No. 652,382. Patented June 26, 1900.

J. H. ATTERBURY.

GAS ENGINE.

(Application filed Sept. 14, 1899.)

(No Model.) 3 Sheets—Sheet 1.

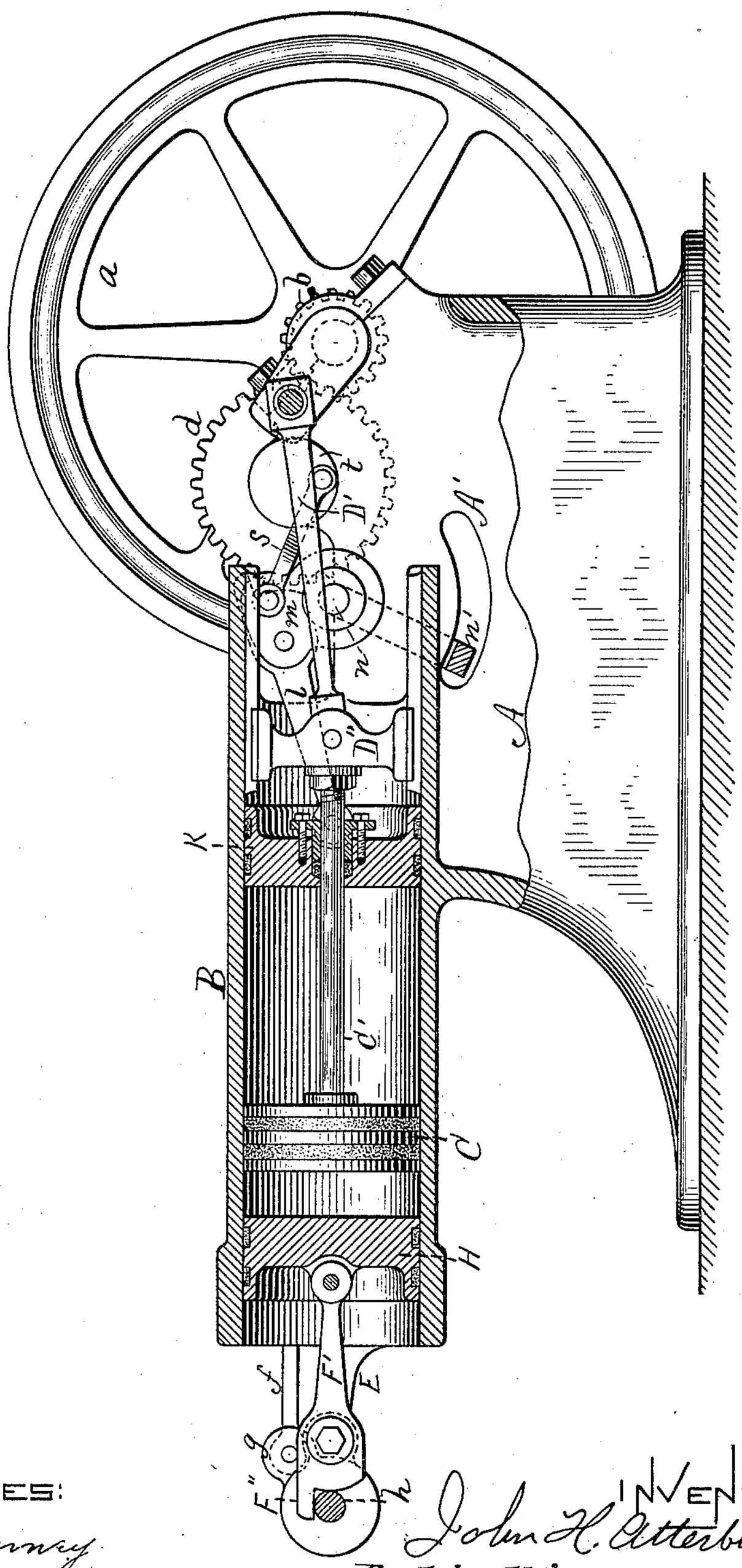

Fig. 1.

WITNESSES:
A. A. Bonney.
E. A. Swett.

INVENTOR:
John H. Atterbury.
By his Atty.
Henry W. Williams

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 3 Sheets—Sheet 2.

