

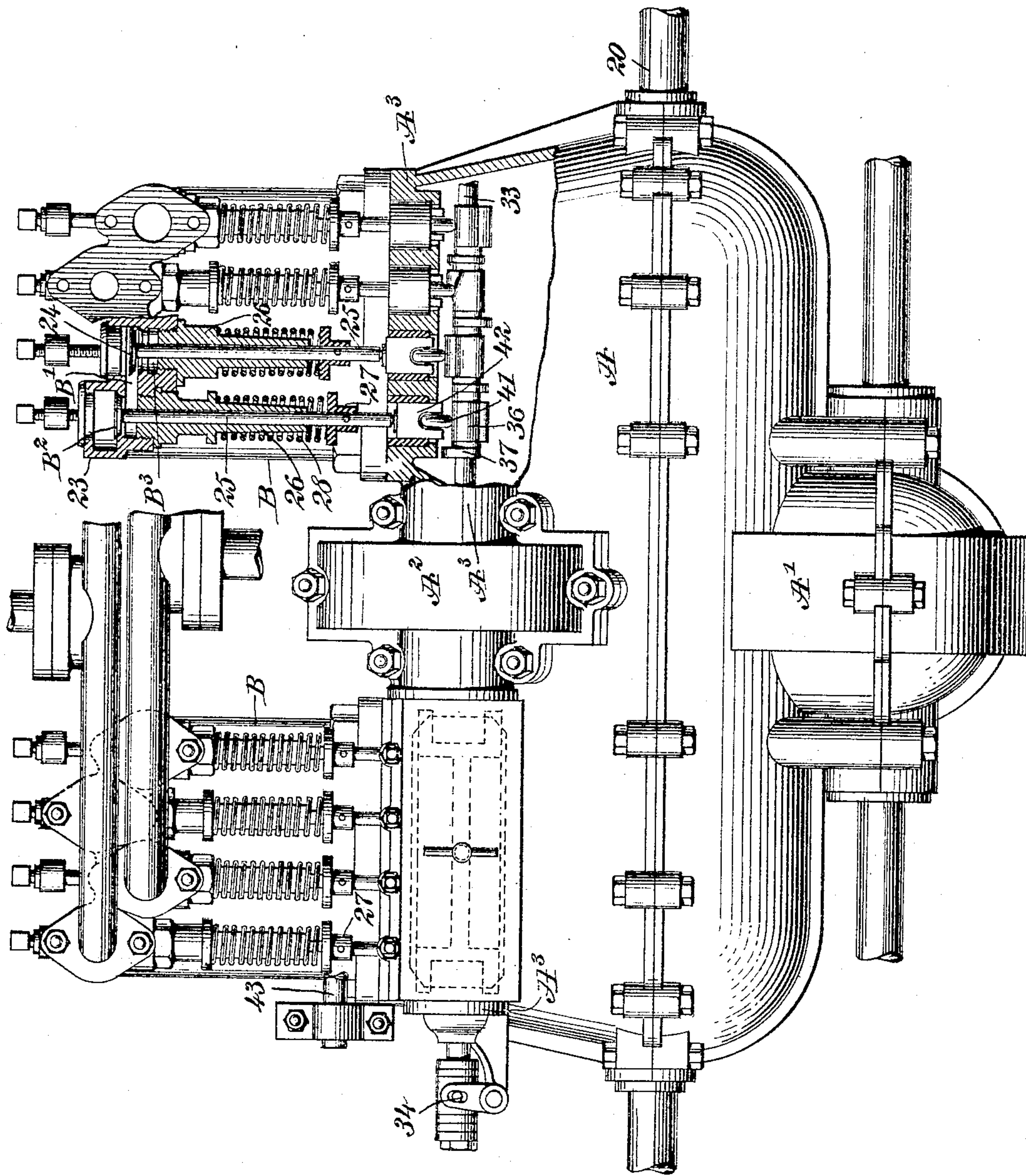
No. 778,632.

PATENTED DEC. 27, 1904.

G. C. CANNON.
ENGINE.

APPLICATION FILED NOV. 5, 1903.

