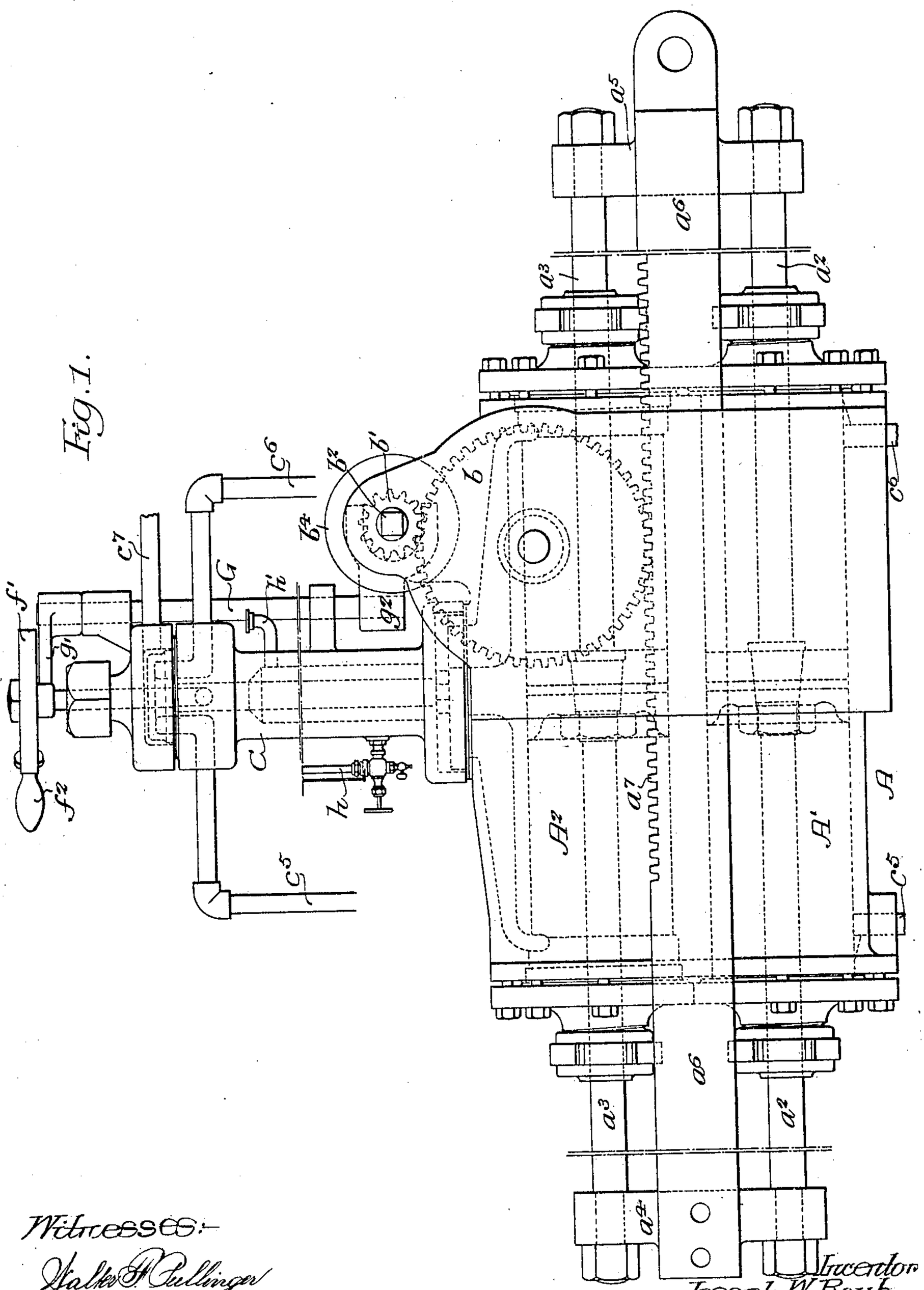
No. 887,518. PATENTED MAY 12, 1908.

J. W. RAUB.

CONTROLLING MECHANISM FOR REVERSING GEARS.

APPLICATION FILED JUNE 22, 1907. 4 SHEETS—SHEET 1.

Fig. 1.



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Titus Nelson.

