No. 833,937. PATENTED OCT. 23, 1906.

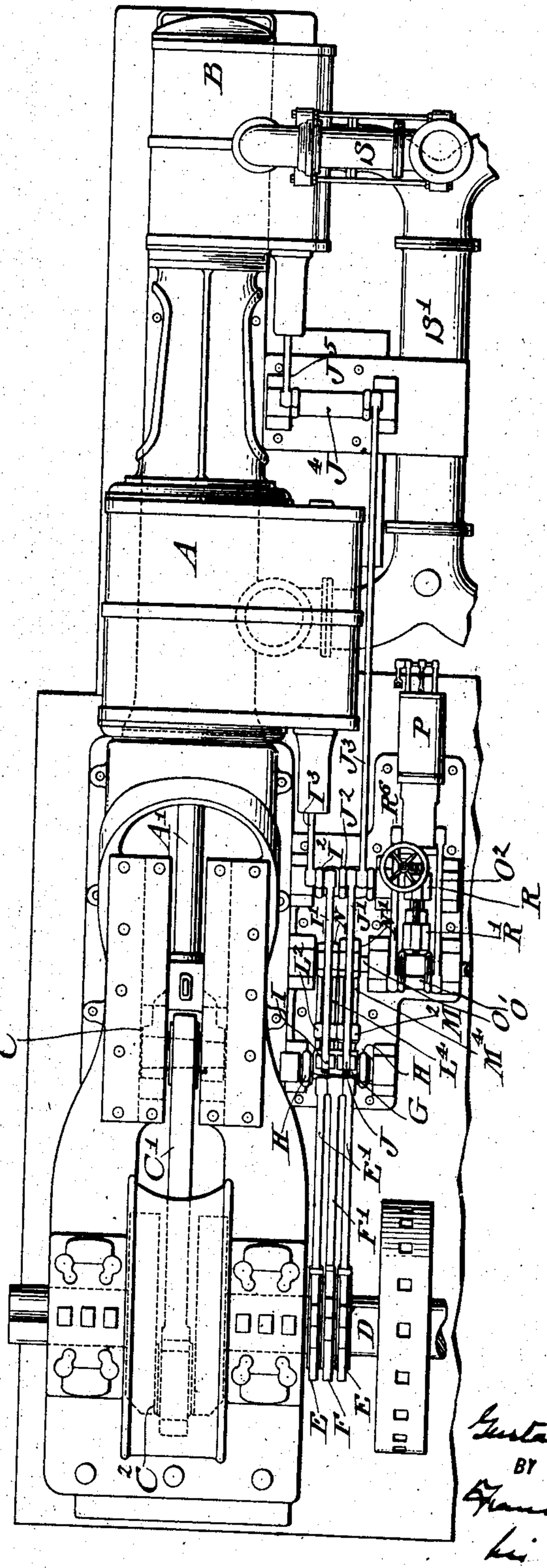
G. B. PETSCHE.

REVERSING MECHANISM FOR COMPOUND ENGINES.

APPLICATION FILED OCT. 20, 1905.

4 SHEETS—SHEET 1.

FIG. 1.



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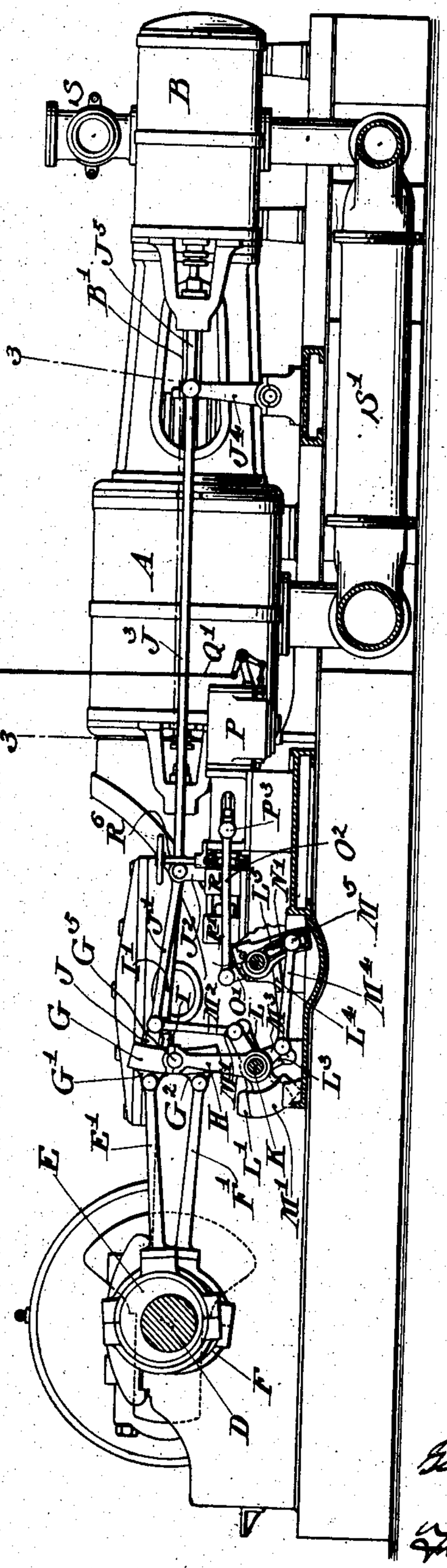
4 SHEETS—SHEET 2.

