

No. 692,307.

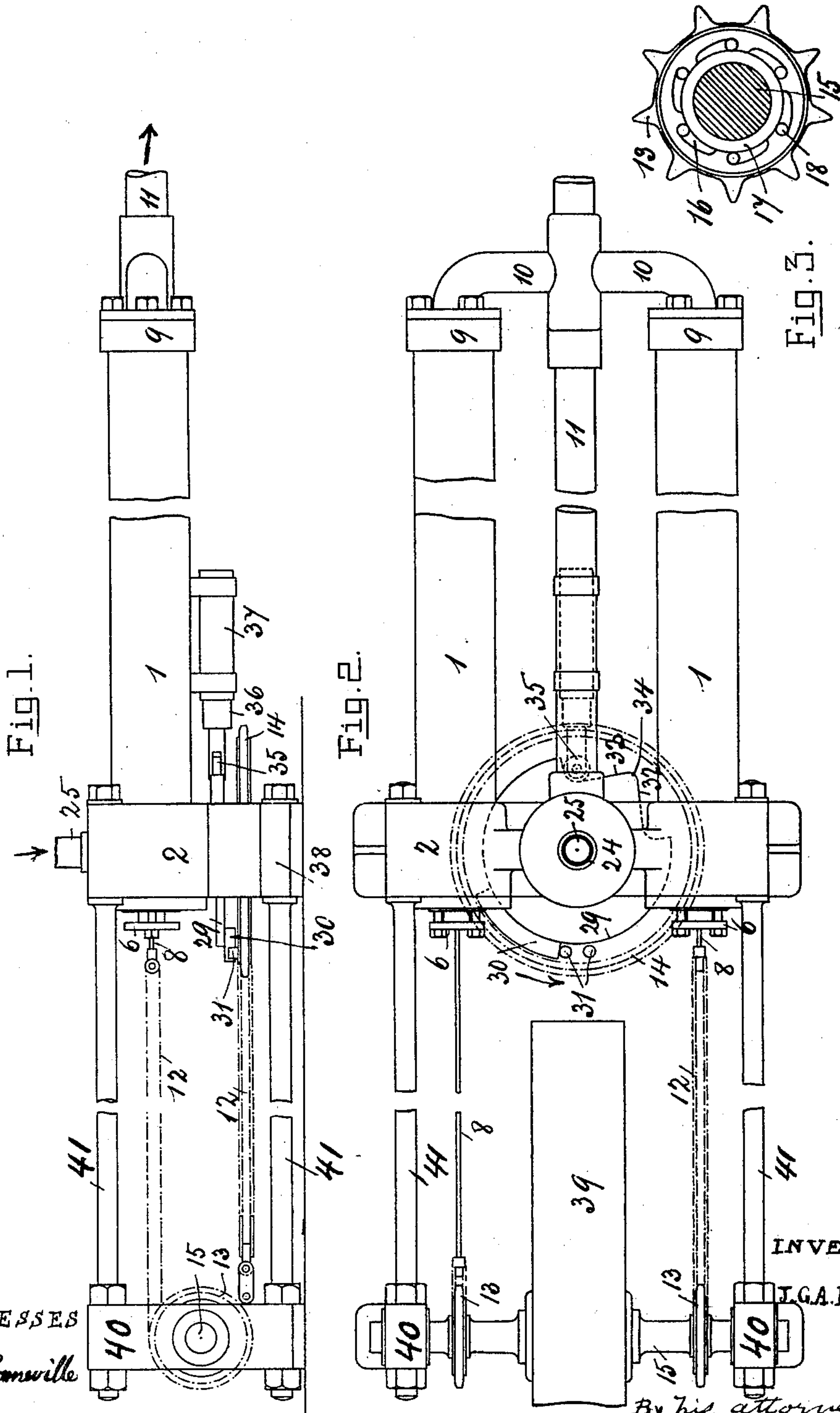
Patented Feb. 4, 1902.

