

PATENT SPECIFICATION

280,355



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PROVISIONAL SPECIFICATION.

No. 27,510, A.D. 1926.

Improvements in or relating to Coin-freed Mechanism for Petrol, Oil and like Pumps.

We, SLACK & PARR, LIMITED, Kegworth, Derby, a British company, and WILLIAM EDWARD BRYAN, of Bryan's Repair Garage, Kegworth, Derby, a British subject, do hereby declare the nature of this invention to be as follows:—

This invention comprises improvements in or relating to petrol, oil and like pumps and has reference to pumps which are fitted with coin-freed apparatus, the object of the invention being to provide a device of a simple and ingenious character which can be readily fitted to any existing type of petrol or oil pump, said device effectively preventing operation of the pump until a suitable coin is inserted therein, the insertion of said coin permitting operation of the pump to an extent sufficient for enabling a predetermined quantity of petrol or the like to be withdrawn.

A feature of the present invention consists in the provision of a petrol, oil or like pump having in connection therewith a coin-freed apparatus embodying a suitably encased locking device normally serving to retain the pump from operation and in which a coin when inserted constitutes a connecting element between an exterior manipulating knob or handle and said locking device and enables the lock to be released.

Another feature consists in the provision in coin-freed mechanism as above of a pawl and rack which are normally in engagement so as to prevent operation of the pump, said members being disengaged for permitting operation of the pump by the displacement of a spring-influenced or weight-influenced member which is connected by an inserted coin with a manipulating knob or handle.

[Price 1/-]

In one convenient method of carrying out this invention, adapted to slide vertically within and through a casing, which is closed by a hinged or other door, is a rack having ratchet teeth on two oppositely disposed faces, the incline of one series of teeth being opposite to that of the other series. Located at one side of the rack is a pivoted pawl which is normally held in engagement with the one series of teeth by spring means or gravity and serves to prevent upward movement of the rack. This pawl is adapted to be moved out of such engagement by the displacement of a suitably guided sliding bar or member against spring or weight influence, which bar is caused to coact with the pawl or a projection thereon.

On the opposite side of the rack to the before-mentioned pawl is a second pivoted pawl which is adapted to coact with the second series of rack teeth and is normally out of engagement, said second pawl being in engagement with the rack when the first pawl is disengaged and vice versa, and when in engagement preventing downward movement of the rack. This second pawl is controlled by the above-named sliding bar, a pin on the pawl engaging with a slot in the bar. If desired, the spring influencing the first-named pawl may be connected to the pin on the second pawl.

Pivoted above the sliding bar is a small catch plate having spring or other means which tend to pull or press same into engagement with an approximately V-shaped notch in the upper edge of the said bar. Normally, however, the catch is out of engagement with said notch. The free end of the catch plate may be curved

Price 2/-

and is adapted to be engaged by a projection on the sliding rack to displace the catch as will be hereinafter described.

The one end of the sliding bar has a reduced nose portion, preferably rounded or bevelled at its extremity, said extremity being normally spaced a short distance, say a distance a little greater than the thickness of a coin, from the face of a vertical plate which is normally pressed by spring means close against the inner face of one side of the casing. In this plate opposite to the sliding bar nose is a hole large enough to accommodate said nose, and to the plate at the rear of the hole is connected a tube portion which projects out through a hole in the casing side and terminates in a knob or the like at the casing exterior, a push on said knob displacing the vertical plate inwardly against its spring.

Located over the space between the nose of the sliding bar and the vertical plate is a coin chute which opens at a slot in the casing, said chute guiding an inserted coin into the confined space between the said bar nose and vertical plate where same rests upon a pair of short spaced pins.

In applying the device to pumps of the type which are operated by rotating a handle and through same a pinion meshing with a rack connected with the pump plunger, the rack in this invention may be connected to said existing rack. Also, in applying the invention to pumps operated by the oscillatory movement of a handle, the rack is suitably connected to the existing plunger lifting mechanism to be moved thereby. In operation, assuming the rack to be in its lowermost position with the first-mentioned pawl in engagement to prevent raising thereof, a suitable coin, say a shilling, is inserted and comes to rest between the sliding bar nose and the vertical plate connected to the push knob. If now the knob is pressed towards the casing, the vertical plate is moved inwards and through the medium of the coin slides the sliding bar against its spring. This bar in turn displaces the said first-named pawl from the rack, permits the second pawl to move by its spring into engagement with the opposite side of said rack and causes the

spring catch plate to engage with the notch in the bar to retain said bar in its displaced position.

The rack is now free to be raised to withdraw a measured quantity of liquid, and the coin falls into the base of the casing or suitable receiver.

The sliding bar is given a slight backward movement by a projection on the rack engaging a cam or stud on the rear of said sliding bar before the rack reaches the end of its stroke. This positively releases the coin.

After the rack has been raised to the extent necessary to withdraw the measured quantity, a projection on said rack coacts with and lifts the catch plate from the bar, which latter is returned by its spring to its normal position, and in so doing displaces the second pawl from the rack and permits the return of the first pawl to its engaged position.

The rack can now be lowered in readiness for a further operation.

A sliding cover or pin covers the coin slot until the rack is at the bottom when a notch cut in the rack allows slide or pin to be moved to uncover the slot.

The dimensions of the coin slot and chute, as also the space between the coin-bearing pins are such as to prevent coins of a wrong size being employed. Further, by providing a comparatively small nose on the sliding bar and an opposing hole, the apparatus cannot be operated by washers. Other means well known in connection with coin-freed devices may also be installed for rendering the mechanism inoperative except by the use of the proper coin.

A stop is also incorporated for preventing the sliding bar from being displaced by manipulation of the push knob when no coin is inserted.

Dated this 2nd day of November, 1926.

ERIC POTTER,
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Commerce Chambers, Parliament Street,
Nottingham.

PROVISIONAL SPECIFICATION.

No. 29,834, A.D. 1926.

Improvements connected with Petrol and other Measured Quantity Delivery Pumps.

