

R. HOWARD.
VALVE MECHANISM.
APPLICATION FILED JUNE 17, 1907.

915,353.

Patented Mar. 16, 1909.

2 SHEETS—SHEET 1.

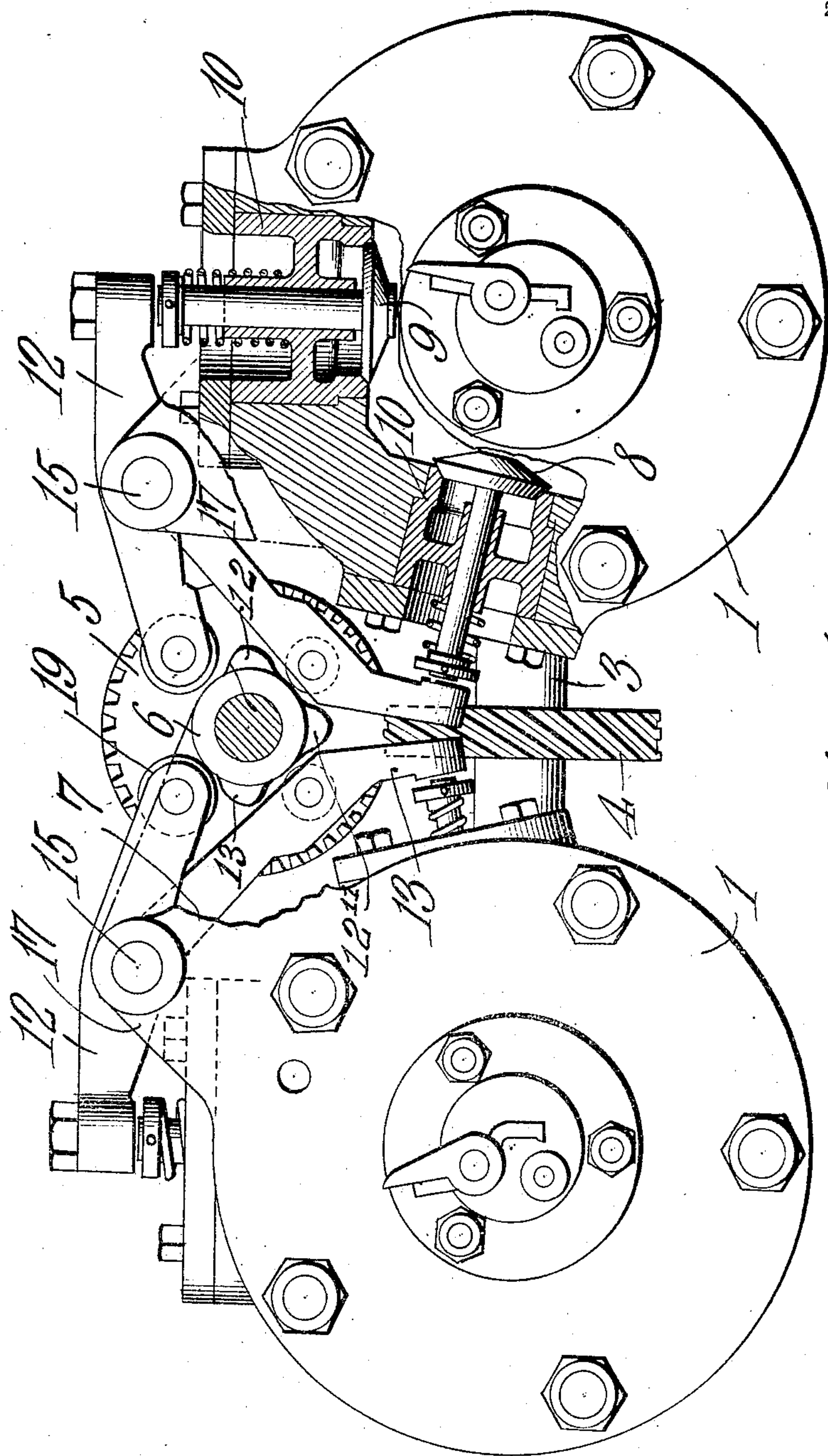


Fig. 1.