6 SHEETS—SHEET 1.



WITNESSES:

John Reigthorn

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FIG. 1

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6 SHEETS—SHEET 2.

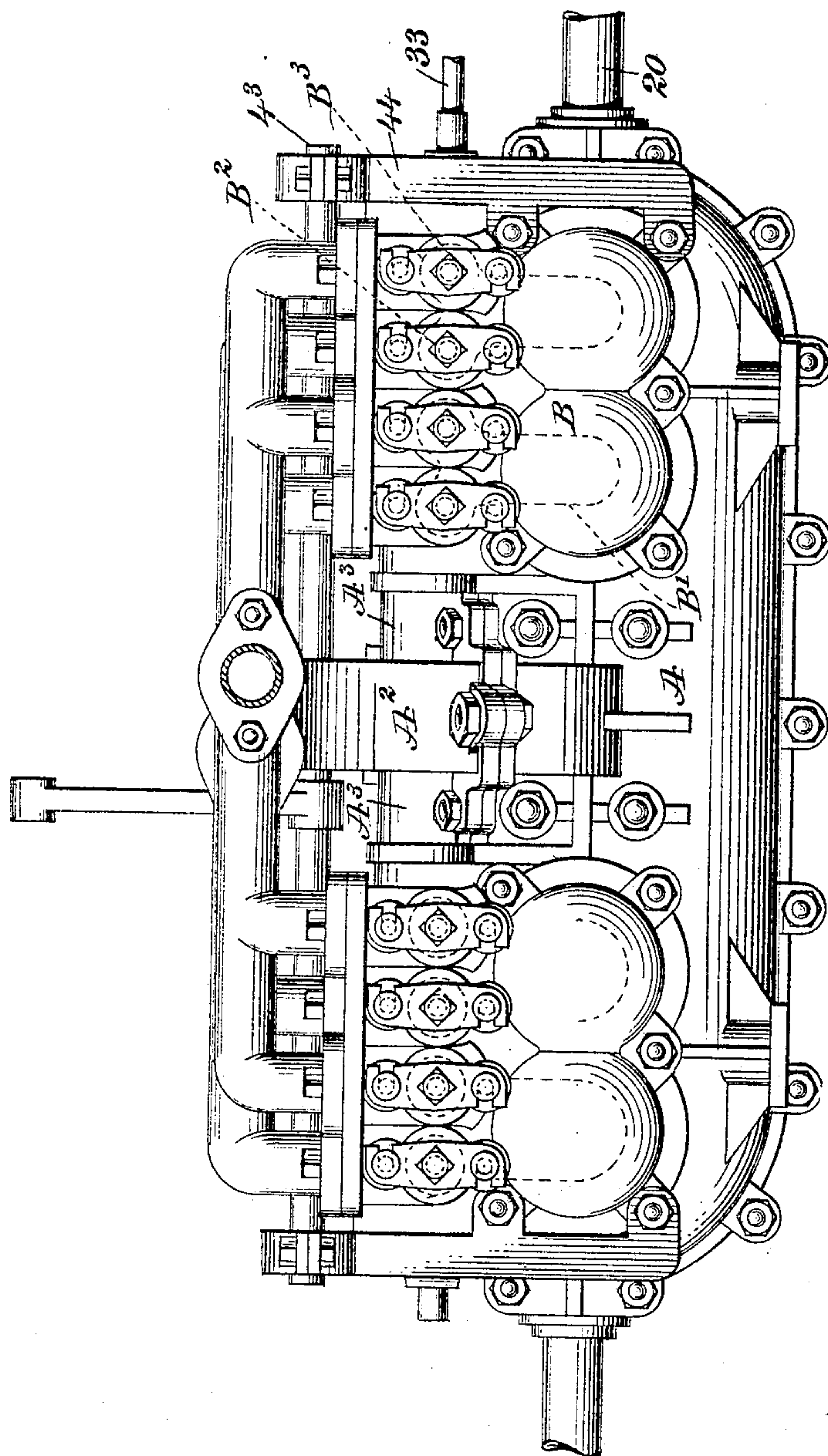


Fig. 2

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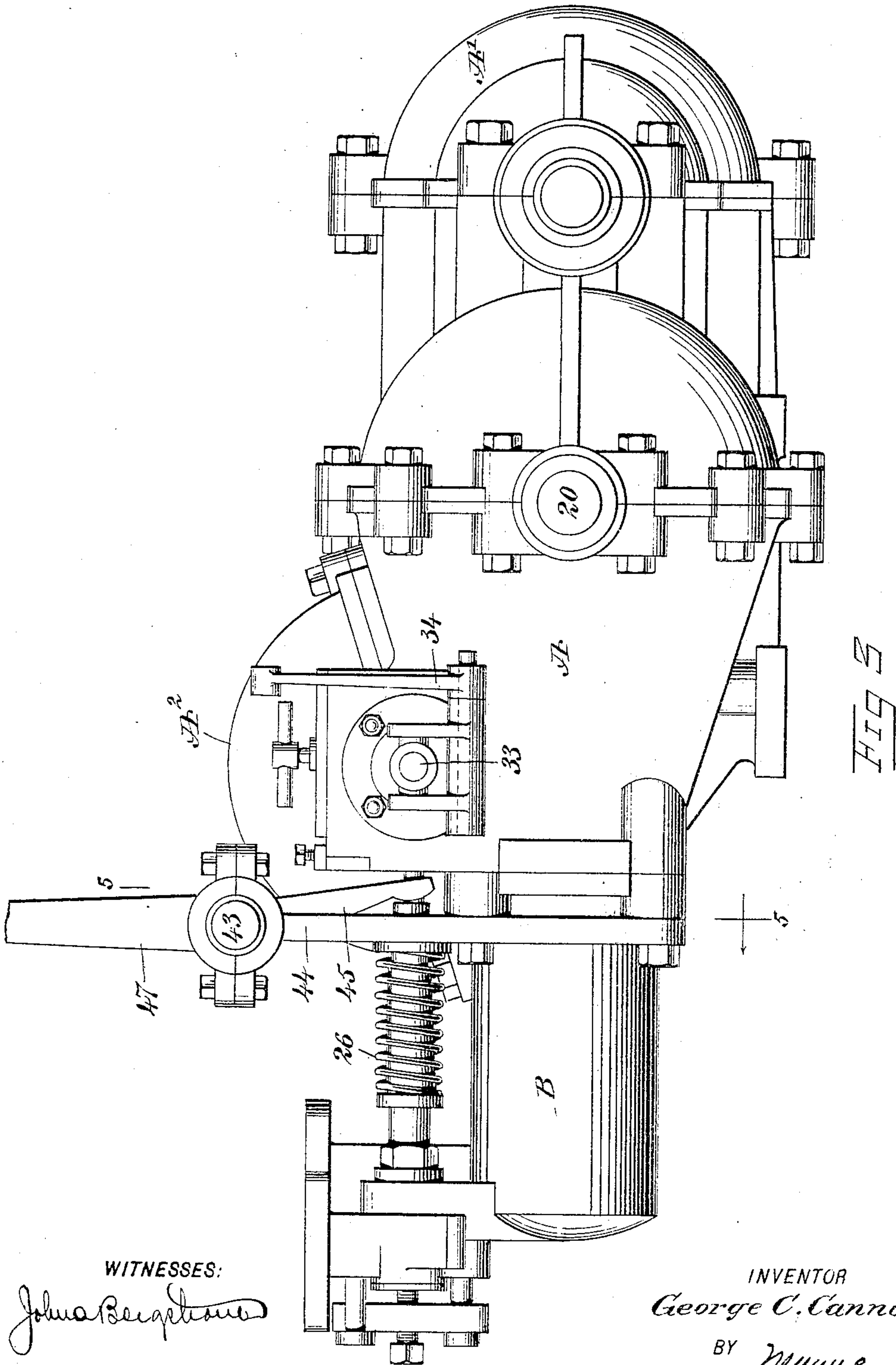
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6 SHEETS—SHEET 3.