J. G. A. KITCHEN.
STEAM ENGINE.

(Application filed May 23, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES

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INVENTOR

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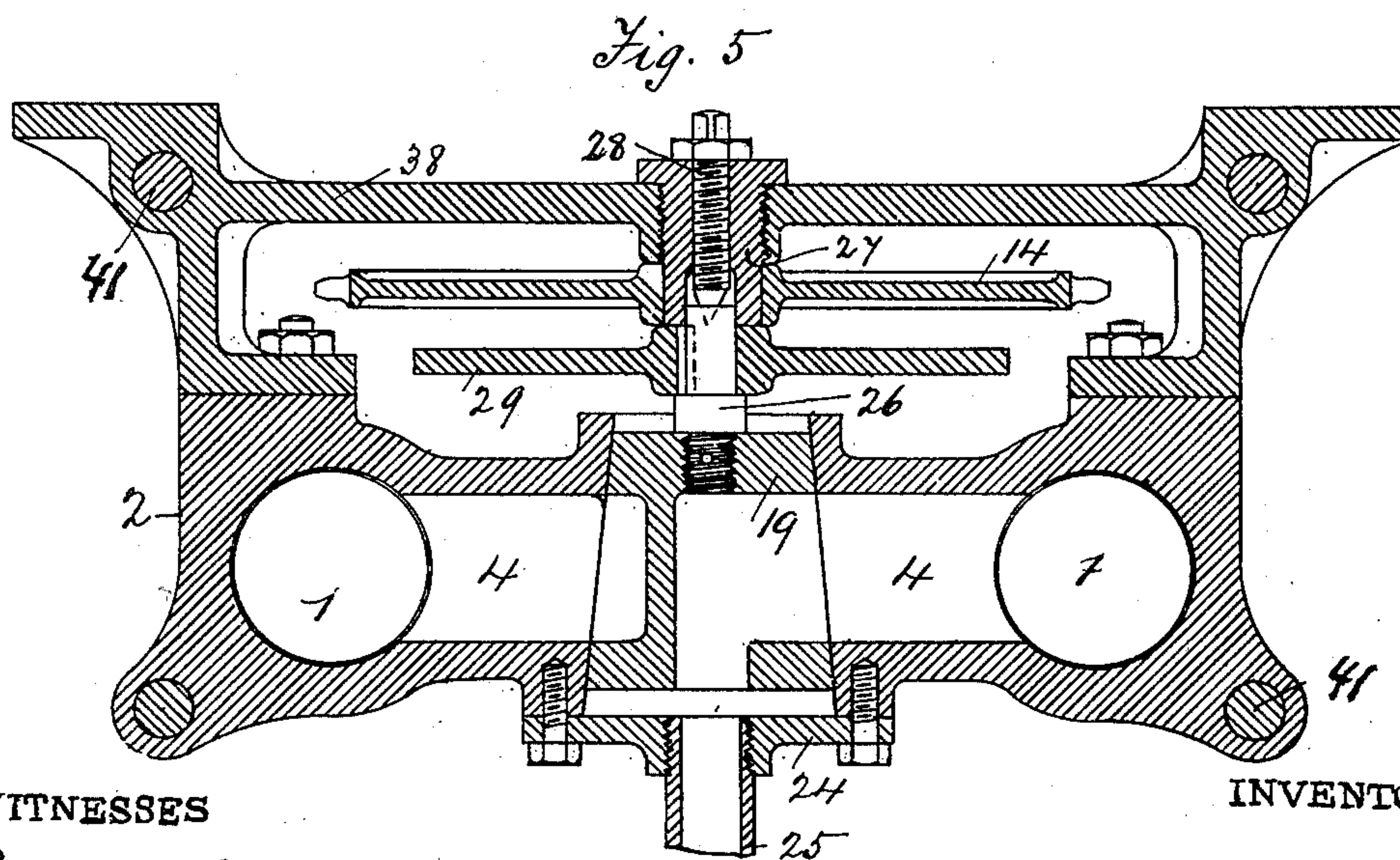
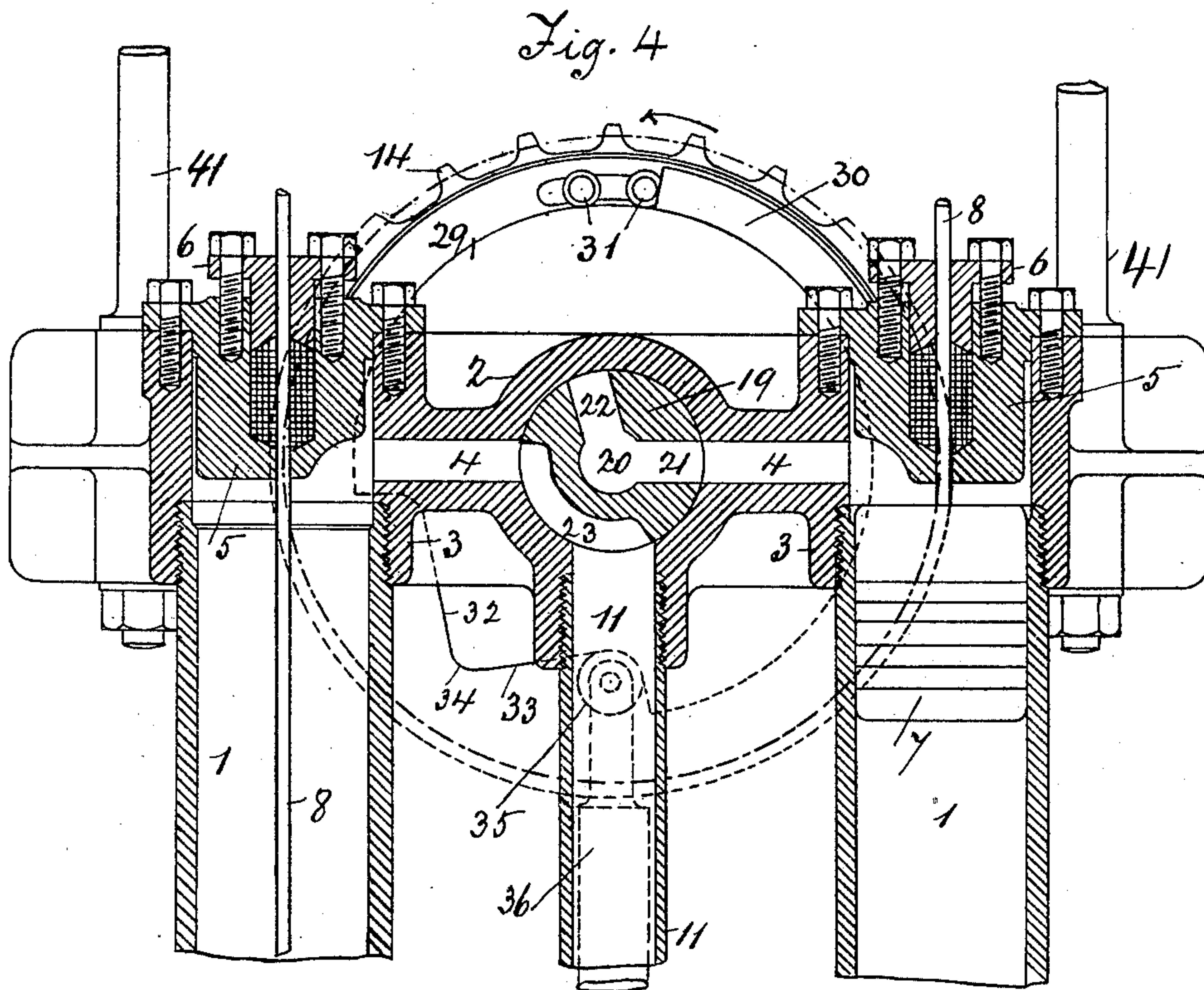
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WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN G. A. KITCHEN, OF WINDERMERE, ENGLAND.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 692,307, dated February 4, 1902.