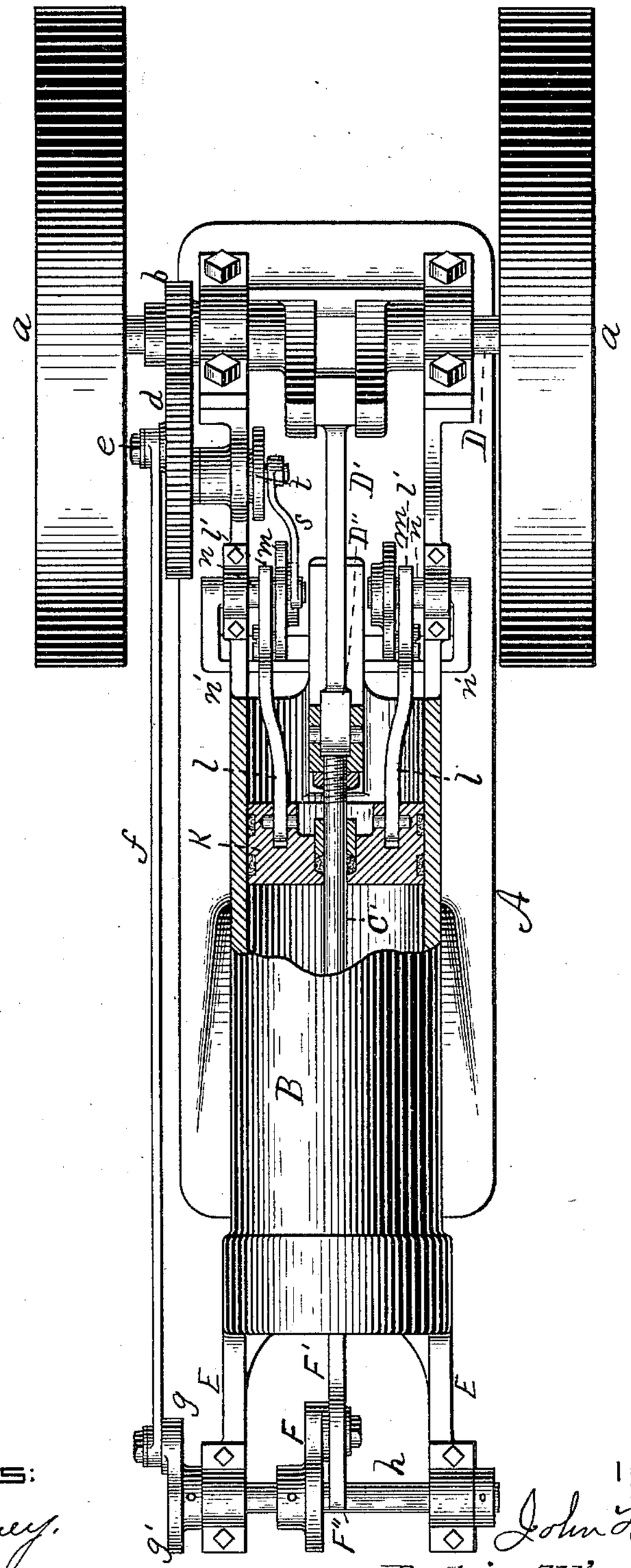

Fig. 2.

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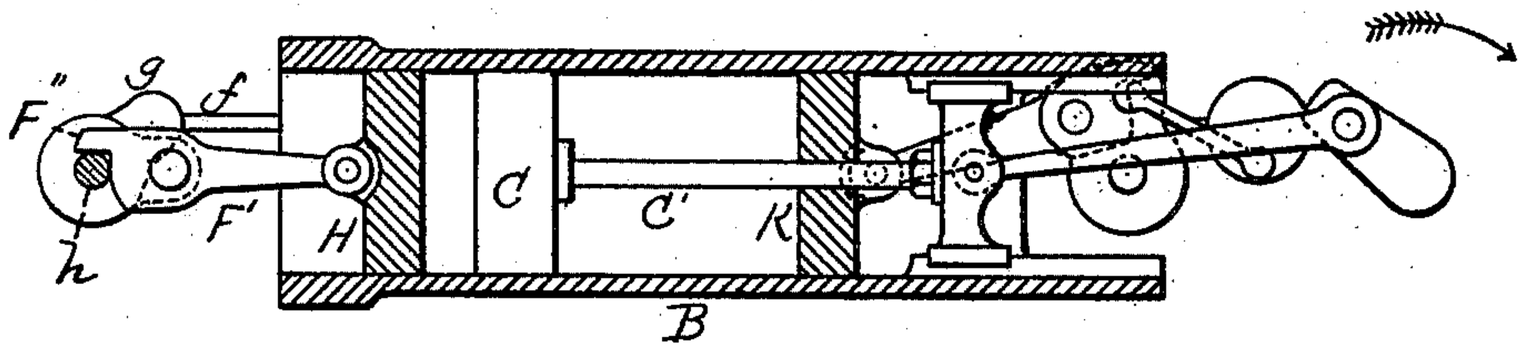