WITNESSES:
E. J. Howard
John E. Parker

Roy Howard,
INVENTOR.
By *C. A. Snow & Co.,*
ATTORNEYS

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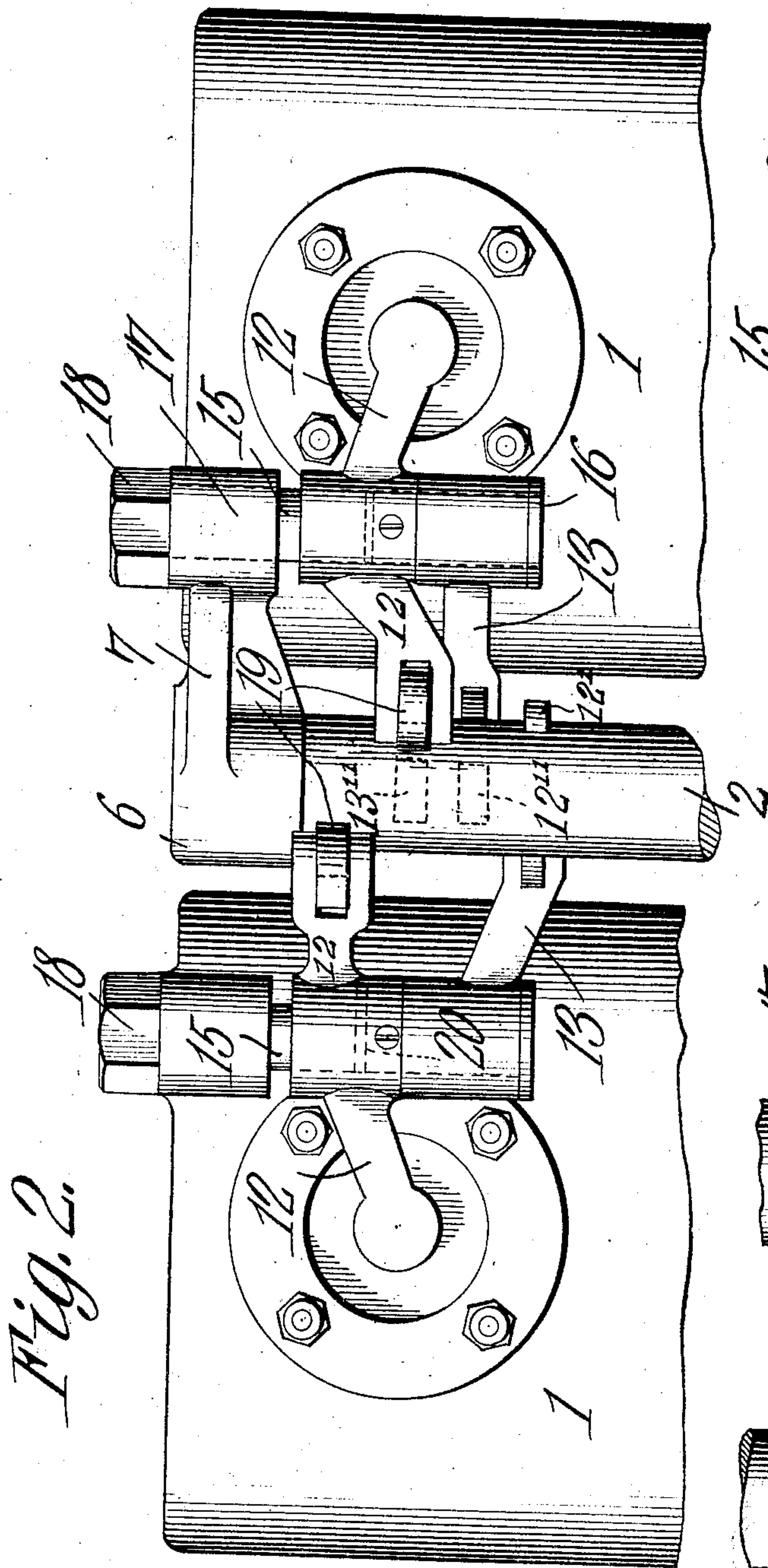


Fig. 2.

