No. 754,272. PATENTED MAR. 8, 1904.

C. G. ATHA.

REVERSING VALVE FOR REGENERATIVE FURNACES, &c.

APPLICATION FILED OCT. 10, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

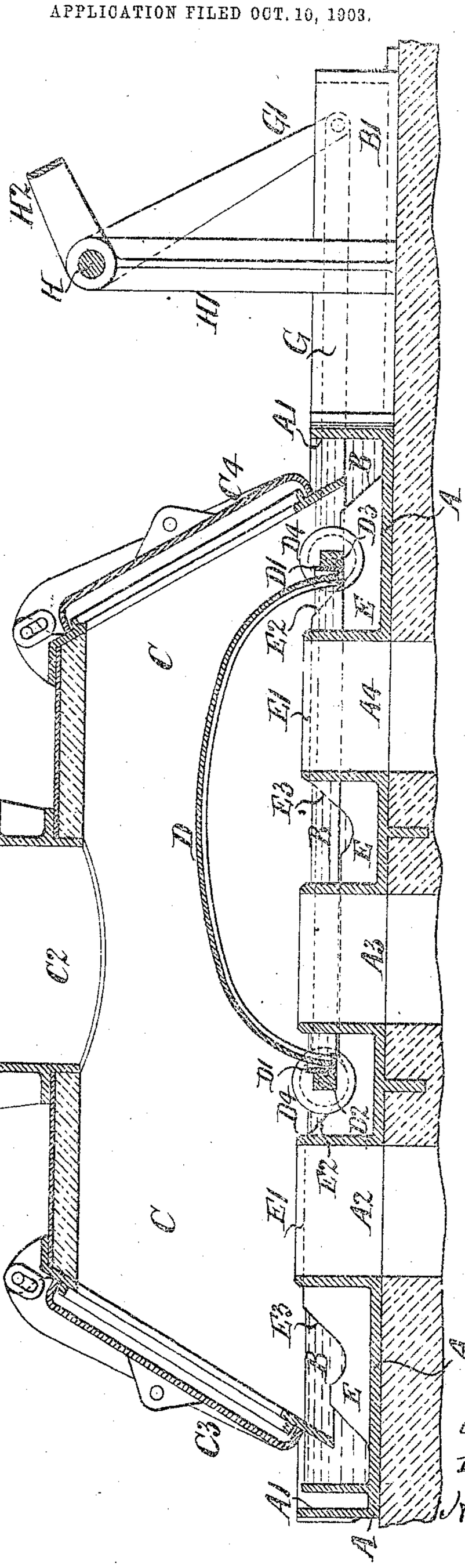

FIG. 1.

C2

WITNESSES:

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E. W. Collins

INVENTOR

Charles G. Atha

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3 SHEETS—SHEET 2.