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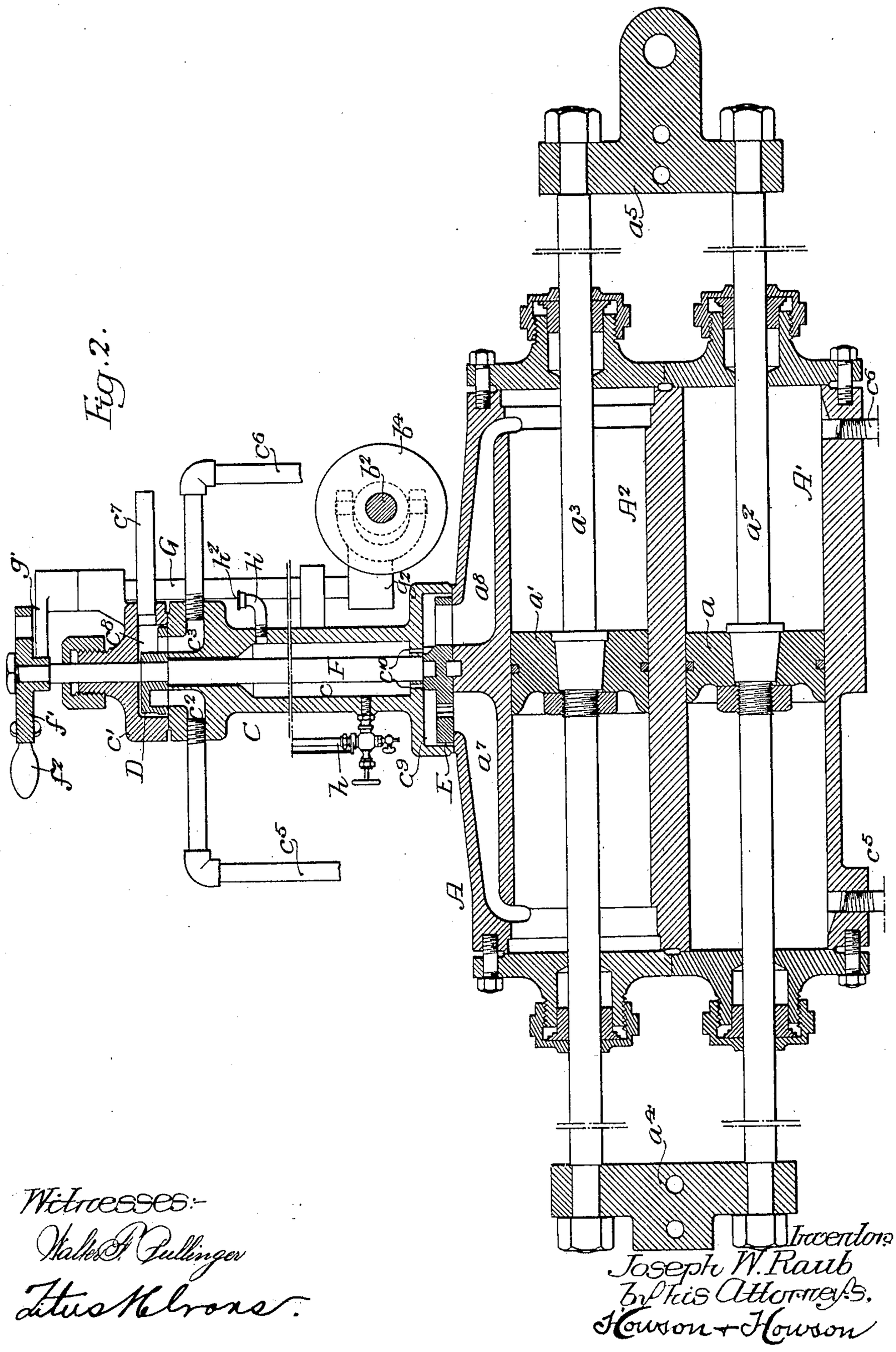
4 SHEETS—SHEET 2.

Fig. 2.



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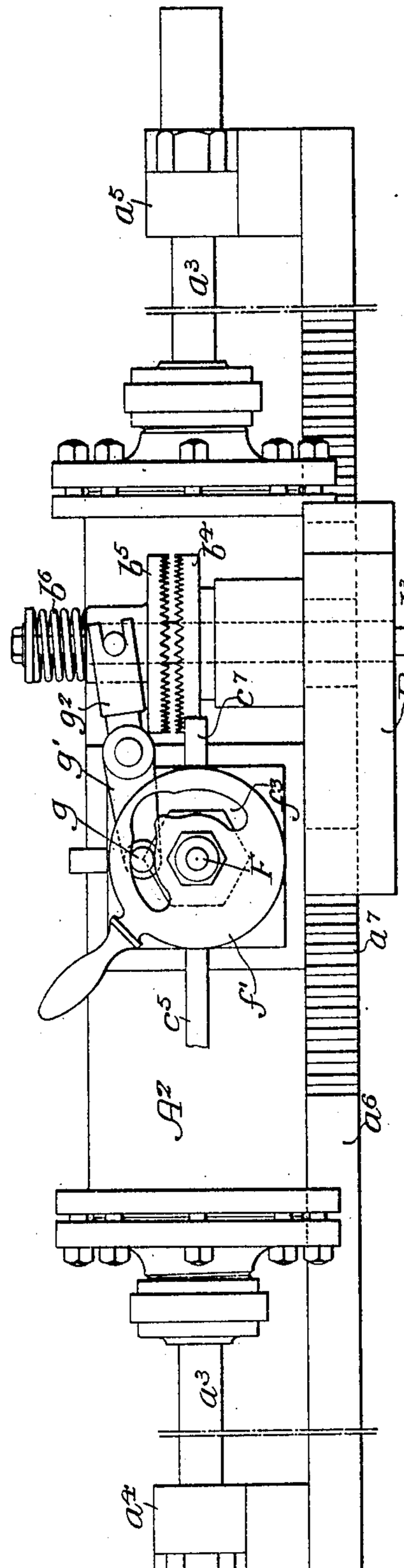
4 SHEETS—SHEET 3.

