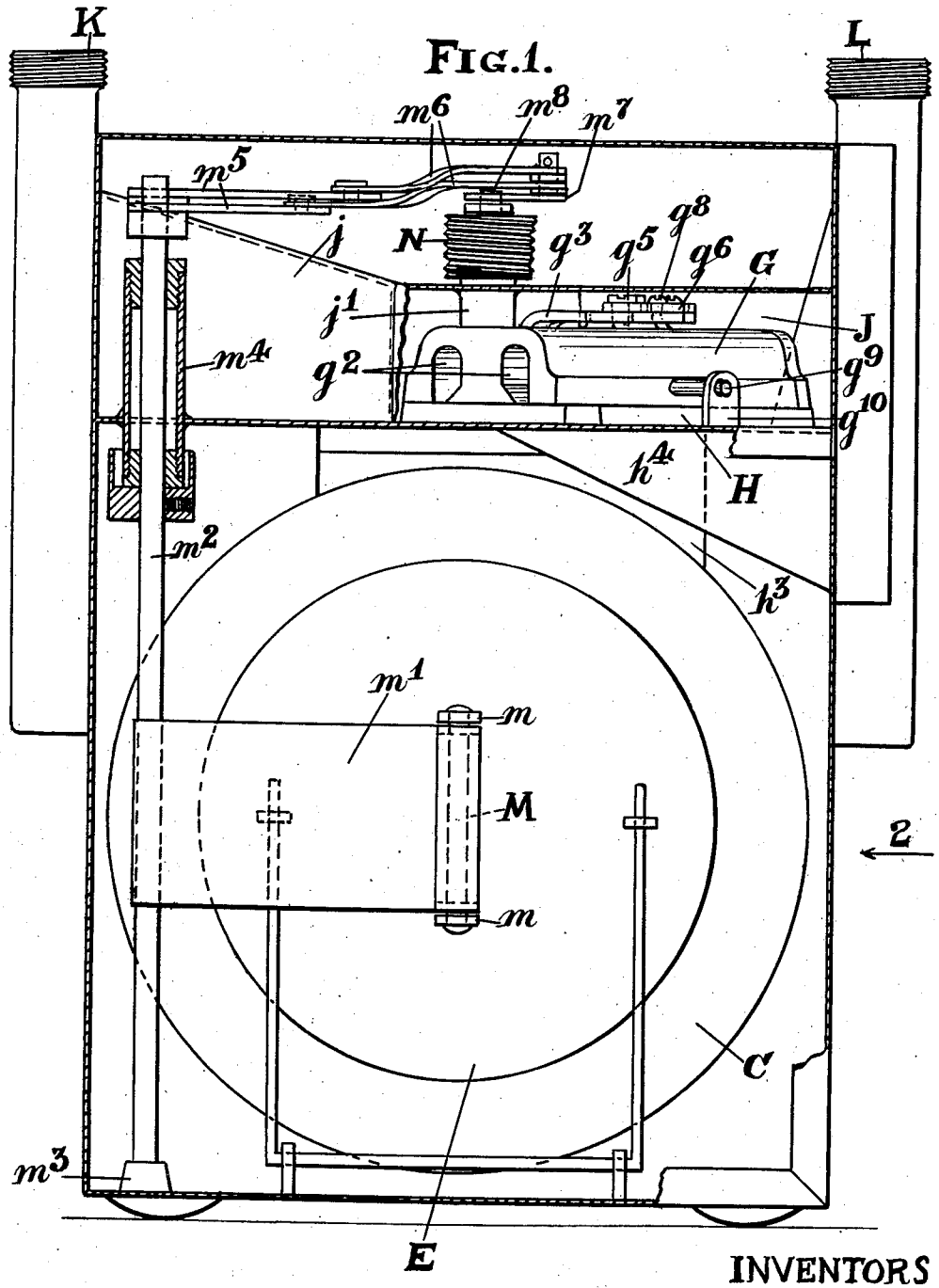
Dec. 3, 1940. J. DERBYSHIRE ET AL 2,223,555

GAS METER

Filed May 12, 1939 3 Sheets-Sheet 1

FIG. 1.



