C. E. HIBBERD.

GAS METER.

APPLICATION FILED APR. 2, 1910.

1,039,942.

Patented Oct. 1, 1912.

4 SHEETS—SHEET 1.

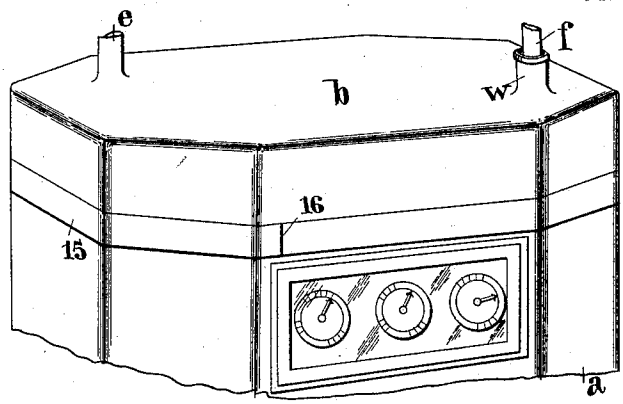

Fig. 1.

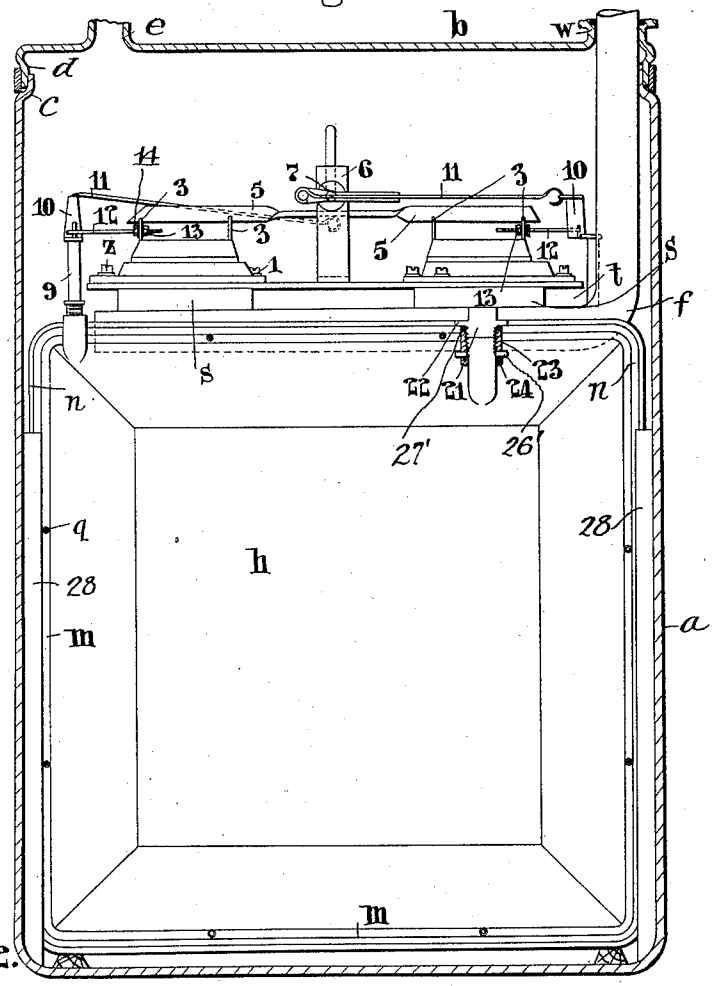

Fig. 2.

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A. L. Peterson

Inventor

Charles Edwin Hibberd

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his Attorneys

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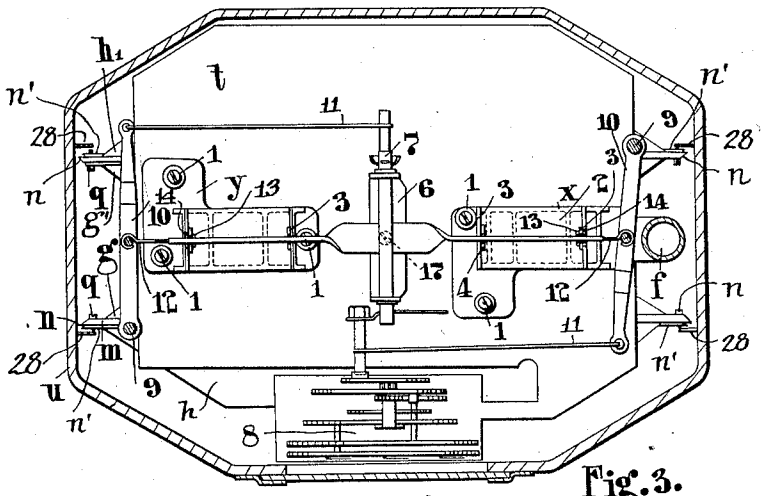

Fig. 3.