Fig. 3.



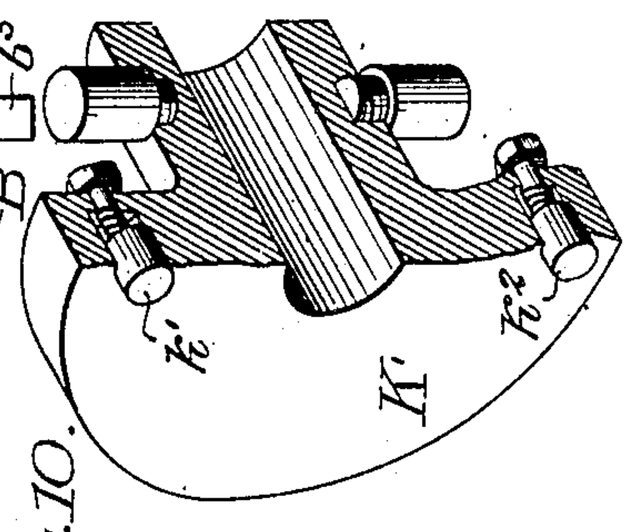


Fig. 10.

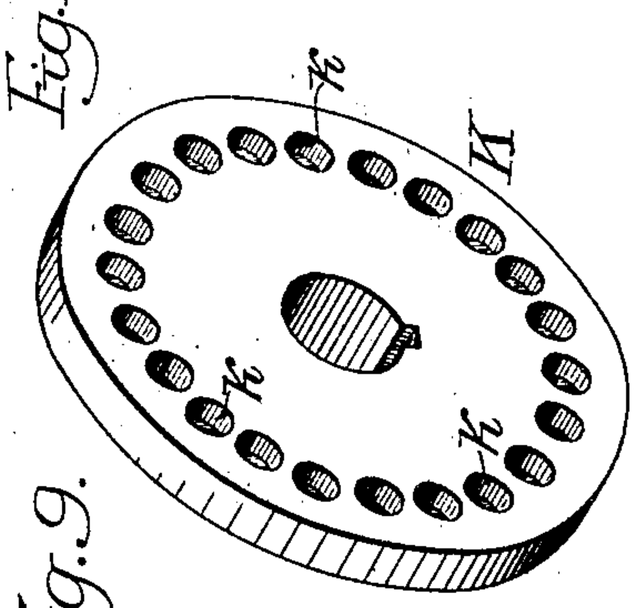


Fig. 9.

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APPLICATION FILED JUNE 22, 1907. 4 SHEETS—SHEET 4.

Fig. 8.

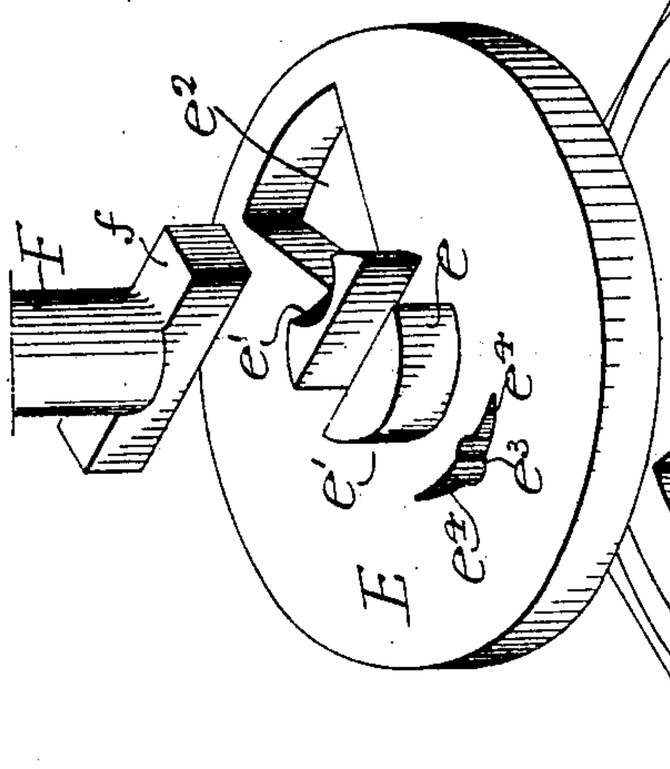


Fig. 7.

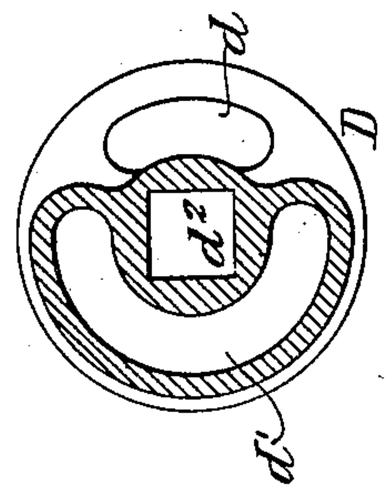


Fig. 5.

