

(No Model.)

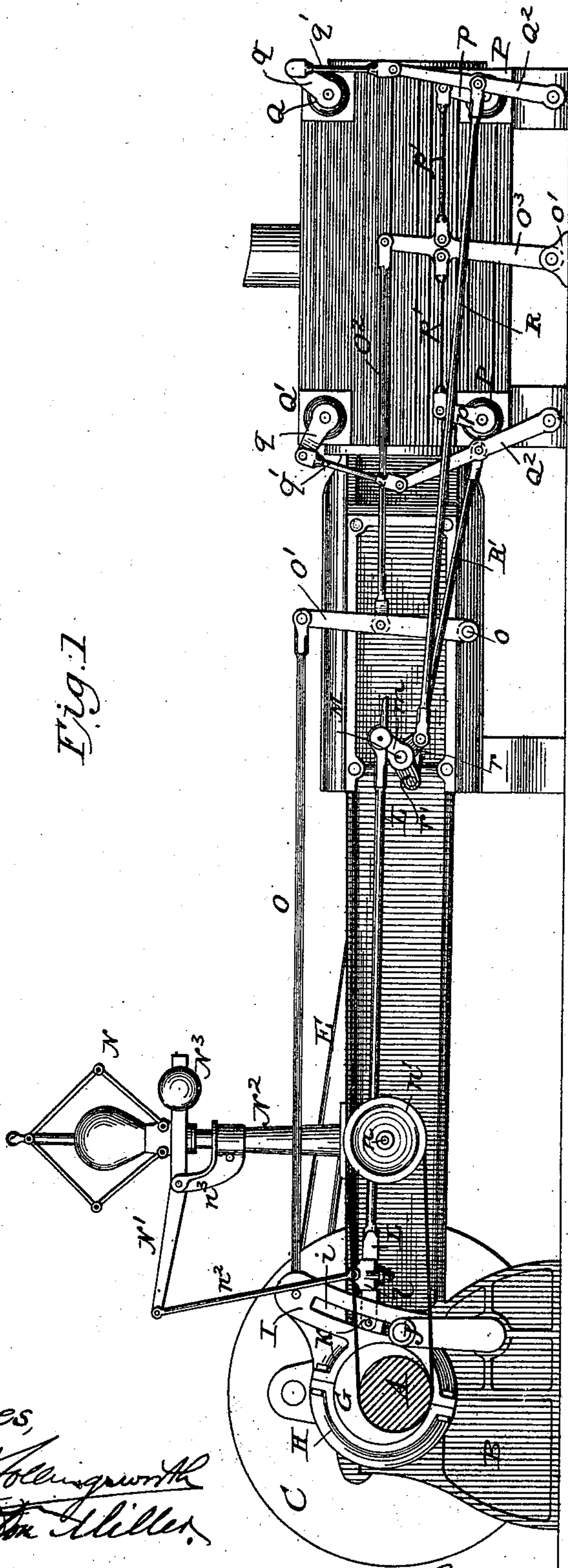
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G. MARSHALL.
STEAM ENGINE.

No. 504,399.

Patented Sept. 5, 1893.

Fig. 1



Witnesses,
Sidney P. Hollingsworth
Washington Miller.

Inventor,
George Marshall
by his attorneys

Palmer Davidson Wright.

(No Model.)