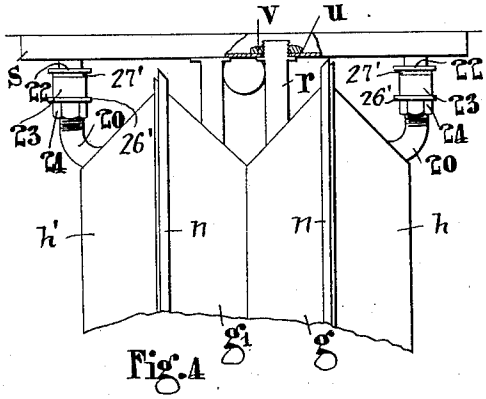

Fig. 4.

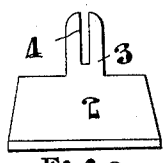

Fig. 8.

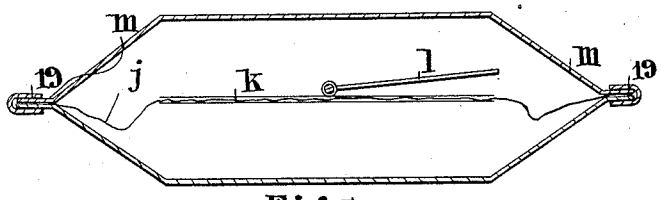

Fig. 5.

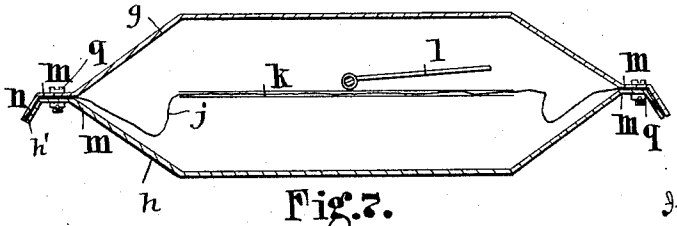

Fig. 7.

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4 SHEETS—SHEET 3.

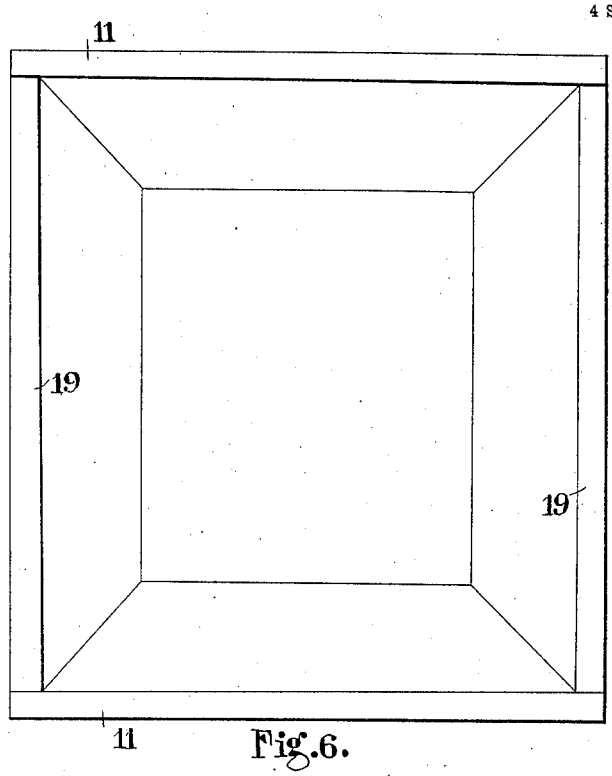

Fig. 6.