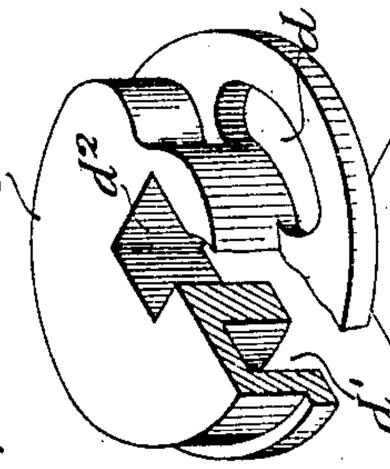


Fig. 6.

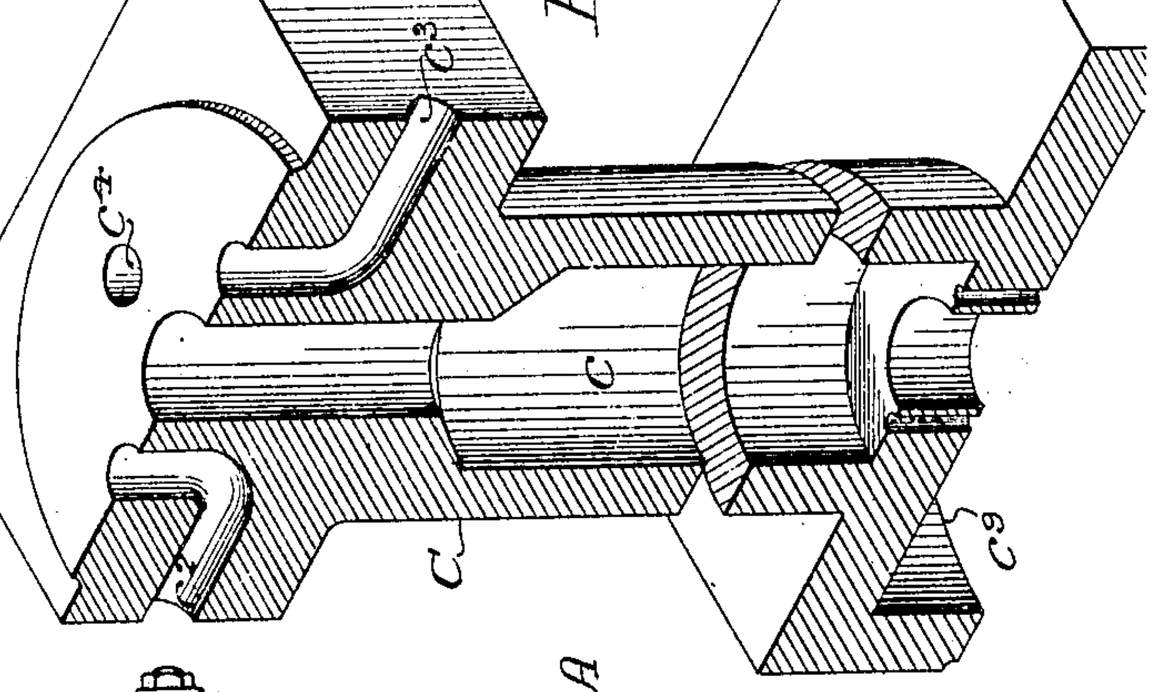
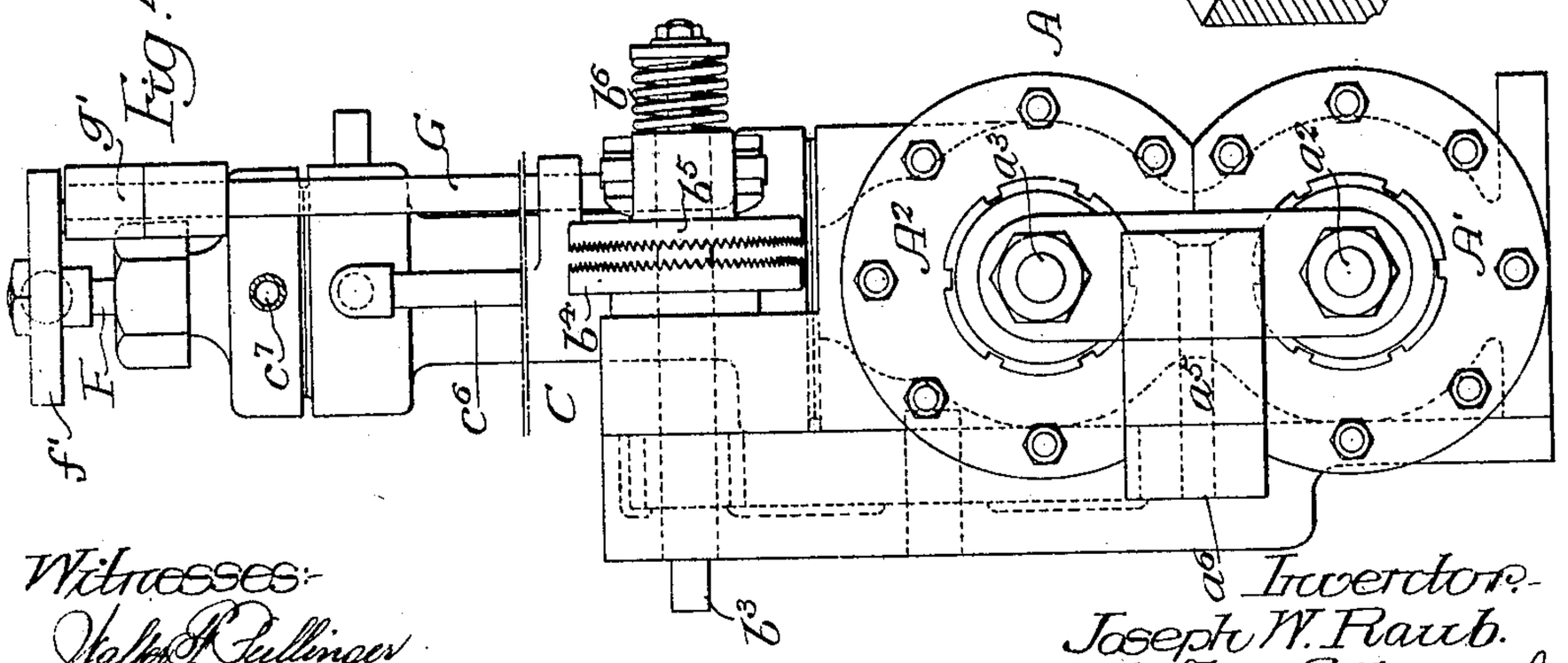