We, SLACK & PARR, LIMITED, of Kegworth, Derby, a company organised under the laws

of Great Britain, and WILLIAM EDWARD BRYAN, D.F.C., M.I.M.T., of Bryan's

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Repair Garage, Kegworth, Derby, a British subject, do hereby declare the nature of this invention to be as follows:—

5 This invention relates to coin-freed apparatus for controlling the operation of petrol and other measured quantity delivery pumps of the type in which the coin-freed mechanism is located adjacent to an externally moving part on the delivery
10 pump, in such a manner as to lock the delivery pump and prevent its operation except when a coin has been inserted of the predetermined value when a predetermined quantity of petrol or other liquid may be
15 delivered in exchange for the coin inserted.

One improvement in such mechanism in accordance with this invention consists of a lost motion interposed in the connection between the coin-freed delivery apparatus
20 and the part of the pump to which it is attached. Generally the part connected is the end of the piston rod of the measuring piston.

This piston rod is connected to the rack
25 or other part operated by the coin-freed mechanism by a lost motion which permits the rack to move up or down a short distance before permitting continued motion of the pump piston. This may be effected
30 by forming a projecting flange on the end of the piston rod and enclosing the flanged end in a cylindrical extension of the rack having an inturned flange at its base.

A further improvement comprises a coin-testing arrangement in which the plunger
35 pressing forward the coin, presses from two sides only and presses the coin against a central edge or sharpened portion which is to be moved in the operation of the coin-freed mechanism. This mechanism may be
40 caused to resist movement to any desired extent, such resistance being adjustable, so that the coin interposed must be of a certain

strength in order to permit the mechanism to be moved by the force exerted on the
45 coin. Bad coins and ordinary metal discs are bent in this apparatus and fall into a receptacle, as also washers do not complete the connection between the plunger and the
50 sharpened edge.

The handle of the coin-freed mechanism is arranged to intercept the handle of the pump whenever it is operated, and it is returned to its initial position by a spring
55 after each operation. Should the handle be pressed forward and held forward away from the initial position, then its location causes interference with the work of the pump.

The coin-freed apparatus may be disconnected from the pump in order to enable
60 the pump to be worked in the ordinary way without the use of the coin-freed mechanism. Such disconnection is arranged by a suitable key and lock which can only be
65 operated by the proprietor or person in authority. A suitable means for effecting this disconnection consists in the lateral displacement of a pawl member which disengages the pawls on the ratchet and
70 permits a coin-interceptor to advance to prevent the insertion of coins during the time the apparatus is to be operated by hand with the coin-freed mechanism disengaged.

Obviously other disengaging means could
75 be employed, such for instance as the disconnection between the piston rod and the measuring apparatus from the rack to which it is coupled during the time when the coin-freed mechanism is coupled to the
80 piston rod.

Dated this 25th day of November, 1926.

BREWER & SON,
33, Chancery Lane, London,
Patent Agents for the Applicants. 85

COMPLETE SPECIFICATION.

Improvements connected with Petrol and other Measured Quantity Delivery Pumps.

We, SLACK & PARR, LIMITED, of Kegworth, Derby, a company organised under the laws of Great Britain, and WILLIAM EDWARD BRYAN, D.F.C., M.I.M.T., of Bryan's
90 Repair Garage, Kegworth, Derby, a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the
95 following statement:—

This invention relates to pumps for delivering measured quantities of petrol or other liquid, the operation of which pumps

is controlled by coin-freed apparatus which is adapted to lock the delivery pump and
100 prevent its operation excepting when a coin of the predetermined value has been inserted, after which the pump can be operated and the predetermined quantity of petrol delivered in exchange for the coin
105 inserted, and the pump again locked.

The present invention refers to such pumps fitted with coin-freed mechanism of that kind in which the inserted coin can be moved forwards by a hand-operated
110 plunger, such movement effecting the

unlocking of the operating mechanism of the pump, and permitting the same to be operated by the usual operating handle for the delivery of the petrol, the mechanism being then returned to position ready for the insertion of another coin, and so on.

According to one arrangement of the present invention the coin-freed locking mechanism is applied to the rack of the pump piston rod, so that the usual pump operating handle and the operating shaft upon which it is fixed is not interfered with; according to another arrangement of the same invention the coin-freed locking mechanism is applied directly to the pump-operating shaft. An essential feature in both such arrangements is the employment of a longitudinally movable slide which is acted upon by the coin and which slide directly controls the positions of two opposed pawls, locking or releasing the pump piston rod, the said pawls in one arrangement directly coacting with the racks of the pump piston rod, and in another arrangement coacting ratchet-like with the periphery of a toothed ratchet wheel fixed upon the usual operating shaft.

The present invention therefore differs from any previous arrangement wherein the traversing of the coin has been utilised to change the position of a pair of toggle levers connected by a spring so that they will be moved over the dead centre, such toggle levers acting to slide a double-faced clutch on the pump-operating shaft out of engagement with a fixed clutch member to permit the pump-operating shaft to be worked, the double-faced clutch being again brought into engagement with the fixed clutch member by a reverse operation of the toggle levers through the medium of a tappet member on the pump piston rod at the termination of its delivery movement.

In the construction according to the present invention the coin falls onto stops in front of a hand-operated plunger by which it is to be advanced, the acting end of the plunger being divided, while the end of the longitudinally movable slide into contact with which the coin is to be brought is knife-edged, so that the advance of the hand-operated plunger tends to bend the coin during the advance movement, the withdrawal of the hand-operated plunger at the termination of the advance movement of the slide permitting the coin to fall into a receptacle.

In order to prevent any movement of the pump piston rod by a slight rocking movement of the operating handle, a small amount of lost motion is provided for between the pump piston rod and the operating handle, such as a small amount of lost motion in the joint between the rack and the pump piston rod, or a small

amount of lost motion between the operating handle and the pinion engaging the pump piston rod.