FIG. 2.



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4 SHEETS—SHEET 3.

FIG. 3.

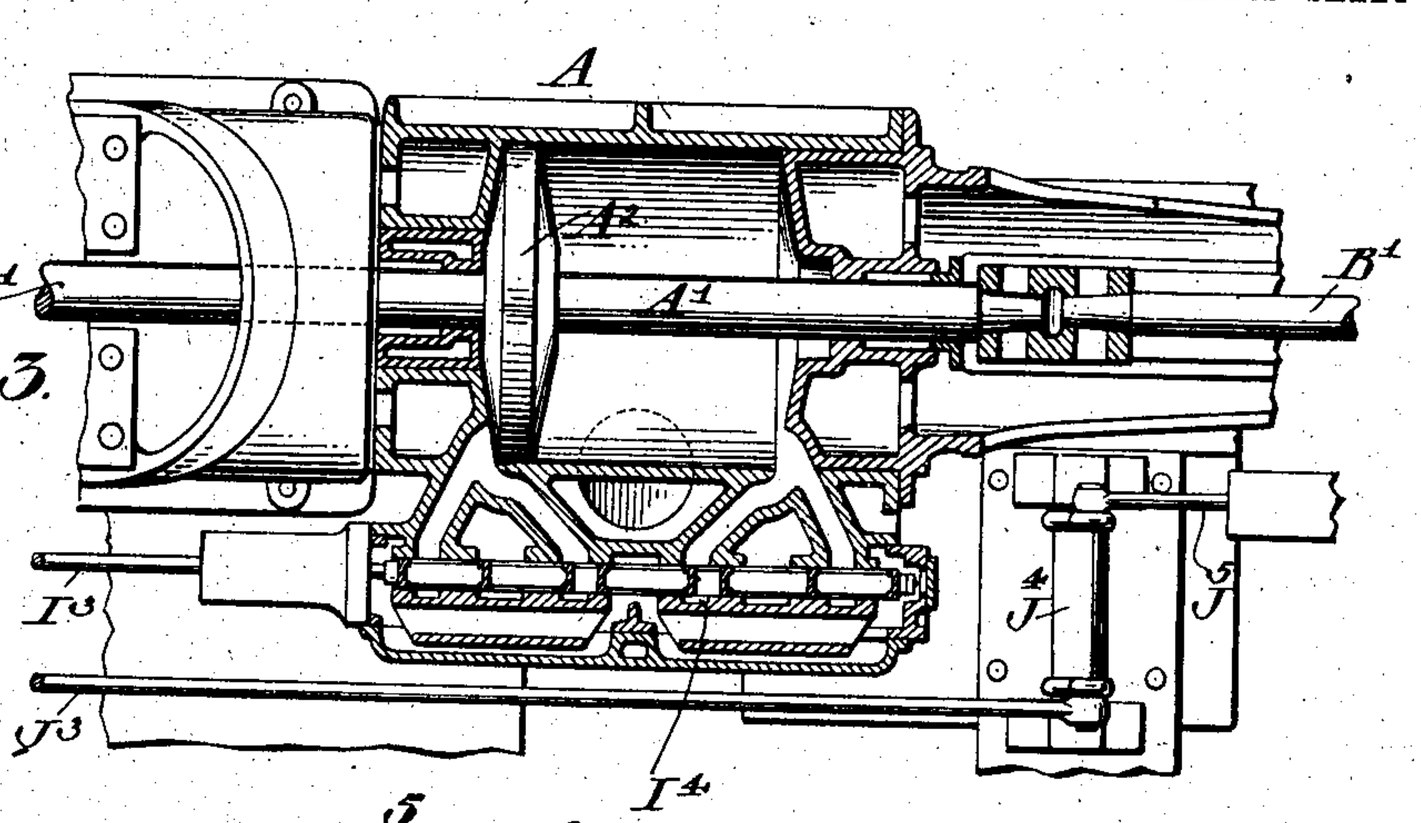


