

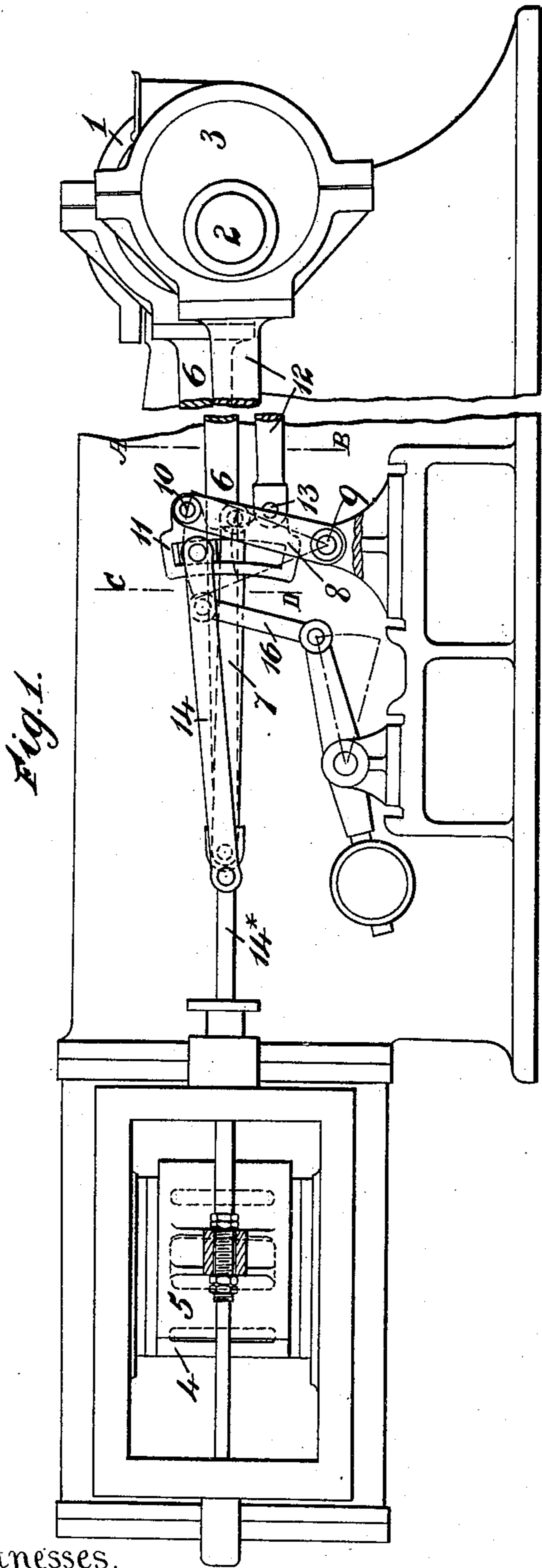
(No Model.)

3 Sheets—Sheet 1..

R. M. BAILY, Jr.
VALVE GEAR.

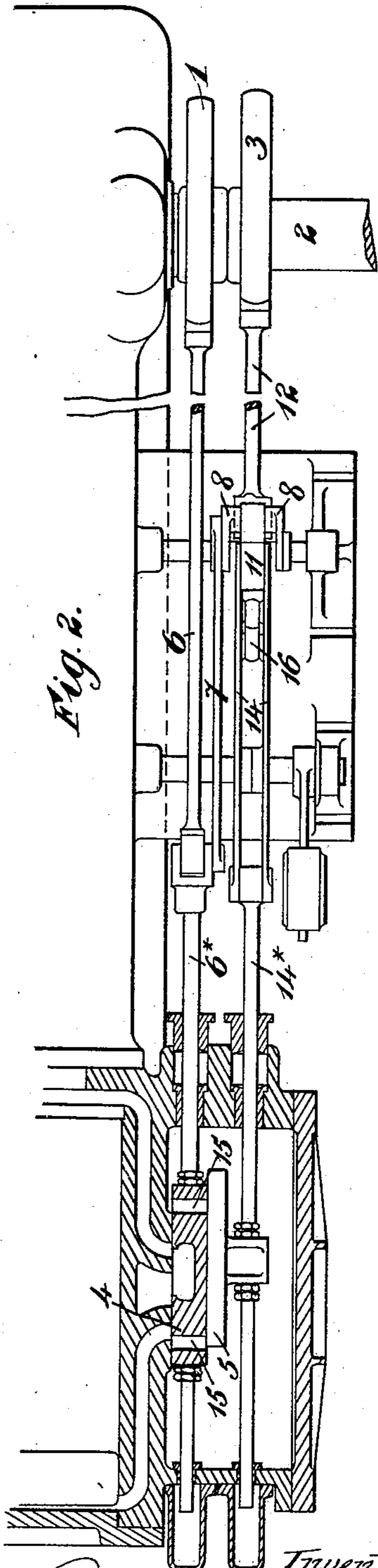
No. 386,285.