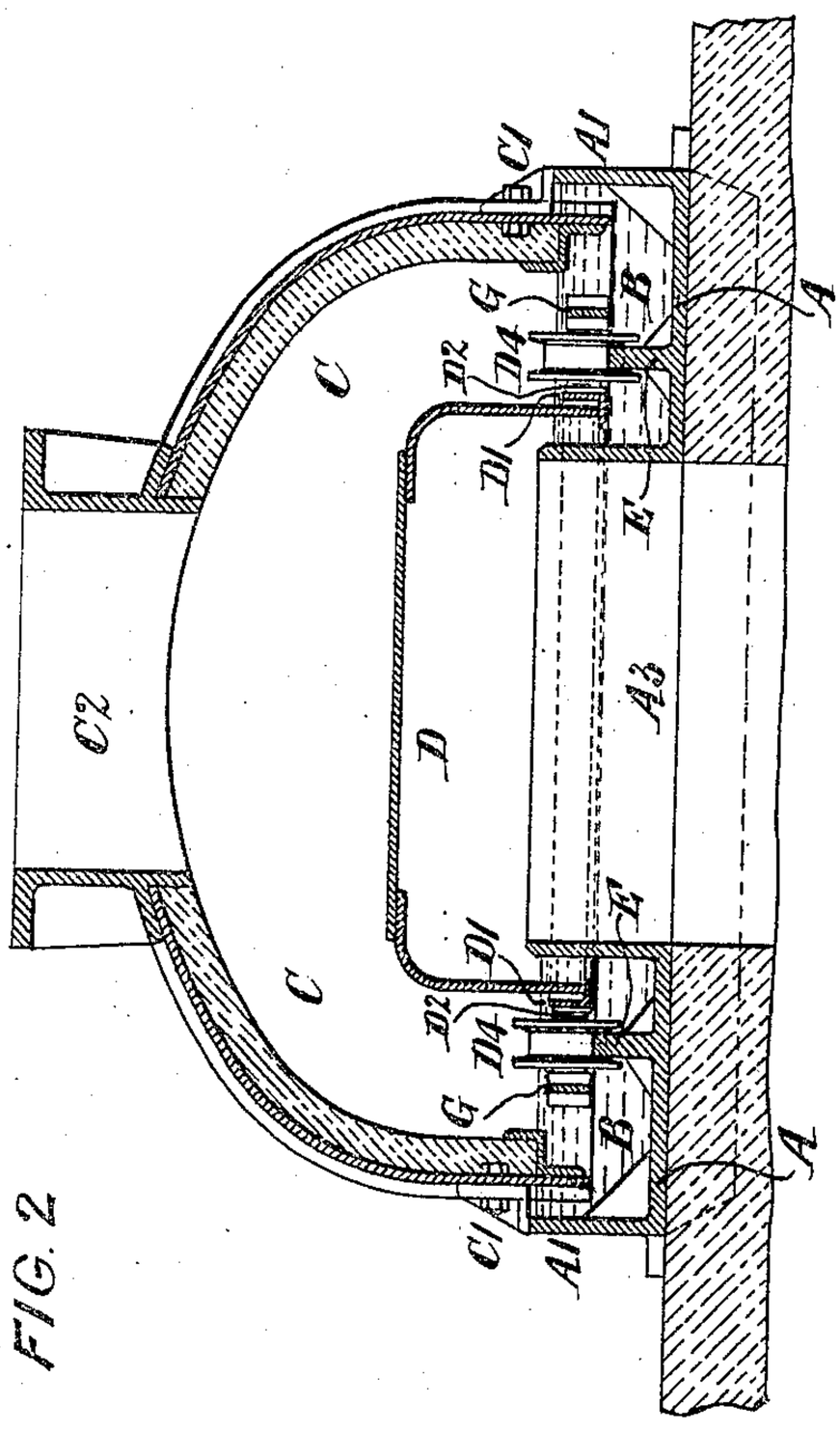

FIG. 2

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NO MODEL.

3 SHEETS—SHEET 3.

FIG. 4.

