

H. KOCOUREK.
LIQUID FEED INDICATOR.
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1,160,418.

Patented Nov. 16, 1915.

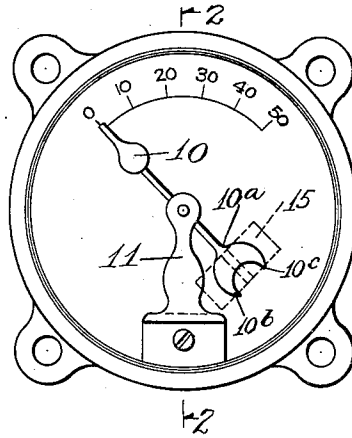


Fig. 1

Fig. 2.

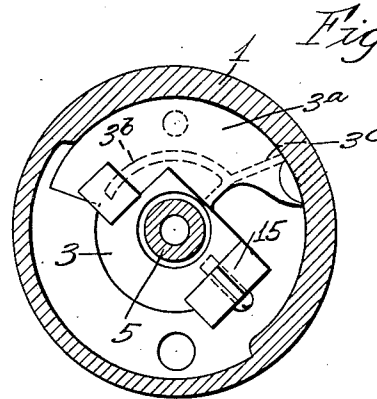
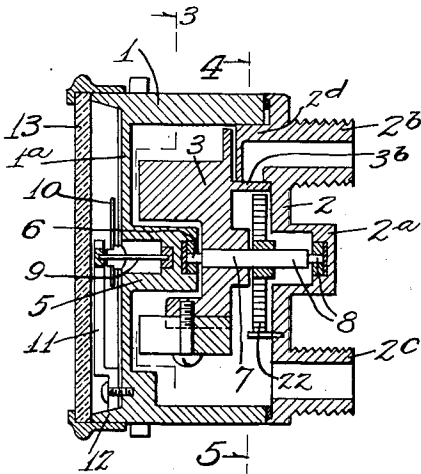


Fig. 3.

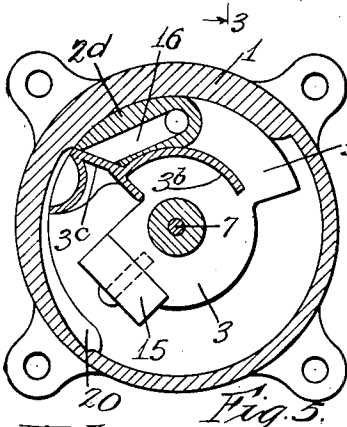


Fig. 4.

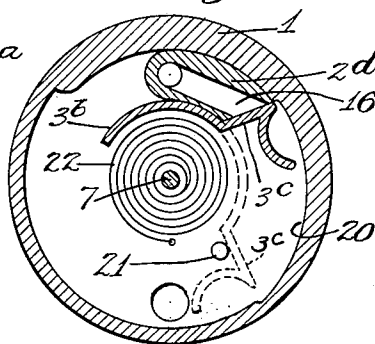


Fig. 5.

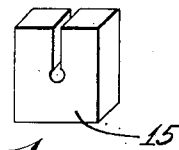


Fig. 6.

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UNITED STATES PATENT OFFICE.

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LIQUID-FEED INDICATOR.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HENRY KOCOUREK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Liquid-Feed Indicators, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved device for indicating the flow of a liquid, such as lubricating oil.

It consists in the elements and features of construction shown and described as indicated in the claims.

In the drawings:—Figure 1 is a face view of an instrument embodying this invention. Fig. 2 is an axial section at the line 2—2 on Fig. 1. Fig. 3 is a transaxial section at the line 3—3 on Fig. 2. Fig. 4 is a transaxial section at the line 4—5 on Fig. 2. Fig. 5 is a transaxial section at the same line as on Fig. 4 looking in the opposite direction. Fig. 6 is a perspective view of the magnet.

The instrument shown in the drawings comprises a casing in the form of a cup, 1, of which the bottom is at the forward side of the instrument. The casing further comprises a back-plate, 2, which closes the cavity of the cup and which has bosses, 2^b and 2^c, for inlet and outlet of the liquid whose flow is to be indicated, the outlet being as shown of somewhat greater diameter than the inlet. From the center of the bottom a boss, 5, projects within the casing and affords one step bearing for the spindle, 6, of a pivoted member, 3, mounted within the casing, having the other end of its spindle, 8, pivoted in a step bearing formed in a central boss, 2^a, of the back-plate, 2, said central boss being axially recessed so as to spread the two bearings of the spindle, 7, as widely as possible, that is, to permit such spindle to be as long as possible within the practicable dimensions of the instrument. A similar reason exists for the formation of the central boss, 5, projecting from the bottom of the cup, 1, namely, to space as widely as possible the pivot bearings for the spindle, 9, of an index hand, 10, which is mounted outside the cup, that is, in front of the bottom thereof, one end of the spindle being stepped at the bottom of a deep axial cavity formed exteriorly in said central boss, 5, the other end of the spindle obtain-