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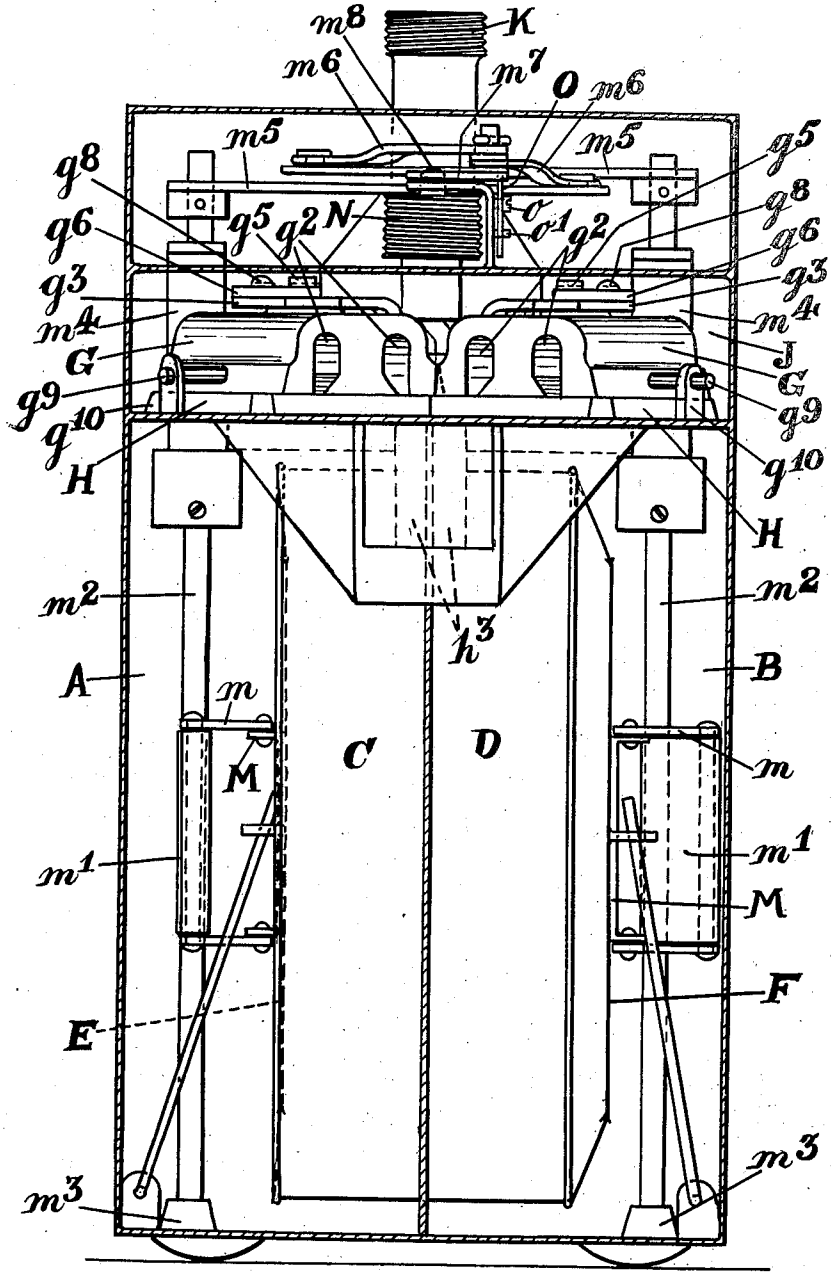
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GAS METER

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FIG. 2.



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GAS METER

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FIG. 3.

