(No Model.)

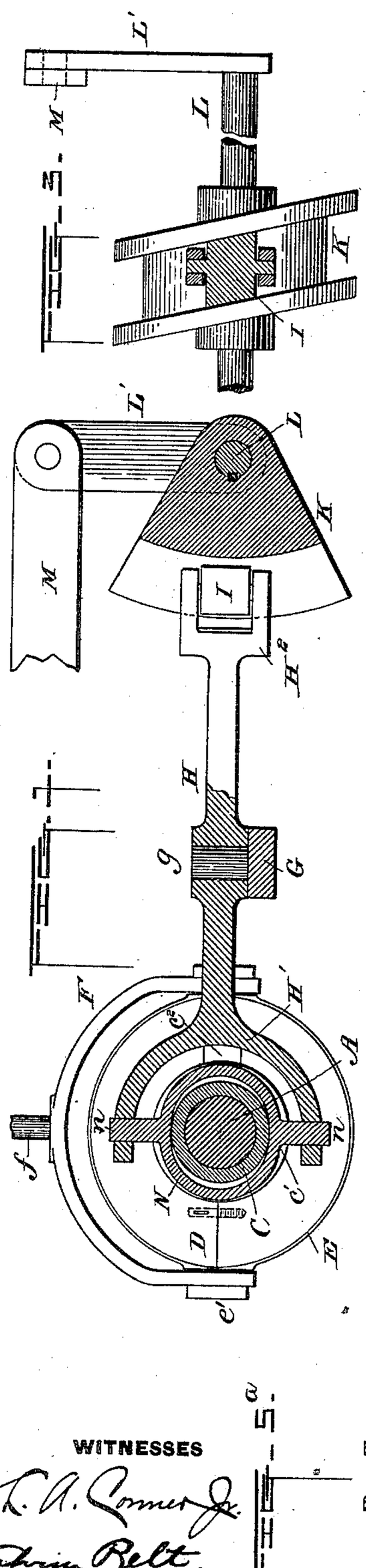
2 Sheets—Sheet 1.

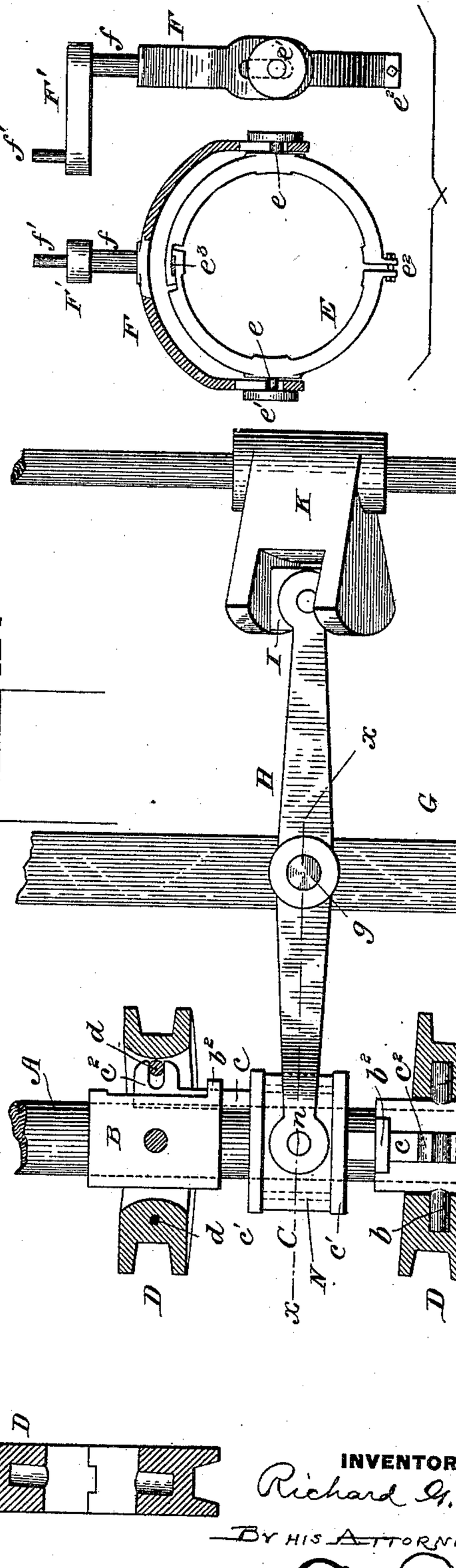
R. G. V. MYTTON.