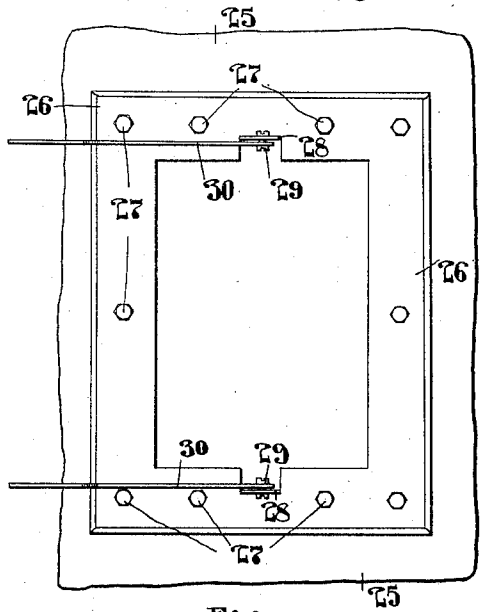

Fig. 9.

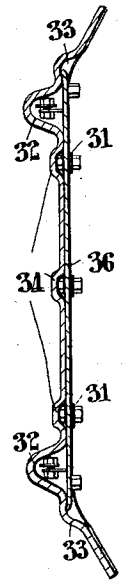

Fig. 10.

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4 SHEETS—SHEET 4.

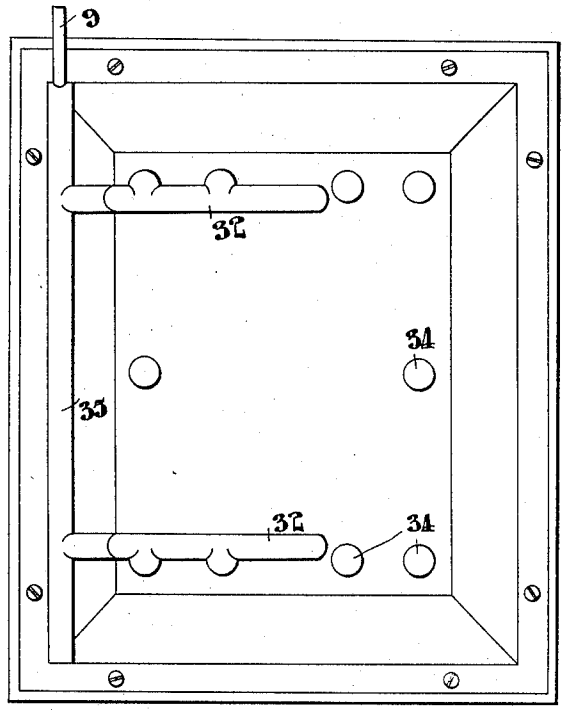

Fig. 11.

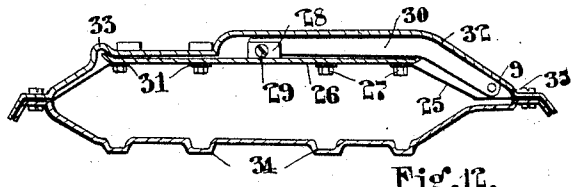

Fig. 12.

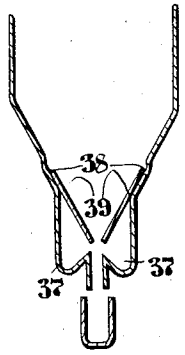

Fig. 13.

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UNITED STATES PATENT OFFICE.

CHARLES E. HIBBERD, OF WESTMINSTER, LONDON, ENGLAND.

GAS-METER.

1,039,942. Specification of Letters Patent. Patented Oct. 1, 1912.

Application filed April 2, 1910. Serial No. 553,101.

To all whom it may concern:

Be it known that I, CHARLES EDWIN HIBBERD, a subject of the King of Great Britain and Ireland, and residing at 28 Victoria Mansions, Victoria street, Westminster, in the county of London, England, have invented certain new and useful Improvements in and Relating to Gas-Meters, of which the following is a specification.

This invention relates to dry gas meters and has for its object to provide means for rendering the parts of the mechanism (such as the valves and the diaphragms) readily accessible for the purposes of inspection or repair, correct reassembly being nevertheless insured, and improved means for insuring accuracy.