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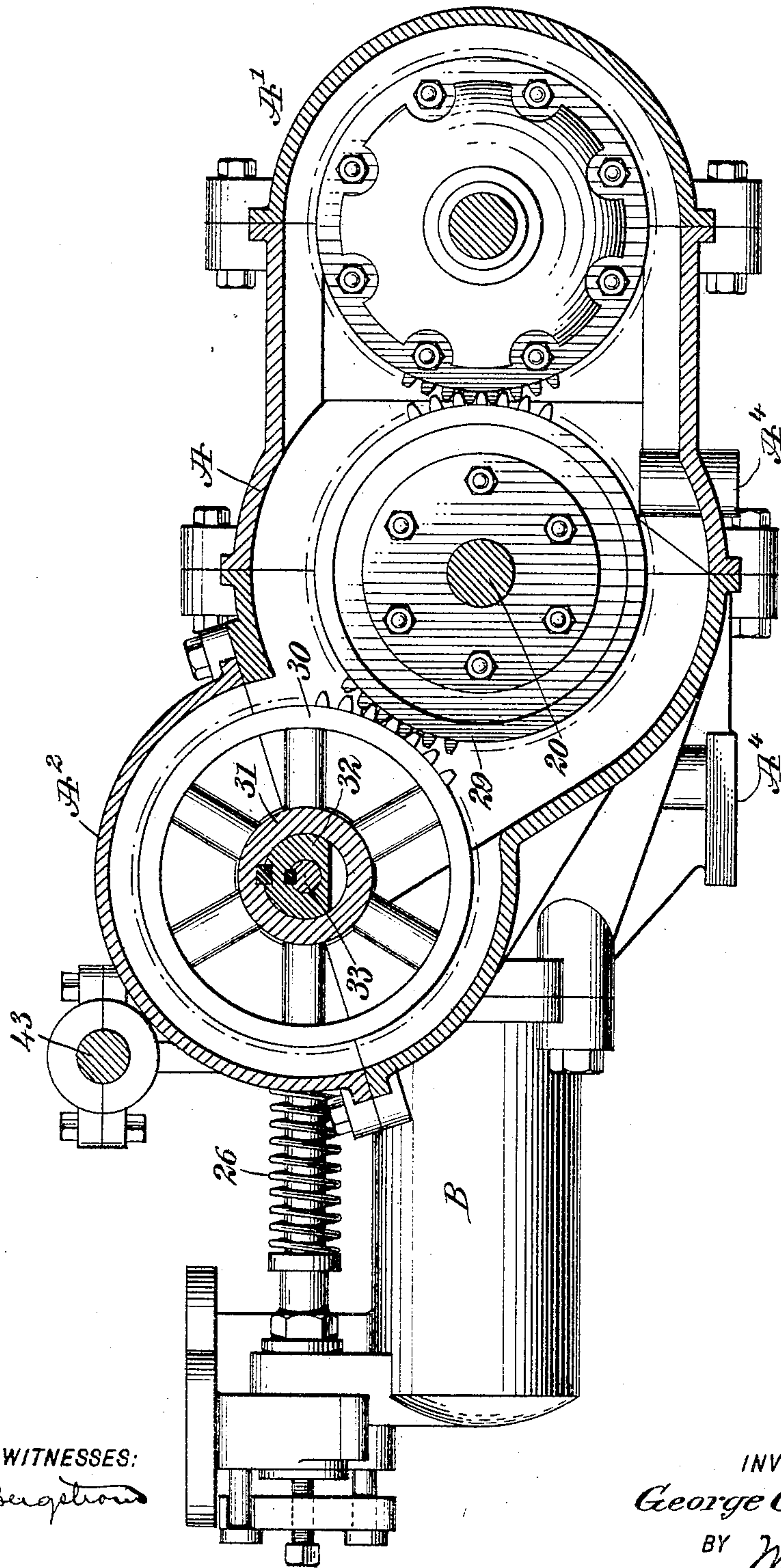


Fig. 4

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6 SHEETS—SHEET 5.