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH W. RAUB, OF PHILADELPHIA, PENNSYLVANIA.

CONTROLLING MECHANISM FOR REVERSING-GEARS.

No. 887,518. Specification of Letters Patent. Patented May 12, 1908.

Application filed June 22, 1907. Serial No. 380,247.

To all whom it may concern:

Be it known that I, JOSEPH W. RAUB, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Controlling Mechanism for Reversing-Gears, of which the following is a specification.

One object of my invention is to provide a device for operating the reversing gear of a locomotive or other engine, which while being relatively simple and free from complication shall be certain in operation and occupy but relatively little space.

It is further desired to provide a device of the character noted in which the various parts shall be so arranged and connected that the strains occurring therein shall be in a large measure balanced; the device contemplating in addition, means whereby, when the controlling handle is in its normal or mid position, the various parts are positively and rigidly locked against movement.

I further desire to provide a device of the class described with a novel form of valve mechanism for controlling the passage of liquid from one end of the liquid containing cylinder to the other, which cylinder is provided with a reservoir for liquid so connected that said cylinder shall be at all times necessarily filled with liquid.

Another object of the invention is to provide a controlling device in which the volume of the cylinder and its ports and passages shall remain constant irrespective of the position of the piston in said cylinder. I also desire to provide valve mechanism for controlling the operation of a device of the character noted, by which it shall be possible to accurately and conveniently govern the flow of liquid between the ends of one of the cylinders and so govern the actuation of the mechanism to be operated.

These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which:—

Figure 1, is a side elevation of my improved reversing gear controlling mechanism; Fig. 2, is a vertical section; Fig. 3, is a plan of the device shown in Fig. 1; Fig. 4, is an end elevation of my device; Fig. 5, is a perspective view, partly in section, illustrating the construction of the air valve; Fig. 6, is a perspective view showing in vertical section, the detail construction of the structure containing the liquid reservoir and the various passages; Fig. 7, is a horizontal section of the valve shown in Fig. 5; Fig. 8, is a detached perspective view of the valve stem, the liquid controlling valve and the seat or face upon which it works, and Figs. 9 and 10, are perspective views illustrating the members of a special form of clutch which may be employed to lock certain parts of my device in any adjusted position.

In the above drawings, A represents a casting in which are formed the air cylinder A′ and the oil cylinder A^2 these extending substantially parallel to each other and respectively having pistons a and a'. The piston a has fixed to it a rod a^2 which extends through stuffing boxes respectively placed in both ends of the cylinder A^8, while the piston a' similarly has a rod a^3, which likewise extends through stuffing boxes on opposite ends of the cylinder A^2. The adjacent ends of these rods are respectively connected by cross heads a^4 and a^5 and, as shown best in Fig. 3, these cross heads are connected by a bar a^6 having teeth forming a rack a^7 cut or set in one of its edges. This rack bar extends outside of the cylinders and through a casing B wherein are mounted two intermeshing gear wheels b and b', of which the first engages the teeth of the rack a^7 and the latter is fixed to a shaft b^2 mounted in a suitable bearing formed in the cylinder casting A. This shaft has a squared end b^3 which projects at one side of the casing B and there is fixed to said shaft one member b^4 of a toothed clutch, the other member b^5 of which is loosely mounted on the shaft so as to be longitudinally movable while being held from rotating by means hereafter described. A spring b^6 constantly acts upon the member b^5 so as to force its teeth into engagement with the teeth of the member b^4.