Two examples of construction of the present invention are shown in the accompanying drawings, whereon Figs. 1 to 11 show the example where the coin-freed apparatus is applied to the rack of the pump piston rod above the ordinary operating handle, while at Figs. 12 to 14 inclusive the coin-freed apparatus is shown applied to the pump-operating shaft, the two applications being intended to thus illustrate that the invention is applicable to pumps of different types while still maintaining the distinctive features of the invention.

Referring to the drawings, Fig. 1 is a vertical section, and Fig. 2 is a horizontal section, showing the coin-freed mechanism applied directly to the rack of the pump piston rod.

Figs. 3 and 4 are detail views relating to the plunger acting upon the coin, Fig. 3 being an elevation showing the end of the plunger with the stops for retaining the coin, and Fig. 4 being a sectional plan view showing the plunger acting upon a coin and advancing the latter against the knife-edge of the longitudinally movable slide.

Fig. 5 is a detail sectional plan view showing the slide and the pivoted arm adapted to retain the slide in its advance position.

Fig. 6 is a sectional plan view showing in detail the longitudinally movable slide and means for controlling the same.

Fig. 7 is a front elevation of the pump showing the coin controlled mechanism fitted thereto above the usual operating handle, and Fig. 8 is a side elevation of the parts shown at Fig. 7.

Fig. 9 is a vertical section showing the mechanism in operative position, Fig. 10 is a similar view showing the coin-freed mechanism thrown out of operation, and Fig. 11 is a sectional plan view of the same parts.

Figs. 12 and 13 are respectively a sectional elevation and plan view of the coin-freed apparatus applied to a pump of different construction, and Fig. 14 is a detail view.

Referring more particularly to Figs. 1 to 11 the coin-freed mechanism is contained within a casing A, one wall of which is formed with an aperture A¹ to receive the coin which passes down a chute A² until arrested by side stops A³ opposite a tubular boss A⁴. Within the casing A is a vertically extending rack B which is connected at its lower end with the pump piston rod B¹ through a lost motion device which permits the rack to move up or down a short

distance before moving the pump piston rod. The provision of means for allowing a lost motion between the rack and the pump piston rod prevents the movement of the pump piston rod by a slight reciprocating movement of the operation of handle J. The rod B¹ is shown in this example as having an enlargement B² on its upper end enclosed within a cylindrical extension B³ of the rack B having an intumed flange at its base.

Pivoted within the casing A at opposite sides of the rack B are two pawls C, C¹ adapted to engage with oppositely directed ratchet teeth formed in the sides of the rack, and movable horizontally in guides within the casing is a slide D formed with a notch D¹ in its underside and having at one end a knife-edged projection D², its other end is formed into a spindle entering a sleeve A⁵ formed in the casing. The two pawls are drawn towards each other by a spring connection attached to pins C² and C³ projecting from the pawls C, C¹.

Within the tubular boss A⁴ is slidably mounted a plunger E; its inner end opposite to the knife-edged projection D² is so shaped as to form two points which will bear against the sides of the coins when the plunger E is pressed inwardly by the auxiliary lever F (see Fig. 4). The lever F is pivoted to a lug carried by the tubular boss A⁴.

Pivotaly mounted above the slide D is an arm G having on its rear side a thickened portion G¹, see Fig. 5. This arm acts as a catch plate, one edge of the thickened portion G¹ forming a tooth to engage with notches in the upper side of the slide D, and the arm is formed at one end with a recess G² suitably shaped to engage with the pin C² of the pawl C, when the arm G is swung upon its pivot, while the end G³ is shaped to act with a cam action upon a pin projecting from a sliding member H, one end of which sliding member enters a recess B⁴ formed in one side of the rack B, while the other end of the sliding member passes through a hole in the casing into the coin aperture A¹.

Upon the face of the rack B is formed a slot B⁵ within which is adjustably mounted a projecting stop B⁶, which upon the rack arriving at its predetermined height, will engage with the under side of the arm G¹ and lift it out of the notch in the upper side of the slide D.

Upon the insertion of a coin into the aperture A¹ it passes down the chute A² and is arrested by the side stops A³ within the casing. The lever F is then pressed inwardly, causing the two points on the inner end of the plunger E to bear upon the coin and press it against the knife-edged projection D² (see Fig. 4). Further

pressure by the lever F causes the slide D to be traversed, the leading edge of the slide engaging the pin C² upon the pawl C lifting it out of its notch upon one side of the rack B, while the spring connection to the pin C³ causes the pawl C¹ to be drawn into engagement with the teeth on the opposite side of the rack B. When this action has been effected the edge G¹ upon the arm G falls into the notch D³ and locks the slide from backward movement. This position of the mechanism is shown at Fig. 9.

The rack B and pump piston rod B¹ are now free to be moved upwardly to supply the liquid. The operator will then, by rotation of the handle J and gear J¹ (Figs. 7 & 8) which engages with teeth on the rack B, commence to raise the rack, but before doing so, as will be seen from Figs. 7 and 8, it is necessary to release the lever F to allow the handle J to pass freely in its rotation. The lever F is so arranged that when pressed inwardly it will intercept and prevent the rotation of the pump operating handle J. Upon the release of the lever F the plunger E is brought back to its outward position by means of a spring, and the coin is released and falls into a receptacle within casing A.

Upon the first upward movement of the rack the sliding member H will be pushed out of the recess B⁴ and will enter the coin aperture A¹, and thus prevent any further coins being placed therein.

It will be seen that the rack can only move in an upward direction, and upon the completion of its stroke the stop B⁶ will engage the under side of the thickened portion G¹ of the arm G and lift it out of the notch D³, thereby freeing the slide D which, by means of a spring, will be returned to its initial position, and at the same time will engage the pin C³ and lift the pawl C¹ out of engagement with the rack, and through the spring connection, will draw the pawl C into its notch on the opposite side of the rack.

The rack can then be lowered to its original position ready for the next supply, and until the rack has reached its lowest position, the sliding member H will obstruct the coin slot and prevent the insertion of any coin. On the rack reaching its lowest position, the inner end of the member H will again enter the recess B⁴ in the rack and the coin slot will be open.