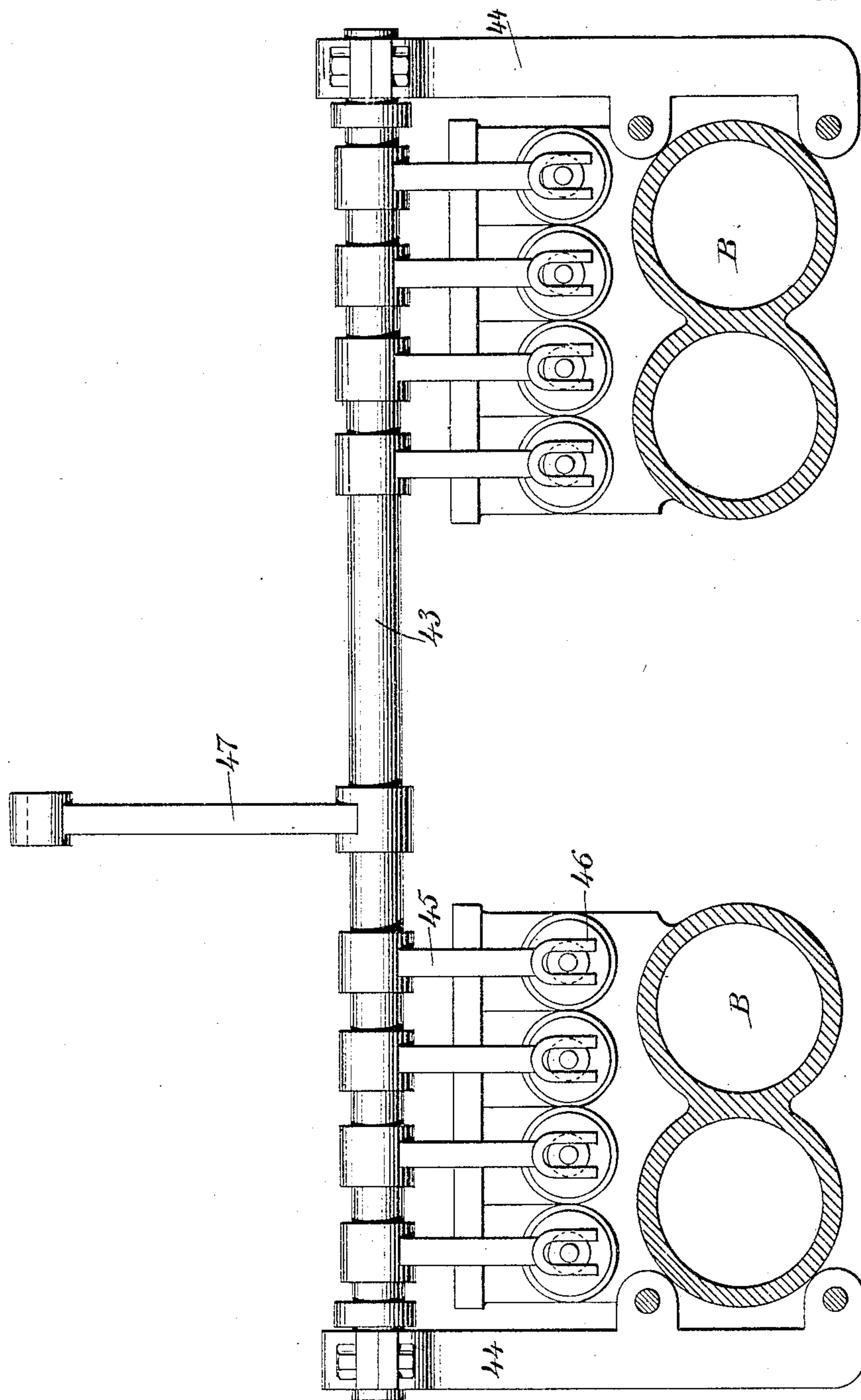


FIG. 5

WITNESSES:

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UNITED STATES PATENT OFFICE.

GEORGE CURTIS CANNON, OF NEW YORK, N. Y.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 778,632, dated December 27, 1904.

Application filed November 5, 1903. Serial No. 179,933.

To all whom it may concern:

Be it known that I, GEORGE CURTIS CANNON, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Engine, of which the following is a full, clear, and exact description.

