

C. L. DUENKEL.
PUMP METER.
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Patented Oct. 19, 1909.

937,516.

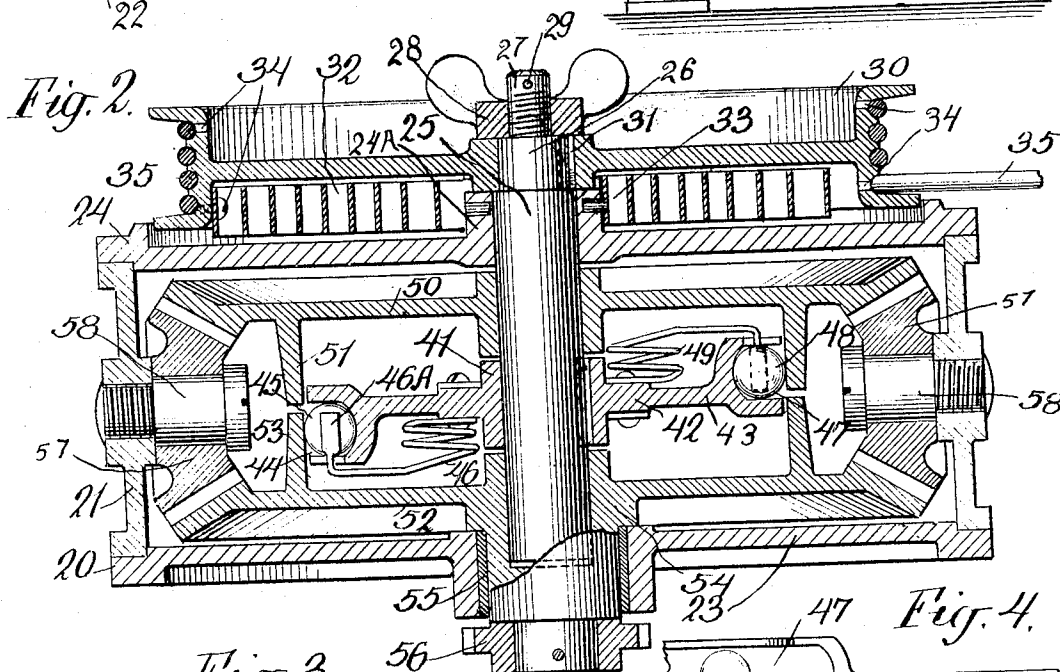
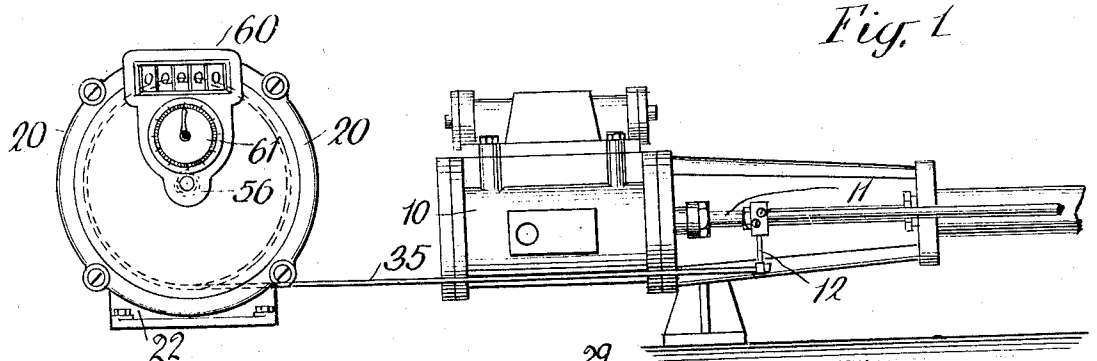
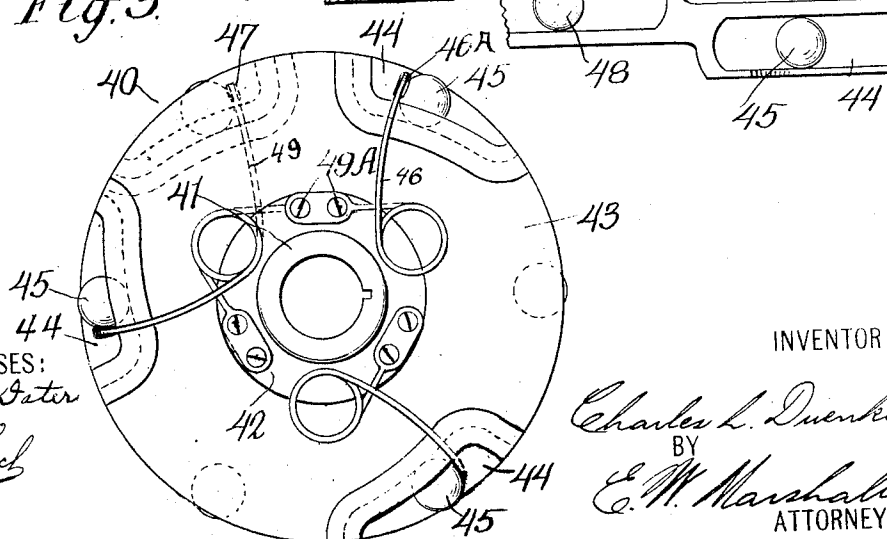