Patented July 17, 1888.




Witnesses.

H. F. Boyle.
Ackland Boyle.



Inventor.


 Inventor.
 Robert M. Bailey, Jr.,
 by his attorney
 Thomas Spradell

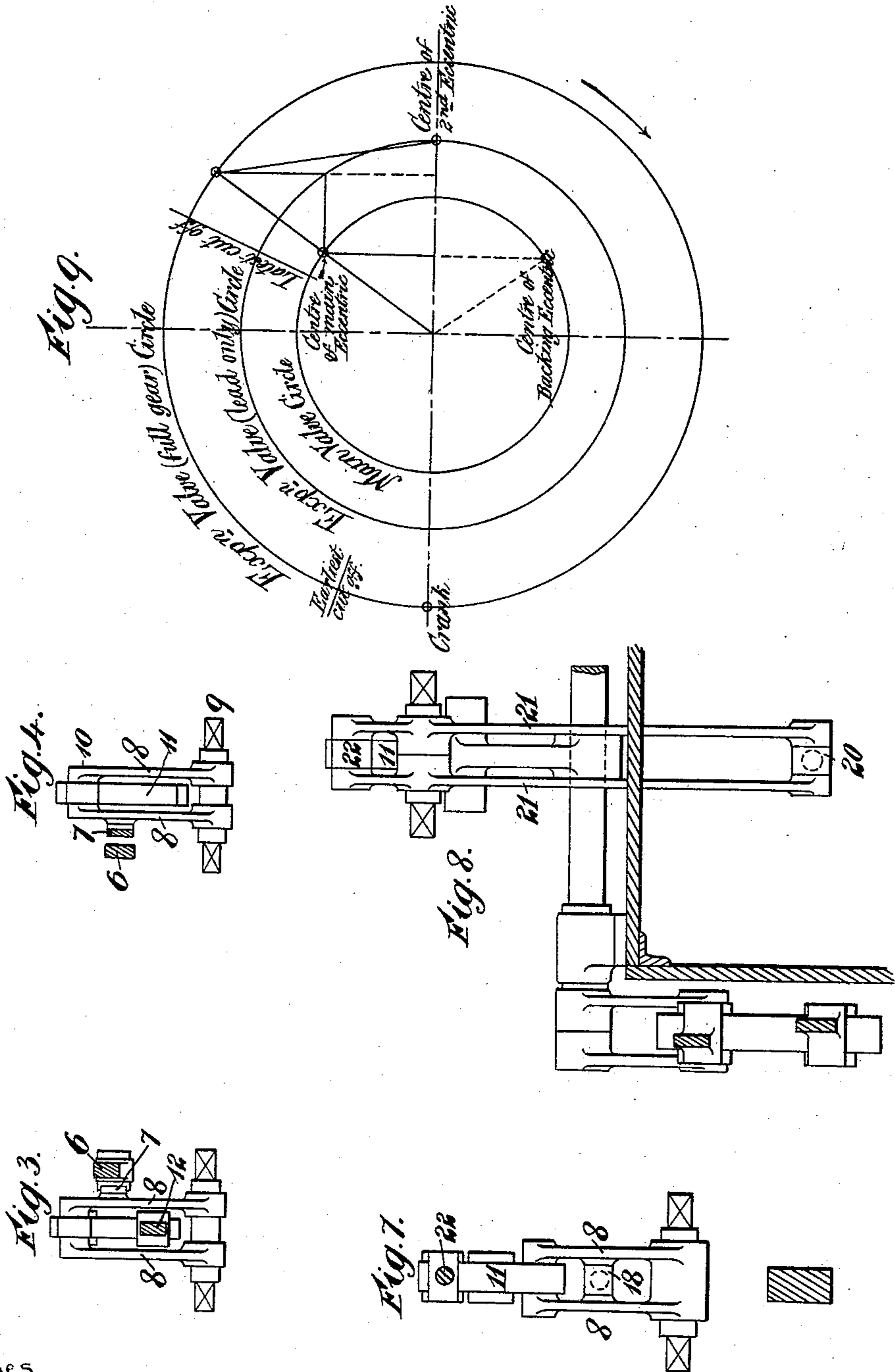
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3 Sheets—Sheet 2.