This invention relates to a puppet-valve steam-engine designed especially for automobile use, but applicable for other purposes, as will be apparent.

The invention resides particularly in the arrangement of the valves in connection with the steam-passages and in the mechanism for operating the valves and for controlling their movements.

The prime object of the invention is to provide a valve-gear by means of which the speed of the engine may be absolutely controlled—that is to say, by which the engine may be run at any speed within the range between high and low speed. This end I attain by a peculiar form of cam and by the arrangement of this cam in connection with the shaft and valve-stems in a manner to be hereinafter fully described.

The invention involves various other novel features, all of which will be fully described hereinafter.

This specification is an exact description of one example of my invention, while the claims define the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of the engine. Fig. 2 is a front end elevation thereof, partly in section. Fig. 3 is a side elevation. Fig. 4 is a central longitudinal section. Fig. 5 is an elevation of the valve-lifting device, showing the cylinders in section on the line 5 5 in Fig. 3. Fig. 6 is a longitudinal section taken through one of the cylinders of the engine and illustrating one of the exhaust-valves. Fig. 7 is an elevation of the cam-shaft and

illustrates also the hub of the driving-gear thereof. Fig. 8 is an elevation of one of the steam-cams. Fig. 9 is an elevation of one of the exhaust-cams, and Figs. 10 to 15 are respectively sections on the corresponding lines marked on Figs. 8 and 9.

A indicates the crank-case of the engine, and B the cylinders. The crank-case has a supplemental case A' for a differential gear, as described in my copending application for automobile driving-gear, filed of even date herewith, Serial No. 179,934. The crank-case is also formed with a supplemental case A² for the gear of the cam-shaft, as will be hereinafter described.

20 indicates the engine crank-shaft, to which the four connecting-rods 21 are joined. Said rods are connected to single-acting trunk-pistons 22, operating in the cylinders B. From the heads of the cylinders B steam-passages B' extend upward, and, as indicated in Figs. 1, 2, and 6, these passages widen at their upper ends to meet the steam-ports B² and the exhaust-ports B³. By this arrangement the steam-passages from the valves to the cylinders are reduced in area as much as possible and a material saving in steam results.

23 indicates the steam-valves, and 24 indicates the exhaust-valves, which are of the puppet type and have their stems 25 fitted to move freely in tubular guides 26, fastened in the cylinder-heads, as shown. Collars 27 are attached to the valve-stems, and springs 28 bear between the collars and the stem-guides to keep the valves normally seated.

Formed on the casing A are two enlargements A³ in transverse alinement with each other and constituting the inclosure for the cam-shaft, these inclosures A³ communicating with the inclosures A² for the cam-shaft gear. Fastened to the crank-shaft 20 is a spur-gear 29, which is meshed with a corresponding gear 30. Said gear has its hub 31 revolubly mounted in the inner extremities of the before-mentioned enlargements A³ of the crank-case, said inner extremities of the enlargements forming the boxes in which the hub of

the gear is mounted. Fastened within the hub 31 is a sleeve 32, and this sleeve encircles the cam-shaft 33 and is splined thereon. In this manner the cam-shaft is revolubly driven
 5 and is allowed to slide or move axially without disturbing its revolution. The ends of the shaft 33 are suitably mounted in the ends of the crank-case, and 34 indicates devices for imparting a sliding movement to the shaft,
 10 these devices being under the control of the engine-driver.

