

Dec. 25, 1928.

E. S. STEPHENS

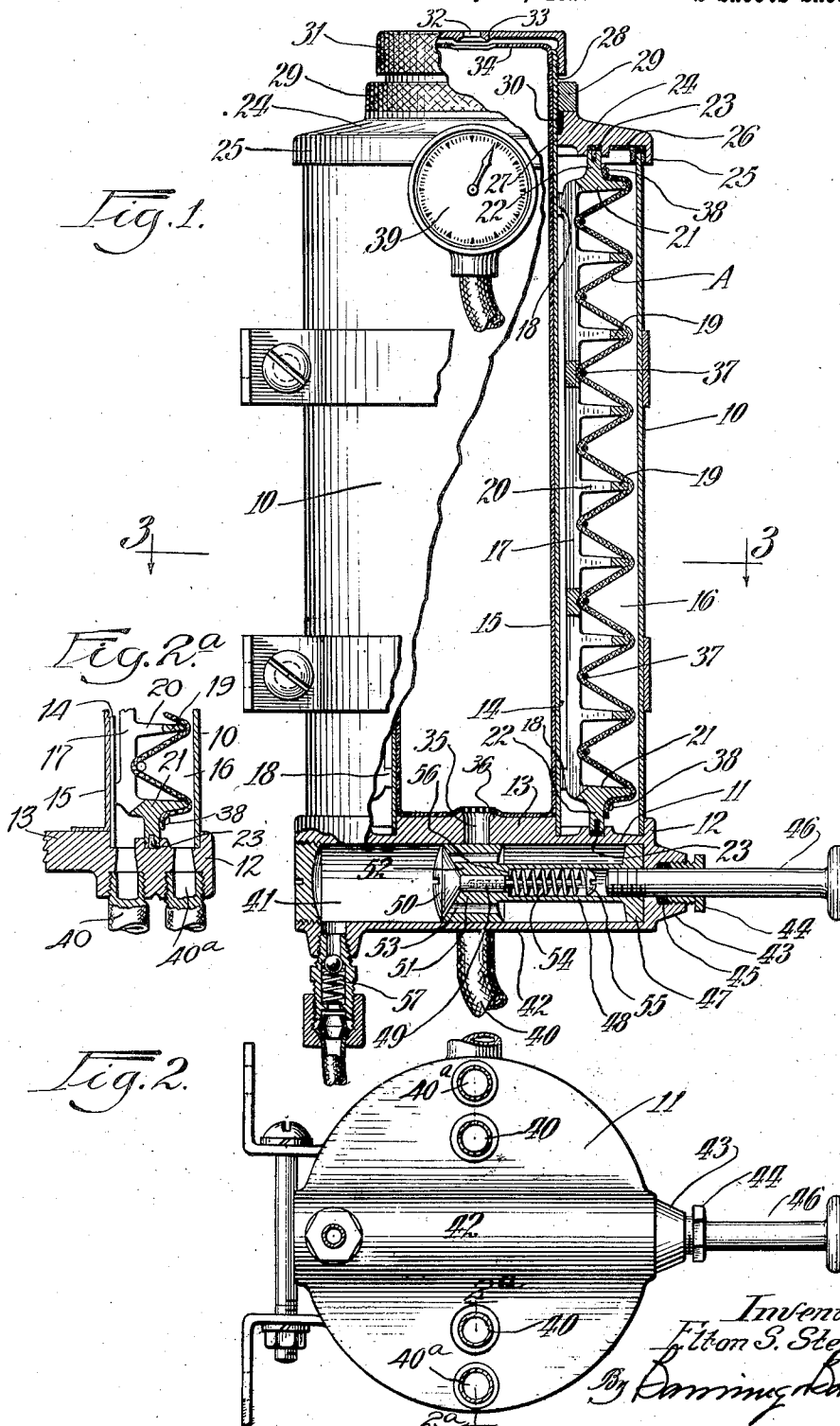
1,696,367

FILTER

Filed May 20, 1927

2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

Fig. 3.