The plunger E pressing forward the coin, presses from two sides only and presses the coin against the centrally placed edge D² on the slide D and in order to act as a test for the coins, the slide D is caused to resist movement to a considerable extent, so that the coin interposed must be of a certain strength in order to permit the mechanism

to be moved by the force exerted on the coin through plunger E by the lever F. Bad coins and ordinary metal discs are bent in this apparatus and fall into a receptacle, and washers do not complete the connection between the plunger and the sharpened edge.

At Fig. 6 a means is shown for giving the necessary resistance to movement of the slide D and for preventing undue strain being produced upon the return of the slide. The rear of the slide is recessed at D⁴, into which a spring-pressed ball D⁵ enters and the first movement of the slide D has to overcome the spring pressure of this ball before compressing the return spring D⁶.

When it is desired to disconnect the coin-freed mechanism and use the pump in the ordinary manner, the operator takes hold of the arm G and draws it forward, compressing the spring G⁴ which surrounds the pivot of the arm, as will be seen at Fig. 11. The arm G is then rocked upon its pivot until its recess G² engages the pin C² and removes the pawl C from its notch while the opposite end G³ at the same time engages a pin on the sliding member H, and causes it to enter the coin aperture A¹ and prevent the insertion of coins. The mechanism in this position is shown at Figs. 10 and 11, and it will be seen that both pawls are held disengaged from the rack which can be raised or lowered at will.

To prevent the operator, after the insertion of the coin, pressing the lever F a short distance and withdrawing, an additional notch D⁷ is formed in the upper edge of the slide D, into which the edge of the part G¹ will enter during the traverse of the slide and prevent backward movement of the slide.

Referring now to Figs. 12 to 14 the pawls C and C¹, pivoted to the casing A, are arranged to engage a ratchet wheel K fixed on the pump operating spindle K¹, the pins C² and C³ of the pawls C and C¹ are connected, as before described and pass through notches formed in the under side of the slide D. The spindle K¹ carries, mounted loosely thereon a pinion L, upon one face of which are outstanding dogs L¹ which upon rotation of the pump spindle engage with similar dogs L² carried by the spindle K¹ which enter loosely between the dogs L¹, permitting a certain distance of lost motion between the spindle K¹ and the movement of the pinion L. The pinion L gears through wheel L³ and pinion L⁴, with a pump operating rack M.

Fixed to the spindle K¹ is a pinion N gearing with a wheel N¹, the face of which carries a cam surface N² and an adjustable finger N³. Upon the rotation of the operating handle on the spindle K¹, the wheel N¹ will rotate and the cam surface N² will

rock a lever O which is pivoted at its lower end to the casing A, thereby sliding a member H into the coin aperture A¹ and preventing further coins being placed therein.

When the spindle K¹ has been rotated to the predetermined extent, the finger N³ will engage the under side of an extension G⁵ of the rocking arm G and will lift the edge G¹ out of the notch D³ in the slide D, into which the edge G¹ had entered to lock the slide in its forward position when operated by a coin, as before described.

In adapting the coin-freed mechanism to a pump of this construction, the lever F does not obstruct the operating handle J of the pump as described in the previous example and to ensure that it shall be compulsory for the lever F to assume its outward position before the actuation of the pump, a rod P, sliding in bearings in the casing, bears with its inner end against the lever O, whereby when the cam N² acts to rock the lever O, the rod P will be pressed outwardly against the under side of the lever F to prevent its being held in its forward position.

When it is desired to disconnect the coin-freed mechanism and use the pump freely, the pawl C¹ is rocked out of engagement with the ratchet K by means of an arm C⁴ pivotally mounted on the pin C³ of the pawl C¹, at the same time passing the shoulder C⁵ on the outer end of the arm C⁴ into engagement with a pin H¹ on the sliding member H, whereby the said member is projected into the coin aperture A¹ and prevents further admission of coins while holding the pawl C¹ out of engagement. The pump operating spindle K¹ can then be freely rotated in either direction.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In petrol and other measured quantity delivery pumps fitted with coin-freed mechanism in which the coin is moved forward by a hand-operated plunger as set forth; a longitudinally movable slide receiving motion from the plunger through the medium of a coin, said slide directly controlling the position of two opposed pivoted pawls for effecting the locking or releasing of the pump piston rod, said pawls co-acting either directly with the rack of the pump piston rod, or co-acting ratchet-like with the periphery of a toothed ratchet wheel fixed upon the usual operating shaft of the pump piston rod.

2. In petrol and other measured quantity delivery pumps as claimed by Claim 1; means for retaining the longitudinally movable slide in the position in which it has

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been traversed through the medium of the coin and with the mechanism in position for the delivery of the petrol, comprising a pivoted arm or catch plate to engage said slide and retain same in the delivery position against the action of its return-spring, and means brought into operation by or during the rise of the pump piston rod to release said slide upon the termination of the delivery movement to permit the mechanism to return to the locked position.

3. In petrol and other measured quantity delivery pumps as claimed by Claim 1; the construction of the longitudinally movable slide controlling the position of two opposed pivoted pawls each adapted to engage rack teeth on the pump piston rod so that in the endway position of rest of said slide one of said pawls engages said teeth and prevents the operative movement of said pump piston rod, while in the opposite position of movement of said slide the said engaging pawl is moved away from said rack by said slide, while the opposed pawl is permitted to come into engagement and permit the said pump piston rod to have operative movement for the delivery of the liquid.

4. In petrol and other measured quantity delivery pumps as claimed by Claim 3; the construction in which a ratchet wheel is fixed on the pump-operating shaft, and the opposed pivoted pawls are adapted to alternately engage said ratchet wheel on diametrically opposite faces thereof.

5. A coin-freed apparatus for controlling the operation of petrol and other measured quantity delivery pumps according to the preceding claims, in which the sliding part is arranged in conjunction with a thrusting device to so hold the coin between them that the advance of the thrusting device tends to bend the coin when the latter contacts with the sliding part, and the withdrawal of the thrusting device permits the coin to fall.