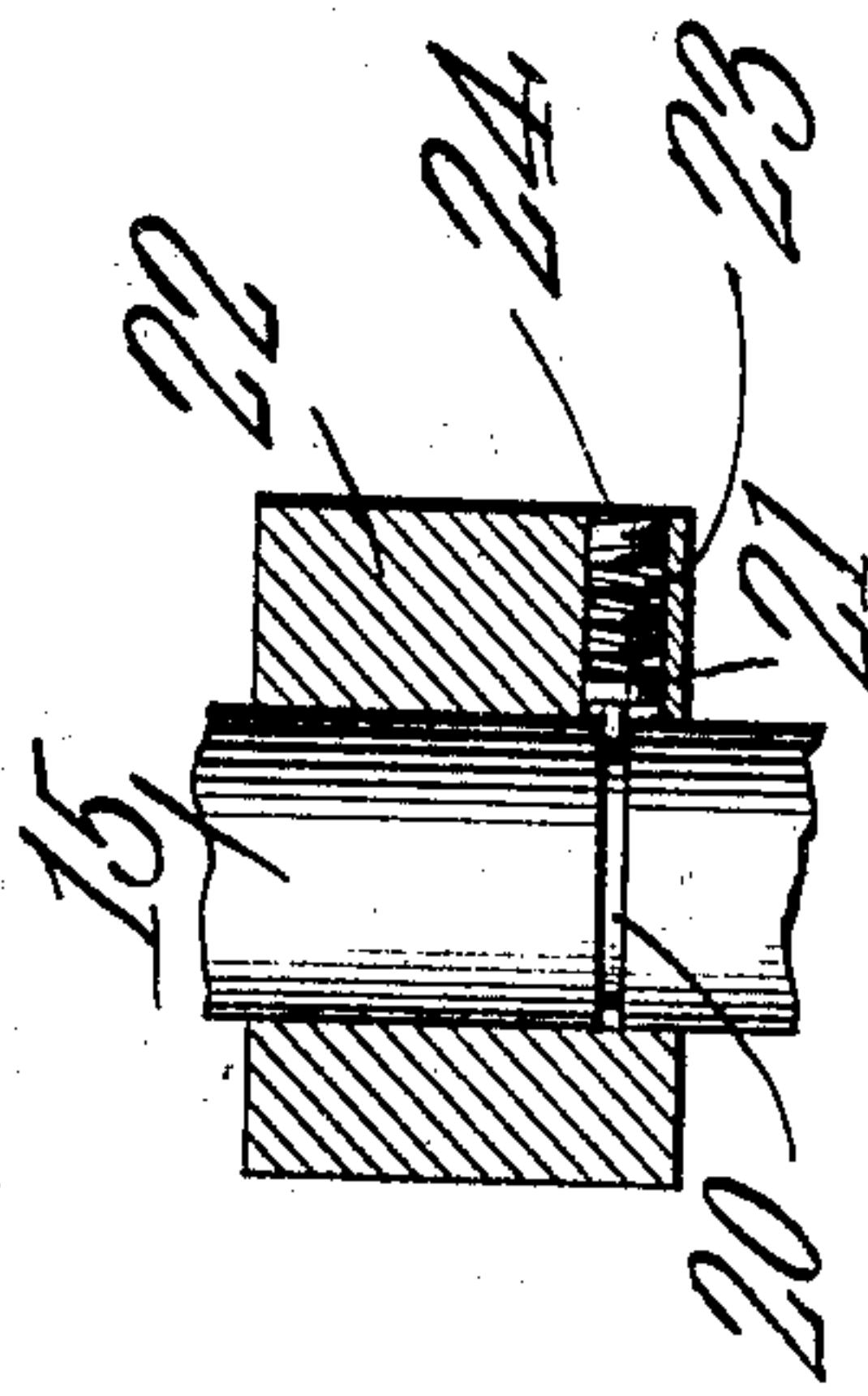


Fig. 4.