This invention has for its object more particularly to remove the difficulties which are found in existing meters in obtaining access to the diaphragms without loss of time and the provision of special tools, in replacing corroded or otherwise faulty valve seats without disconnecting the valve gear and in insuring accurate registration of the valves and their seats. Further in dry meters having slide valves, on account of the shortness of the valves proportionately to their width, it is essential to insure accurate registration of the valves with their seats throughout their travel. This is adequately insured by the guiding means provided according to the present invention.

In dry gas meters of the type referred to, it is usual to mount slide mechanism in the casing above the measuring devices and the plate bearing the same is fixed to and forms part of the gas meter casing. Under these conditions the replacement of a valve seat or any repair to such parts necessitates the unsoldering of the entire valve apparatus. It has been proposed heretofore to minimize this disadvantage by mounting the valve seats upon a detachable base plate which is made removable from the rest of the apparatus. Even under these conditions it is necessary in order to remove the valve gear to uncouple the whole of the crank connecting rods and the slide valve rods from the vane rods and then further to unscrew the two or more screws connecting the plate to the rest of the meter. According to the present invention however the valve seats are rendered independently accessible. It is only necessary to remove that one which it is desired to repair or to replace and none of the moving parts is disturbed in such a way as to render adjustment necessary on reassembly.

In meters in which a measuring chamber is provided with a central membrane which reciprocates between two walls of the same, the said membrane being connected to means which operate the valves, and counting train mechanism, it has been usual to provide at the center of the membrane a metal disk, to which the membrane is fixed, or between which it is clamped, this disk being in some cases rounded in order to avoid puckerings and foldings of the membrane around its periphery, and the walls being suitably shaped, in order that the membrane, when in its extreme position, may lie closely against the wall.

This invention has also for its object to provide improved devices of this kind.

The invention consists in mounting the valve seats upon the plate supporting the valve mechanism to be readily detachable therefrom and so disposing the valves and their moving parts in relation to the plate that it is at most only necessary in order to remove one valve seat from the meter to disconnect the valve from its rod.

This invention further consists in forming each gas meter measuring chamber of a fixed wall and a detachable wall between the edges of which the diaphragm is clamped each provided with a flange around its periphery, which flanges co-act tightly to close the chamber and which may further be provided at intervals with registering perforations or the like through which clamping devices pass or with any other suitable clamping means.

This invention also consists in providing a gas connection to the measuring chamber of the kind having a detachable wall consisting of a screw coupling connecting gas pipes leading to the gas distributing devices and to the chamber respectively, the screw sleeve abutting when in position upon a collar or the like at one end, a washer or the like being provided if desired between the sleeve and the collar and a lock nut adapted to abut upon the opposite end of the sleeve, a washer or the like being also provided if desired, between this sleeve and the lock nut.

This invention also consists in a gas meter

measuring chamber of the nature referred to, wherein the membrane is attached to a central frame-like element, by readily detachable means, in such a manner that detrimental folds or the like are avoided.

This invention also consists in the use in gas meter measuring chambers of a frame-like vane element, connected to the mechanism, and attached to the membrane by readily detachable means, in such a manner that folds and creases in the membrane are not produced.

This invention also consists in the use in gas meter measuring chambers of the nature referred to of a frame-like vane element, to which the membrane is attached by a plurality of screws, nuts, lead rivets or like readily detachable means, disposed upon the side or face elements of the frame, the frame being suitably connected by crank or like means to the operating and registering mechanisms.

This invention also further consists in a gas meter measuring chamber, provided with means whereby condensed products within the chamber may be allowed to collect without affecting the accuracy of the same, as by providing a receptacle into which the same may flow, and means whereby the collection of the same may be prevented from affecting the stroke of the membrane.

This invention also consists in the improvements in gas meters hereinafter described.

The accompanying drawings diagrammatically indicate in Figure 1 an external perspective view of the upper portion of the meter in one form, in Figs. 2 and 3 respectively in front sectional elevation and in horizontal section, a meter of this kind; the former with the counting train removed; in Fig. 4 details of a connection of the drum gas ducts with the valve ducts; in Figs. 5 and 6 in sectional plan and in elevation respectively, a modified form of drum according to this invention; in Fig. 7 an enlarged horizontal sectional view of a drum of the nature shown in Figs. 2 and 3; and in Fig. 8 a detail view of a form of valve according to this invention. Fig. 9 shows in elevation one form of the vane-like element referred to; Fig. 10 indicates a side sectional elevation through part of the measuring drum, provided with such an element; Fig. 11 shows an outside view of a measuring drum, similarly provided; Fig. 12 a sectional plan through the same; and Fig. 13 shows in sectional elevation a means for collecting the condensed meter liquor.