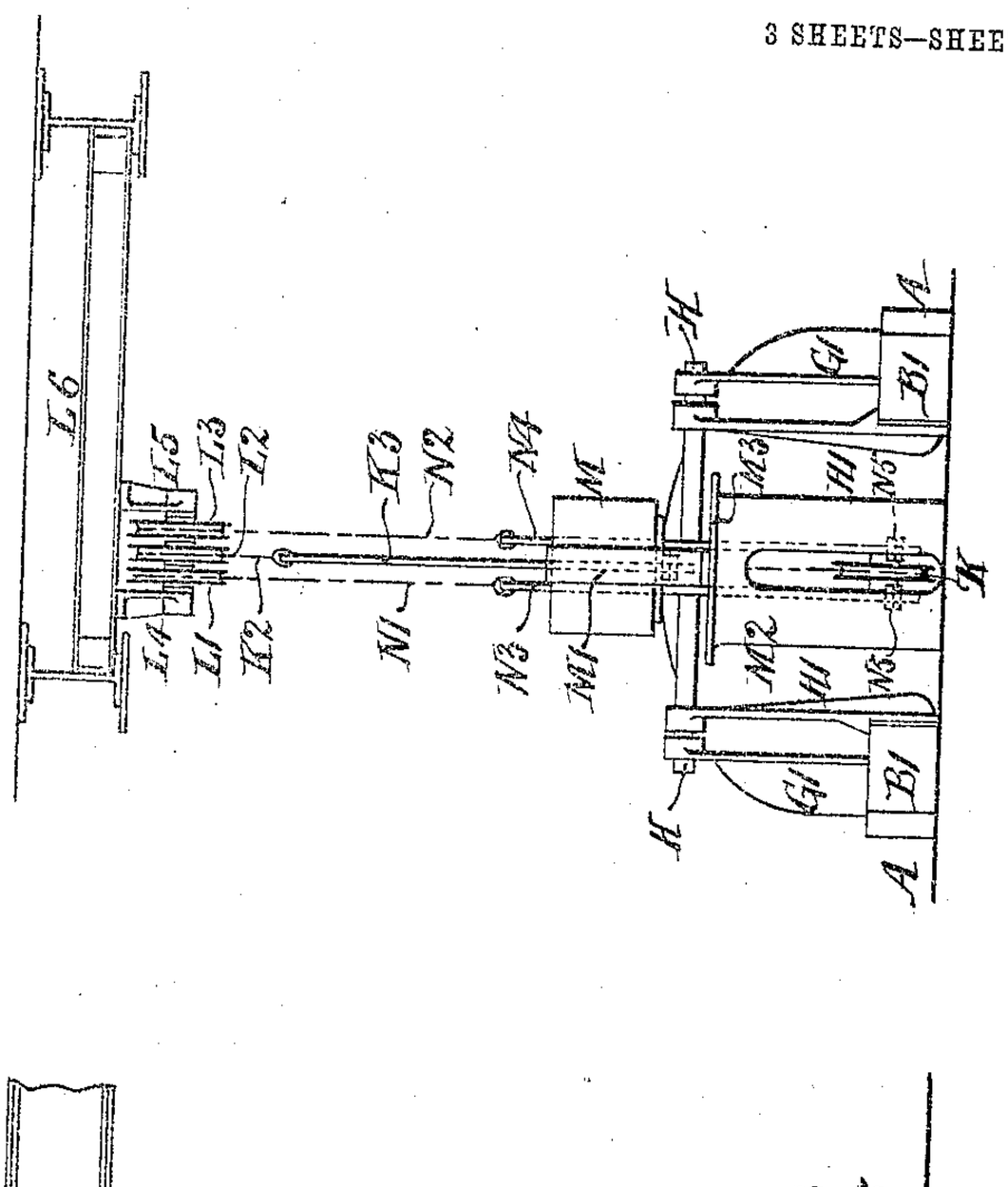
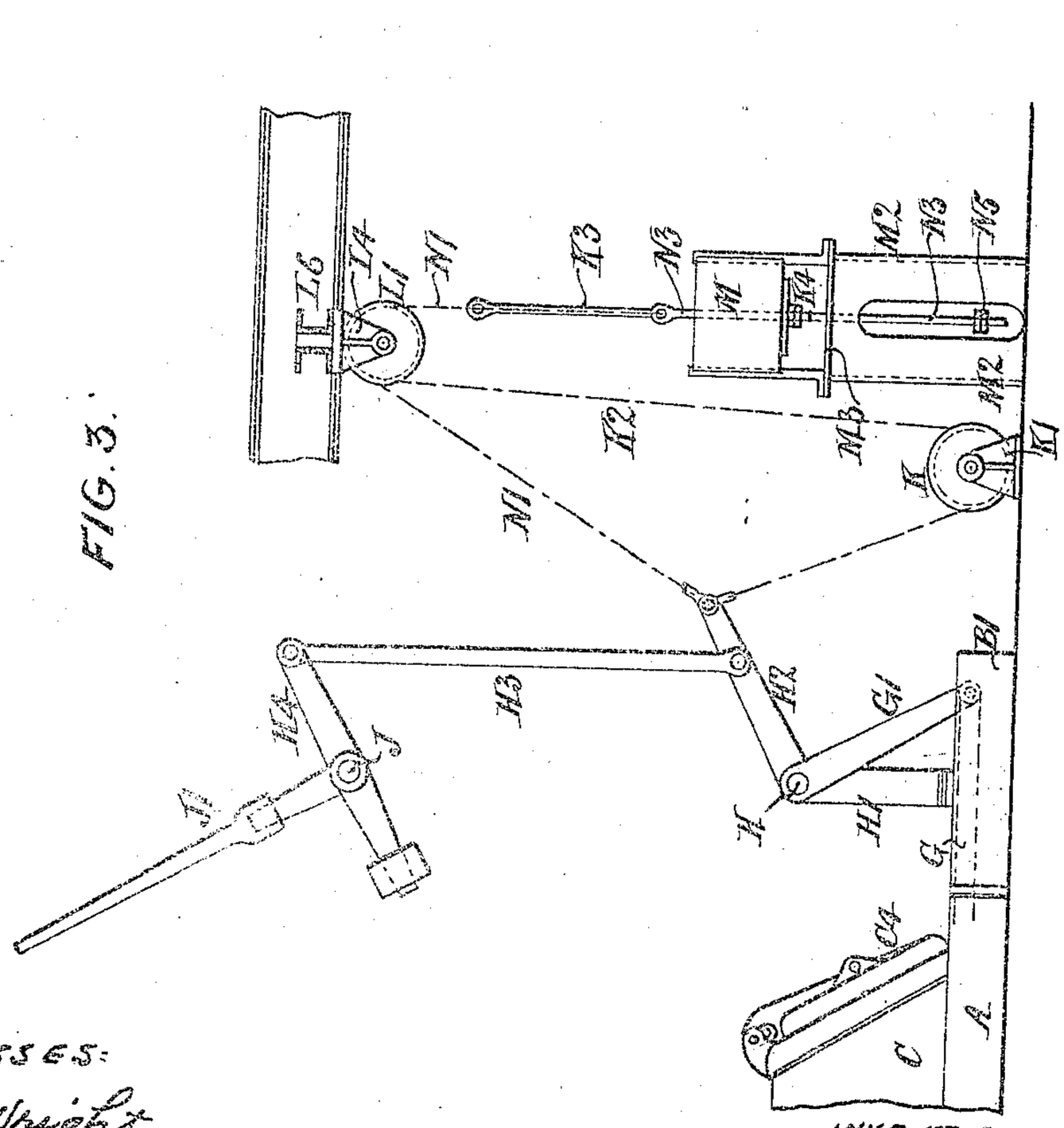