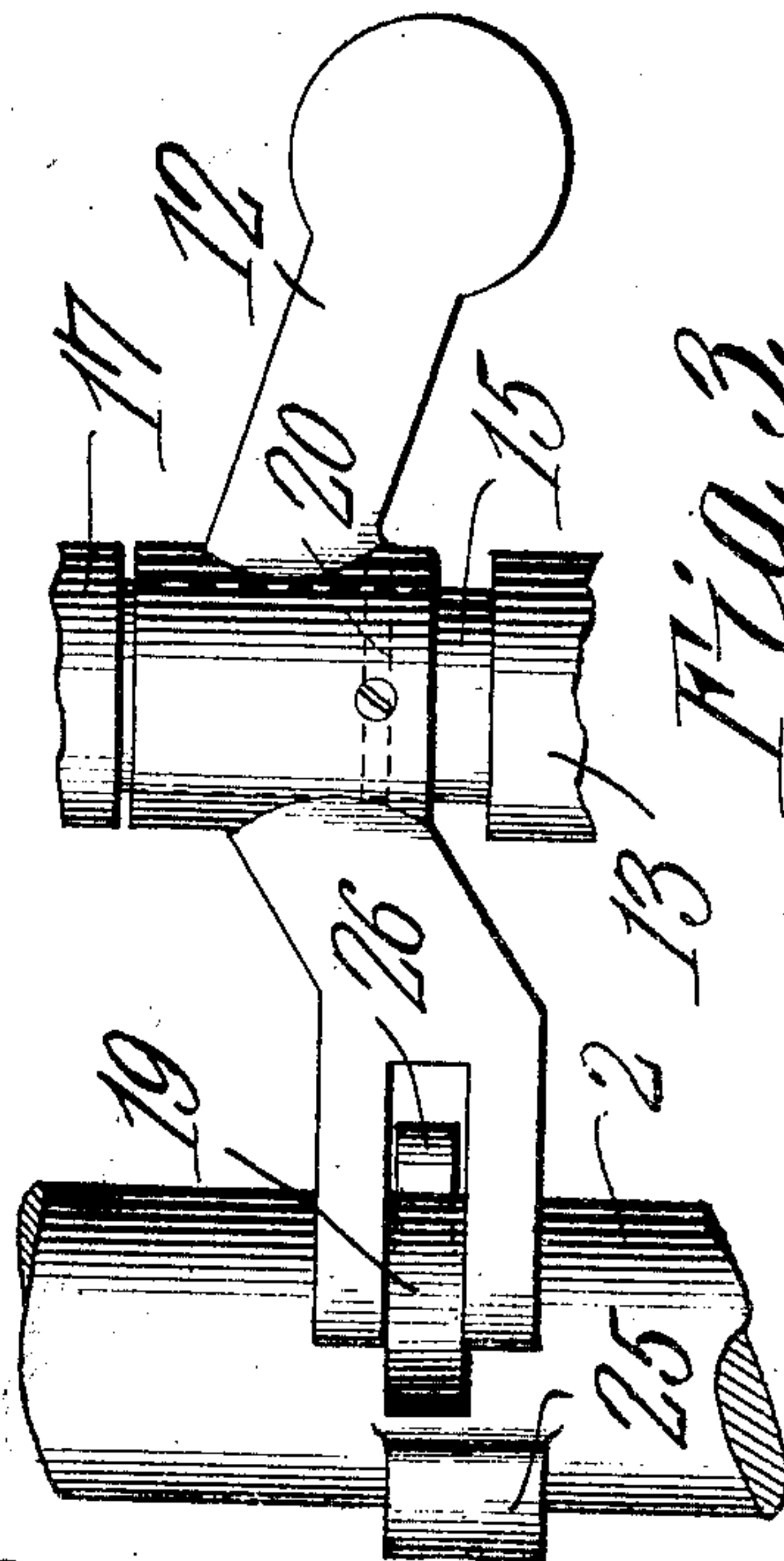


Fig. 3.

WITNESSES:
E. J. [Signature]
John [Signature]

Roy Howard, INVENTOR.
By *Chas. Snow & Co.* ATTORNEYS

UNITED STATES PATENT OFFICE.