Fig. 3.



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PUMP-METER.

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To all whom it may concern:

Be it known that I, CHARLES L. DUENKEL, a citizen of the United States, and a resident of the city of East Orange, in the county of Essex and State of New Jersey, United States of America, have invented certain new and useful Improvements in Pump-Meters, of which the following is a specification.

My invention relates to a meter for registering the total travel of a reciprocating body and is especially adaptable for use in conjunction with that form of pumps in which a piston is reciprocally driven within a cylinder and arranged to pump water or other fluid in both directions of its travel. Such pumps are often driven by steam and are commonly called duplex pumps.

I will describe my invention in the following specification and point out the novel features thereof in appended claims.

Referring to the drawings, Figure 1 is a side elevation of a portion of a reciprocating pump with one of my improved meters connected therewith. Fig. 2 is a sectional plan view of my meter. Fig. 3 is a side elevation of one of the parts of my apparatus. Fig. 4 is a development of a portion of the device shown in Fig. 3.

Like characters of reference designate corresponding parts in all of the figures.

10 designates the cylinder of an ordinary duplex pump. 11 is its piston rod which is driven back and forth by any desired motive power.

12 is a bracket rigidly affixed to the cross-head or to the piston rod of the pump.

20 designates the casing of the meter, which casing comprises an annular body portion 21 having a depending pedestal or base 22, a front plate 23 and a rear plate 24. This casing is adapted to be secured to a portion of the pump 10 or to some other convenient fixture, preferably in such a position that a straight pull may be obtained between the meter and the piston rod of the pump.

25 is a shaft which runs centrally through the meter and which is supported by the rear plate 24 of the casing and also by the front plate 23 in a manner which will fully

appear hereinafter. The rear end of this shaft is cut down to a somewhat smaller diameter as shown at 26 leaving a shoulder, and beyond this reduced portion, the end of it is threaded as at 27 and adapted to receive a thumb-nut 28. A hole 29 may be drilled through this nut and the threaded end of shaft 25 so that if desired a pin may be put through these parts locking them together.

30 is a sheave provided with a central hub which fits over the portion 26 of shaft 25. A feather of key 31 prevents the sheave from turning on the shaft 25 when it is placed thereon, and the parts are held together by the thumb-nut above described. As this sheave may have considerable peripheral speed and is subjected to quick reversals, it is made as light as possible, consistent with the required strength, and its web is cored out for this purpose. That portion of the rear plate 24 which forms a bearing for the shaft 25 projects outward, forming a hub 24^A. Between this hub and the inner flange of sheave 30 a flat spiral spring 32 is placed. One end of this spring is affixed to the hub 24^A as at 33 and its other end is fastened to the flange of sheave 30 at 34.

35 is a flexible cord affixed to the sheave 30 and passing around its periphery which is grooved for its reception. The other end of cord 35 is connected with the bracket 12 on the cross-head or piston of the pump.

40 is a ball disk within the casing 20 and keyed to the shaft 25 so that it rotates in unison with the sheave 30. This ball disk comprises a hub 41 which is keyed to the shaft and from the center of which a thick web 42 projects for a short distance. 43 is a thinner extension of this centrally disposed web. Upon one side of the disk and near its periphery a plurality of pockets with wedge-shaped or curved inclined bottoms are formed. These are designated in the drawings by the numeral 44 and each is designed to carry a roller or ball 45.