FIG. 3.



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No. 754,272. Patented March 8, 1904.

UNITED STATES PATENT OFFICE.

CHARLES G. ATHA, OF PARTICK, SCOTLAND, ASSIGNOR OF ONE-HALF TO WILLIAM BEARDMORE AND COMPANY, LIMITED, GLASGOW COUNTY, SCOTLAND.

REVERSING-VALVE FOR REGENERATIVE FURNACES, &c.

SPECIFICATION forming part of Letters Patent No. 754,272, dated March 8, 1904.

Application filed October 10 1903. Serial No. 176,521. (No model.)

To all whom it may concern:

Be it known that I, CHARLES GURNEY ATHA, a citizen of the United States of America, and a resident of Partick, in the county of Renfrew, Scotland, (whose postal address is Manhanset, Bishop's Road, Partick, Scotland,) have invented certain new and useful Improvements in and Connected with Reversing-Valves for Regenerative Furnaces and the Like, (for which application for a British patent has been made, No. 6,004, dated March 16, 1903,) of which the following is a specification.

The said invention relates to what are known as "water-sealed" reversing-valves for regenerative furnaces and other furnaces in connection with which it is necessary to be able to reverse the direction of flow of the gas or gas and air when desired; and the invention has for its object to improve and simplify the construction and operation of the carrying and operating mechanism of such valves so that they will be reliable and satisfactory in use.

The invention is illustrated by the accompanying drawings, which will be referred to in the course of the description, the same reference-letters being used throughout the said drawings to mark the same or like parts wherever they are repeated.

Figures 1 and 2 of the drawings are respectively a longitudinal and a transverse section of my improved reversing-valve arrangement. Figs. 3 and 4 are respectively a side elevation and an end elevation of mechanism employed in connection with the working of the reversing-valve.