In the form shown in Figs. 1 to 4 in which figures are shown only such parts as are necessary for the purposes of the ensuing description, the mechanism and measuring devices are inclosed in a casing formed of two main parts, the inclosing portion, *a*, and the lid portion, *b*. The inclosing portion may be reduced in diameter at its upper part, as shown at, *c*, and co-acting with this reduced portion is a lid flanged as at *d*, bearing for example an inlet pipe, *e*, and an orifice *w* for the passage of the outlet pipe, *f*. The mechanism and measuring devices are shown formed as an entity and are made readily removable from the inclosing casing, *a*, as by simply lifting, while suitable guiding or alining means 28 are provided. The measuring devices consist of two flattened chambers placed side by side, and formed each of two parts, an inner wall *g*, or *g'*, (which inner walls are rigidly connected together and with the valve gallery), and an outer wall, *h* or *h'*. Between the inner and outer walls are the membranes, *j*, Figs. 5 and 7, which carry the mechanism operating means, *k*, *l*, and which are clamped around the edges between flat portions, *m*, of each wall, and affixed thereto. The chamber is hermetically closed by the co-action of the flanges, *n*, *n'*, which may be coned as shown and the flattened portions, *m*, clamping the membrane between them. The walls, *h h'* and *g g'*, are further clamped as by screws, *q*.

The fixed walls, *g g'*, of the measuring chambers are provided with gas ducts, *r*, which pass into the gas channels, *s*, beneath the valve gallery, *t*. They are connected thereto as by flanges, *u*, upon them which are brought firmly to bear upon the walls of the channels by nuts, *v*, co-acting with screw threads formed upon the upper extremities of the ducts, *r*. Connected with the gas channels, *s*, is the gas outlet pipe, *f*, which when the meter is assembled emerges from the lid, *b*, through the orifice which may be flanged and cupped as indicated at *w*, for sealing by soldering.

The valve gallery, *t*, is provided with ports indicated in dotted lines at, *x*, Fig. 3, and valve seats, *y*, are fixed over these as by screws, *z*, passing through lugs upon them. It is preferable to place fine leaden or similar washers, 1, between the valve seat lugs and the screw heads when screwing down, as these in the event of the lugs being distorted allow of the firm tight seating of the valve seat, *y*. Traversing each valve seat is a valve, 2, of usual type which carries upon it two upstanding lugs, 3, slotted at 4, which co-act with the guide rail, 5, fixed to the standard 6, bearing the axle, 7, connecting the mechanism of the valves and to the counting train indicated at 8.

Each membrane, *j*, in the measuring chambers is connected to a rod, as 9, which carries and swings an arm as 10, about its axis. To this arm is connected the crank rod, 11, and the connecting rod, 12. The latter is screw-threaded at its extremity and

is by two nuts, 13, 14, held in connection with the valve, 2, and operates the same.

The casing lid, *b*, is fixed to the main casing *a*, by a band of metal, 15, placed in the groove formed where the lid is placed upon the main casing and is soldered thereto and therein, its ends overlapping as at 16.

The steps necessary to the complete dismantling of the meter described will now be indicated.

The end of the metal band, 15, is raised and by suitable pulling force in the direction of its length the whole of it may be stripped off. The gas outlet pipe, *f*, is disconnected from the lid, *e. g.*, by removing the solder, and the lid, *b*, is then lifted off and the whole interior of the meter may then be lifted out. If a valve is to be removed for any purpose, it is only necessary to slacken the guide rail screw, 17, (Fig. 3) to raise the guide rail 5, clear from the valve lug slots, 4, when the valve, 2, and connecting rod, 12, may be swung clear, and immediately the valve 2, is clear of the seat *y*, the connecting rod, 12, can be lifted from the slot, 4, and the valve, 2, is free.

If a valve seat, *y*, is to be removed the screws *z*, are taken out, and by sliding the valve seat, *y* sidewise, after some slight slackening of the guide rail, 5 if necessary, the same may be removed.