ROY HOWARD, OF SAN DIEGO, CALIFORNIA.

VALVE MECHANISM.

No. 915,353.

Specification of Letters Patent.

Patented March 16, 1909.

Application filed June 17, 1907. Serial No. 379,516.

To all whom it may concern:

Be it known that I, ROY HOWARD, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented a new and useful Valve Mechanism, of which the following is a specification.

This invention relates to internal combustion and other engines of that construction in which the valve actuating levers are operated from a single shaft, and it relates more particularly to a novel arrangement of valves and their actuating levers.

The invention has for one of its objects to improve and simplify the construction and arrangement of the valve actuating mechanism so as to obtain economy of manufacture and of maintenance, compactness of the parts, and facility of removal of the valve cages for the purpose of inspection, renewal and repair.

A further object of the invention is to provide a valve mechanism whereby the exhaust valve levers are arranged and adapted to hold the exhaust valve open to relieve the compression within the cylinder during the starting of the engine, the levers being shiftably mounted so that they can be adjusted for engagement with auxiliary cams arranged so as to actuate the levers during the compression strokes on the pistons.

With these objects in view, and others, as will appear as the nature of the invention is better understood, the invention comprises the various novel features of construction and arrangement of parts, which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one of the embodiments of the invention, Figure 1 is a plan view of a two cylinder explosion engine with the valve gear applied thereto, a portion of one of the cylinders being broken away to show the inlet exhaust valves. Fig. 2 is a rear elevation of the valve gear and upper portions of the cylinder. Fig. 3 is an enlarged view of one of the exhaust valve levers shown in the position for relieving the compression within the cylinder associated with the lever. Fig. 4 is a detail sectional view of the exhaust valve lever showing the means for holding it in the position shown in Fig. 3.

Corresponding parts in the several figures are indicated throughout by similar characters of reference.

In the present instance, I have preferred to illustrate the invention as applied to a two-cylinder internal combustion engine, and while the invention works out satisfactorily in this connection, it possesses certain features which are capable of use in a single and multiple cylinder engine, so that I do not wish to be limited to the particular construction shown.

Referring to the drawings, 1 designates the cylinders of the engine which are arranged side by side and suitably spaced apart so as to facilitate the removal of the inlet valves in the spaces between the cylinders. Located in the plane centrally between the cylinders is a half speed cam shaft 2 disposed parallel with the axes of the cylinders and geared adjacent one end to the crank shaft 3 through the gears 4 and 5. The end of the cam shaft opposite from the gears is supported in the bearing 6 formed in the arm 7 that is cast integral with one of the cylinders, the right hand cylinder in Fig. 2.

The inlet and exhaust valves 8 and 9, respectively, of each cylinder, are preferably arranged in the same plane extending transversely of the cylinder and they are removably secured in place by the cages 10 that fit in machined openings provided in the cylinder wall. The cages 10, which may be of any desired construction, are arranged to be removable in a direction extending transversely of the cylinders, and the exhaust valves are removable in a rearward direction, as viewed in Fig. 1, while the inlet valves are removable in a lateral direction, the said latter valves being arranged approximately ninety degrees from the exhaust valves and at opposed portions of the cylinders.

Each valve is actuated by an independent lever, the levers for the exhaust and inlet valves of each cylinder being arranged in pairs and mounted on a common fulcrum. The exhaust valve levers, designated by 12, are of the first order, and the inlet valve levers, designated by 13, are of the second order. As shown in Fig. 2, the levers 13 are located below the levers 12, and since the valve stems of all the valves are arranged in a common plane, the levers are more or less dissimilarly bent, so that they may all be presented to a common cam shaft without one interfering with the other. The levers 12 and 13 of each cylinder are fulcrumed on a common spindle 15 in the nature of a bolt having a head or enlargement 16 and a

threaded opposite end that passes through an apertured extension or arm 17 and receives a retaining nut 18. The apertured portion 17 in which the spindle 15 of the right hand cylinder, Fig. 2, is supported, is formed integral with the arm 7 that carries the cam shaft bearing. The other apertured arm is preferably formed integral with the left hand cylinder. By this simple means of suspending the valve actuating levers, the latter can be readily removed when it is desired to take out the valve cages.