46 designates peculiarly shaped springs which are affixed to the thick portion 42 of the web and are so arranged that their outer ends contact with the rollers or balls 45 and tend to push the latter up the inclined bot-

toms of their respective pockets and, therefore, away from the center of the disk. The portions 46^A of these springs which are in contact with the rollers or balls may be enlarged as shown.

It is to be noted that the pockets 44 are not centrally disposed about the ball disk, but that they are offset a certain amount toward the front of the meter. A similar set of pockets 47 is provided upon the other side of the disk and projecting a similar amount toward the back of the instrument. These pockets are also provided with wedge-shaped or inclined bottoms, but the incline in them is in the opposite direction to that in the pockets 44. The rollers or balls 48 in these pockets 47 are pressed outward by springs 49. In the drawings I have shown a preferred design of this ball disk and its associated parts, in which there are three pockets 44 spaced 120° apart on one side of the disk, and the same number of pockets 47 on the other side of the disk and placed midway between the pockets 44. The springs 46 and 49 are so shaped and proportioned that each set is fastened to the part 42 of the web at the same point by the same rivets or through bolts as, for example, at 49^A. It is important that this ball disk and the parts which it supports should have no more weight than necessary, and the structure which I have shown is designed to have considerable strength with little weight.

50 is a bevel gear loosely mounted upon the shaft 25 between the ball disk 40 and the back plate 24 of the casing. This gear is provided with an annular web 51 projecting at right-angles to the diameter of the gear and over the path of movement of the balls 48. 52 is another bevel gear of the same diameter and provided with an annular web 53 in the path of movement of the balls 45. The hub 54 of this gear 52 fits over the forward end of the shaft 25. Its outer surface is turned to fit into a bearing in the front plate 23 of the casing and may be surrounded by a bushing 55 if desired.

56 is a gear or pinion affixed to the forward portion of the hub 54, which extends through the front of the casing.

57, 57 are two bevel pinions mounted upon studs 58, 58 which are screwed into the body portion 21 of the casing preferably at diametrically opposite points. These pinions rotate in opposite directions, but the direction of rotation of each of them is always in one direction. The studs may therefore be threaded in opposite directions which will prevent them from working loose, and their ends may be riveted over to further secure them. The pinions 57, 57 are in mesh with the bevel gears 50 and 52 so that any movement of either of them is transmitted to the other but in the opposite direction.

60 designates a registering mechanism of any desired construction which is mounted upon the casing 20 and is arranged to be driven by the gear or pinion 56. This registering mechanism is preferably arranged with a dial 61 which registers ten feet for each revolution of its pointer and is subdivided into feet, tenths of feet and hundredths of feet. The other dials may be arranged to register one hundred feet, one thousand feet, &c.

The operation of this device is as follows: The instrument is mounted near the pump or other reciprocating body, the travel of which is to be measured. The flexible cord 35 is then connected directly or indirectly with the movable body. It is evident that when the body moves away from the instrument it will pull the flexible cord with it, thus unwinding the cord from the sheave 30 and rotating the latter and ball disk 40 in one direction. This rotation of the ball disk will be imparted to the bevel gear 52 by the balls 45 being wedged between the inclined bottoms of their pockets and the annular web 53. At the same time the balls 48 in the pockets on the opposite side of the ball disk will have a tendency to roll back into their pockets against the action of springs 49 and will have no effect upon this part of the operation. The rotation thus obtained will be transmitted to the registering mechanism and the parts are so proportioned that one foot of travel of the movable body will cause the pointer on the large dial to move one tenth of a revolution. The rotation of sheave 30 has wound up spiral spring 32 so that when the pull of the flexible cord 35 is released by the return movement of the movable body, this spring will rotate the sheave 30 and the ball disk 40 in the opposite direction. In this case the balls 45 are loosened from their grip and the balls 48 engage with the annular disk 51, thus causing the bevel gear 50 to rotate with the sheave 30 and ball disk 40. This rotation will then be imparted to the bevel gear 52, but in the opposite direction, and to the register 60 through pinion 56. Thus the pinion 56 and all the gears will rotate always in the same direction and the travel of the reciprocating body will be cumulatively registered.

In order to facilitate the use of this instrument I have designed the connection between the shaft 25 and sheave 30 which I have described as this affords a simple means for reversing the sheave to run the cord 35 in opposite direction or replacing it with another sheave. The casing is constructed to form an oil bath so that the moving parts within it may be always freely lubricated.