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VALVE GEAR.

No. 386,285.

Patented July 17, 1888.



Witnesses.

Aekland Doyle,
M. H. Doyle.

Inventor.
Robert M. Baily, Jr.
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Thomas Green Jackson

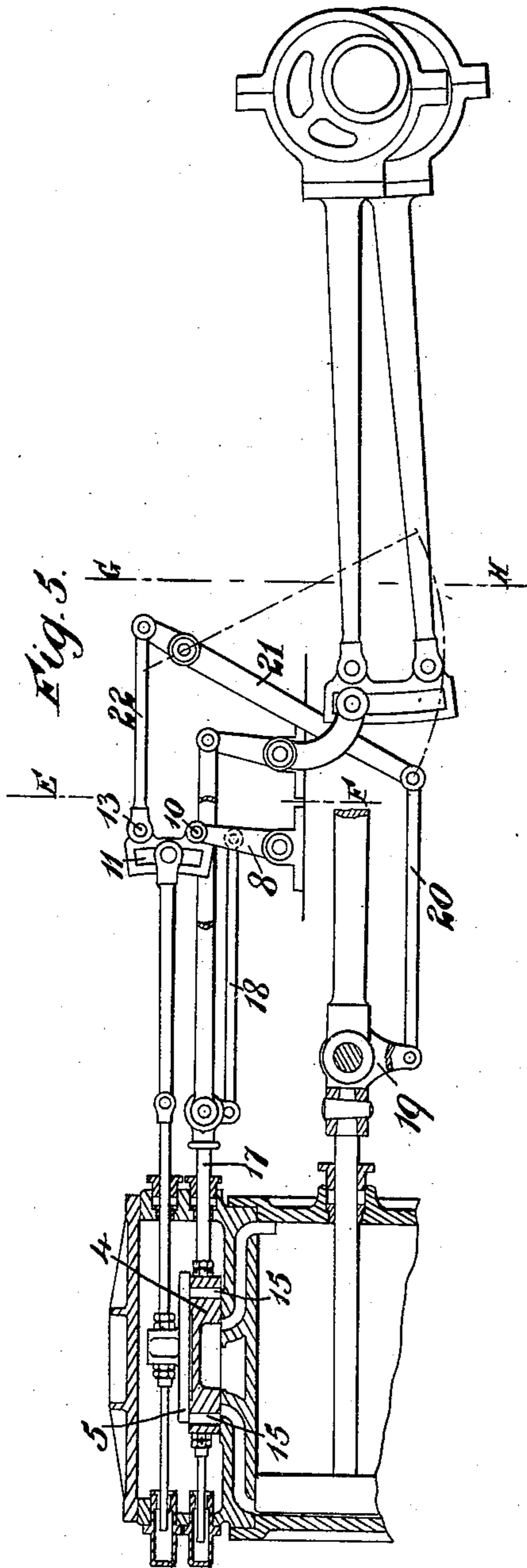
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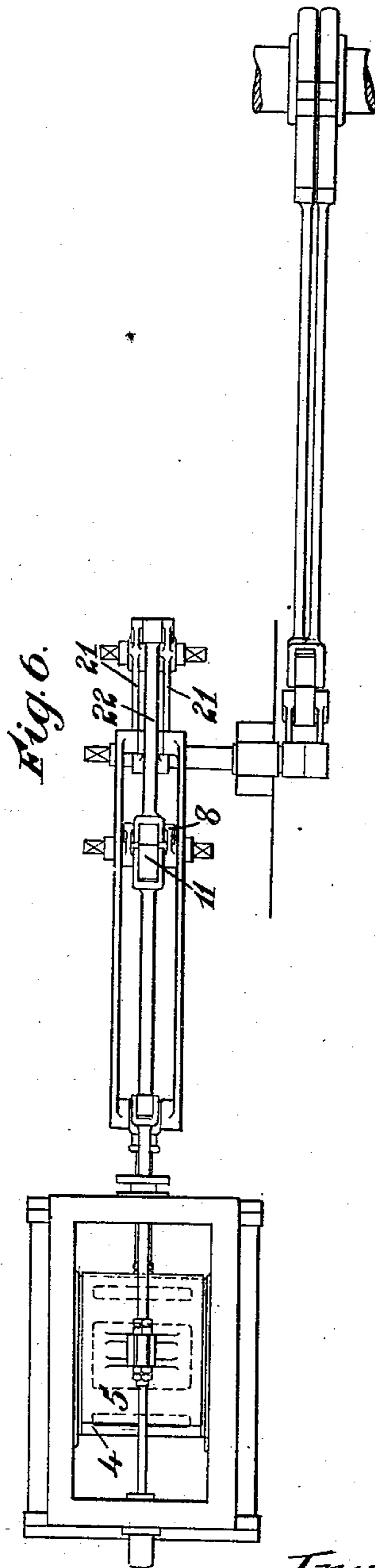
R. M. BAILY, Jr.
VALVE GEAR.