ing bearing in a bracket, 11, secured upon the forward side of the cup and standing within a marginal flange, 12, which projects forwardly from said bottom for positioning a glass, 13, which closes the cavity bounded by said annular boss within which the index hand vibrates. The pivoted member, 3, carries and comprises a magnet, 15, which is preferably of the form shown, being in general of the horseshoe or split-ring form having its poles close together, the magnet being mounted at one end of said pivoted member, the opposite end of which is suitably formed to substantially counterbalance the magnet, said magnet being thus mounted with its poles both facing toward the bottom or forward wall of the cup or casing, and standing as near thereto as consistent with the free and easy movement of the parts in view of the fact that the cup cavity will be occupied with the liquid whose flow is being measured, and which would tend to retard the pivotal movement of said pivoted member if the same had its forward surface positioned too close to the inner surface of the bottom of the cup. Said pivoted member, 3, comprises two projecting webs, 3^a and 3^b, which are respectively transaxial and co-axial with respect to the cup cavity or casing chamber, and which contact respectively at their edges the interior surface of the circumferential wall of the cup and the interior surface of the back-plate; so that together with said interior wall and back-plate they form a pocket which is closed at one end by an approximately radial web, 3^c, extending from the member, 3, to the peripheral wall of the casing chamber. The back-plate has formed upon it a boss, 2^a, which fits piston-wise in said pocket and which at one end stands directly opposite the liquid inlet boss, 2^b; and the liquid inlet duct formed through said boss as shown at 16, extends through said piston-wise fitting boss, 2^a, to the end thereof; and said end of said boss is formed to seat the end closure 3^c, of said pocket, as shown in Fig. 4. The circumferential wall of the cup, 1, is cut back from its normal form—cylindrical about the axis of the pivoted member—from a point at the end of the piston-wise fitting boss, 2^a, along the path of movement of said closure, 3^c, which will result from the pressure of the liquid forced through the inlet duct of said piston-wise fitting boss against

said pocket-end-closure; and there is thus formed in said circumferential wall a channel, 20, which constitutes a by-pass around the end of the closure, 3^c, for the escape of the liquid past said closure into the cavity of the casing. The channel thus formed is tapered, deepening or widening along said path of opening movement of the closure, 3^c. A stop pin, 21, is provided to limit the turning movement of the element, 3, for carrying said pocket end closure away from the end of the boss, 2^a. A spring, 22, is connected to the back-plate, 2, and to the spindle of said pivoted member, 3, for yieldingly resisting the pocket-opening movement of the pivoted member.

The operation of this device when the inlet is connected with a source of liquid whose flow is to be indicated, is that the pressure of the liquid which is being supplied opens the way for its movement into and through the casing by forcing the pocket closure, 3^c, away from the end of the boss, 2^a, turning the member, 3, about its pivot, this movement being produced against the resistance of the spring, 22, which increases as the turning proceeds, so that the extent of turning movement produced is an approximately accurate measure of the pressure operating to produce it; and as such turning proceeds, the available cross sectional area of the by-pass, 20, around the end of the closure, 3^c, increases, so that the flow of liquid is substantially proportionate to the angular movement of said pivoted member, 3. This angular movement of the pivoted member is indicated by the index hand, 10, which is positioned so that its tail, 10^a, stands normally directly opposite the poles of the magnet, 15, that is, at the opposite side of the bottom, 1^a, of the cup, 1, from the position of said poles within the cup, so that the attraction of the magnet for said needle, the latter being of steel or iron, or at least having its tail piece composed of steel or iron, causes the tail piece to follow the magnet around as the pivoted element, 3, turns on its pivot.

If the tail piece of the index hand had but a single terminal, that tail piece under the attraction of the magnet might stand at any position within the width of the two poles of the magnet; that is, if the tail piece once became positioned directly opposite the end of one of the poles, it would follow that pole and remain opposite the same, while if it had become positioned opposite the end of the other pole it would similarly follow said other pole. The difference in indication would be sufficient to defeat the accuracy of the information conveyed by the instrument; and to avoid this, the tail piece of the indicating needle is formed with two pointed terminals, 10^b and 10^c, which are spaced apart a little farther than the dis-

tance between the magnet poles and substantially or approximately as far apart as the distance between the true magnetic poles or foci of the lines of flux emanating from said poles, respectively, as nearly as this can be ascertained. The resulting form of the tail piece is preferably substantially crescent-shaped, as shown; and with this form the index hand will always assume the same position with respect to the magnet, thereby rendering the indication of the instrument accurate as to the angular change of position of the pivoted element, 3, and the corresponding cross sectional area of the by-pass which is available for the flow of the liquid through the instrument, and consequently accurate as to the rate of flow of the liquid.

