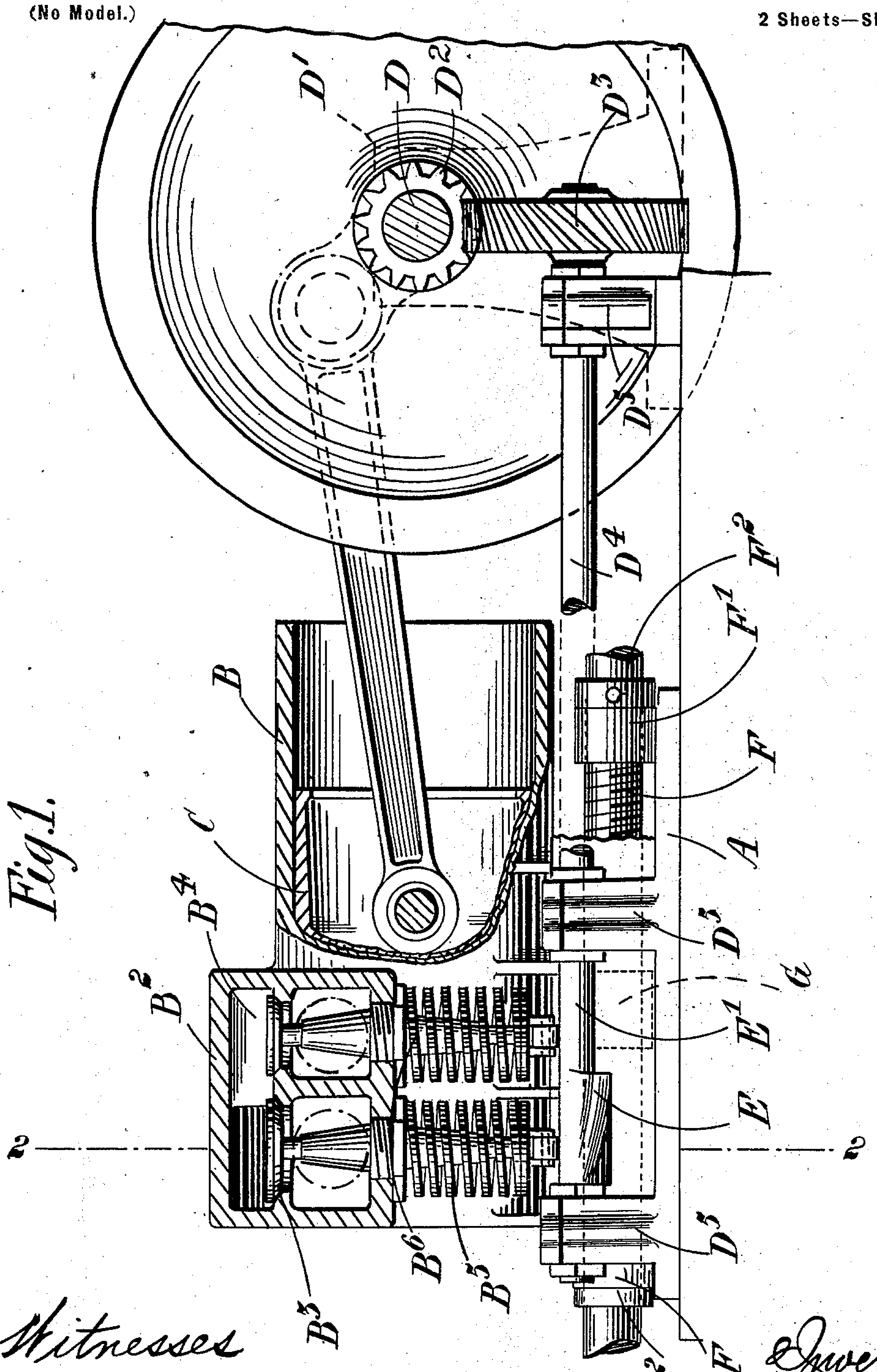

Fig. 1.

Witnesses

W. K. Boulter

[signature]

Inventor

William J. Robb

By Wm. E. Boulter

attorney

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Fig. 3.

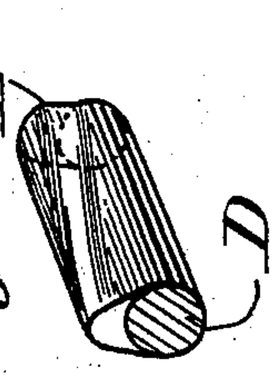

Fig. 2.

Witnesses:
T. K. Boulter

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UNITED STATES PATENT OFFICE.

WILLIAM JOHN ROBB, OF PORTADOWN, IRELAND.

INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 700,241, dated May 20, 1902.

Application filed December 30, 1901. Serial No. 87,835. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JOHN ROBB, a subject of the King of England, residing at Portadown, Ireland, have invented certain new and useful Improvements in or Relating to Internal-Combustion Engines, (for which application for Letters Patent has been made in Great Britain under No. 5,857, dated March 20, 1901,) of which the following is a specification.