No. 386,285.

Patented July 17, 1888.



Witnesses.
M. H. Boyle,
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Inventor.
Robert M. Baily, Jr.,
by his attorney:
James D. Sisson.

UNITED STATES PATENT OFFICE.

ROBERT MAJOR BAILY, JR., OF PADDINGTON, COUNTY OF MIDDLESEX,
ENGLAND.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 386,285, dated July 17, 1888.

Application filed September 29, 1886. Serial No. 214,840. (No model.) Patented in England November 17, 1885, No. 14,059, and in Canada October 30, 1886, No. 25,298.

To all whom it may concern:

Be it known that I, ROBERT MAJOR BAILY, Jr., a subject of the Queen of Great Britain and Ireland, residing at Paddington, in the county of Middlesex, Kingdom of Great Britain and Ireland, have invented new and useful Improvements in Expansion Valve-Gear for Steam and other Engines, (part of which has been patented in England, dated November 17, 1885, No. 14,059,) of which the following is a specification.

This invention relates to that class of valve-gears in which a slide-valve on the back of the main valve has a variable travel. It has for its object the variation of the point of cut-off either independently of the points of release and compression or in combination with a variation of them; and in order that the nature of my invention and the manner of carrying the same into practical effect may be fully understood, I append hereto three sheets of illustrative drawings, in which my invention is represented under two modifications.

Figures 1 to 4 illustrate the application of my invention in a horizontal engine with main slide-valve and expansion-valve mounted by the side of the cylinder, Fig. 1 being a side elevation; Fig. 2, a plan, partly in section; and Figs. 3 and 4, cross-sections taken on the lines A B and C D, respectively, of Fig. 1. Figs. 5 to 8 illustrate the application of my invention in a reversing-engine in which the valve-chest is above the cylinder, Fig. 5 being a side elevation, partly in section; Fig. 6, a plan; and Figs. 7 and 8, sections on the lines E F and G H, Fig. 5. Fig. 9 is a diagram for setting eccentrics for my engines with cut-off valves or slides on the backs of main slides, whether reversing or not.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

Referring to Figs. 1 to 4, 1 is an eccentric keyed on the crank-shaft 2, in the same position and with the same advance as in the ordinary non-variable slide-valve gear.

3 is an eccentric keyed on the crank-shaft opposite the crank-pin. Its throw or travel is equal to twice the advance of the main valve 4 plus twice the advance of the expansion-valve

5 relative to the main valve 4. The eccentric 1 operates the main valve 4 direct, as usual, by means of connecting-rods 6 6*, and also by means of a rod, 7, imparts motion to the rocking or swinging arm or lever 8, which is pivoted at 9, and is of such a length that the point 10 sweeps at each vibration through a distance equal to the greatest travel of the expansion-valve 5 corresponding to latest cut-off. The pin at 10 operates one end of the slot-link 11. The other end of it is operated by the eccentric 3, its rod 12 being attached at 13 to the link. The expansion-valve 5 is worked from the slot-link 11 by means of a sliding block therein and rods 14 14*, as shown. The position of the sliding block in the slot-link 11 may be varied and controlled by hand, (by any suitable device, such as a lever and sector, a screw and wheel, &c.,) or by the governor directly, or by a cataract cylinder operated by the governor.