2 Sheets—Sheet 2.

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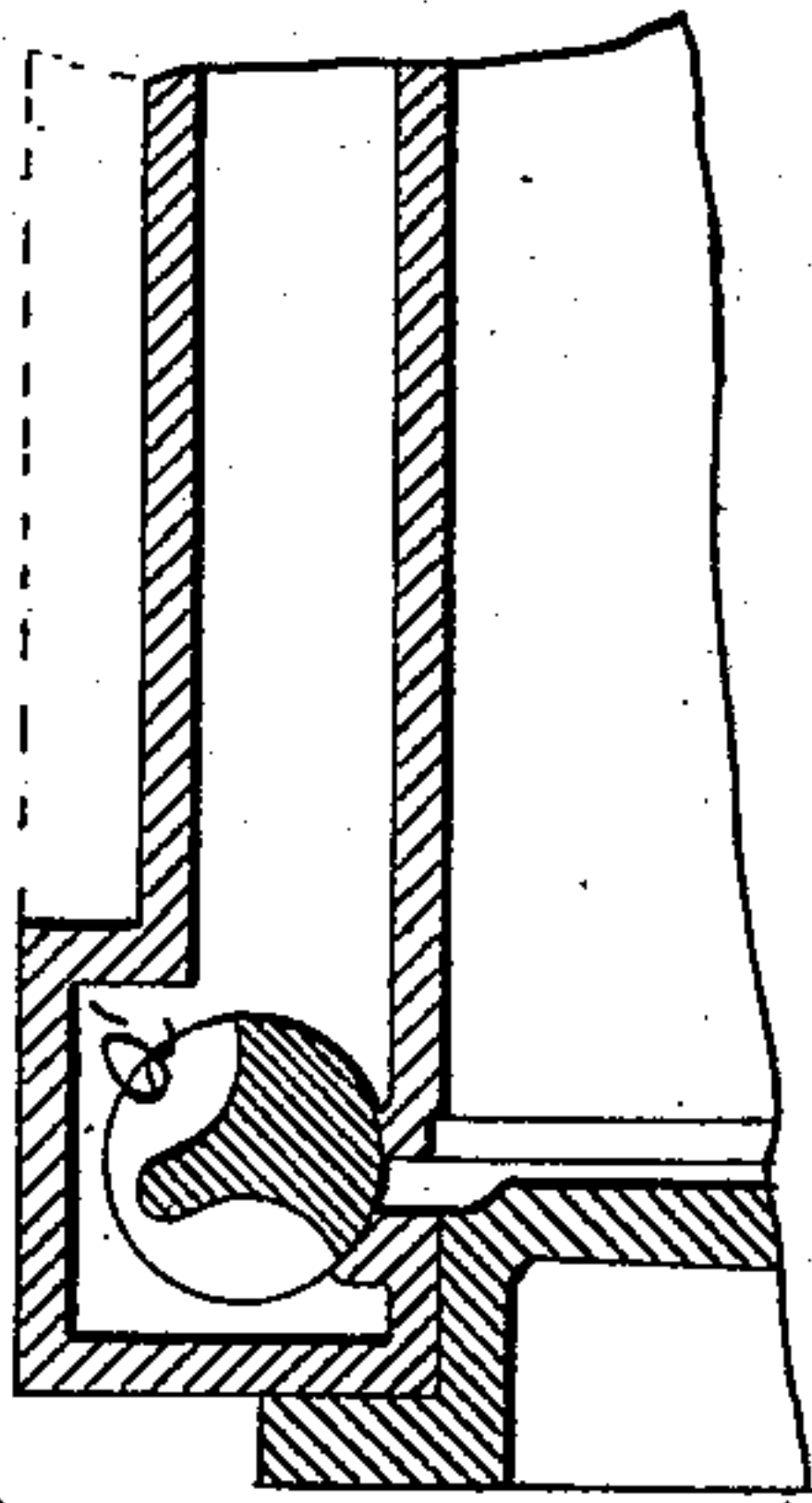