On the cylinder casting A is a vertically extending casting C having a hollow portion c which forms a reservoir for oil. This casting has a bonnet or cover c' in which is an air valve D, while inclosed within the lower portion of the casting c and operative upon the adjacent face of the cylinder casting A is an oil valve E. A single valve rod F extends vertically through the bonnet c' and the casting C so that its lower end, as shown in Fig. 8, may engage and turn the oil valve E, as indicated in Fig. 8. For this purpose said valve is provided with a projecting lug e, transversely slotted to receive the parallel sided end f of said rod.

On the upper end of the rod F is mounted a cam plate f', having a handle f^2 whereby said rod may be turned on its axis; there being in said plate a cam groove f^3, as shown in Fig. 3, for the reception of a pin g having an arm g'. This arm is mounted upon a vertically extending spindle G having suitable supporting bearings and carrying on its lower end a second arm g^2 forked, as shown in dotted lines in Figs. 1 and 2. The forks of this arm extend around a boss on the member b^5 of the clutch carried by the shaft b^2 and are pinned to the same so as to prevent its revolution, while being capable of causing it to slide on said shaft. These various parts are so assembled that when the cam plate f' is in the position corresponding to a closed position of air and oil valves hereafter described, the pin g is in that portion of the cam groove f^3 farthest from the axial line of the valve rod F, and, as a consequence, the teeth of the two members b^4 and b^5 are in engagement with each other. The said cam groove is so designed that any movement of the plate f' to either side of its central position will immediately cause the member b^5 to be moved out of engagement with the member b^4 and the consequent unlocking of the shaft b^2 whereby it is left free to turn. Three ports c^2, c^3 and c^4 open on the top face of the casting C and of these the two first are connected through pipes c^5 and c^6 respectively with opposite ends of the cylinder A'. The port c^4 opens outside of the casting and serves as the exhaust port of the valve.

As shown in Figs. 5 and 7, the valve D has an opening d extending through its flat portion and in addition has an interior recess d', which, in the present instance, extends for about 180 degrees around the valve. It will be understood that the valve rod F is squared to fit within a similarly squared opening d^2 in said valve D, which operates within a suitably formed chest or cavity within the bonnet c', supplied with air from any suitable source through a pipe c^7. The valve rod F passes loosely through the upper part of the casting C, so that air under pressure from the valve chest c^8 is free to pass along said valve rod through the center of the valve D, down into the oil reservoir surrounding the lower portion of said rod.

From opposite ends of the oil cylinder a^2 extend ports a^7 and a^8 and these open in a suitable plane face formed in the top surface of the cylinder casting A as illustrated in Fig. 8. The valve E, as shown, consists of a disk-shaped plate which operates on this plane face within a chamber c^9 at the lower end of the casting C. This chamber communicates through oppositely placed openings c^{10} with the interior of the oil reservoir c and in order that at predetermined times the oil may be free to pass from the said reservoir into this chamber, I notch or recess the lug e on one side as indicated at e'. I also form through the valve E two openings or ports e^2 and e^3, of which the first is of relatively large area,—for example, substantially equal to that of either of the openings a^7 or a^8, while the opening e^3 is relatively small and has two V-shaped or angular extensions e^4 projecting from opposite sides. The reservoir c is provided with a gage glass h and a filling pipe h' normally closed by a plug h^2.

With the above described arrangement of parts, it will be understood that the cross head a^5 is directly connected to the link or other structure through which the reversing gear or other device is to be operated;—the possible movement of the said cross head being determined by the design of the cylinders and their ports, as required to operate the reversing gear between its two extreme positions. If, now, the cam plate f' be moved from its normal position to the position illustrated in Fig. 3, the first action resulting therefrom is a disengagement of the teeth of the clutch member b^5 from those of the member b^4 so that thereafter the rack bar a^6 with the reversing gear and piston rods are free to move. The continued movement of the cam plate, being transmitted through the valve rod F to the valve D, causes said valve to connect the port c^2 with the exhaust port c^4 and hence connect the left hand end of the cylinder A' with said exhaust port through the pipe c^5. On the other hand, the opening d in the valve D uncovers the port c^3, so that this is supplied with air under pressure from the valve chest c^8 and the air passes through the pipe c^6 to the right hand end of the cylinder A' in which it exerts pressure upon the piston a. No movement, however, of said piston or of the other parts of the device can occur for the reason that said piston is rigidly connected to the rod a^2, the two cross heads a^4 and a^5 and the rod a^3 which in turn is fixed to the piston a'. This latter is immovably held by reason of the fact that both ends of its cylinder, as well as the passages a^7 and a^8 are filled with oil; it being understood that the valve E is so set on the rod F that it does not open the ports a^7 and a^8 until after air has been admitted to one or the other ends of the cylinder A'. The continued turning of the cam plate f', however, finally causes the opening e^2 to uncover the port a^8, but even then there can be no movement of the apparatus because the oil cannot escape from the passage or port a^7. Finally, one of the narrow angular extensions e^4 of the opening e^3 is moved over the opening of the port a^7, thereby permitting a very gradual escape of the oil from the left hand end of the cylinder A^2 by reason of the pressure exerted upon it by the piston a'.