FIG. 4.

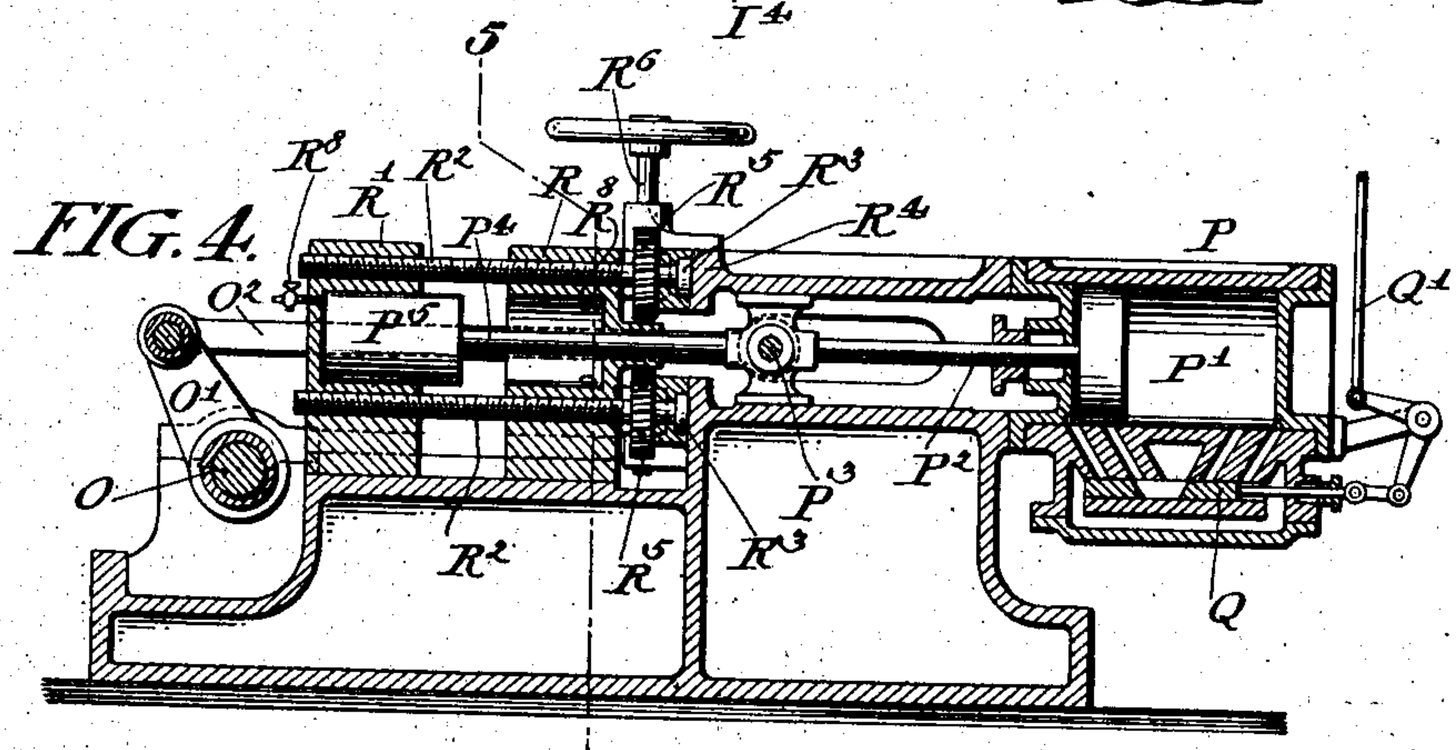
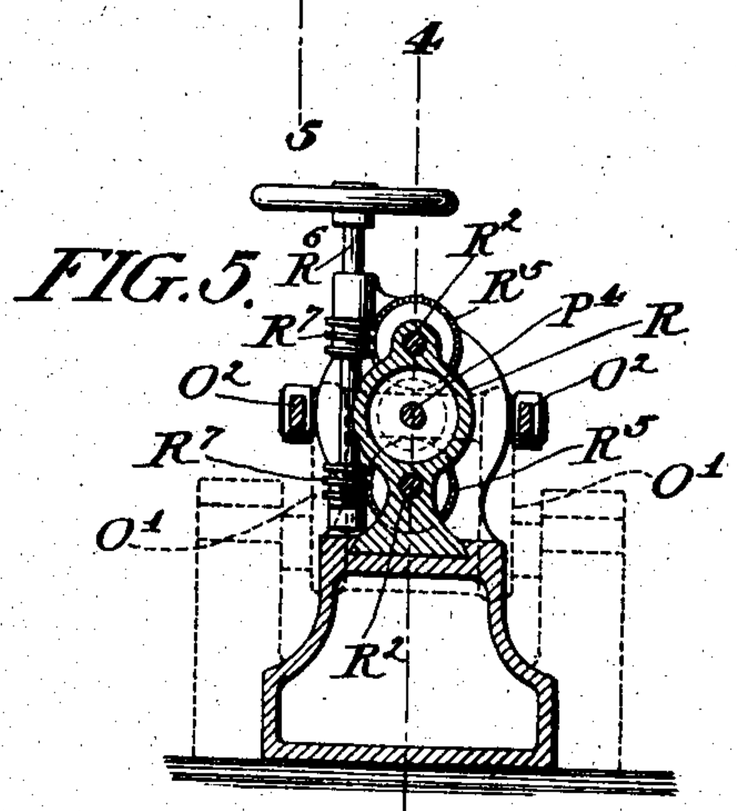