Application filed May 23, 1900. Serial No. 17,769. (No model.)

To all whom it may concern:

Be it known that I, JOHN GEORGE AULSEBROOK KITCHEN, a subject of the Queen of Great Britain, residing at Heathwaite, Windermere, in the county of Lancaster, England, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

This invention consists in an improved construction of a steam-engine and valve mechanism therefor more particularly intended for motor-carriages, but applicable for other purposes, the object of the invention being to obtain lightness, compactness, and a high number of revolutions of the engine-shaft with a comparatively long piston-stroke.

On the two sheets of drawings annexed hereunto, Figure 1 shows a side view of the improved engine; Fig. 2, a plan; Fig. 3, a section of one of the driving-chain wheels and clutch; Fig. 4, a longitudinal section of the cylinder ends and valve, and Fig. 5 a cross-section of the same.

The improved engine is preferably made with two single-acting cylinders 1 1, connected by a cross-piece 2, forming the valve-chest. Preferably the end parts 3 of the cylinders containing the steam-ports 4 are cast in one piece with the valve-chest, as shown, and the working length of the cylinders formed of tubes screwed into them. The cylinders are closed at the front ends by covers 5, containing stuffing-boxes and glands 6 for the piston-rods. Each cylinder is fitted with a piston 7, fixed to a piston-rod 8, which, being subject only to tensile strains, can be made very thin. The back ends of the cylinders 1 may be open to the atmosphere, but are preferably closed by caps 9, connected by pipes 10 to the exhaust-pipe 11.