This invention is for improvements in or relating to internal-combustion engines, and has for its object to provide means by which the capacity of the combustion-space of the working cylinder may be varied, while, if desired, the volume of the charge admitted to the cylinder may be simultaneously varied in proportion to the capacity of the cylinder. When an engine is running at high speed, it is often preferred to increase the compression, as is well known, and similarly when running at a low speed a decrease of compression is often desired.

In the accompanying drawings, which illustrate one method of carrying out this invention as applied to a one-cylinder engine, Figure 1 is a side elevation of the engine in part section. Fig. 2 is a section on the line 2 2 of Fig. 1, and Fig. 3 is a perspective view of a detail of the engine.

The bed-plate A of the engine is provided with longitudinal V-grooves A′, and the cylinder B carries a correspondingly V-shaped lug B′, by which it is supported in the grooves in the bed-plate and is free to slide in a longitudinal direction. The piston C of the cylinder is connected by a rod C′ to a crank-shaft D, carried in supports D′, rigidly secured to the bed-plate A.

On the shaft D a worm D^2 is mounted, gearing with a worm-wheel D^3, carried by a longitudinal shaft D^4, supported in bearings D^5 on the bed-plate A. The shaft D^4 extends along the side of the cylinder B and carries at its rear end cams E E′.

Above the cams E E′ a valve-box B^2 is provided on the cylinder B, within which inlet and exhaust valves B^3 B^4, respectively, are mounted in any well-known manner. The valves B^3 B^4 are each controlled by springs B^5 B^6, sufficiently strong to resist the suction of the piston, so that both valves are positively operated. The valve-stem of the valve B^3 extends downwardly to the cam E, so that it comes into contact with and coöperates with the latter. The valve-stem of the valve B^4 similarly coöperates with the cam E′. Both cams are made of sufficient length to allow the valve-stems to be moved nearer to or farther from the crank-shaft of the engine without becoming disengaged from the cams.

To retain the cylinder B in place in the V-grooves A′ and to adjust its position upon the bed-plate so that it may be placed nearer to or farther from the crank-shaft D, as may be desired, a longitudinal screw-threaded shaft F is mounted beneath the cylinder in supports F′, fast on the bed-plate A. A lug G is secured to the under side of the lug B′ on the cylinder, and this lug is screw-threaded to receive the shaft F, so that as the shaft is rotated the cylinder is advanced or withdrawn in the V-grooves A′. To prevent longitudinal travel of the shaft F, the latter is provided with collars F^2, which bear against the supports F′ on the bed-plate.

The operation of this engine is as follows: When it is desired to vary the compression, the shaft F is rotated by any convenient means in one direction or the other, so that the cylinder B is advanced to or withdrawn from the crank-shaft D. This movement of the cylinder B decreases or increases the combustion-space of the cylinder by advancing the end of the cylinder toward or withdrawing it from the piston C, and presuming the inlet-valve to be opened for a uniform period the charge of necessity is compressed to a greater or less degree. To render the variation of the combustion-space of the cylinder more effective in the working of the engine, it is found of great advantage to vary the volume of the charge admitted to the cylinder simultaneously with the capacity of the combustion-space, so that uniform compression may be maintained and the speed of the engine decreased or increased by variation of the volume of the explosive charge only. To effect this, the cam E, which operates the inlet-valve, is graduated off in the direction of its longitudinal axis, as shown clearly in perspective in Fig. 3. This graduation of the cam causes the charge admitted to the cylinder to be cut off at an earlier or later period by allowing the valve to close

before or after the normal time, according to the position of the valve-stem relatively to the cam. The cam is graduated so that the valve is opened for the shortest period when the valve-stem is over that end of the cam nearest the crank-shaft—that is, when the combustion-space of the cylinder is reduced to its smallest capacity—and the graduation of the cam way be so regulated that the amount of charge permitted to enter the cylinder may always bear the same proportion to the capacity of the combustion-chamber whatever the position of the cylinder be relatively to the crank-shaft D.

It will be understood that this invention may be applied to a single or multiple cylinder engine whether horizontally or vertically arranged.

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

In a four-cycle explosion-engine, the combination of a working cylinder, a support for the cylinder, a piston to the cylinder, means for sliding the cylinder upon its support relatively to the piston, a crank-shaft carried by the support, means for operatively connecting the piston with the crank-shaft, a valve to admit fuel to the cylinder, a cam graduated in the direction of its axis of rotation for operating the valve, means for operatively connecting one of these members with the cylinder so that movement of the cylinder causes different portions of the cam to coöperate with the valve, means for operatively connecting the cam with the crank-shaft, and means for maintaining this operative connection when the cylinder is moved upon its support, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM JOHN ROBB.

Witnesses:
B. E. DUNBAR KILBURN,
HARRY B. BRIDGE.