16 is a lifting link or rod, which may be employed to shift the sliding block. It should have its center of motion on the same side of the center line of the gear as the center 9 of the arm or lever 8, and its length should be such as to correct the error arising from the angular movement of the arm or lever 8.

The main valve 4 has ports 15 15 through it. These may be single, as shown, or double or treble, as may be desired; also, there may be separate main and expansion valves for each end of the cylinder to reduce clearance and waste spaces. According to the position of the sliding block in the slot-link 11, the expansion-valve 5 will have a motion varying from the movement of the point 10, which is similar to that of the main valve, but of greater amplitude, (corresponding to latest cut-off,) to the movement of the point 13, (corresponding to lead opening only,) the exhaust edges of the main valve remaining undisturbed. The point 13 of the slot-link 11 need not of necessity be worked by an eccentric; but, if more convenient, its motion may be taken from some other moving part of the engine, care being taken to insure that its stroke shall be equal to twice the linear advance of the expansion-valve and its motion opposite to that of the piston.

Referring to Figs. 5 to 8, the main valve-gear is of the kind well-known as the "Stephenson"

link-motion, and requires no further description. The slot-link 11 is operated at 10 by the arm or lever 8, to which it is pivoted, and which receives motion from the main-valve rod or spindle 17 by means of the nearly-parallel rod 18. The point 13 in this case takes its motion from the cross-head 19 by means of a nearly-parallel rod, 20, levers 21, and rod 22, as shown. The point 10 has a movement similar to that of the main valve 4, but of greater amount or amplitude, corresponding to latest cut-off, and the point 13 has a motion corresponding to lead opening only, its motion being always opposite to that of the piston. By varying the position of the sliding block in the slot-link 11 any desired cut-off can be obtained without interfering with the exhaust; also, the main valve can be reversed without altering the point of cut-off. The compression may, if desired, with the earlier cut-offs, be increased by notching up the main valve without appreciably altering the cut-off. When the engine requires to be frequently reversed, the expansion-gear is left in full gear and the engine is handled by the main valve only. No separate reversing-gear is required for the expansion-valve, as owing to the motion of the full-gear end of the expansion link being taken from the main-valve rod, if the main valve be reversed, the expansion valve is reversed with it.

My invention can be readily applied in conjunction with other well known reversing-gears, such as Gooch's, Allan's, Wischaert's, or Joy's; but I have not considered it necessary to give drawings of these, inasmuch as the examples illustrated and described herein will serve to enable a competent person to apply my invention in connection with other gears than those I have shown.

The diagram Fig. 9, which will be readily understood by a competent mechanic accustomed to valve-setting, illustrates the arrangement relatively to one another of the eccentrics, crank, and valves. It is not deemed necessary to insert figures or letters of refer-

ence here, because the different parts are described on the diagram itself.

I have in another application for United States patent filed on the same day as this—to wit, September 29, 1886, Serial No. 214,839—set forth a slotted link receiving a block connected with the valve, one end of which link is actuated by an eccentric or a pair of eccentrics, and the other being worked with different time and having a motion less than that of the valve at its greatest work. Such I do not claim in this application.

What I claim is—

1. In a steam or gas engine, in combination with a main valve, 4, and an expansion-valve, 5, a slot-link, 11, connected near its full-gear end to the main-valve rod 6 through a lever, 8, whereby such link has a movement similar in time to that of the main valve, but of greater amplitude, corresponding to the latest cut-off, and its other end connected to a part of the engine having a movement opposite to that of the piston corresponding to the earliest cut-off, all combined and arranged for joint operation substantially as herein specified.

2. In a steam or gas engine, a main slide-valve, 4, and an expansion-valve, 5, riding thereon, a slot-link, 11, a rod, 7, and lever 8, connecting one end of said slot-link with the main-valve rod 6, and a rod, 12, connecting the other end of said slot-link with an eccentric, 3, in combination with each other and with a block sliding in said slot-link and connected with the rod of the expansion valve 5, and with means, 16, for adjusting the position of said block, all substantially as herein specified.

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

ROBERT MAJOR BAILY, JR.

Witnesses:

F. J. BROUGHAM,

HENRY A. BROUGHAM,

Both of 46 Lincoln's Inn Fields, London, W. C.