Fig. 5

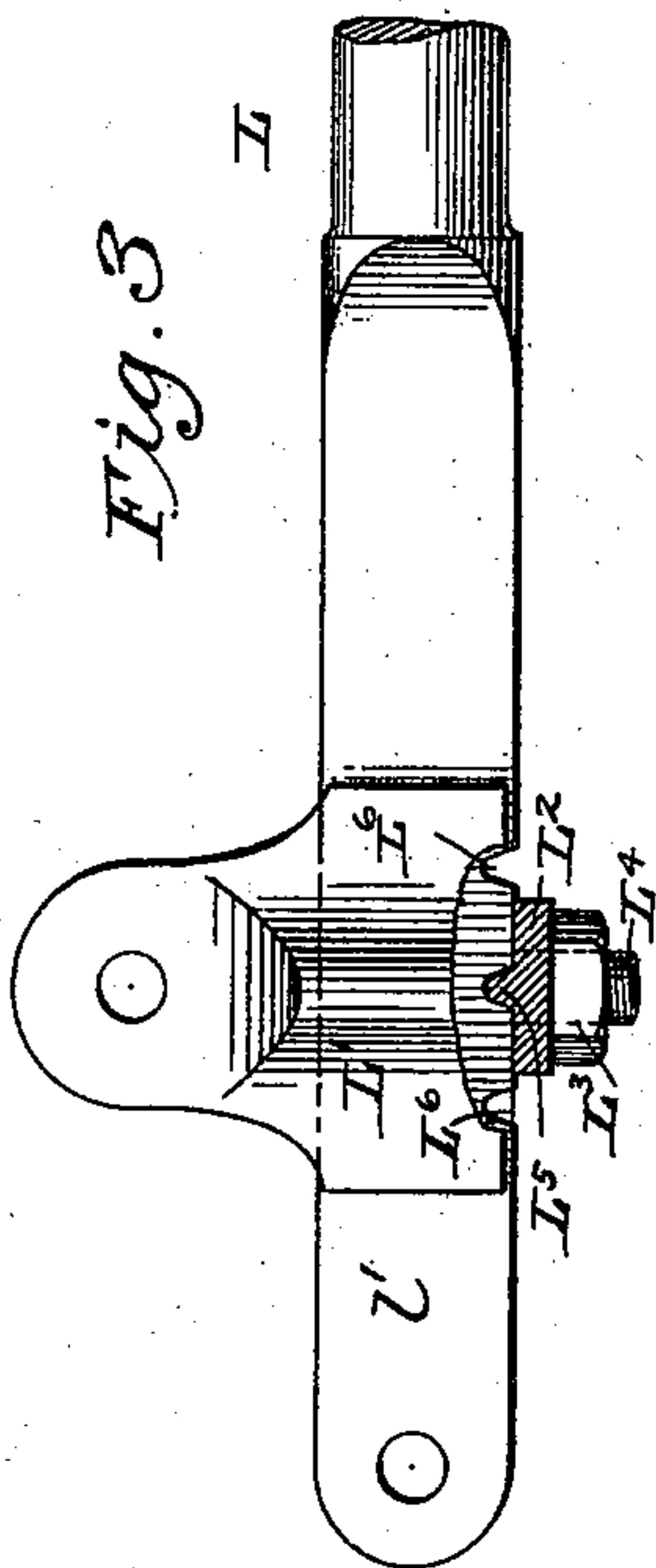


Fig. 3

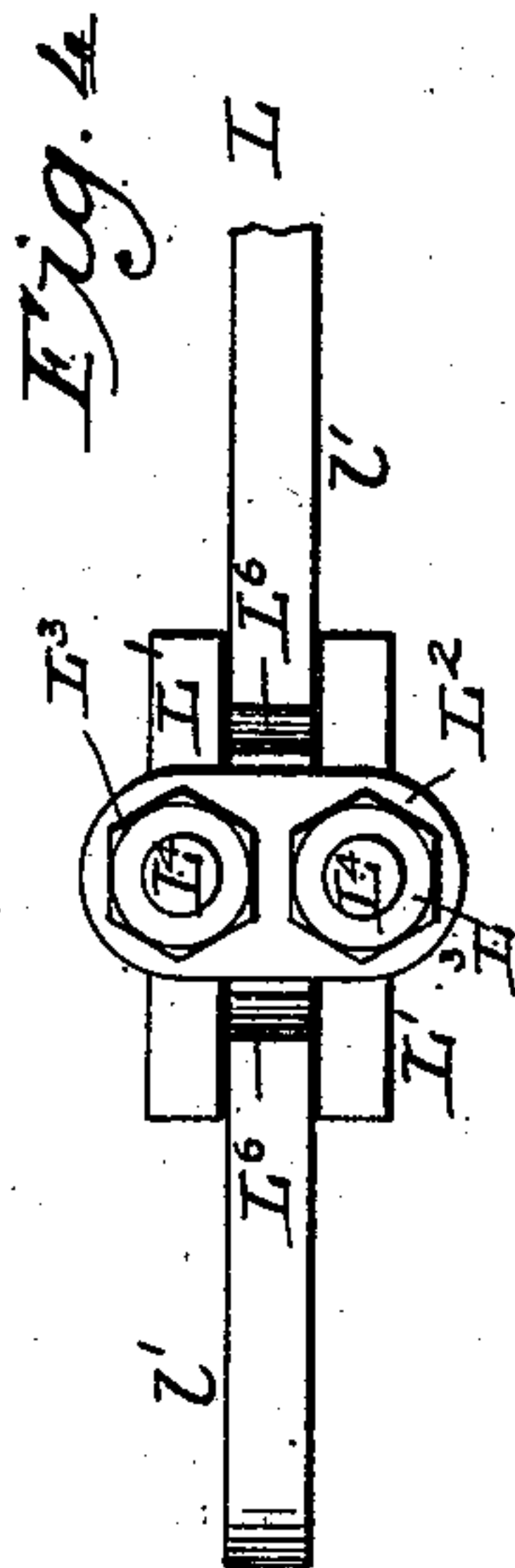
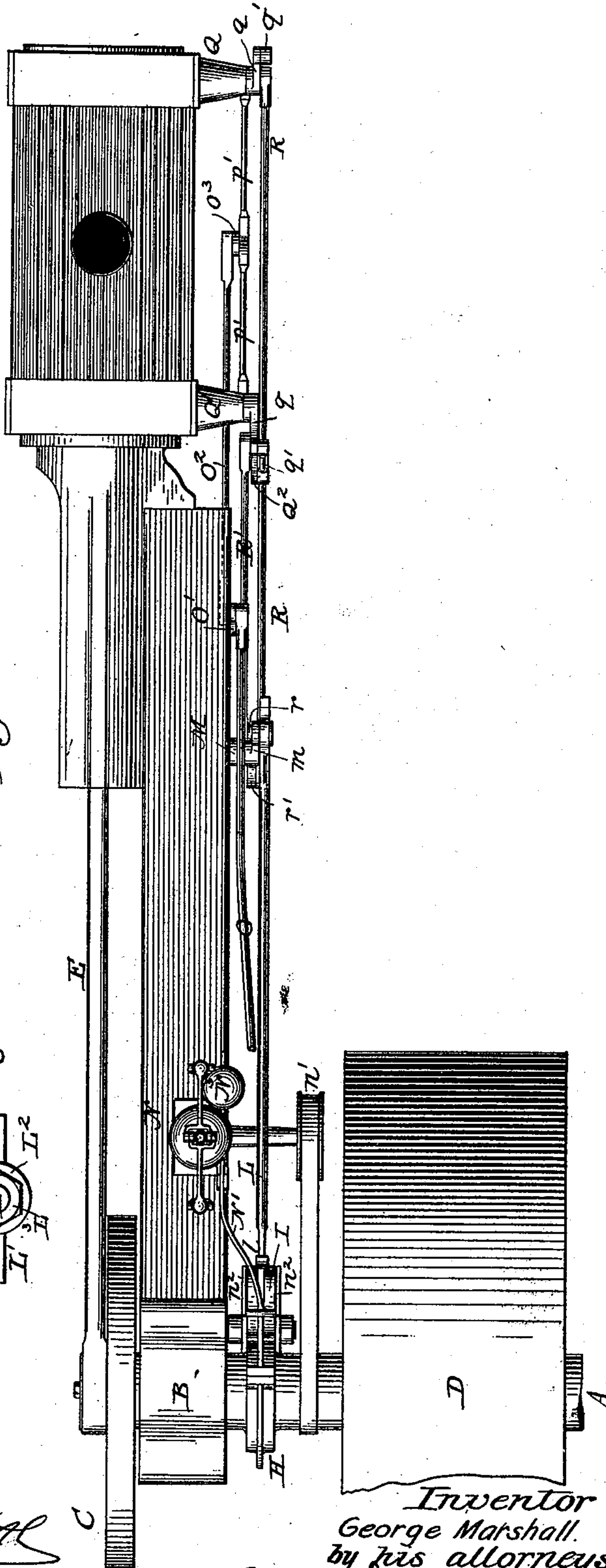


Fig. 4

Fig. 2



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UNITED STATES PATENT OFFICE.

GEORGE MARSHALL, OF FREMONT, NEBRASKA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 504,399, dated September 5, 1893.

Application filed May 12, 1893. Serial No. 473,966. (No model.)

To all whom it may concern:

Be it known that I, GEORGE MARSHALL, a citizen of the United States, residing at Fremont, in the county of Dodge and State of Nebraska, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

My invention especially relates to the valve gear of steam engines.

My object is to operate cylindrical or rotary valves of the Reynolds-Corliss type without the use of dash-pots, by means of a slotted link operated by an eccentric on the main shaft.

My invention involves certain novel organizations of instrumentalities for connecting the valves with the link, and certain details of construction, which will be hereinafter described.

In the accompanying drawings,—Figure 1 is a side elevation of a steam engine embodying my improvements. Fig. 2 is a plan view thereof. Figs. 3 and 4 are detail views of the adjustable connections between the governor and the radius bar. Fig. 5 is a detail in section showing one of the admission valves arranged in its casing.