This meter, when applied to pumps, may be made to register the total travel of the

piston in feet or any other desired units. By using the area of the pump cylinder a table of constants may be prepared by means of which and the reading of the meter the total volume of fluid which should have been pumped may be ascertained. If the slip of the pump is known another table of constants may be prepared from which the actual amount of water pumped may be computed by the use of this meter. These tables are mentioned as suggesting means for increasing the usefulness of the instrument.

I have shown my instrument as applied to a pump as this is one of its most advantageous uses, but it is clearly within the scope of this invention to use it in conjunction with other devices than pumps.

The sheave 30 which carries the flexible cord may be removed and another of smaller or larger diameter put in its place for the purpose of adapting this meter for use in conjunction with different movable bodies.

What I claim is.—

1. A registering mechanism actuating device comprising a shaft arranged to be rotated in both directions in proportion to the movements of a reciprocatory body, a sheave and a disk affixed to said shaft, gearing mechanically associated with said disk, one set of circular locking members upon one side of the disk for engagement with one part of the gearing when the disk is rotated in one direction, and another set of circular locking members on the other side of the disk for engagement with the other part of the gearing when the disk is rotated in the opposite direction, said gearing being arranged to transmit the reverse movement of the shaft in one direction.

2. A registering mechanism actuating device comprising a shaft arranged to be rotated in both directions in proportion to the movements of a reciprocatory body, a sheave and a disk affixed to said shaft, a pair of gears loosely mounted upon the shaft at either side of the disk, each of said gears having an annular web projecting over the disk, one set of circular locking members on one side of the disk arranged to engage the web on one of the gears when the disk is rotated in one direction, another set of circular locking members on the other side of the disk arranged to engage the web on the other of the gears when the disk is rotated in the opposite direction, and mechanism connecting said gears and arranged to cause the rotation of either gear to be transmitted to the other, and to obtain a unidirectional rotation.

3. A registering mechanism actuating device comprising a shaft arranged to be rotated in both directions in proportion to the movements of a reciprocatory body, a

sheave and a disk affixed to said shaft, a pair of bevel gears loosely mounted upon the shaft at either side of the disk, each of said gears having an annular web projecting from the disk, one set of circular locking members on one side of the periphery of the disk arranged to engage the web on one of the gears when the disk is rotated in one direction, another set of circular locking members on the other side of the periphery of the disk arranged to engage the web on the other side of the gears when the disk is rotated in the opposite direction, and a bevel pinion between said gears arranged to cause the rotation of either gear to be transmitted to the other, and to obtain a unidirectional rotation.

4. A registering mechanism actuating device comprising a shaft arranged to be rotated in both directions in proportion to the movements of a reciprocatory body, a sheave and a disk affixed to said shaft, said sheave being arranged to be rotated in one direction by an external pull, a spring for rotating the sheave in the opposite direction, a pair of bevel gears loosely mounted upon the shaft at either side of the disk, each of said gears having an annular web projecting from the disk, one set of circular locking members on one side of the periphery of the disk arranged to engage the web on one side of the gears when the disk is rotated in one direction, another set of circular locking members on the other side of the periphery of the disk arranged to engage the web on the other side of the gears when the disk is rotated in the opposite direction, springs for throwing said locking members into engagement, and a bevel pinion between said gears arranged to cause the rotation of either gear to be transmitted to the other, and to obtain a unidirectional rotation.

5. A registering mechanism actuating device comprising a shaft, a disk affixed to the shaft, a removable sheave connected with the shaft, a flexible cord about the sheave arranged to be connected with a reciprocatory body to rotate the sheave in one direction when said body moves in one direction, a spiral spring within the sheave for rotating the sheave in the opposite direction when the body moves in the opposite direction, a pair of bevel gears loosely mounted upon the shaft at either side of the disk, each of said gears having a smooth annular web projecting from the disk, one set of circular locking members on one side of the periphery of the disk arranged to engage the web on one of the gears when the disk is rotated in one direction, another set of circular locking members on the other side of the periphery of the disk arranged to engage the web on the other of the gears when the disk is rotated in the opposite direction, said disk

being constructed to form pockets beveled in
opposite directions for holding said locking
members, springs for throwing the locking
members into engagement, bevel pinions be-
5 tween said gears arranged to cause the rota-
tion of either gear to be transmitted to the
other, and a driving pinion connected with
one of the bevel gears.

In testimony whereof I have signed my
name to this specification in the presence of 10
two subscribing witnesses.

CHARLES L. DUENKEL.

Witnesses:

EDITH BEBEE,
ELLA TUCH.