It will be seen that while the escape of oil from the port a^7 is very much throttled, its flow into the passage a^8 and into the opposite

end of the cylinder A^2 is permitted with the utmost freedom through the opening e^2. As a consequence, the air pressure on the piston a moves this with its cross head and the rack rod, thereby operating the reversing gear in the well known manner. In order to prevent the possibility of the piston striking and injuring the cylinder head, the ports are so arranged that they are wholly or partially cut off by the piston a^3, before this reaches the end of its stroke in either direction, thereby inclosing a body of oil between said piston and the head, which serves as a cushion in preventing damage to said head.

The longitudinal movement of the rack bar a^6 turns the gears b and f' and with them the shaft b^2 and clutch member b^4. As soon however, as the handle f^2 with the cam plate f' is returned to its normal position the cam groove forces inwardly the arm g^2 and throws the teeth of the member b^5 into engagement with those of the member b^4, thus locking the rack bar and the mechanism attached thereto against possible movement from any cause.

Should it so happen that the teeth of one of the members should, instead of entering the recesses of the other member, engage the points of its teeth, it will be seen that the spring b^6 will yield sufficiently to permit of the cam plate being moved to its normal position, while thereafter a very slight movement of the member b^4 caused for example by leakage, etc., will suffice to permit its teeth being properly engaged by the teeth of the member b^5 under the action of the spring b^6; there being sufficient lost motion between the various parts to permit of this.

It will be noted that the volume of the cylinder A^2 and its ports a^7 and a^8 always remains constant, by reason of the fact that the rod a^3 extends through both ends of the cylinder. Moreover, by reason of the fact that the rods a^2 and a^3, with the rack bar a^6, are connected to the cross heads a^4 and a^5 as shown, the resulting structure is relatively strong and solid and has no tendency to give rise to undue strains in any of the parts under operating conditions.

Whatever leakage might possibly occur from the stuffing boxes of the oil cylinder or otherwise is fully compensated for by the oil supplied from the reservoir c through the openings c^{10}, and it is to be noted that at no time and under no circumstances can there be any air spaces in the cylinder A or its passages, since the air under pressure is at liberty to find its way from the valve chamber or chest c^8 down around the rod F, so as to force oil from the reservoir c into the cylinder A^2 or its passages whenever there is any vacancy therein. If, for any reason, the air pressure should fail, the device may be operated by hand by the application of a suitable crank handle to the squared end b^3 of the shaft b^2; it being noted that under such conditions the cam plate would first be operated so as to disconnect the clutch members b^3 and b^5.

While the above described mechanism is particularly designed to control the reversing gear of an engine, it is to be understood that it may be used to control the operation of other devices or machines without departing from my invention.

In Figs. 9 and 10 I have illustrated one of the many forms of clutch which may be substituted for that illustrated in the other figures of this case, and this preferably consists of two flat disks in one of which is formed a circular series of holes k. In the other clutch member K′ are placed two spring actuated plungers k' and k^2 projecting from the face of said member, which, under operating conditions, is adjacent to the face of the clutch member K. These two plungers are so placed that when the clutch members are together one of the plungers will be at liberty to enter one of the holes k, while the other plunger will be forced into its containing recess in the clutch member K′, inasmuch as it will come opposite a part of the clutch member K immediately between two holes k. In other words, a revolution of one of the clutch members to the extent of one-half the distance between a pair of adjacent holes k is sufficient to permit one of the plungers entering a hole so as to lock said two clutch members and their attached parts from further movement in the manner already described in connection with the two clutch members b^4 and b^5. In case the two clutch members K and K′ should be employed, the spring b^6 may be omitted, since, in the event of the two clutch members being in such positions that the plungers k' and k^2 could not enter any of the holes, said plungers would merely be depressed or forced into their recesses until one of the said clutch members had moved sufficiently to permit one plunger entering a hole k.

While throughout the specification I have referred to oil and air as the two fluids employed in the cylinders A′ and A^2 and their associated structures, it is to be understood that under operating conditions other liquids may be substituted for oil, while similarly any suitable fluid under pressure may be used in place of the compressed air.

I claim:

1. The combination in controlling mechanism for reversing gear, of two cylinders mounted side by side, each provided with a piston, a rod for each piston extending through both ends of its cylinder, cross heads respectively uniting the adjacent ends of said two rods, means for supplying fluid under pressure to one of the cylinders, means for controlling the passage of liquid from one end to the other of the second cylinder, with means for positively locking said piston rods

in any adjusted position, substantially as described.

2. The combination of two cylinders, each having a piston and a rod connected thereto, said rods being connected together, means for controlling the admission of fluid under pressure to one of the cylinders, means for controlling the flow of liquid between the ends of the other cylinder, and means for positively locking the piston rods in any adjusted position, said controlling and locking means having a common operating member, substantially as described.

3. The combination of two cylinders, each having a piston and a piston rod, means for connecting said rods to each other and to mechanism to be operated, a valve for controlling the admission of fluid under pressure to either end of one of the cylinders, with a second valve for controlling the flow of liquid between the ends of the other cylinder, means for controlling said valves, and a locking device controlled by said valve controlling means for positively holding the piston rods in any adjusted position, substantially as described.