If it is desired to inspect or repair the diaphragm, *j*, the clamping screws and nuts, *q*, are removed, and access is readily obtained by simply lifting away of the side wall member, *h*, or *h'*.

The construction described for allowing the ready removal of the valve seats is merely described by way of example, and may be materially varied as regards the clamping means or form of valve seat adopted to insure the proper positioning of the valve, while yet allowing of ready detachment, the present invention residing in the provision in any gas meter which has valves operated by linkages and rods, of valve seats which may be removed from the ported plate or supporting element to which they are fixed without the disturbance or unshipping of any links, rods or other mechanism, and consequent entailment of setting and readjustment after such removal.

Where space is limited and does not permit of removal of the valve seat, *y*, by sliding it from under the valve, 2, the guiding device may be slackened sufficiently or removed to allow swinging the valve in such a way as to provide room for the removal of the seat.

As regards the guiding of the valves positively upon the seats, which is necessary in order to obtain the most accurate registration owing to the radial movement which is imparted to the valves by the swinging arm in meters of the type referred to; the constructions for effecting this may also vary considerably. It will be understood that the essential elements consist of a guide and means coacting therewith one element being carried on the valve and the other on a fixed part the structure being such that the removal of the valve is not hindered thereby.

It is preferable to construct the measuring drums of two parts in the general form indicated, namely a fixed part and a removable part bearing the same relation to each other as a box and its lid and coacting by a flange or flanges *e. g.* the flange of the lid member coacting with the box member which may be of any form as such constructions lend themselves readily to manufacture by spinning or stamping. The chambers may be conveniently formed in any desired shape and will preferably be rounded at their meeting edges as shown in Fig. 2. Further advantages of this construction are that the membrane acts as a washer and gives a gas tight joint without necessitating other packing or sealing means particularly in the case where the flanges are somewhat inclined to each other that is, are at slightly different angles to the principal plane of the drum. Nevertheless it may be convenient to construct the chamber without inclined flanges as indicated in Figs. 5 and 6 the membrane still acting as a washer the clamping means however consisting here of four U-shaped strips 19 placed around the edges and merely fixed at certain points as by soldering their junctions. In all these forms it is preferable in order to obtain the full advantage of the improved construction to arrange the gas duct 20 which leads into the half of the chamber formed by the detachable wall *h* or *h'* so as to be readily disconnected from the gas distributing channel *s* and this may be effected in one way by arranging the gas duct 20 to abut when in position against the gas distributing pipe 21, the abutting ends having screw threads formed upon them and the distributing pipe preferably a flange 22 against which a screwed sleeve coupling 23 abuts which may further be locked by a nut 24; washers 26', 27', being if desired placed between the junction.

To allow of easy removal of the valve and gallery *t* from the drums the fixed parts of the drums may be connected to the same by its ducts passing through orifices in the distributing channels formed rigid with the gallery and clamped to the same as mentioned between a flange on the duct and a nut screwed on to the same, the nut being, for example, accessible through the ports in the gallery when the valve seats are removed.

The meter casing referred to in the figures is only described, as will be understood, by way of example, the lid element being not

necessarily at the top nor the casing of any special form, provided always that it is so constructed that the main portion contains the mechanism and working parts in such a manner as to be easily removed therefrom and is closed by a member bearing the relation to it of a lid to a box which is then sealed to it in any suitable way or by any suitable clamping devices.

In the form illustrated in Figs. 9 to 12 a measuring chamber of the general nature already indicated is provided with a membrane 25 to the center of which is attached a frame-like element 26 by suitable bolts and nuts 27. This frame-like element is formed as a square frame, with its edges slightly beveled, or turned over in a direction away from the surface in contact with the membrane. It is provided with extensions 28 to which are fixed by screw and nut elements or other suitable means 29 the crank members 30 which oscillate by the movement of the vane the rod 9 which is connected to the registering mechanism. The bolts and nuts 27 are provided with suitable washers or the like, indicated at 31. The walls of the chamber are suitably formed, as by stamping, to accommodate the present arrangement, and such special construction, in the form described, consists of hollows 32 adapted to receive the crank members and the extensions to which they are fixed, suitable further hollows 33 to receive the turned over edges of the frame, and further hollowed parts 34, which may be provided with buffer means to receive the heads of the bolts 27 when the frame like element is in its opposite extreme of travel from that in which it is shown in Fig. 12. A suitable recess or hollowed part is also formed, as shown at 35 to accommodate the vertical shaft 9. The membrane is fixed in such a manner that the portion 36 occupying the center of the frame abuts against the wall of the chamber and the walls of the measuring chamber are so formed in combination with the hollows before referred to, that when the membrane is in either extreme of travel, it shall closely abut against the wall of the chamber.