Fig. 3.

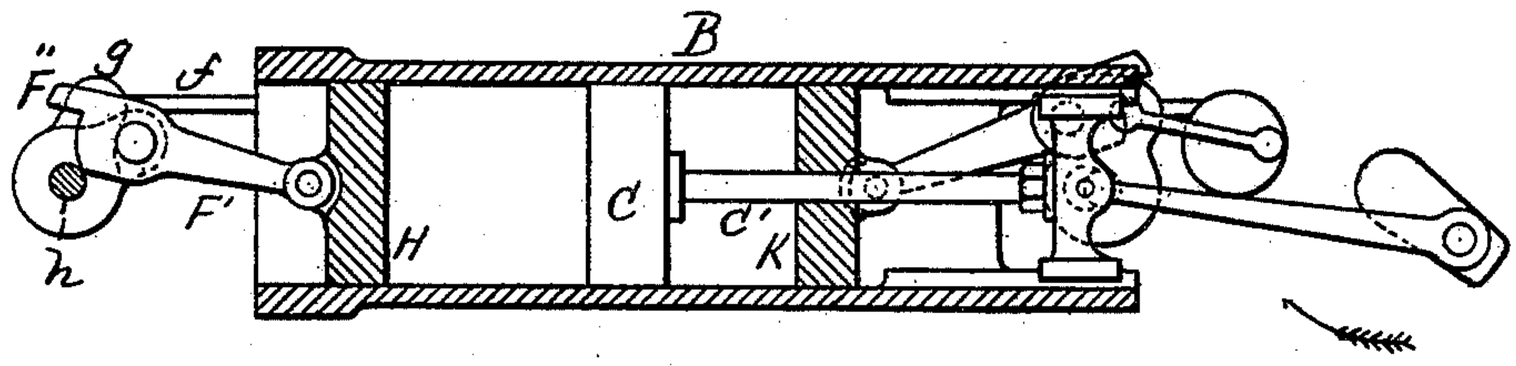

Fig. 4.

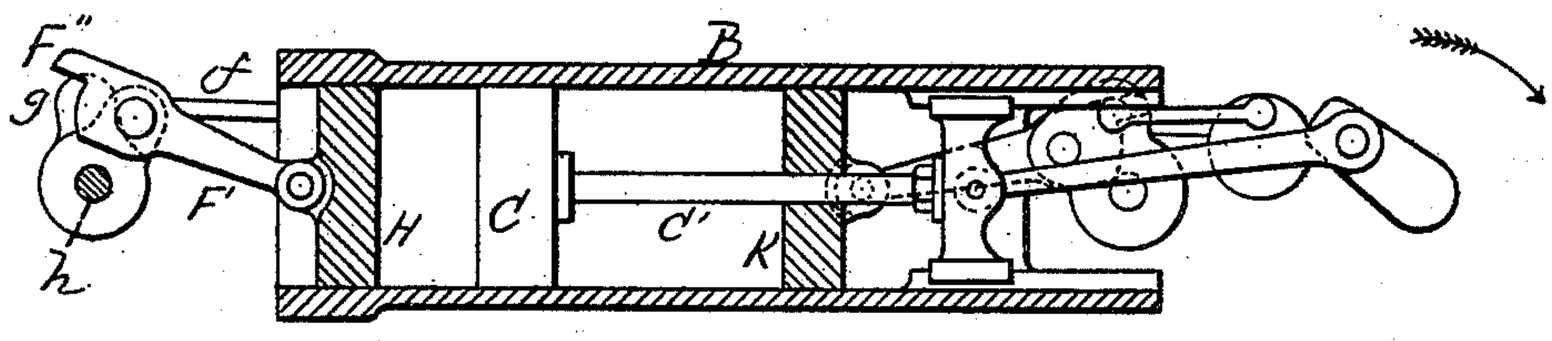

Fig. 5.