VALVE GEARING.

No. 427,704.

Patented May 13, 1890.





WITNESSES

L. A. Sommer Jr.

Alvin Belt,

INVENTOR

Richard G. V. Mytton,

BY HIS ATTORNEY

Geo. P. Whittemore

(No Model,)

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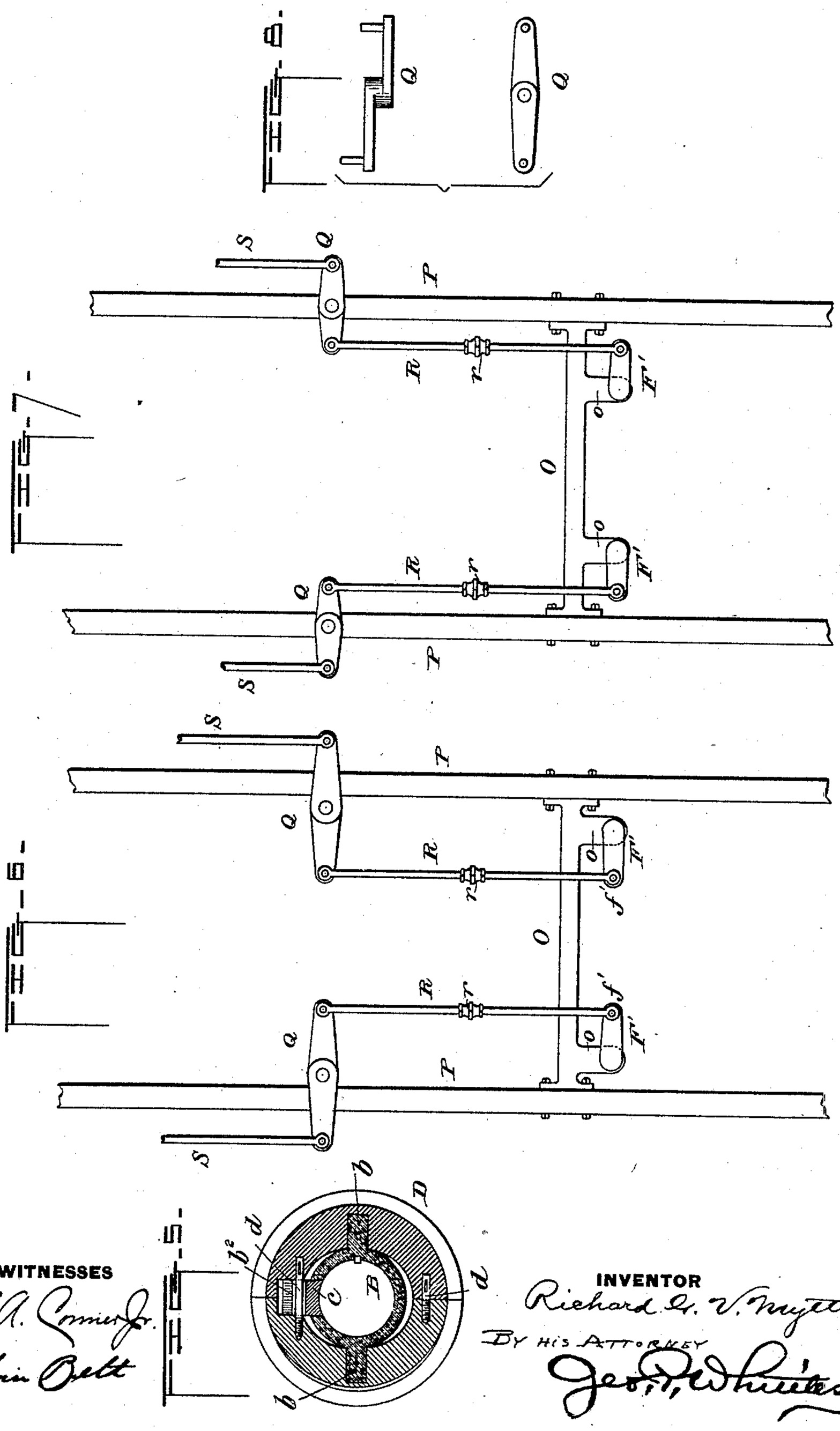

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UNITED STATES PATENT OFFICE.