In carrying out the invention there is provided the usual bed-plate A, having an upwardly-projecting rim A′ round it of a height sufficient to hold the desired depth of water B to form a seal for the valve, end extensions B′ being attached to the bed-plate on each side to allow for the working of certain link parts to be hereinafter described. This trough-shaped bed-plate A is formed with three ports A^2 A^3 A^4, suitably spaced from each other and having their top edges projecting a little above the level of the water seal B. The parts A^2 A^3 A^4 are arranged as ordinarily, the center one, A^3, being the discharge-port leading to the chimney, while the other two ports, A^2 A^4, which are on each side of the discharge-port, are those through which the gas passes alternately to the furnace. A brick-lined inlet-casing C is fitted, by means of side fixing-brackets C′, to the bed-plate A and is arranged to extend over the ports, its sides being kept some distance clear of the sides of the bed-plate, while its lower edges dip down into the water seal B. The gas or air inlet C^2 is formed on the casing C, and doors C^3 C^4 are arranged on its ends for the purpose of obtaining access to the interior. The valve for controlling the passage of the gas, as described, is a plate or hood D, of metal or other suitable material, somewhat arch-shaped and formed so as to cover the central port A^3 and one side port, as A^4, at one time, as shown in Fig. 1. According to the invention the valve D is carried on an angle-iron frame D′, fitted with two cross-axles D^2 D^3, furnished with wheels D^4, arranged to run on rails E, formed on or fixed to the floor of the bed-plate A along each side of the ports A^2 A^3 A^4, or the axles D^2 D^3 may be attached directly to the valve-hood D. When the valve D, as shown in Fig. 1, is covering the ports A^3 A^4, its lower edge dips all round into the water seal B, and thus prevents the possibility of leakage of the gas. The rails E are arranged with raised portions E′ at suitable points so as to lift the valve clear of the edges of the ports A^2 A^4 when it is being shifted from one position to the other.

The gear for operating the valve D is shown in Figs. 3 and 4 and is composed and arranged as follows: The front axle D^2 is connected by links G to levers G′, fixed to a cross-shaft H, mounted on fixed brackets H′. The cross-shaft H has fixed to it an intermediate lever H^2, connected by a rod H^3, Fig. 3, to a balanced lever H^4, fixed to a rocking shaft J, fitted with a handled operating-lever J′. Below the intermediate lever H^2 a rope pulley K is mounted on a bracket K″, fixed to the floor, and above the said lever three similar pulleys L′ L^2 L^3

are mounted on brackets L^4 L^5, fixed to a cross-beam L^6. A rope K^2 is carried down from the end of the intermediate lever H^2 and led round the under side of the lower pulley K and then carried up and round the upper central pulley L^2, from which it is then led down and attached to a vertical rod K^3, which passes down through an opening formed for it in the center of a balance-weight M, arranged to rise and fall between vertical guide parts M′, fixed to a stool or seat M^2, through the top M^3 of which an opening is also made for the passage of the rod, the lower end of the said rod being fitted with an adjustable stop K^4. Two ropes N′ N^2 are also attached to the end of the intermediate lever H^2 and are carried up and led round the two remaining upper pulleys L′ L^3 and attached to vertical rods N^3 N^4, passing down through openings formed for them in the balance-weight M and in the top M^3 of the stool M^2, the rods being also provided with adjustable stops N^5.

When the parts are in action and in the position, for example, which is shown in the drawings, the gases entering through the inlet C^2 to the interior of the casing C pass to the furnace through the port A^2 not covered by the valve D, while at the same time the gases from the furnace pass out through the port A^4 and then through the central discharge-port A^3 to the chimney. When it is desired to reverse the direction of the flow of the gas, the valve D is moved to the other end of the casing C by working the operating-lever J′, connected, as has been described, with the axle part D^2 of the valve. This shifting of the valve D will thus cover the left-hand port A^2 and uncover the right-hand one, A^4, as required. During the first part of the change movement of the valve D—say toward the left—its wheels D^4 encounter and ride up sloping parts E^2, leading up to the higher level portions E′ of the rails E. This will lift the valve D out of the water seal B and above the level of the ports, as required, and the raised level portions E′ of the rails E, as shown in Fig. 1, are made long enough so that the valve will be kept in this raised position until it has almost reached its other position, when the wheels will pass down other similar sloping parts E^3 to the lower level of the rails, and the valve will then be brought to the end of its travel or to its other sealing position. When the valve D is returned again to its right-hand position, the action or function of the sloping parts E^2 E^3 is simply reversed, the sloping part E^3 now contributing to raise the valve and the part E^2 to lower it on nearing the end of its travel.