FIG. 5.



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4 SHEETS—SHEET 4.

FIG. 6.

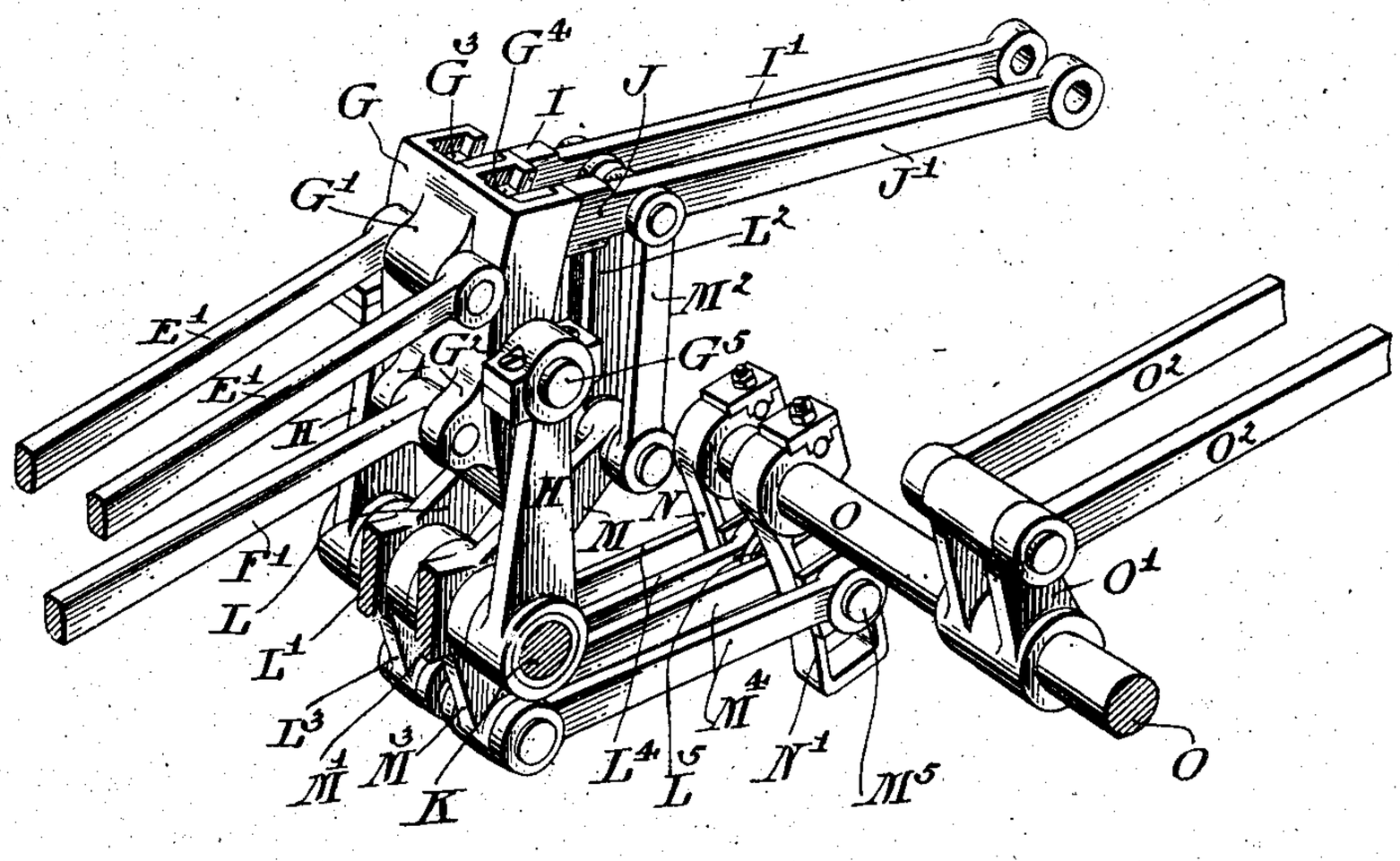


FIG. 7.