It is not designed that this instrument should be large enough, or at least it need not be large enough, to provide for the entire flow of liquid which is to be measured. Instead, it is sufficient, and the intended mode of use of the instrument is, that its inlet and outlet shall be connected with a shunt circuit leading from and back to the main circuit in which the liquid, lubricating oil or other material is being supplied and whose flow is to be measured. The flow in the shunt circuit, so long as that circuit is unobstructed except by the instrument, will be substantially proportional to the flow in the main circuit, and the instrument indicating the flow in the shunt circuit affords the desired information as to the fact, and substantially as to the rate, of flow in the main circuit.

I claim:—

1. In a liquid feed indicator, in combination with a casing comprising a chamber having a liquid outlet, an element mounted in the chamber for pivotal movement, and comprising webs which maintain contact with the walls of the chamber throughout a limited range of angular movement about the pivot, and which with said walls form a pocket closed at one end, the closure being a part of said pivoted element; the casing having a rigid part which protrudes from the wall of said chamber into said pocket and fits substantially piston-wise in the pocket, said protruding part having a duct which forms a liquid inlet into the pocket from the outside of the casing; said duct opening for discharge in the pocket at the end of said piston-wise fitting part toward said pocket closure, whereby liquid pressure through said duct tends to turn said pivoted member in the chamber, the fixed parts of the casing being formed relatively to said pocket closure for gradual increase of the outlet of the pocket into the cavity of the chamber-at-large by the movement of said pivoted member caused by the liquid pressure against the closure, a spring which

resists such movement, and means by which said movement is indicated outside the chamber.

2. In a liquid feed indicator, in combination with a casing, an element mounted in the casing for pivotal movement, comprising webs which maintain contact with the casing walls throughout a limited range of angular movement about the pivot, and which with said walls form a pocket closed at one end, the closure being a part of the pivoted element, the casing having a rigid part protruding from the wall thereof into said pocket and fitting substantially piston-wise therein, said part having a duct which forms a liquid inlet into the pocket from the outside of the casing, said duct opening for discharge in the pocket at the end of said piston-wise fitting part toward said pocket closure, whereby liquid pressure through said duct tends to turn said pivoted member in the casing, the casing wall being cut back along the path of movement of the closure to form a by-pass around the latter leading out of the pocket into the general cavity of the casing, said by-pass being tapered and increasing in cross section along the path of movement of said closure away from closed position, means yieldingly resisting the turning of the pivoted member under the liquid pressure, and means outside the casing for indicating the extent of movement of said pivoted member.

3. In combination with a casing having a chamber with a liquid inlet and outlet, an element pivoted in the casing for being turned about its pivot by the pressure of the liquid forced through the chamber; a magnet carried by the pivoted element within the chamber; a magnetically susceptible index hand pivoted outside the chamber coaxially with the pivoted element within the chamber, the magnet having its two poles juxtaposed, and the index hand having one end provided with two pointed terminals spaced apart a little more than the distance between the magnet poles.

4. In an instrument for the purpose indicated, in combination with a casing in the form of a cup of which the bottom forms a front of the instrument, and has an interior boss projecting substantially centrally

from the bottom, a cap plate which forms the back of the instrument, a member pivoted within the casing having one of its pivot bearings upon the end of the boss therein and recessed at the forward side to receive the boss, and having another pivot bearing in the back plate, liquid inlet and outlet connections leading into the cavity of the casing, said pivoted element being formed and positioned with respect to said inlet and outlet openings so as to be turned about its pivot by the pressure of liquid thereon, and means for yieldingly resisting such turning movement of the pivoted element, said boss having an axial cavity leading into it from the outside of the bottom of the cup, and an index hand in the front of said cup having a spindle stepped in the bottom of said last-mentioned axial cavity, and means operatively connecting said index hand with said pivoted element.

5. A liquid feed indicator comprising a casing having two chambers, one chamber having an inlet and an outlet for liquid, a member movable about an axis in response to the flow of liquid in the chamber, and a magnet mounted to move in unison with said member at one side only of the axis, the other chamber having a transparent wall, a dial, and an index member of magnetic metal mounted in said chamber to move over said dial in response to the movement of the magnet.

6. A liquid feed indicator comprising a liquid-tight chamber having an inlet and an outlet, a member pivotally mounted in the chamber adapted to turn on its pivot in response to the flow of liquid through the chamber, a magnet carried by said member having its poles unsymmetrically disposed with respect to the pivot axis, and an index member of magnetic metal pivoted outside said chamber to move in unison with the magnet inside.

In testimony whereof I have hereunto set my hand at Chicago, Illinois, this 20th day of October, 1914.

HENRY KOCOUREK.

Witnesses:

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LUCY I. STONE.