RICHARD GRIFFITH VERE MYTTON, OF BIRMINGHAM, ALABAMA.

VALVE-GEARING.

SPECIFICATION forming part of Letters Patent No. 427,704, dated May 13, 1890.

Application filed December 5, 1889. Serial No. 332,678. (No model.)

To all whom it may concern:

Be it known that I, RICHARD GRIFFITH VERE MYTTON, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Valve-Gearing; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to that class of valve-gears in which the valves are operated by means of a rocking disk pivoted to a driving or intermediate shaft and capable of being canted thereon by means of a shifter placed on or adjoining the said shaft.

The objects of the improvement are, first, to obtain "lead," where such is required, without the addition of extra parts; second, to provide a construction in which all the parts will co-operate in gaining simplicity by arranging certain parts to perform double duty, or, rather, serve two purposes; third, to provide for wear where such is most liable to take place; fourth, to provide a simple, practical, and efficient means of moving the shifter in altering the travel of valve and reversing it; fifth, to provide a simple and practical construction which will facilitate its application to a locomotive by enabling certain parts now in general use on locomotives to be retained, and thus avoid the necessity of remodeling nearly the complete machine, and, sixth, to provide a new and improved means of compensating for the vertical movement of the locomotive in its axle-boxes, so that no matter how violently the engine may be pitching the valves will move as accurately as they would if the engine were perfectly steady. I attain these objects by means of the mechanism set forth in the accompanying drawings, wherein—

Figure 1 is an end elevation, partly in section, of my improved valve-gear, the section being taken on line $x\,x$, Fig. 2. Fig. 2 is a plan partly in section. Fig. 3 is an edge elevation of the sector. Fig. 4 is a side and edge view of a modified form of strap and stirrup. Figs. 5 and 5^a are cross-sections of one of the rocking disks. Figs. 6 and 7 show the manner of supporting the stirrups on a locomotive-frame, and also the manner of conveying the motion outside the frames to the valves; and Fig. 8 is a plan and elevation of the horizontal rock-shaft and arms.

The same letters refer to the same parts in all the figures.

The shaft A may be either the main driving-axle of the locomotive or other engine or a counter-shaft geared thereto. Fitted on the shaft and keyed thereto is a sleeve B, having pins b, which form the pivots for the rocking disks, projecting one on each side at diametrically-opposite points. Midway between the two pins a longitudinal slot b' is cut completely through one side of the sleeve, extending from one end of the sleeve nearly to the other. At the open end of the slot a bridge b^2, integral with or attached to the sleeve, crosses the slot, the inner edge of the slot forming with the bridge a way or guide in which slides the arm c of the shifter C. This latter consists of a sleeve or collar provided with flanges c' and sliding freely on the shaft A. In a locomotive-engine the shifter is supplied with two arms c, projecting in opposite directions along the shaft or axle, one being ninety degrees in advance of the other around the axle, and each arm operating to cant a disk.

The rocking disk or disks D are formed in halves diametrically and tongued and grooved one into the other, as shown in Fig. 5^a, the two parts being held together by means of two eye-screws d, screwed into one part and keyed to the other, as shown. One of these screws forms a wrist-pin, by means of which the disk is connected with the shifter C, the meeting edges of the halves of the disk being cut away at that point to permit the arm c of the shifter to pass through. Said arm is provided with two outwardly-projecting jaws c^2, between which is received the wrist-pin d. The disk being pivotedly mounted on the pins b, it is plain that any movement of the shifter along the shaft A will cant the disk one way or the other from an equatorial position on the shaft. It is also evident that the

wrist-pin *d* must be parallel with the pivot-pins *b* in order to prevent it from binding in the jaws of the shifting-arm. In all cases the pivots *b* are set at right angles to the shaft, and in the case of a locomotive those on one sleeve are set ninety degrees ahead of those on the other. The opening through the disk is made elliptical, with its major axis at right angles to the axis of the pivots, in order to allow room for the disk to rock on the shaft. I obtain any desired lead of the valve by placing the disk on the shaft at an angle with the axis of the pivots *b*, the holes for the pivots being made obliquely to the plane of the disk, as shown in Fig. 2. The proper angle to give the desired lead having been once determined and the disk accurately set, there is no valve-setting to be done.