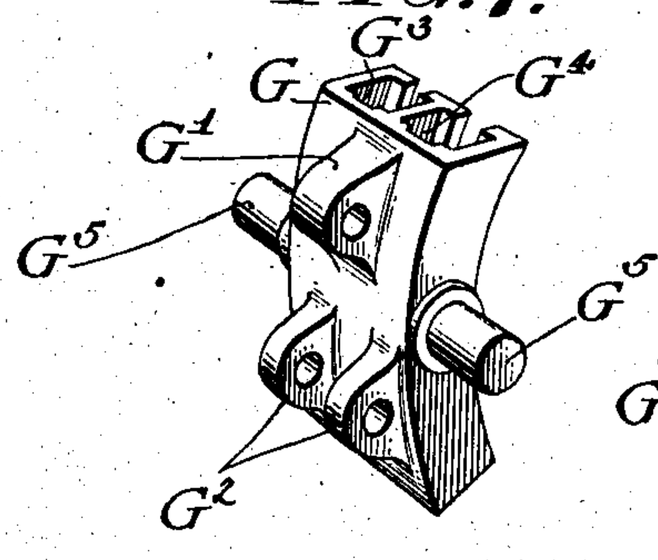


FIG. 8.

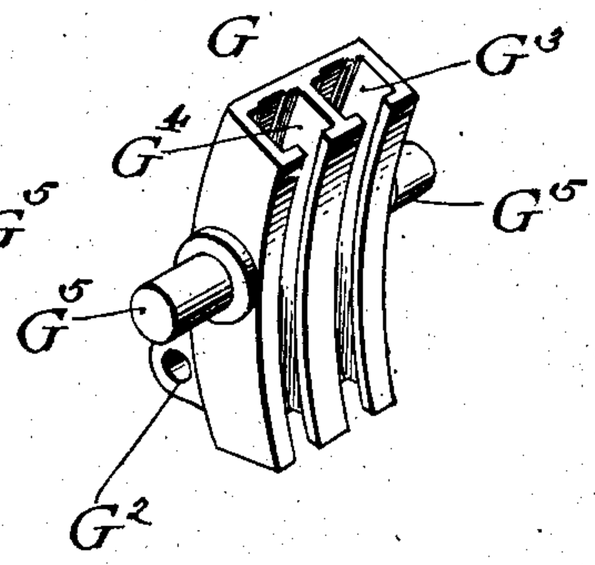
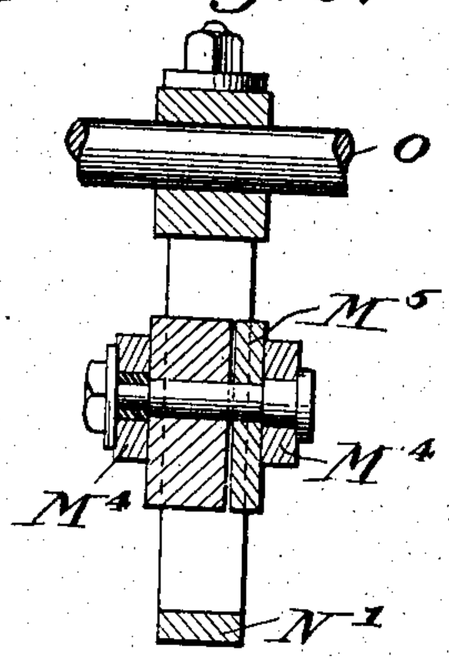


Fig. 9.