The weight-and-pulley gear is arranged for balancing purposes and acts as follows: The central and side rods K^3 N^3 N^4, passing down through the balance-weight M, by reason of their special connection with the intermediate lever H^2 rise and fall alternately during each to-and-fro movement of the valve D, so that while the central rod K^3 is in its highest position, as shown in Fig. 3, the side rods N^3 N^4 are in their lowest. The weight M during its up-and-down movement always rests on either the central or the side adjusting-stops K^4 or N^5, and in the present position of the parts, as shown in Fig. 1, it is resting on the stop K^4 on the central rod K^3, the distance between this stop and the stops N^5 on the other rods, N^3 N^4, being now equal to the stroke of the rods or the travel of the outer end of the intermediate lever H^2. With this arrangement it follows that during the first portion of the travel of the valve D toward the left in Fig. 1—that is, when the wheels are ascending the sloping parts E^2 of the rails E—the balance-weight M will fall till it rests on the top M^3 of the stool M^2, owing to the downward movement of the intermediate lever H^2 producing a falling movement on the central rod K^3. During the travel of the valve D on the raised portion E′ of the rails the weight M continues to rest on the stool M^2, and during the last similar sloping portion E^3 of the valve's travel the weight will be pulled up again to its former position by reason of it encountering the stops N^5 on the other rods, N^3 N^4, which are then completing the last part of their upstroke, being drawn up by the pull of their rope attachments N′ N^2. The movement of the balance-weight M is precisely similar when the valve D is reversed, the side rods N^3 N^4 on this occasion traveling downward, while the central rod K^3 is pulled up again to its former position. By this means a most efficient balancing arrangement is thus produced, as the weight M in falling from its highest position to the top M^3 of the stool M′ assists the wheeling of the valve D up the sloping parts E^2 or E^3 of the rails E while in rising from the stool to its former or highest position it breaks the valve's movement when the valve-wheels are passing down the slopes of the rails toward the end of the valve's travel. All undue strain in working the valve-operating lever J′ is thus avoided and the valve can be moved from one position to the other with comparative ease and without any jarring action being set up.

If desired, the axles D^2 D^3, carrying the wheels D^4, may be extended to the outside of the casing C and bed-plate A, being suitably cranked to pass underneath the sides of the casing and also over the rim A′ of the bed-plate. The wheels D^4 in this case would run on rails arranged along the outside of the casing at each side, or the frame D′, carrying the valve-hood D, may be made to extend underneath the ends of the casing C, so that the wheels D^4 will run on rails constructed as hereinbefore described, but extending beyond each end of the casing instead of along each side of it.

What I claim as my invention is—

1. Improvements in and connected with reversing-valves, comprising, in combination, a

water-seal bed-plate, ports therein, a stationary casing fitted thereto, rails formed with level and sloping portions, a frame having wheels adapted to run on the rails, a reversing-valve detachably fixed to the frame and working over the ports, an operating-shaft outside the casing, and means for operating the frame and valve from such shaft, as described.

2. Improvements in and connected with reversing-valves, comprising, in combination, a trough-shaped water-seal bed-plate, ports formed in the floor thereof, a stationary casing fitted thereto and having its lower edge dipping into the seal, an inlet in the casing, rails formed on the floor of the bed-plate along each side of the ports, and having level and sloping portions, a frame working over the ports, axles in the frame, wheels carried on the axles and running on the rails, links attached to the axles and normally below the level of the seal, a reversing-valve detachably fixed to the frame, and a shaft external to the casing for operating the frame and valve through the links, as described.

3. Improvements in and connected with reversing-valves comprising in combination, a water-seal bed-plate, ports formed therein, an inlet-casing fitted to the bed-plate, a reversing-valve controlling the ports, wheels on the valve, rails on which the wheels travel and made with level and sloping portions, a handled operating-lever connected to the valve and to two sets of vertical rods fitted with adjustable stops, a balance-weight on the rods and a fixed stool for same, substantially as and for the purposes herein set forth.

4. In connection with a reversing-valve traveling on rails formed with level and sloping parts, an operating-lever, two sets of vertical rods fitted with adjustable stops, connections between the valve and the lever and between the lever and the rods, a balance-weight on the rods, a fixed stool for same, the balance-weight resting on the stool and being lifted thereoff alternately by each respective set of stops, substantially as and for the purposes herein set forth.

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

CHARLES G. ATHA.

Witnesses:
DAVID FERGUSON,
GEORGE PATTERSON.