To convey the rocking motion of the disk to the valve, the periphery of the disk is grooved and a strap E is placed therein provided with diametrically-opposite journals *e*, on which are pivoted the arms of the stirrup F. Midway between the pivotal points of the arms the stirrup has a stem or shaft *f* projecting at right angles with the shaft A and adapted to be received in a suitable bearing, whereby the stirrup is supported in proper relation to the shaft. The oscillating or rocking motion imparted to this shaft *f* is readily caused to reciprocate the valve-stem by means of a rock-arm F′ and wrist-pin *f*′.

In a locomotive, since the stem *f* must be supported on the frame, while the axle A is carried in the axle-boxes, it is necessary to provide means for permitting the axle to rise and fall in the pedestals without disturbing the action of the gear. This I accomplish by means of the devices shown in Fig. 4, where the sides of the strap adjacent to the journals are faced off and the stirrup-arms are slotted to permit the journals to rise and fall therein, the journals having large heads *e*′, or some similar device, to hold the stirrup in place. The strap here shown is made in two parts, so as to be adjustable to the disk and to provide for taking up wear. The two parts of the strap are held together at one end by a bolt e^2 and at the other end by a wedge e^3, driven between opposing lugs on the two parts.

The mechanism for moving the shifter to and fro along the shaft and holding it and the disk or disks at any desired point is as follows: Fulcrumed upon a fixed brace G, which in a locomotive may be fastened across between the frames, is a lever H, capable of turning horizontally about a vertical pivot G, and having at one end a fork H′ to connect it with the shifter, as hereinafter more fully described, and at the other a fork H^2, the arms of the forks lying in vertical planes.

In the fork H^2 is pivoted a small block I, whose top, bottom, front, and back may be perpendicular; but whose sides are chamfered off or inclined, so that a section of the block forms a rhomb, as shown in Fig. 3. The block is thus fitted to slide between the flanges of a peripherally-grooved sector K, secured obliquely on a tumbling-shaft L. To compensate for the versed sine of the angle, through which the arm of the lever moves and which would tend to draw the block I out of the grooved sector, the curve of the sector is struck with a radius greater than the distance from the center of the tumbling-shaft to the edge of the sector, so that the block has a solid bearing in whatever position the sector may be. It is obvious that with certain proportions of the sector and the lever-arm, through which the shifter is moved, the curves of the sector will become a straight line, and if the arms of the lever be very small the curve may have to be described with a convex instead of a concave surface.

In a locomotive the tumbling-shaft L may be the one now used to shift the links, the lifting-arms being dispensed with. The shaft may be rocked, as usual, by the arm L′ and the reach-rod M. When the shaft is rotated from one position to another, the inclined sector acts to throw the lever H one way or the other and thereby slide the shifter along the main shaft A, whereby the disks D are more or less inclined, and the travel of the valve is regulated. In moving from one extreme of its travel to the other the sector causes the disks to be canted from one position to the opposite, and thereby operates to reverse the engine from full front to full back, or vice versa. When the sector is arrested at any intermediate position, it holds the disks at such an angle that the steam is cut off more or less early in the stroke. At the same time the lever H and shifter C are rigidly locked against displacement by the strain on the disks. The lever is conected to the shifter, preferably by the following means: An elliptical ring N is placed in the groove of the shifter and accurately fitted between the flanges *c*′. The ring may be made in halves and bolted together, or one of the flanges *c*′ on the shifter may be made removable, to allow the ring to be slipped on. As shown in Fig. 1, the minor axis of the ring is placed vertically, the major axis providing for the necessary play equal to the versed sine of the angle described by the end of the lever H in moving the shifter. The axial pins *n* are placed on the line of the major axis, and have an accurate sliding fit in holes in the arm of the fork H′, the spread of the fork and the length of the pins being great enough to provide for the vertical play of the shaft A in its bearings. This vertical play may be provided for by placing the major axis of the ring vertically and making the minor axis enough larger than the diameter of the shifter to allow for the versed sine of the arc described by the lever H. Since the disks D must be placed inside of the frames in a locomotive, some provision must be made for transmitting their motion to the outside, where the valve-chests are located. In Figs. 6 and 7 a