6. A coin-freed apparatus for controlling

the operation of petrol and other measured quantity delivery pumps according to the preceding claims, in which the slide is provided with a knife-edged or pointed part located centrally opposite to the position occupied by a coin employed for releasing the coin-freed mechanism, in combination with a thrusting device having lateral projections and located on the opposite side of the said coin and at a distance from the central knife-edge part on the slide, elastic resistance on the slide resisting movement and causing pressure on the centre of the coin, when the thrusting device is advanced, to move the slide to the necessary extent, the coin thus being subjected to bending stress between the said knife-edged part and the lateral projections.

7. In a coin-freed apparatus for controlling the operation of petrol and other measured quantity delivery pumps as claimed in the preceding claims; the connection between the coin-freed control mechanism and the measuring pump piston of a connection having a lost motion causing the first portion of the reversed movement of the part operating the piston to impart no movement to the piston until it has travelled a short predetermined distance.

8. A coin-freed apparatus for controlling the operation of petrol and other measured quantity delivery pumps as claimed in the preceding claims, substantially as illustrated in Figs. 1 to 11 of the accompanying drawings.

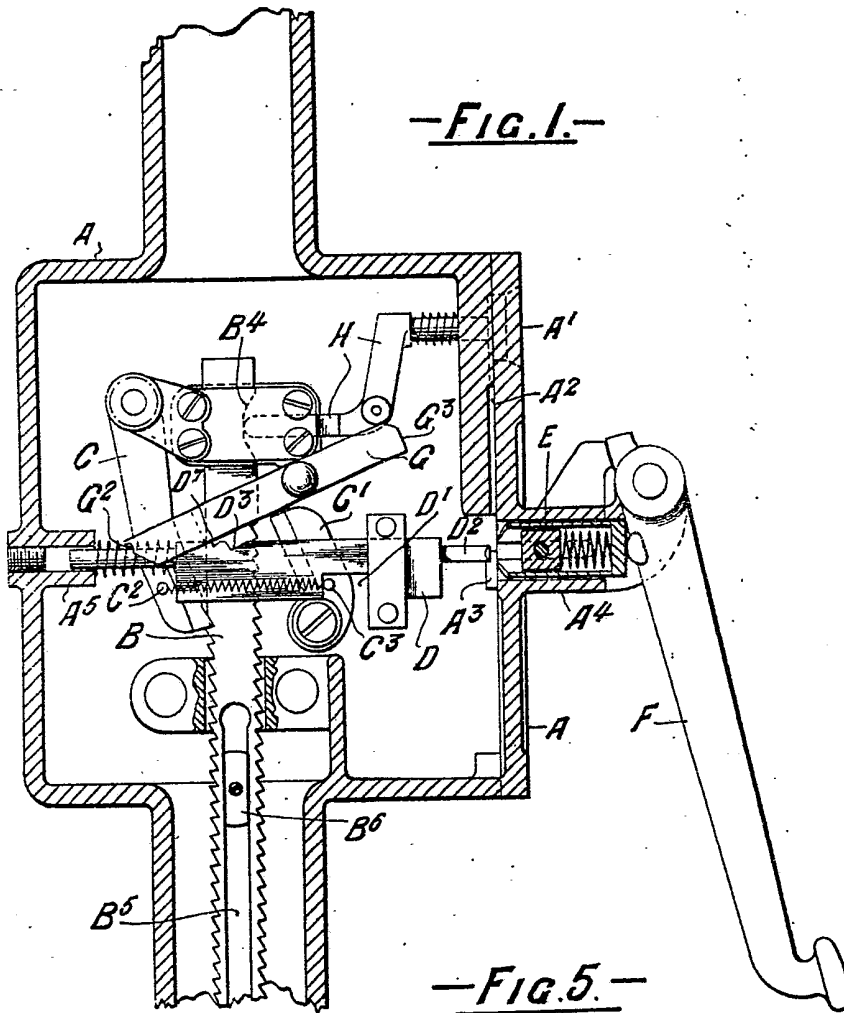
9. A coin-freed apparatus for controlling the operation of petrol and other measured quantity delivery pumps as claimed in the preceding claims, substantially as illustrated in Figs. 12 to 14 of the accompanying drawings.

Dated this 21st day of February, 1927.

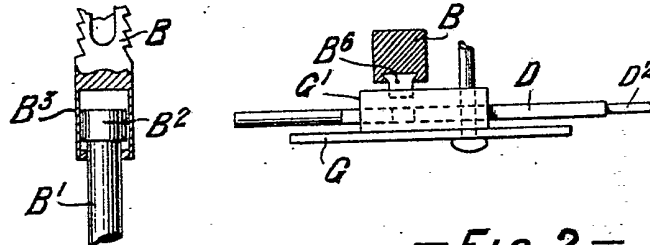
BREWER & SON,
33, Chancery Lane, London,
Patent Agents for the Applicants.

[This Drawing is a reproduction of the Original on a reduced scale.]

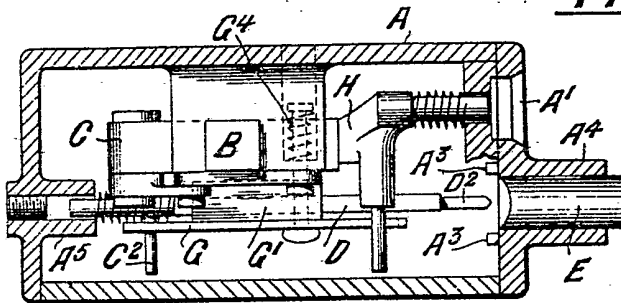
-FIG.1.-



-FIG.5.-



-FIG.2.-



A-
A'.
F-

B3

FIG. 7.