The shaft A, is arranged in suitable bearings in pillow blocks B, and carries a crank wheel C, and pulley D. The pitman rod E, connects the crank wheel C and cross-head, in any suitable way, and operates the piston in the usual manner. An eccentric G, is formed on or secured to the shaft A, and is encircled by the eccentric strap H, which is formed with or secured to a slotted link I, of the Porter-Allen type. The trunnions J, of well known construction, are pivoted in the pillow blocks and connected with the slotted link in the usual manner. A block K, is arranged in the slot *i* of the link, and is free to slide therein. It is pivotally connected with the radius bar L, which, in turn, is connected with an arm *m* on the rock shaft M.

A governor N, of suitable construction, is geared to a shaft *n*, carrying a pulley *n'* which is belted or geared to the shaft A, by which arrangement, the governor is operated. A rod *n*² is adjustably connected with the radius bar L, at *l*, and at its upper end is secured to a lever N', pivoted to a bracket *n*³, on the governor standard N². This lever is counter-

balanced by a weight N³, and is connected with the mechanism of the governor in any suitable way. By this means, the position of the block K, in the slotted link is varied correspondingly with the speed of the driving shaft, and the operation of the admission valves is correspondingly varied. The connection between the rod *n*² and the radius bar L, is adjustable, preferably, by means of the mechanism shown in detail and on an enlarged scale in Figs. 3 and 4. As there shown, the bar is reduced or flattened at *l'*, and is embraced by a yoke L', to which the rod *n*² is connected. A plate L² is secured to the yoke by means of nuts L³, working on a screw-threaded stud L⁴, projecting downwardly from the yoke. The plate is provided with a rib *l*⁵, adapted to engage with notches L⁶ in the bar L. By this mechanism, the throw of the valves and the point of cut-off may be varied and equalized.

To the upper end of the link I, is pivotally connected a rod O, which, in turn, is connected with a lever O', pivotally connected at *o* with the engine frame. Between the upper and lower ends of the rod O', is pivotally connected a rod O², which is connected at its opposite end to the upper end of a lever O³, pivoted to the bed plate in brackets *o'*.

The rotary exhaust valves P, are provided with arms *p*, which are connected by pivoted rods or links P' with the lever O³. By this mechanism, the exhaust valves are operated regularly and to the same extent, successively as the crank shaft rotates. The admission valves Q Q' are provided each with an arm *q* to the outer end of which is pivotally connected a rod *q'*, which, in turn, is connected with a lever Q², pivoted at its lower end to the frame work of the engine. The lever Q² of the valve Q, is connected between its upper and lower ends to a rod R, which, in turn, is connected with an arm *r*, on the rock shaft M. In like manner, the lever Q², of the valve Q', is connected by means of a rod R', to an arm *r'*, on the shaft M.

As clearly shown in Fig. 1, the angle formed by the arms *r* is more than a right angle, and less than one hundred and eighty degrees. In the instance shown, it is about one hundred and twenty degrees.

By the specific arrangement illustrated, the

admission valves are made to operate successively in such manner as to admit the steam at the proper time to the proper end of the cylinder, and to quickly cut off the supply when the piston is in the right position. It is, of course, important that the movement of the valves to cut off the supply of steam should be quick and positive. The organization of the mechanism illustrated, most efficiently accomplishes this result.

I claim as my invention—

1. The combination of the steam cylinder, the cylindrical or rotary valves, controlling the supply of steam thereto, the crank shaft, the eccentric thereon, the slotted link connected with and operated by the eccentric, the rotary exhaust valves, the rock shaft, crank arms on the cylindrical admission valves and the cylindrical exhaust valves, a lever connected by links with the arms of the exhaust valves, rods connecting this lever with the link which is operated by the eccentric, a sliding block in the link, a rod connecting this block with

the rock shaft, and connections between arms on the rock shaft and the crank arms on the admission valves.

2. The combination of the crank shaft, the eccentric thereon, a slotted link, connected with and operated by the eccentric, the rotary exhaust valves, rods and levers connected with said valves and connected directly with the link, a block arranged in the slotted link, a rock shaft, a rod connecting the block with the rock shaft, arms on the rock shaft and projecting therefrom in different directions, the rotary admission valves having laterally projecting arms, levers pivoted to the frame of the engine and connected by links with the arms of the valves, and connections between the levers and the arms of the rock shaft.

In testimony whereof I have hereunto subscribed my name.

GEORGE MARSHALL.

Witnesses:

WILLIAM MARSHALL,
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