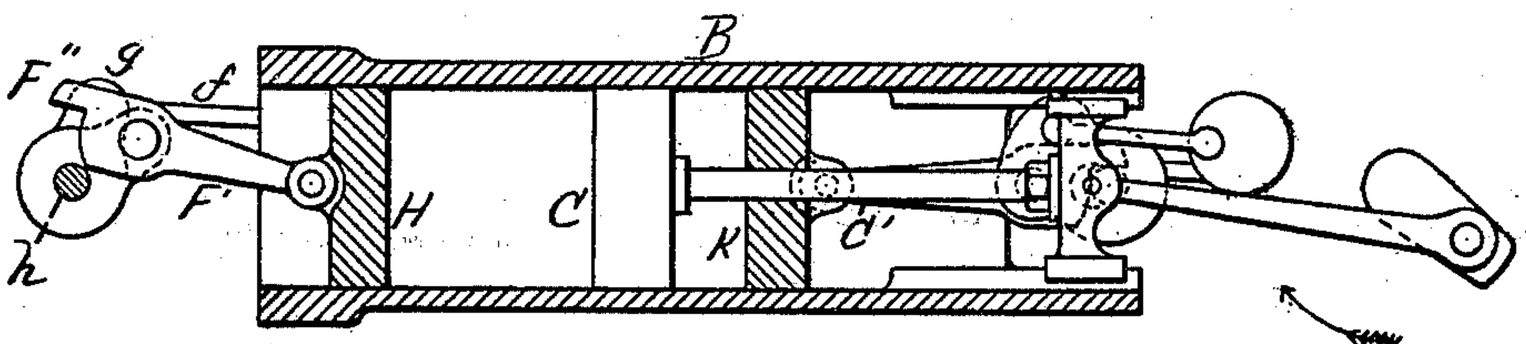

Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN H. ATTERBURY, OF AVON, MASSACHUSETTS.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 652,382, dated June 26, 1900.

Application filed September 14, 1899. Serial No. 730,453. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. ATTERBURY, a citizen of the United States, residing at Avon, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Gas-Engines, of which the following is a specification.

As is well understood, gas-engines explode their gas at the beginning of the stroke of the piston, or, in other words, when the piston-rod and crank are in line. The effect of this is that the force of the explosion is largely expended in heating the cylinder and other parts to an intense degree, making a water-jacket necessary around it for the purpose of carrying off the heat. Thus a large proportion of the power which might be applied to the engine is lost. The burned gas expands until it loses value when the crank is at the point indicated in the accompanying drawings—say at one-sixth of its stroke. A large portion of the heat is lost to the engine for the reason that the explosion chamber or cylinder has so much space to be filled.

My improvement relates to that class of inventions which have for their object to remove this difficulty.

While the invention can be applied to either a single or a double acting gas-engine, in the following description and the drawings referred to therein the invention is embodied in a double-acting engine. In this contrivance I provide extra or supplemental pistons which are arranged to follow alternately the main piston or engine-piston before the gas is exploded, thus making the space so much smaller and correspondingly compressing the gas that when it is exploded on either side of the main piston the crank is in the best position to receive the force of the explosion. Thus the amount of gas needed to do the work is so much reduced that the heat units are expended in actual force instead of being largely used in heating the cylinder.

The nature of my invention in detail is fully described below and illustrated in the accompanying drawings, in which—

Figure 1 is a view, partly in elevation and partly in longitudinal vertical section, embodying my invention. Fig. 2 is a plan view of the same, a portion of the cylinder being represented as broken out. Fig. 3 is a sectional or diagrammatic view showing the piston in position for the ignition of the charge on the left face and for driving out the charge on the right face. Fig. 4 is a similar view showing the piston expelling the spent gases on the left side and taking in gas on the right side. Fig. 5 shows the piston compressing gas and air on the right side and taking in gas on the left side. Fig. 6 shows a piston in position for ignition on the right side and for compression on the left side, after which it will assume the position indicated in Fig. 3 to repeat the operation.