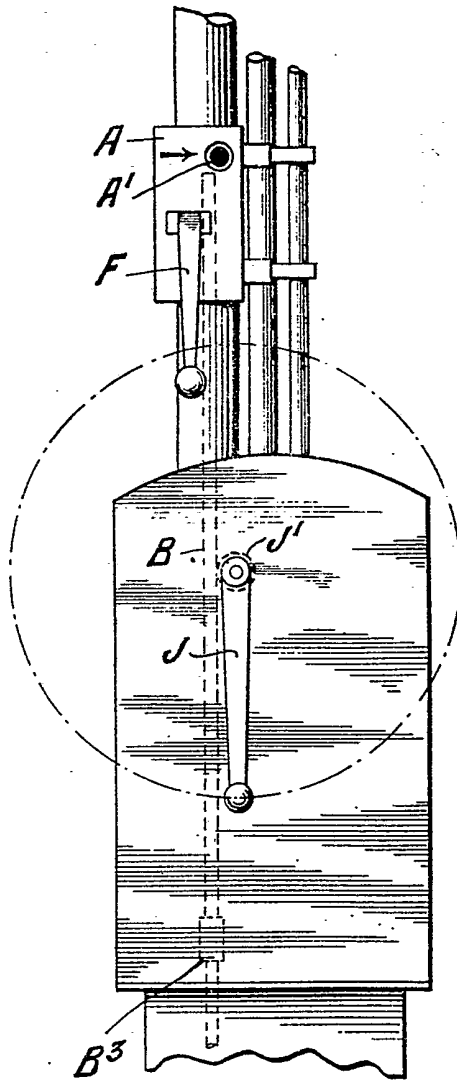


FIG. 8.

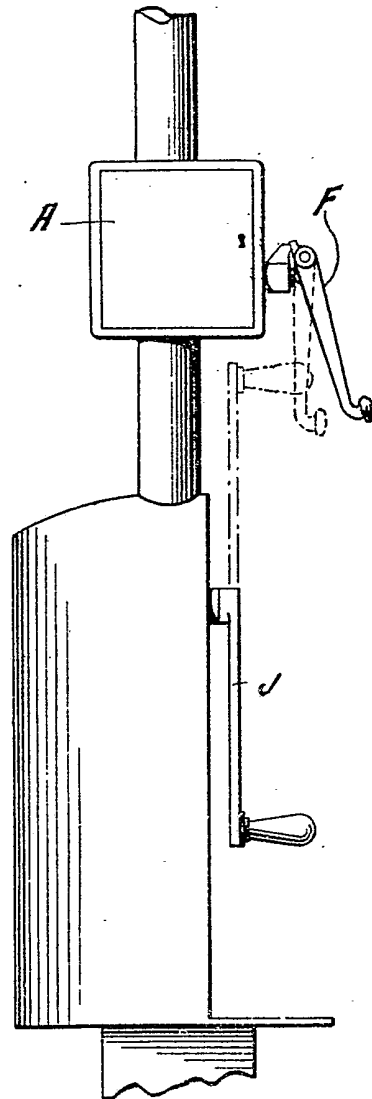
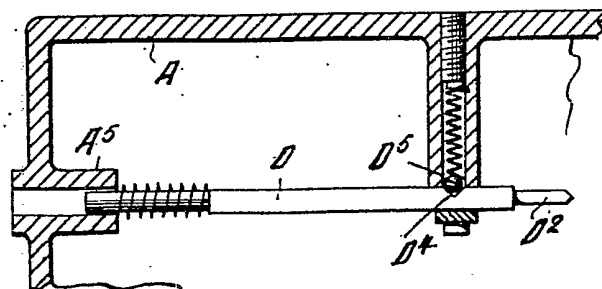


FIG. 6.



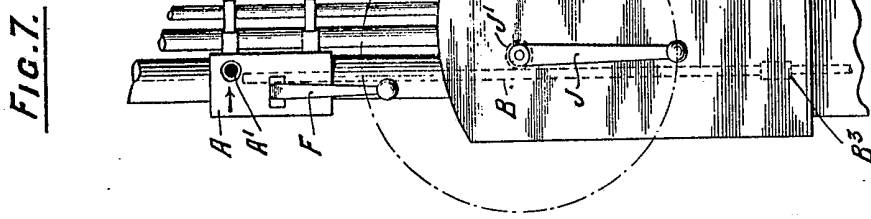
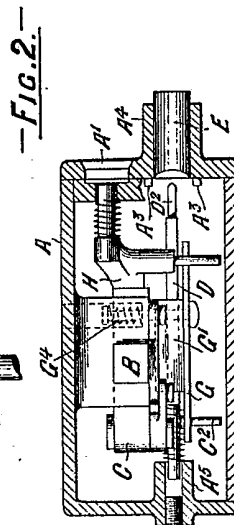
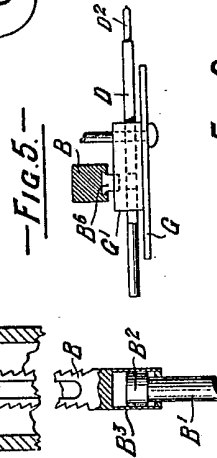
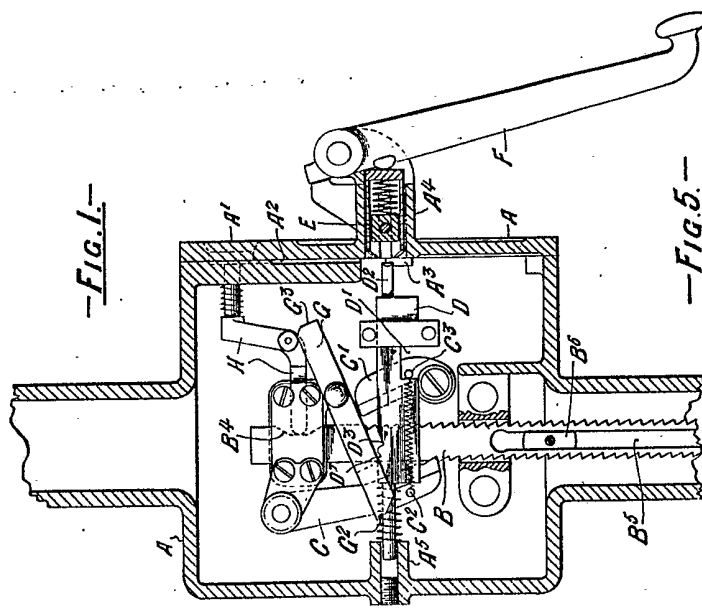


FIG. 6.