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UNITED STATES PATENT OFFICE.

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REVERSING MECHANISM FOR COMPOUND ENGINES.

No. 833,937. Specification of Letters Patent. Patented Oct. 23, 1906.

Application filed October 20, 1905. Serial No. 283,579.

To all whom it may concern:

Be it known that I, GUSTAV BERNHARD PETSCHE, a subject of the German Emperor, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Reversing Mechanism for Compound Engines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to compound engines, and particularly to the class of engines known as "compound reversing-engines," and used in rolling-mills.

The object of my invention is to provide an engine of this kind with improved mechanism for actuating the valves to reverse the engine, and particularly with simple and efficient reversing mechanism which will permit of an independent adjustment of the cut-off for either the high or low pressure cylinders.

The leading feature of my invention consists in combining with a positively-actuated device for giving motion to the valves, and generally of the character known as a "valve-link," adjustable devices or link-blocks directly connected with the valves, means for shifting said blocks simultaneously to effect the reversal of the engine, and means for shifting or adjusting said blocks independently, so as to regulate the cut-off with regard to either the high or low pressure cylinders independently.

A further improved feature of my invention consists in providing adjustable stops for regulating the extent of movement of the link-blocks in reversing the engine.

Other features of my invention will best be understood as described in connection with the drawings, which illustrate a reversing-engine provided with my improvements, and in which—

Figure 1 is a plan view of an engine provided with my improvements and separated from the other similar engine or engines, with which in practice such engines are generally associated in sets. Fig. 2 is a side elevation of the engine. Fig. 3 is a section through the low-pressure cylinder and its valve, taken as on the line 3 3 of Fig. 2. Fig. 4 is a section, on an enlarged scale, taken through the power-reversing mechanism, as on the line 4 4 of Fig. 5. Fig. 5 is a cross-section on the line 5 5 of Fig. 4. Fig. 6 is a perspective view of the valve-link, together with the link-blocks and mechanism for moving and adjusting these blocks. Figs. 7 and 8 are perspective views from different angles, showing the construction of the link-blocks; and Fig. 9 is a longitudinal section through link N′ and the clamping-slide secured to it.

A and B are respectively the low and high pressure cylinders of the engine.

A′ is the piston-rod of the low-pressure cylinder, to which is attached the piston A^2, coupled through the cross-head C with the connecting-rod C′, coupled in turn to the crank C^2 on the engine-shaft B. The rod A′ is coupled, as shown in Fig. 3, with the piston-rod B′ of the high-pressure cylinder.

E E are parallel eccentrics secured on the shaft B on opposite sides of the angularly-set eccentric F, the eccentrics E being connected by the rods E′ E′ with the lug G′ at the top of the valve-link G, while the eccentric F is coupled by the rod F′ with the lugs G^2 G^2 at the bottom of the link. The link G is provided with the slideways G^3 and G^4 and with the laterally-extending trunnions G^5 G^5, which are supported on the rock-levers H H, pivoted on the shaft K, which is suitably supported on the frame of the engine.

I and J are link-blocks moving in the slideways G^3 and G^4, block I being connected, through the rod I′ and rock-lever I^2, with the valve I^3 of the low-pressure cylinder, the valve of which is shown at I^4, Fig. 3. The link-block J is connected to actuate the valve of the high-pressure cylinder, the connections being, as shown, through the connecting-rod J′ and rock-lever J^2 to the rod J^3, which in turn connects through the rock-lever J^4 with the valve-rod J^5.