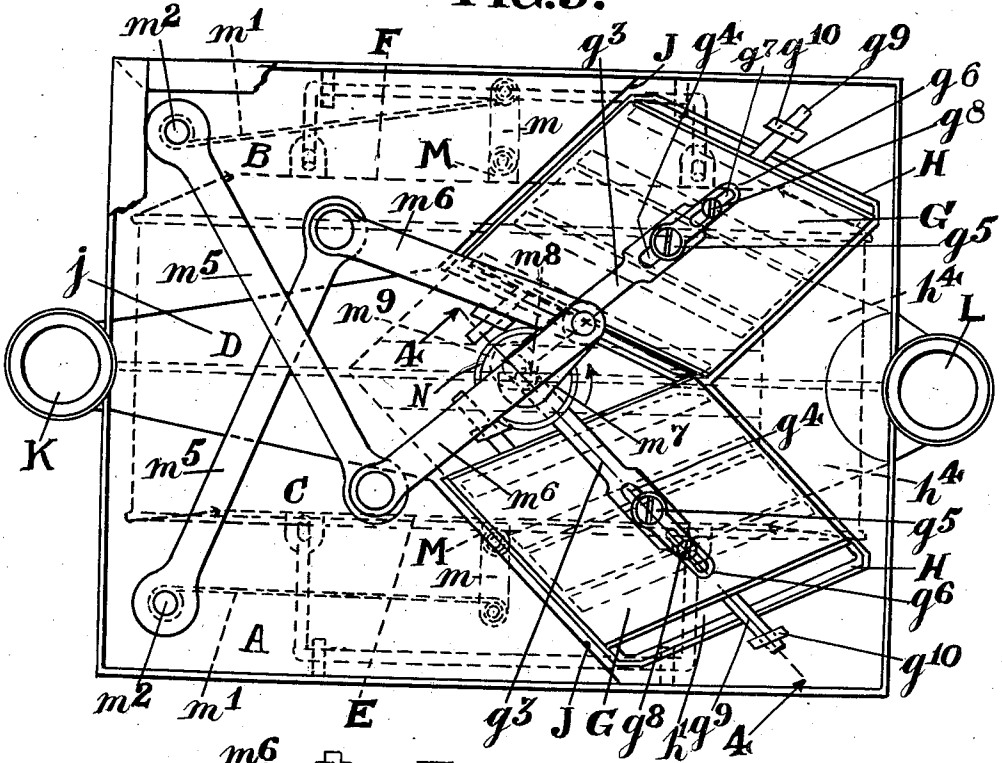
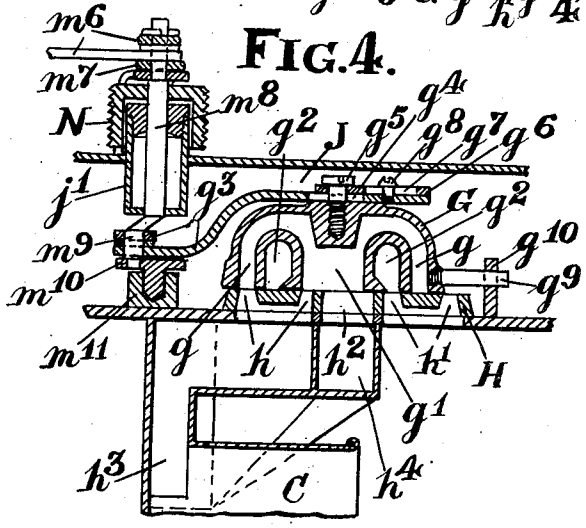


FIG. 4.



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UNITED STATES PATENT OFFICE

2,223,555

GAS METER

Jim Derbyshire, Nelson, and Walter Edward Fishwick, Brierfield, England

Application May 12, 1939, Serial No. 273,318
In Great Britain May 18, 1938

1 Claim. (Cl. 73—263)

This invention relates to a gas meter of the diaphragm type having four chambers controlled by two diaphragms actuated by the flow of the gas to operate two slide valves for controlling the flow of gas. Hitherto gas meters of this type have employed the ordinary single ported slide valve. The present invention has for its chief object to introduce an improved valve arrangement which will pass a greater quantity of gas per hour in a meter having a case of a given size and thereby increase the range of the meter. For example it would enable a meter case that is ordinarily provided for a 100 cubic feet per hour to be used for at least 200 cubic feet per hour, with the result that the present number of variety of case sizes is not necessary.

According to this invention each of the slide valves is made double ported or multi-ported and works in conjunction with a valve seating having a number of ports on each side of a centrally disposed exhaust port. Each valve is formed with a large port area which counterbalances to a considerable extent the external pressure on the valve and may have half the usual travel for the given output, thereby reducing wear and friction, increased output being obtained by increasing the width of the ports and so giving a greater port opening or area for any given travel of the valves. The reason why the ports may have greater area although the valve has only half the usual travel is that with the ordinary slide valve for use with a grid or valve seating having a port at each side of a central exhaust port it is necessary that the valve should travel the length of the outer ports on each side of the centre port to give the full opening for the gas. With the double ported valve for use with a grid having two ports at each side of the centre port the same port area can be obtained by moving the valve half the distance. Owing to this reduction in the movement of the valve it is possible without altering the size of the meter casing to employ a grid and valve in which the ports are made wider and without the valve fouling the casing or any other part of the meter during its movements. The word "wider" is used herein to describe the major dimension of the ports. Each valve may receive a rectilinear reciprocating movement by connections from the diaphragms, and in the case of a prepayment meter, a similar valve may be operated by the coin mechanism. Each valve is pivotally connected to an arm, the pivoted connection being adjustable to enable a more accurate setting of the valves to be obtained.

In the accompanying drawings—

Fig. 1 is an elevation of an ordinary dry gas meter with front panel, index and index drive removed and fitted with adjustably mounted multi-ported valves, and stuffing box in accordance with this invention.

Fig. 2 is an end view looking in the direction of the arrow 2 in Fig. 1 with side plate and outlet tube removed.

Fig. 3 is a plan of the meter with the meter cover, valve box cover, index and index drive removed showing the slide valves and gear, and

Fig. 4 is a section taken on line 4—4 of Fig. 3.

A, B, C and D indicate the four chambers, E and F the two diaphragms G the slide valves and H the slide valve seatings.