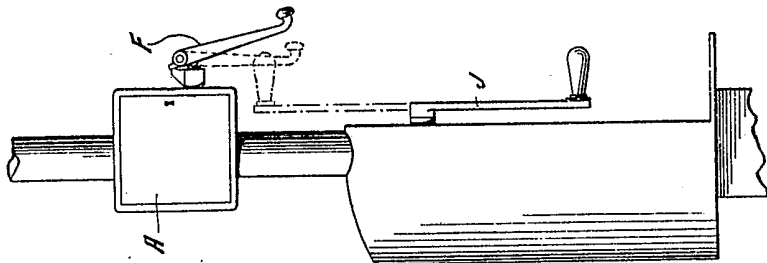
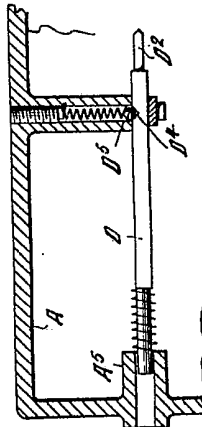
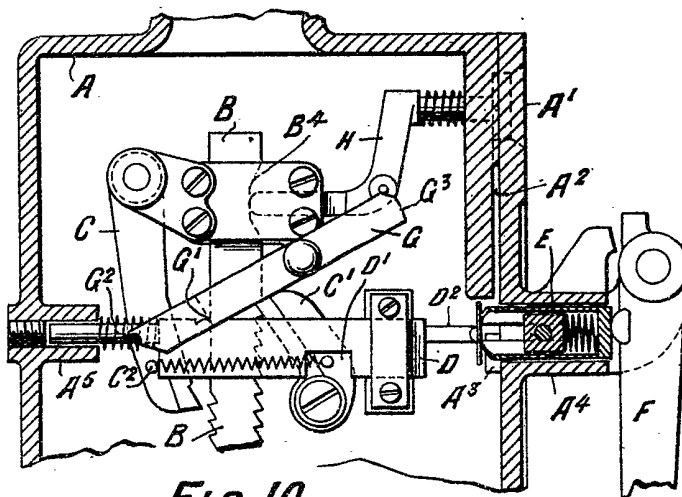


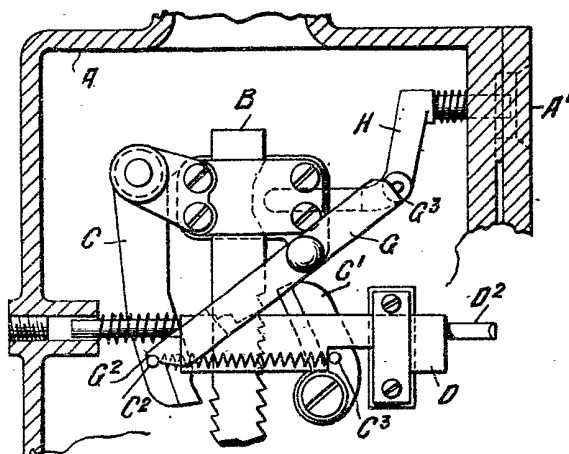
FIG. 8.

[This Drawing is a reproduction of the Original on a reduced scale]

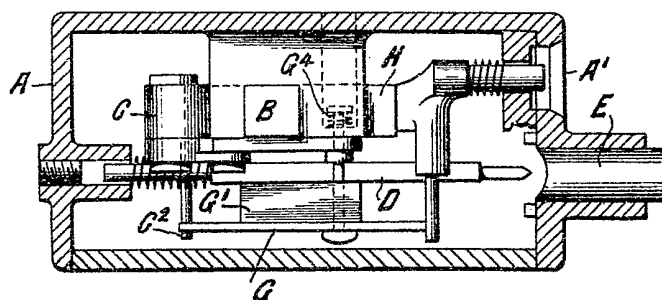
-FIG. 9.-



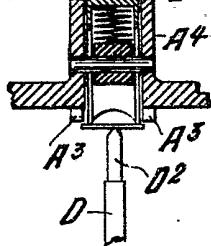
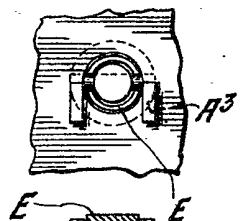
-FIG. 10.-



-FIG. 11.-



-FIG. 3.-



-FIG. 4.-

[This Drawing is a reproduction of the Original on a reduced scale.]