L and M are levers pivoted on the shaft K and connected, through the rods L^2 and M^2, with the link-blocks J and I. The levers L and M are counterweighted, as shown at L′ and M′, and provided with angular lever-arms L^3 and M^3, which are connected, through the rods L^4 and M^4 and the clamping-blocks, (indicated at L^5 and M^5,) with the slotted reversing-levers, (indicated at N and N′,) these levers extending parallel to each other from

the rock-shaft O, to which they are secured and from the upper side of which extends the lever-arm O′, connected, through the rods O^2 O^2, with the cross-head P^3 of the power reversing mechanism, which consists, as shown, of the cylinder P, having working in it a piston P′, connected by the piston-rod P^2 with the cross-head P^3, from which cross-head extends the rod P^4, which may properly be a continuation of the rod P^2 and to the end of which is attached the plunger P^5. This plunger works between the adjustable heads R and R′, each formed with a cylindrical cavity adapted to receive the plunger P^5 and each by preference furnished with a vent-cock, as indicated at R^8, to enable air to escape from the bottoms of the cylindrical cavities, which serve the purpose of dash-pots.

The stop-blocks are held in position and adjusted by means of the right and left threaded screw-rods R^2 R^2, held in position on the framing R^4 by means of heads, as indicated at R^3 R^3 in Fig. 4. Each of the threaded rods has attached to it a worm-wheel, as indicated at R^5 R^5, and the rods are turned by the worms R^7 R^7, secured to the vertical shaft R^6 and engaged with the worm-wheels, as shown in Fig. 5.

Q is the valve regulating the admission to the cylinder P and actuated through the rod Q′ by a mechanism not shown.

S indicates the high-pressure steam-main connecting with the high-pressure cylinder, and S′ is the low-pressure steam-receiver connecting the exhaust of the high-pressure cylinder with the low-pressure cylinder.

The oscillating motion of the link G is imparted, through the link-blocks I and J and the connections described, to the valves of the high and low pressure cylinders, and when it is desired to reverse the engine it is only necessary that the link-blocks should be shifted in the link from a position on one side of its trunnion-pivots G^5 to a position on the other side of said pivots. Obviously the cut-off of either valve can be regulated by adjusting the link-block by which it is actuated to a greater or less distance from the pivot of the link.

In my engine the reversal of the link-blocks is effected by causing the reversing-levers N N′ to oscillate, their motion being communicated through the connecting-rods L^4 M^4 to the levers L L^3 and M M^3 and through the connecting-rods L^2 M^2 to the link-blocks, which are caused to move from the position they occupy on one side of the pivot of the link to exactly corresponding positions on the other side of the pivot. The independent adjustment of the link-blocks for the purpose of regulating the cut-off of the controlled valve is effected in the structure shown by adjusting the clamping sides L^5 or M^5 in the slotted reversal links N or N′, and it will be seen that by this general arrangement it is practicable to independently adjust the cut-off for either cylinder and to preserve this adjustment when the engine is reversed. In Fig. 9 I have shown a practicable construction for adjusting the clamping-slide in the links N or N′, but of course any convenient equivalent device may be used. My construction also enables me to regulate the valve throw and cut-off of both valves by varying the oscillatory movements of the reversing-levers, which in the construction shown I do by providing the adjustable stop-blocks R R′, having moving between them the stop-plunger P^5, connected directly with the piston P′, as described, and by means of which the travel of the piston in the actuating-cylinder P is limited.

The importance of the dash-pot cylinders in the stop-blocks is of course obvious, in that it prevents injurious and destructive blows on the stop-blocks, and the described mechanism for adjusting the stop-blocks, including the threaded rods R^2, the worm-wheels, worms, and actuating-shaft, is obviously a simple and efficient mechanism for accomplishing the desired purpose.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a compound engine, reversing mechanism, comprising means positively actuated by a moving part of the engine for actuating the valves, means adjustably connected to said positively-actuated device and directly connected to the valves, reversing mechanism to which both of said adjustable devices are connected and through which they are connected together and means for independently adjusting said devices to vary the cut-off of either the high or low pressure valves.

2. In a compound engine, reversing mechanism comprising means positively actuated by a moving part of the engine for actuating the valves, means adjustably connected to said positively-actuated device and directly connected to the valves, reversing mechanism to which both of said adjustable devices are connected and through which they are connected together, adjustable stops for regulating the extent of movement of the adjustable valve-actuating devices in reversing the engine, and means for independently adjusting said devices to vary the cut-off of either the high or low pressure valves.