The steam-cams, as indicated in Figs. 7, 10, 11, 12, and 13, comprise sleeves 35, keyed on the cam-shaft and having cams 36 and 37
 15 formed thereon. The cams 36 have longitudinally-disposed shoulders 36^a and diagonal shoulders 36^b. The cams 37 are the reverse-cams and have square or longitudinal shoulders at each side. The exhaust-cams com-
 20 prise sleeves 38, on which two cams 39 and 40 are formed. Both of these cams have square or longitudinal shoulders, the cam 39 operating when the engine is running ahead and the cam 40 operating under the reverse move-
 25 ment. The said steam and exhaust cams are fastened on the shaft under their respective valves and engage rollers 41, mounted in sliding blocks 42, which in turn are carried in
 30 the front walls of the enlargements A³ of the crank-case, and the valve-stems bear on the respective blocks 42, as shown. In this manner the valves are properly operated. The exhaust-cams hold the valves open uniformly during the exhaust period of the operation of
 35 each cylinder. The steam-cams turn so as to lift the valves with their square or longitudinal shoulders and as the cams turn under the valve-rollers 41 said rollers drop down the diagonal shoulders 36^b of the cams. Con-
 40 sequently by shifting the cams axially the period of cut-off may be regulated at will, and owing to the fact that the diagonal edge or shoulder 36^b is continuous it is clear that the adjustment of the cam may be very fine, and
 45 consequently the engine may be controlled with absolute certainty. To reverse the engine, it is necessary to shift the shaft so as to throw the cams 37 and 40 under their respective valves. Figs. 10 to 15 show profiles of
 50 the various cams at the points indicated in Figs. 8 and 9.

In order to lift all of the valves from their seats when the engine is running empty during the coasting of the automobile, I provide
 55 the arrangement shown in Fig. 5, which consists in a rock-shaft 43, mounted in brackets 44, suitably attached to the frame of the engine. Said rock-shaft carries an arm 45 for each valve-stem. These arms have forked
 60 ends 46, which bear under the collars 27 of the valve-stems, as shown best in Fig. 6. To the rock-shaft 43 is attached any suitable

means (indicated at 47) for operating the shaft, and it is clear that by properly rocking the shaft 43 all of the valves may be raised from
 65 their seats for the purpose explained hereinbefore.

The enlargements A³ of the crank-case containing the cam-shaft, as explained, are open at their upper sides and are provided with
 70 cover-plates 48, which are movable to expose the cams for repair and otherwise. 49 indicates a suitable locking device for said cover-plates 48, and 50 indicates handles for oper-
 75 ating the locking devices. A⁴ indicates projections from the engine-frame forming the base of the engine and by which the engine is mounted on its support.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—
 80

1. A valve-operating cam, comprising a sleeve forming the body or main part, and reverse and ahead cam-sections spaced from each other on the sleeve, the reverse-section having
 85 essentially square or longitudinal shoulders and the ahead-section having one square or longitudinal shoulder and a triangular shoulder, the said reverse and ahead cam-sections being set opposite to each other.

2. In an engine, the combination of a frame
 90 provided with bearings, a gear having its hub ends mounted to turn in the bearings, means for driving the gear, a sliding shaft mounted in the hub intermediate the ends of the shaft, and connected with the hub to turn therewith,
 95 and cams attached to the shaft at each side of the gear.

3. In an engine, the combination of a frame provided with bearings, a gear having its hub
 100 mounted in the bearings, means for driving the gear, and a cam-shaft passing through and driven from the gear, said cam-shaft being reciprocal for the purpose specified, and being connected with the gear to slide therein
 105 and to turn therewith.

4. In an engine, the combination with a frame having enlargements forming boxes, of a gear having a hub turning therewith and projecting from each side thereof, the pro-
 110 jected ends of the hub being respectively mounted in said boxes, means for driving the gear, a sliding shaft mounted in and connected to turn with the hub, and a cam attached to the shaft.

5. An engine, comprising an engine-frame
 115 having bearings therein and openings at each side of the bearings, a gear having its hub mounted in the bearings, a cam-shaft passed axially through and driven from the gear, means for driving the gear, and a closure re-
 120 movably secured over the said openings in the engine-frame, the cams of the cam-shaft lying opposite said openings.

6. An engine comprising a valve, a stem

connected therewith, means for operating the valve through the medium of the stem, a rock-shaft, an arm attached to the rock-shaft and engaging the valve to lift the same, and
5 means for operating the rock-shaft.

7. An engine comprising a plurality of valves, stems attached thereto, means for operating the valves through the medium of their stems, a rock-shaft, forked arms carried
10 by the rock-shaft reciprocally engaging the

valve-stems, and means for operating the rock-shaft.

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

GEORGE CURTIS CANNON.

Witnesses:

JENNY O. CANNON,
ARTHUR J. MOULTON.