Referring to Fig. 13 there is there indicated a base of a chamber of the nature referred to, in which is provided a channel-like recess 37 the walls of which are continuous with those of the chamber. The inclined walls of the same are recessed at 38 and strips of tin 39 are soldered thereto in such a manner as to allow the membrane, when clamped in position, to swing to either side, and when in the extreme position, closely to abut against the whole of a sloping side 39, while allowing sufficient clearance for substance condensing within the chamber to collect in the receptacle at 37. In this manner condensed products flowing down will pass into this chamber, and will not interfere with or act to decrease the stroke, and thus the capacity of the measuring chambers.

The form of construction indicated by way of example in Figs. 9 to 13 presents many advantages, more particularly in combination with the special kind of chamber referred to, as it provides means whereby the chamber may readily be detached and dismantled whereby during construction, risks of rupture of the membrane upon sharp edged metal parts are very considerably reduced, and also a lighter construction, and one consequently having much less inertia.

It will be understood that the form of construction may be varied in very many ways, without departing from the general spirit of the invention, it being understood that it may be varied as regards, for example, the precise shape of the frame or supporting means, the manner of its connection to the operating mechanism, the means whereby the membrane is attached to the same, and the shape of the measuring vessel in which it moves. It will also be understood that the form shown in Fig. 13 is merely indicated by way of example, and may also be varied in a great number of ways.

It will be seen that the improved meter constructions herein described all allow of dismantlement without any destruction or distortion of parts and yet insure accurate reconstruction without the employment of skilled labor or special tools.

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

1. In a dry gas meter in combination a gas distributing valve, a valve gallery means for operating said valve, a valve seat detachable from said gallery and coacting with the aforesaid valve and removable without disturbance of the operating mechanism; as set forth.

2. In a dry gas meter in combination a gas distributing valve, means for operating said valve, a platform bearing said operating means and aforesaid valve, and a valve seat supported upon said platform and independently removable therefrom without disturbance of the operating mechanism; as set forth.

3. In a dry gas meter in combination a ported mechanism supporting plate, a valve seat adapted to coact with a port on said plate, clamping means clamping said seat to aforesaid plate, a valve coöperating with said seat and valve operating means; as set forth.

4. In a dry gas meter in combination a ported mechanism supporting plate, a valve seat having a lug thereon disposed about a port on said plate, screw clamping means connecting said lug to the aforesaid plate,

a valve coöperating with said seat, and valve operating means; as set forth.

5. In a dry gas meter in combination a valve seat, a valve movable on said seat, valve operating means, slotted lugs upon said valve and a fixed guide rail disposed parallel to the line of motion of said valve and co-acting with the slots in the same; as set forth.

6. In a dry gas meter in combination two oppositely disposed hollowed elements provided around their periphery with flat portions and with flanges inclined to these flat portions and a diaphragm disposed between aforesaid hollowed elements, the flanges of one of said elements being adapted to fit within the flanges upon the other to hold the two hollowed elements in co-action to form a closed chamber, the aforesaid flat portions and flanges clamping the diaphragm between them; as set forth.

7. In a dry gas meter in combination two oppositely disposed and mutually co-acting hollowed members, a diaphragm disposed between said members a gas duct disposed in proximity to one of said hollowed members, a further gas duct upon the other of said hollowed members adapted to abut when said members are in co-action upon the former duct and readily disconnectible coupling means connecting the abutting parts of said ducts; as set forth.

8. In combination in a gas meter, a measuring chamber having walls parts of which are inclined to one another, a membrane, a channeled receptacle at the base of said chamber, together with extensions upon the inclined walls of the chamber whereby the membrane may closely abut against the walls in its extremes of travel and the condensed meter liquor may flow past the same into the aforesaid receptacle, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

C. E. HIBBERD.

Witnesses:

BERTRAM H. MATTHEWS,

J. PHILLIPS CRAWLEY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."