—Fig. 12.—

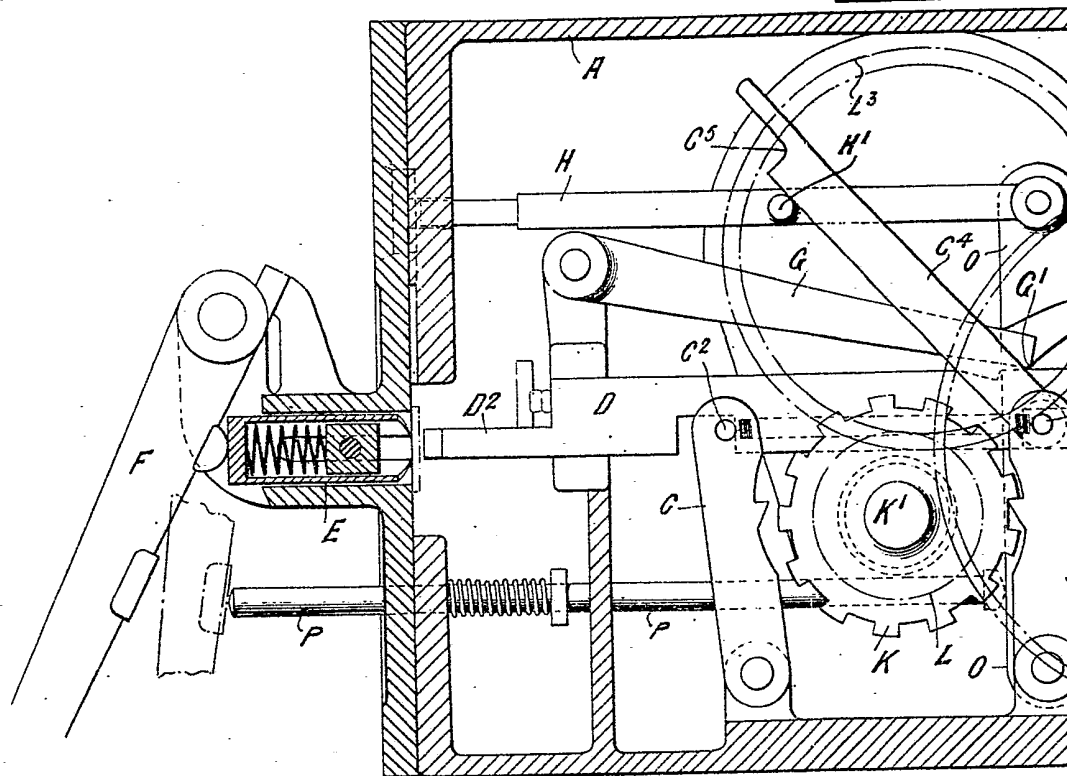
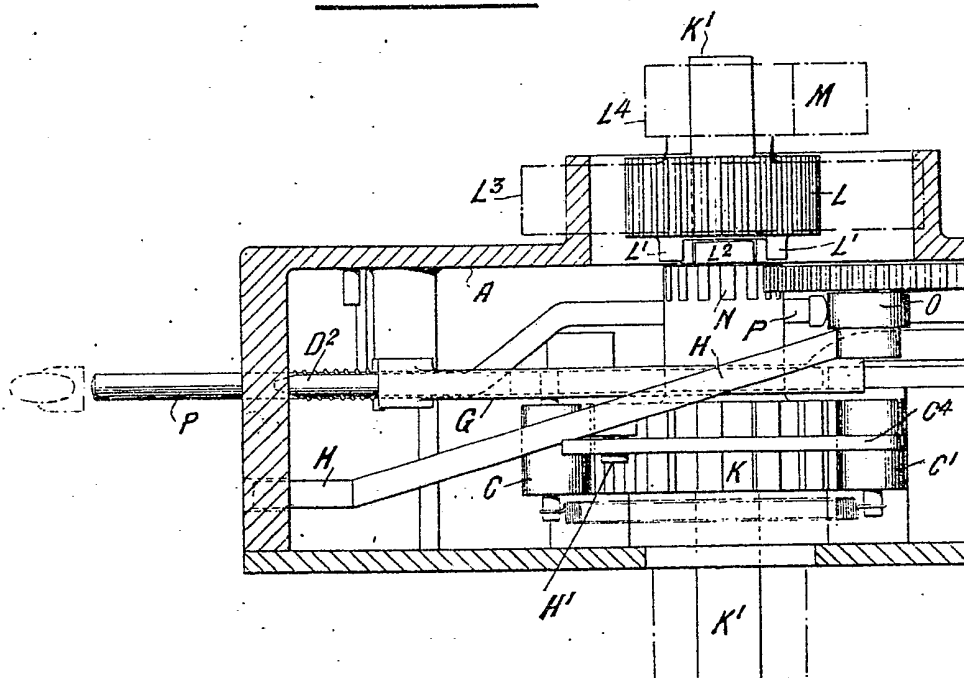
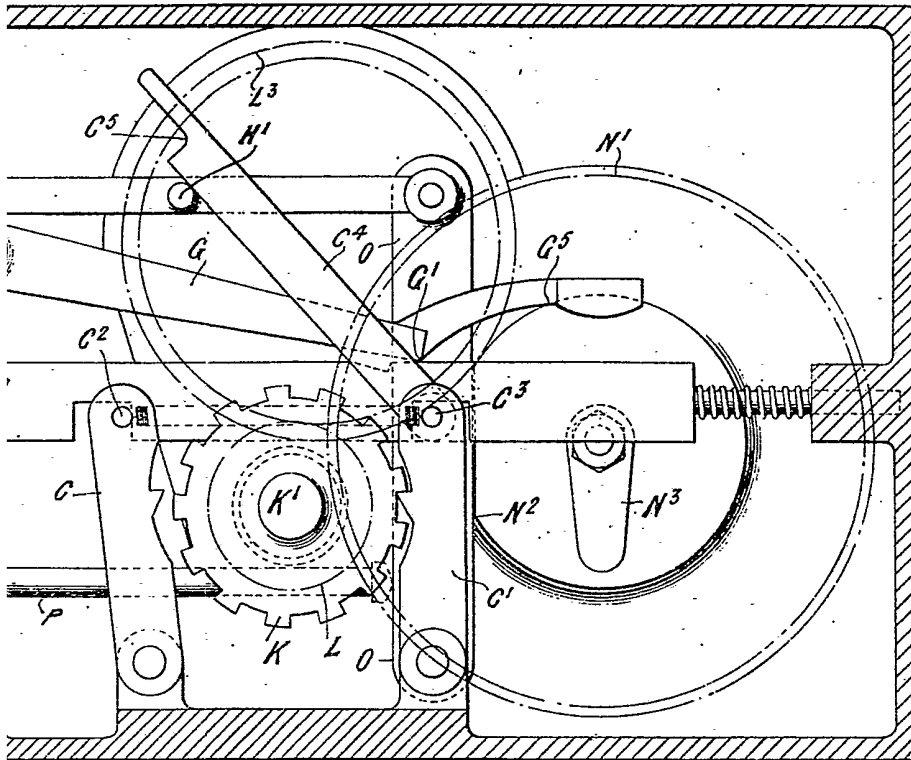


Fig. 13.



—Fig. 12.—



—Fig. 14.—