At 12' is shown the exhaust cam for the left-hand cylinder of Fig. 1, and at 13' the cam which actuates the admission valve for this cylinder.

12'' and 13'' indicate respectively the exhaust and admission cams for the right-hand cylinder.

In order to reduce the friction between the levers and cams, the former are provided with rollers 19.

To relieve the compression in the cylinders during the starting of the engine, the exhaust valve levers 12 are arranged so as to be adjustable on their fulcrums for the purpose of throwing their rollers into alinement with auxiliary cams on the cam shaft that are disposed to tilt the levers during the compression strokes. To this end, sufficient clearance is provided between each lever 12 and the apertured member 17, Fig. 2, to permit the levers to be raised on their respective spindles 15. Each spindle is provided with a groove 20 in which a spring pressed key or follower 21, Fig. 4, is adapted to engage when a lever is raised to the position shown in Fig. 3.

The follower 21 is arranged in an opening provided in the hub 22 of each lever 12 and is pressed inwardly by the helical compression spring 23 that abuts at its outer end on the screw plug 24 that closes the opening. The transversely extending groove 20 of the spindle 15 and the key 21 are so shaped as to readily engage and disengage under a slight pressure exerted on the lever when the same is to be raised or lowered. The raising of the exhaust valve levers is not carried to such an extent as to move their free ends out of operative relation to the stems of the exhaust valves. As shown in Fig. 3, the main exhaust valve cam extends slightly below the auxiliary or compression relief cam. The main cam 25 is arranged on the opposite side of the cam shaft from the auxiliary cam 26, so that the latter will open the exhaust valve during the compression stroke. Thus in starting the engine, the two levers 12 are lifted, so as to bring the keys 21 thereof into engagement with their respective slots 20 of the spindles 15. This will automatically hold the levers in alinement with the auxiliary cams. The engine is now cranked and, after the main shaft makes a turn or two, the levers 12 are pressed down so as to snap the

keys 21 out of the grooves 20 and throw the levers into proper relation to the lower portions of the main exhaust cams. The engine will thus take up its cycle of operation and operate in the ordinary manner.

I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, but I desire to have it understood that the apparatus shown is merely illustrative, and that various changes may be made when desired, as are within the scope of the invention.

I claim:—

1. In an internal combustion engine, a cylinder provided with a valve, a cam shaft provided with main and auxiliary cams, a spindle parallel with said shaft and provided with a peripheral groove, a valve lever mounted on the spindle adjustable lengthwise thereof, and a spring pressed follower carried by said valve lever and arranged to engage the groove to thereby maintain the lever in adjusted position.

2. In an internal combustion engine, a cylinder having inlet and exhaust valves, a cam shaft arranged parallel with the axis of the cylinder and provided with a main inlet and exhaust cams, a spindle parallel with the shaft and provided with a peripheral groove, an inlet valve lever mounted on said spindle and arranged to be engaged by the main inlet cam, an exhaust valve operating lever also mounted on the spindle and arranged to be engaged by the exhaust cam, said exhaust valve lever being adjustable lengthwise of the cylinder to a position to be engaged by both the exhaust and auxiliary cams, and a spring pressed follower carried by the exhaust valve lever and arranged to engage the groove to thereby maintain the lever in adjusted position.

3. In an internal combustion engine, a plurality of cylinders having parallel axes, a shaft, the axis of which is parallel with the axis of the cylinders, inlet and exhaust valves for said cylinders, a pair of vertically disposed spindles arranged parallel with the shaft, one of said spindles being adjacent to each cylinder, inlet valve levers mounted on the spindle, main inlet cams carried by the shaft, and arranged to engage said levers, exhaust valve levers adjustable lengthwise of the spindles, means for holding said levers in adjusted position, and main and auxiliary cams carried by the shaft and arranged to operate said exhaust valve levers.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

ROY HOWARD.

Witnesses:

C. HARRY WOODWARD,
R. C. MARKS.