To the outer ends of the piston-rods 8 is connected a driving-chain 12, which passes over two toothed chain-wheels 13, placed tangentially to the center lines of the cylinders and over a toothed guide chain-wheel 14, so that when steam is admitted to one of the cylinders and the piston therein makes its outward stroke the other piston is pulled by the chain and piston-rods and makes its inward stroke. The two chain-wheels 13 are loose upon the engine-shaft 15 and each provided with a clutch-box so arranged that it

clutches the shaft 15 and rotates it when the chain-wheel is pulled around by the chain 12 in one direction and releases the same when pulled in the other direction. These clutch-boxes may be of any suitable known construction; but preferably a silent roller-clutch of well-known arrangement, as shown in section by Fig. 3, is used. The chain-wheel 13 is formed with a series of tapering pockets 16, the peripheral surfaces of which form inclines relatively to the circumference of the boss 17 on the shaft 15 and contain rollers 18, which wedge themselves between this circumference and the bottom of the pocket when the wheel 13 is pulled around by the chain in the direction of the arrow and release themselves when the wheel is pulled around in the opposite direction. Any other kind of clutch having the same effect may be used. In consequence of this arrangement the two chain-wheels 13 alternately drive the shaft 15 during the time the respective piston makes its outward pressure-stroke and run loose on the shaft during the exhaust-stroke. As the circumference of the chain-wheels is shorter than the length of the piston-stroke, the shaft makes more than two revolutions for each double stroke of the pistons.

The driving-chain 12 passes, as stated, over a guide chain-wheel 14, the axis of which is at a right angle to the shaft 15. In order to avoid any twist in the chain, it is preferably made in three parts, the links in the middle part being placed at a right angle to those of the end parts.

The diameter of the guide-wheel 14 is preferably made of such dimensions that the wheel makes one complete revolution for each piston-stroke in alternating directions; but it may be larger and in some cases somewhat smaller. This reciprocating rotary motion is utilized to operate valve mechanism for alternately admitting steam to the two cylinders. While steam is admitted to one cylinder the other must be in communication with the exhaust-pipe, and the change in the distribution must be effected when the pistons arrive at the end of their stroke. Preferably I use the arrangement of valve and operating mechanism shown on the drawings, which is arranged as follows:

The distributing-valve is a cock 19, fitting

into a conical bore of the valve-chest 2. The latter is formed with two ports 4, communicating with the cylinders, and a third port opening into the exhaust-pipe 11. The cock-valve 19 has a central bore 20, from which two steam-ports 21 and 22 branch off and is cut out on one side to form an exhaust-port 23. The valve-chest is closed at its wider end by a cover 24, to which the steam-pipe 25 is connected. A stud 26 is screwed into the other end of the cock 19 and pinned or otherwise fixed thereto and enters a boss 27, fixed to a cross-rail 38, in which a tail-pin 28 is arranged to take up the pressure of the steam upon the larger end of the cock and adjust it so as to turn easily, while being steam-tight. The chain-wheel 14 is mounted loose upon the boss 27, and upon the stud 26 is fixed a disk 29. This disk is formed with a projection 30, which is in the path of a driver fixed to the chain-wheel 14. Preferably the driver is composed of two pins 31, fixed to the side of the chain-wheel and adjustable in a slot. Opposite to the projection 30 the disk 29 is formed with two inclined edges 32 33, the inclinations of which start in opposite directions from a point 34, diametrically opposite the center of the projection 30. Against the inclines a roller 35 is pressed by a helical spring compressed between the closed outer ends of the tubes 36 37. The former slides in the other and is prevented from turning, while the tube 37 is fixed by clips to the exhaust-pipe 11. The action of this valve mechanism is as follows: In the position shown on the drawings the right-hand piston is at the start of its outward stroke, and steam is admitted to the right-hand cylinder through the bore 20 and port 21 of the cock, while the left-hand cylinder communicates through the port 23 with the exhaust-pipe 11. The right-hand piston will thus make its outward stroke and in doing so pull the guide-wheel around in the direction of the arrow. When the piston nears the end of its stroke, the leading pin 31 encounters the projection 30 and turns the disk 29 and cock 19, whereby the port 21 is closed and the port 22 opened to the left-hand port 4, the port 23 opening at the same time the right-hand port 4 to the exhaust. As the fly-wheel shaft 15 cannot push the piston and the weight of the moving parts is very small, the pistons may be arrested as soon as the change in the steam distribution has taken place, and the steam and exhaust ports would not be opened sufficiently. By the time, however, the steam-port 22 begins to open, the summit 34 of the inclines has passed over the roller 35, which now presses upon the incline 32, and thereby turns the disk 29 and cock 19 until the ports are fully opened. The left-hand piston then makes its outward stroke, and at the end of it the wheel 14 turns the disk 29 till the roller 35 presses on incline 33 and returns the cock 19 into the position shown on the drawings.