3. In a compound engine, reversing mechanism comprising an oscillating valve-actuating link operated by a moving part of the engine, in combination with independent link-blocks, slidingly secured to said link, and connected one with the valve of the high-pressure cylinder and the other with the valve of the low-pressure cylinder synchronously oscillating reversing-levers for

shifting the link-blocks to reverse the engine, and connections from the link-blocks to the reversing-levers radially adjustable along said levers to vary the cut-off of the valves.

4. In a compound engine, reversing mechanism comprising an oscillating valve-actuating link operated by a moving part of the engine, in combination with independent link-blocks, slidingly secured to said link and connected one with the valve of the high-pressure cylinder and the other with the valve of the low-pressure cylinder synchronously oscillating reversing-levers for shifting the link-blocks to reverse the engine, connections from the link-blocks to the reversing-levers radially adjustable along said levers to vary the cut-off of the valves, power mechanism for oscillating the reversing-levers, and adjustable stops for regulating the extent of their movements.

5. In a compound engine, reversing mechanism comprising an oscillating valve-actuating link operated by a moving part of the engine, in combination with independent link-blocks, slidingly secured to said link and connected one with the valve of the high-pressure cylinder and the other with the valve of the low-pressure cylinder synchronously oscillating reversing-levers for shifting the link-blocks to reverse the engine, connections from the link-blocks to the reversing-levers radially adjustable along said levers to vary the cut-off of the valves, power mechanism for oscillating the reversing-levers, and adjustable dash-pots acting as stops for regulating the extent of their movements.

6. In a compound engine, reversing mechanism comprising an oscillating valve-actuating link operated by a moving part of the engine in combination with independent link-blocks, slidingly secured to said link and connected one with the valve of the high-pressure cylinder and the other with the valve of the low-pressure cylinder synchronously oscillating reversing-levers for shifting the link-blocks to reverse the engine, connections from the link-blocks to the reversing-levers radially adjustable along said levers to vary the cut-off of the valves, power mechanism for oscillating the reversing-levers, and adjustable stops for regulating the extent of their movements, a cylinder and piston for oscillating the reversing-levers, a plunger moving with said piston, two movable heads having dash-pot cylinders formed in them between which the plunger moves, and means for moving said heads toward and from each other to vary the movements of the plunger and parts connected thereto.

7. In a compound engine, reversing mechanism comprising an oscillating valve-actuating link operated by a moving part of the engine in combination with independent link-blocks, slidingly secured to said link and connected one with the valve of the high-pressure cylinder and the other with the valve of the low-pressure cylinder synchronously oscillating reversing-levers for shifting the link-blocks to reverse the engine, connections from the link-blocks to the reversing-levers radially adjustable along said levers to vary the cut-off of the valves, power mechanism for oscillating the reversing-levers, and adjustable stops for regulating the extent of their movements, a cylinder and piston for oscillating the reversing-levers, a plunger moving with said piston, two movable heads having dash-pot cylinders formed in them, between which the plunger moves, rods R^2, R^2, having right and left screw-threads formed on them and screwing into the dash-pot heads, and means for simultaneously rotating said rods to move the heads toward or from each other.

8. In a compound engine, reversing mechanism comprising an oscillating valve-actuating link pivoted on rock-levers H, and actuated by a moving part of the engine, in combination with independently-movable link-blocks movable in said links and moved by them, said link-blocks being connected to the valves of the high and low pressure cylinders, lever-arms L^2, L^3, M^2, M^3, pivoted on the same center as the rock-levers H, and connected to the link-blocks oscillating reversing-levers N N′ connecting-rods L^4 M^4, connecting the lever-arms L^3 M^3, with the reversing-levers, said rods being radially adjustable in their connection with the reversing-levers so as to independently adjust the link-blocks, and means for oscillating the reversing-levers.

9. In a compound engine, reversing mechanism comprising an oscillating valve-actuating link pivoted on rock-levers H, and actuated by a moving part of the engine, in combination with independently-movable link-blocks movable in said links and moved by them, said link-blocks being connected to the valves of the high and low pressure cylinders, lever-arms L^2, L^3, M^2, M^3, pivoted on the same center as the rock-levers H, and connected to the link-blocks oscillating reversing-levers N, N′, connecting-rods L^4, M^4, connecting the lever-arms L^3, M^3, with the reversing-levers, said rods being radially adjustable in their connection with the reversing-levers so as to independently adjust the link-blocks, means for oscillating the reversing-levers, and adjustable stops for regulating their range of movement.

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