4. The combination of two cylinders, a piston and a piston rod for each cylinder, each rod extending through both ends of its cylinder, cross heads respectively uniting the adjacent ends of the piston rods, a rack rod also extending between the cross heads, a valve for controlling the supply of fluid under pressure to one of the cylinders, means for controlling the flow of liquid between the ends of the other cylinder, a controlling device for said valve, a locking device governed by said controlling means, and gearing connecting said locking device with the rack rod, substantially as described.

5. The combination of two cylinders each having a piston and a piston rod, a rack rod, means for connecting said rack rod with said piston rods, a clutch, means for connecting one of the clutch members with the rack rod, valves for respectively governing the flow of liquid between the ends of one of the cylinders and the flow of fluid under pressure to the other cylinder, means for operating the said valves, and a device operatively connecting the second member of the clutch with said valve operating means, substantially as described.

6. The combination of two cylinders each having a piston and a piston rod, a rack bar extending parallel to said piston rods, two cross heads respectively connecting the adjacent ends of the rack rod and the two piston rods, a gear wheel meshing with the teeth of the rack rod, a clutch having one member connected to said gear wheel, means for moving the second member of the clutch into and out of engagement with said first member, valves for controlling the movement of the pistons in their cylinders, and a handle for operating the valves operatively connected to the movable member of the clutch, substantially as described.

7. The combination of two cylinders each having a piston and a piston rod, a rack bar extending parallel to said piston rods, two cross heads respectively connecting the adjacent ends of the rack rod and the two piston rods, a gear wheel meshing with the teeth of the rack rod, a clutch having one member connected to said gear wheel, means for moving the second member of the clutch into and out of engagement with said first member, valves for controlling the movement of the pistons in their cylinders, a handle for operating said valves operatively connected to the movable member of the clutch, with a yieldable member interposed between said handle and the second member of the clutch, substantially as described.

8. The combination of two cylinders each having a piston and a piston rod, means including a clutch for locking said piston rods in any adjusted position, valves for controlling the movement of the pistons in their cylinders, and a handle for operating said valves, said handle including a plate having a cam, with an arm actuated by said cam, and means for operatively connecting said arm to one of the members of the clutch, substantially as described.

9. The combination of two cylinders each having a piston and a piston rod, means including a clutch for locking said piston rods in any adjusted position, valves for controlling the movement of the pistons in their cylinders, a handle for operating said valves, said handle including a plate having a cam, an arm actuated by said cam, means for operatively connecting said arm to one of the members of the clutch, and a spring interposed between said clutch member and the handle, substantially as described.

10. The combination of two cylinders, each having a piston, means for connecting said pistons to each other and to a reversing gear to be operated, a valve for controlling the admission of fluid under pressure to either end of one of the cylinders, a structure having a valve chamber into which open passages from both ends of the second cylinder, and a valve in said chamber controlling the flow of liquid from one end to the other of the second cylinder, said valve having a large and a small port, each capable of being brought into communication with either of the passages leading to the ends of the second cylinder, substantially as described.

11. The combination of two cylinders each having a piston, means for connecting said pistons to each other and to a mechanism to be operated, means for governing the flow of fluid under pressure to one of the cylinders, a structure having a valve chamber, a valve in said chamber, means for operating said valve,

there being two passages opening into said chamber from opposite ends of the second cylinder, a valve in the chamber having a relatively large opening and also a relatively small opening with restricted extensions, either of said openings being capable of being moved so as to communicate with the passages leading from the second cylinder, substantially as described.

12. The combination of two cylinders each having a piston, means for connecting said pistons to each other and to mechanism to be operated, a valve for controlling the flow of fluid under pressure to one of the cylinders, a structure having a valve chamber and a reservoir, the second cylinder having passages opening from its ends into said valve chamber, and the said structure also having passages opening from its reservoir into said chamber, with a valve in the chamber constructed to govern the flow of liquid between the ends of the second cylinder and from the reservoir into the cylinder, substantially as described.

13. The combination of two cylinders each having a piston, means for connecting said two pistons to each other and to a device to be operated, a structure having two valve chambers and a reservoir for liquid placed to communicate with both of said chambers, means for connecting one of the valve chambers with both ends of one of the cylinders, the second cylinder having passages opening into the other valve chamber, two valves respectively mounted in said chambers, and a valve rod operatively connected to both of said valves, the second valve being constructed to throttle the liquid as it flows into the second valve chamber from one end of the second cylinder, substantially as described.

14. The combination of two cylinders each having a piston, means for connecting said two pistons to each other and to a device to be operated, a structure having two valve chambers and a reservoir for liquid in communication with each other, means for connecting one of the valve chambers with both ends of one of the cylinders, the second cylinder having passages opening into the other valve chamber, two valves respectively mounted in said chambers, and a valve rod operatively connected to both of said valves, the second valve being constructed to throttle liquid as it flows into the second valve chamber from one end of the second cylinder and also to govern the passage of liquid from the reservoir to said second cylinder, substantially as described.

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

JOSEPH W. RAUB.

Witnesses:
WM. E. SHUPE,
JOS. H. KLEIN.