The shaft 15 is supported in bearings, pref-

erably of the cone-and-ball type used in cycles, in the boxes 40, which are connected by four stay-bolts 41 to the valve-chest 2 and the cross-rail 38 and carries a fly-wheel 39. The boxes are preferably made adjustable on the stay-bolts to adjust the position of the pistons in the cylinders. The boxes 36 and the cross-rails 38 may be formed with feet to fix the engine to a foundation or wall. If used for a motor bicycle or tricycle, these feet would be omitted and the fly-wheel 39 replaced by the driving-wheel, the stay-bolts 41, with cross-heads 40, forming the wheel-fork and the cylinders one part of the tubular cycle-frame.

In some cases I may use only one cylinder and chain-wheel 13, arranged in the manner described, the other cylinder and the port leading to it, as well as the respective steam-port in the cock 19, being omitted. The chain passes around the guide-wheel 14 and is pulled back by any convenient means.

I claim as my invention—

1. In a steam-engine the combination with a cylinder having a steam-port at its inner end, a piston in the cylinder, a piston-rod, a cylinder-cover, and gland for the piston-rod, of a driving-chain attached to said piston-rod and passing over a chain-wheel mounted loose upon the engine-shaft and over a toothed chain-guide wheel, and a clutch-box clutching the chain-wheel to the shaft when pulled by the chain in one direction and releasing it when pulled in the other direction, and valve mechanism connected up with the said chain-guide wheel for alternately admitting steam to said cylinder, and exhausting it therefrom.

2. In a steam-engine the combination with two parallel cylinders each having a steam-port, a cover with a gland, a piston, and a piston-rod passing through said gland, of a driving-chain connecting the outer ends of said piston-rods, and passing over two toothed chain-wheels mounted loose upon the engine-shaft and over a toothed guide-wheel, clutch-boxes connected to said chain-wheels and adapted to clutch each wheel to the shaft when pulled around by the chain in one direction and to become disengaged when pulled around in the opposite direction, and valve mechanism operated by the said guide-wheel for alternately admitting steam to the said cylinders between the covers and pistons and exhausting the steam.

3. In a steam-engine the combination of an engine-shaft mounted in bearings, two clutch-boxes mounted loose on the said shaft self-actingly clutching the same when turned in one direction and releasing it when turned in the other direction, two chain-wheels forming part of said clutch-boxes, two cylinders the center lines of which are tangential to said chain-wheels, a piston in each cylinder and a piston-rod passing through a gland in a cylinder-cover, a driving-chain connected to both piston-rods and passing over said chain-wheels and a guide-wheel, and valve mechanism operated by said guide-wheel for ad-

mitting steam alternately to said cylinders between the pistons and cover and exhausting it therefrom.

4. In a steam-engine the combination of
5 two steam-cylinders, a steam-chest communicating with each cylinder by a port and by third port with the exhaust-pipe, a cock-valve in said steam-chest controlling the admission and exhaust of steam to and from said cylinders, and actuated by the reciprocating rotary motion of a chain-wheel, a piston and piston-rod for each cylinder, a driving-chain connecting the outer ends of said piston-rods and passing around said chain-wheel and two
15 other chain-wheels mounted loose on the engine-shaft and provided with clutch-boxes adapted to clutch the shaft when they are turned in one direction and releasing it when turned in the other direction.

20 5. In a steam-engine having two single-acting cylinders the pistons of which drive the engine-shafts by means of a chain which is connected to the piston-rods and passes over two chain-wheels on said shaft formed with
25 clutch-boxes locking the chain-wheels to the

shaft when turned in one direction and releasing them when turned in the other direction, and over a third guide chain-wheel, the combination therewith of a steam-chest having ports communicating with each cylinder and the exhaust-pipe, a cock-valve adapted to alternately place each cylinder into communication with the steam-space and the exhaust-port in said steam-chest, a disk keyed upon a spindle fixed centrally in said
30 cock-valve, a projection on said disk in the path of a driver fixed in said guide chain-wheel, two inclines formed on the edge of said disk in opposite directions, from a point of the edge centrally opposite the said projection, and a roller pressed by a spring against the inclines in a radial direction, substantially
35 as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two witnesses. 45

J. G. A. KITCHEN.

Witnesses:

R. J. URQUHART,
CARL BOLLÉ.