mode of doing this is shown, the first illustrating the arrangement employed when the disks are near the ends of the axle, and the other, that to be preferred when the disks are for some reason obliged to be close together. A transverse brace O is bolted securely to the frame P, having offsets *o*, in which are journaled the stirrup-shafts *f*. Horizontal rocker-arms Q are suitably mounted on the frames transversely thereto, and their inner ends are connected by rods R with the wrist-pin *f'* of the stirrups. The rods are provided with some accurate device for adjusting their lengths, such as turn-buckles *r*. The outer ends of the rocker-arms Q are connected with the valve-stems S.

I am aware that so-called "drunken disks" have been used in valve-gearing, and I do not claim, broadly, such a disk as the actuating element of a valve motion; but

What I do claim, and desire to secure by Letters Patent, is—

1. In a valve-gearing, the disk D, formed in halves, tongued and grooved together, and united by eyebolts *d*, the meeting edges of the parts being cut away adjacent to one of said bolts, whereby it is adapted to serve as a wrist-pin for moving the disk, substantially as described.

2. The combination, with the shaft A and pivoted disk D, of the shifter C, consisting of a flanged sleeve encircling the shaft, and having an arm engaging with the disk, and an elliptical ring N, fitted between the flanges of the shifter, and provided with pins *n*, substantially as described.

3. The combination, with the shaft A, of the sleeve B, secured thereto, having the pins *b*, the slot *b'*, and bridge b^2, the shifter C, sliding on the shaft and having an arm *c*, fitted to slide in the slot *b'*, the disk D, pivoted on the pins *b*, and having a wrist-pin *d*, engaged by the arm of the shifter, substantially as described.

4. The combination, with the shaft A, of the sleeves B, secured thereon, and provided with the pins *b*, projecting at right angles to the shaft, the pins on one sleeve lying in a plane at right angles with that of the pins on the other sleeve, a shifter C, located between the sleeves and having two arms *c*, extending along the sleeves midway between the pins *b* and the disks D, mounted on said pins *b*, and connected with the arms *c*, the plane of each disk being at an angle with the axis of the pins, substantially as described.

5. The combination, with the shifter C, of a lever having one end engaging with the shifter and adapted to move it, and a grooved sector placed obliquely on a tumbling-shaft and engaging with the other end of the lever, substantially as described.

6. The combination, with the shifter C, of the lever H, engaging therewith at one end and carrying at its other end a pivoted block I, having inclined sides, a tumbling-shaft L, a sector K, secured thereto in an oblique position and having a grooved periphery in which the block I is fitted to slide, substantially as described.

7. The combination, with the flanged shifter C, of the elliptical ring N, fitting between the flanges and provided with pivot-pins *n*, and a forked lever engaging with said pins, substantially as described.

8. The combination, with a cylindrical flanged shifter C, of an elliptical ring N, fitted between the flanges thereof, having its major axis horizontal and its minor axis substantially the same as the diameter of the shifter and provided with pivot-pins *n* on the line of its minor axis, and a lever having a forked end receiving the pivot-pins, the spread of the fork being somewhat greater than the outer diameter of the ring at its minor axis, substantially as described.

9. In a valve-gear, the combination, with a grooved disk, of a strap fitted in said groove and composed of two halves united by a bolt at one end and a wedge at the other, whereby the strap can be adjusted for wear, substantially as described.

10. The combination, with the rocking disk D, of the strap E, provided with the pins *e* and faced off adjacent thereto, and the stirrup F, having the pivot-shaft *f*, and slotted ends engaging with the pins *e*, substantially as described.

11. The combination, with the locomotive-frames P, of a transverse brace O, the rock-arms *f'*, journaled in said brace, the rocking levers Q, mounted on the frames, the adjustable rods R, uniting the arms *f'* and the levers Q, and valve-stems S, connected with the rocking levers, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

RICHARD GRIFFITH VERE MYTTON.

Witnesses:
I. G. TOMLINSON,
W. H. TOMLINSON.