Similar letters of reference indicate corresponding parts.

A represents the main body or frame of the machine.

B is the cylinder, open at both ends.

C is the usual piston, connected by the piston-rod C′ and pitman D′ with the crank-shaft D, having the fly-wheels *a* mounted thereon, D″ being a guide sliding in ways in the cylinder.

Rigidly secured to the shaft D is a pinion *b*, meshing into a gear-wheel *d*, provided on its outer surface with a crank-pin *e*, which is connected by the connecting-rod *f* with a crank *g*, whose hub *g*′ is mounted on the shaft *h*, supported by horizontal brackets E, extending from the cylinder. Fast on the shaft *h* is a crank F, whose outer end is connected by a pitman F′ with the extra or supplemental piston H, located between the main piston C and the open outer end of the cylinder.

Power being applied to the main shaft, the gear *b d* and the mechanism *e*, *f*, *g*, *h*, F, and F′ operate to move the piston H with relation to the main piston C so that the space between them at the time of explosion is very small, as indicated in Fig. 1, with the effect or result above mentioned. The outer end of the pitman F′ is provided with a short arm F″, which when the pitman and the crank F are in line rests on the shaft *h*. As it is when the parts are in this position that the explosion occurs, the piston H constitutes at this moment a firm and solid back, being securely locked in such position by the parts described.

As the drawings illustrate a double-acting engine, I provide another supplemental or auxiliary piston K on the other side of the main piston, intended to operate alternately

with the piston H. This piston, like the piston H, fits in the cylinder, and it moves on the piston-rod C′. This piston K is connected by two pitmen *l*, on opposite sides of the piston-rod C′, with cranks *m*, fast on shafts *n*, mounted in the frame of the machine and constituting the ends of a bow *n′*, which thus connects the pitmen *l*, with the effect of producing an even strain on the piston K. Provision is made for the swinging of this bow as its shaft ends oscillate by forming curved slots A′ in the frame. One of these cranks *m* is connected by a crank-arm *s* with the crank-disk *t* on the shaft upon which the gear-wheel *d* is mounted. By this construction the piston K operates with relation to the main piston C in the same manner as the piston H, but alternately with it. By bringing up one supplemental piston the charge is compressed by one stroke, the other supplemental piston enlarging the space on the other side. Thus I accommodate a greater amount of explosive gas on each side alternately and then compress the gas on opposite sides of the main piston, with the effect of obtaining increased power from the explosions. The successive positions of the piston are illustrated in Figs. 3 to 6, inclusive, and will be understood from the foregoing description of said figures.

The pitmen *l* being pivotally secured to the cranks *m* at some distance from their ends the rear end *l′* of the said pitmen are enabled to rest on the shafts *n* in the same manner that the arm F″ rests on the shaft *h*, with the effect of locking the piston K, and thereby providing a firm and solid back for the explosion.

I am aware that an attempt has been made to produce the result above mentioned, such attempt consisting in moving the cylinder, say, four inches in every stroke of three hundred to the minute. This, however, uses up nearly all the power in moving the cylinder. I calculate, in comparing such a structure with my device, that where this structure is obliged to move about nine tons per minute mine moves but about one ton per minute, which is not practically felt by the engine, as the atmospheric pressure would be but about fourteen pounds to the square inch. Instead of moving a heavy cylinder I move a comparatively-light piston to close up the space left by the traveling or receding main piston.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

In a gas-engine of the character described, the combination with the open-ended cylinder B, main piston and piston-rod in said cylinder, the pitmen and crank-shaft and the supplemental pistons H and K located within the cylinder and between the main piston and the opposite ends of said cylinder; of the shaft *h* supported by the cylinder, the crank F fast on said shaft, the pitman F′ connecting said crank and the supplemental piston H, said pitman being provided with the arm F″ adapted to rest on the shaft *h* when the pitman F′ and crank F are in line, the crank *g* on said shaft *h* and mechanism connecting said crank *g* and crank-shaft; and mechanism intermediate with the crank-shaft and the pistons H and K communicating movement relative to that of the main piston to the supplemental pistons alternately, substantially as described.

JOHN H. ATTERBURY.

Witnesses:
HENRY W. WILLIAMS,
A. N. BONNEY.