Each of the slide valves G is formed with two inlet ports g arranged parallel with one another and leading inwardly to a central exhaust port g^1. Each valve seating H comprises a grid like structure having a pair of ports h, h^1 at opposite sides of a central exhaust port h^2. Each slide valve is also formed with an internal passage g^2 that is open at each end and in open communication with the valve chamber J to which gas is supplied from an inlet K and along a passage j leading from the inlet K to the valve chamber J. The ports h in the valve seating H communicate with the chambers C and D through throats h^3 and the ports h^1 in the valve seating open directly into the chambers A and B. The exhaust port h^2 in each valve seating H communicates through a passage h^4 with a centrally disposed outlet L. In the construction shown the two slide valves are arranged in V fashion and each valve receives a rectilinear reciprocating movement from the diaphragms E, F as gas is being used. For this purpose each diaphragm has attached to it a bracket M connected by links m to arms m^1 rigidly fixed to rods m^2. These rods are supported by footstep bearings m^3 and pass through stuffing boxes m^4 fixed in a partition that separates the diaphragm chambers from the valve chamber. The upper end of each rod m^2 has attached to it an arm m^5 that is connected by a link m^6 to a crank arm m^7 on a centre shaft m^8. This shaft passes through a stuffing box j^1 Fig. 4 fixed in the top of the valve chamber J and carries a worm N for driving the indexing mechanism, not shown. The lower end of the centre shaft m^8 is cranked at m^9 to form a crank pin which passes through one end of each of the valve arms g^3 and is then reduced in diameter to enter a hole in a disc m^{10} which is rotatably supported in a bearing m^{11}. The other end of each of the valve arms g^3 is slotted at g^4 to receive a

screw g^5 that passes through a plate g^6 and is screwed into the valve. The plate g^6 is formed with a slot g^7 for a screw g^8 by which it is adjustably secured to the valve arm g^3. This construction enables the pivotal point of the valve to be adjusted in relation to the crank pin. Each valve is guided in its movement by means of two rods g^9 that are fixed to the valve and passes through stationary guides g^{10}. To ensure that the centre shaft m^8 rotates in an anti-clockwise direction as shown by the arrow in Fig. 3 the crank arm m^7 Fig. 2 is arranged to travel past the upper end of a lever O that is pivoted at o and turn such lever, movement of the latter in the opposite direction by the crank arm m^7 being prevented by a stop o^1.

With a view to improving the working efficiency of the meter the stuffing boxes m^4 are made extra long and double ended so that stuffing can be done from either end. The worm N is formed with a hollow centre for the reception of an extra deep stuffing box j^1. The initial pressure instead of acting on the whole area of the valve in a direction to force it hard on to the valve seating and increase friction is eased by the initial gas passing along the passages g^2 thus giving a counterbalancing effect and reducing friction and wear.

By constructing gas meters in the manner described they are cheaper to produce in relation to their gas output, greater flexibility of supply of gas with accuracy is obtained, less wear and quieter running of the working parts takes place thereby giving the gas meter a longer life. These benefits are achieved in my construction by reason of the fact that when a meter having a case of a given size is constructed, the maximum size of grid and valve that can be used in such case is placed therein. When not operating to capacity, there is less movement of the parts and hence less wear and less danger of inaccuracies due to wear. Increased accuracy and less wear is obtained also by the relatively shorter travel of the valve than in conventional valve structures. The longer stroke of such conventional valve structures, I have found, cause the valve to rock on the grid and produce a rounded surface on the latter which results in leakage and inaccuracies. As stated, earlier, my construction permits a single size of grid and valve to pass substantially twice as much gas as similar sized meters, hence the greater flexibility.

What we claim as our invention and desire to secure by Letters Patent in the United States is:

In a gas meter of the kind described, a valve chamber, a plurality of multi-ported slide valves situated therein, diaphragms actuated by the flow of gas to operate said slide valves, mechanism connected with said diaphragms and slide valves to actuate the latter, each slide valve having a central exhaust port and an inner port and an outer port at opposite sides of said central exhaust port, each outer port being closed at the ends and in open communication with said exhaust port and each inner port being open at the ends and closed to said exhaust port, valve seatings each comprising a grid-like structure having a central port and an inner port and an outer port at each side of said central port, said ports of said valves and seatings being arranged so that an outer port of each valve at one side of said exhaust port thereof is adapted to be sealed by said grid in one position of each valve while the inner and outer grid ports at that side of each central grid port are both open to the passage of gas from said valve chamber to the meter, while said inner port of each valve at the other side of said exhaust port thereof is sealed by said grid while said inner and outer grid ports at the latter side of each central grid port are both open to the passage of gas from the meter to said central exhaust port in each slide valve.

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