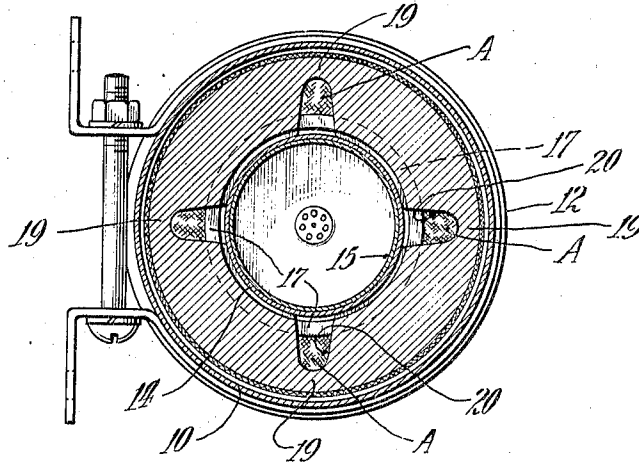
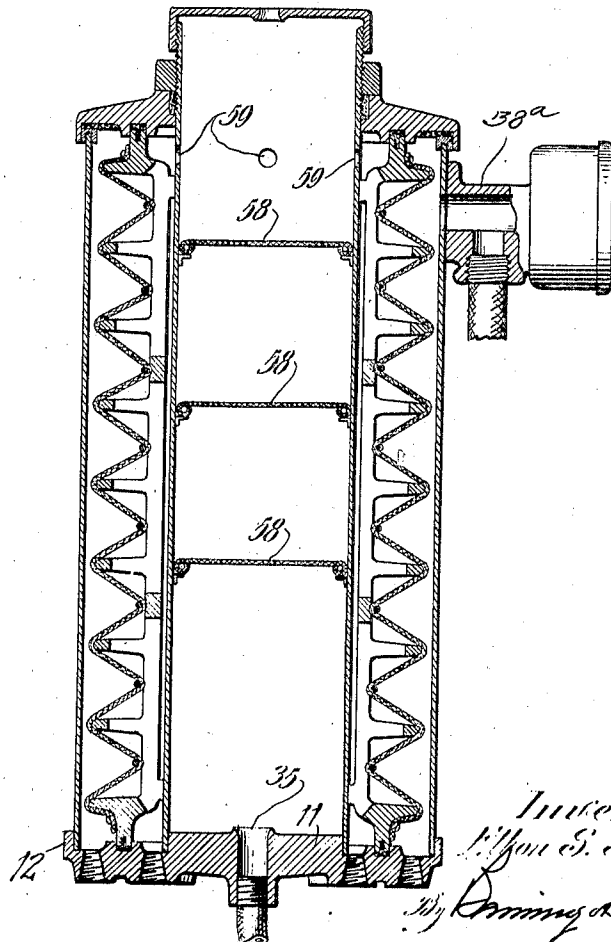


Fig. 4.



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FILTER.

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The filter of the present invention is designed primarily for the purpose of filtering oil delivered to a lubricating liquid, and the object of the invention is to provide an extensive filtering surface within a comparatively restricted compass, so that the filter device as a whole may be made compact and easily detachable for use in the lubricating system of a truck, automobile, or the like.

10 A further object of the invention is to provide within the structure of the filter itself a receptacle for a heavier grade of lubricant which may be injected or charged into the system from time to time in order to "boost" the lubricant in the system when the same becomes unduly thinned out.

Further objects have to do with the construction and arrangement of the various portions of the device in such a way that the structure may be readily assembled or disassembled as occasion may require.

In the drawing:

Figure 1 is an elevation, partly in section, showing the filter of the present invention;

25 Fig. 2 is an end view of the lower end of the filter;

Fig. 2^a is a detail in section taken on line 2—2 of Fig. 2;

30 Fig. 3 is a cross sectional view taken on line 3—3 of Fig. 1; and

Fig. 4, which shows a structure generally similar to Fig. 1 except for the omission of the force pump, is a vertical section taken centrally in the plane of line 2—2 of Fig. 2.

35 The filter as a whole comprises an outer elongated cylindrical shell 10 which, at its lower end, is fitted into a base plate 11 provided with a peripheral flange 12 and provided in its center with a boss 13, which latter serves to center and support an inner tubular well 14 adapted to receive and enclose a cartridge 15 containing the heavy lubricant intended to be charged into the system for "boosting" or thickening the same.

45 The inner well affords in effect a central post or pillar in spaced relation to the outer shell leaving between the two an annular chamber 16 within which the filtering takes place. Surrounding the inner well is a cage comprising a cylindrical wall 17 provided near its upper and lower ends with inwardly extending ring shaped lugs 18 which abut against the well and afford spacers for maintaining the cage in spaced relation to the inner well.

55 The cylindrical wall 17 of the cage is pro-

vided on its exterior with a plurality of outwardly extending circumferential ribs 19, and at recurrent intervals the ribbed wall of the shell is cut through by longitudinally extending slots 20, which are of a depth to cut through the outstanding ribs, which later, however, are uncut at their outer edges so as to maintain the integrity of the cage as a whole. The upper and lower ribs 21 of the cage are but slightly slotted to afford substantially unbroken ends for the cage, and each of these end portions is provided with a longitudinally extending vertically disposed ring shaped flange 22 which is grooved in its edge to provide a seat for a packing ring 23 of felt or other compressible material.

The lower end of the cage rests upon the base plate 11, the packing ring 23 being interposed to effectually seal the parts at this point, while the upper end of the cage is clamped and positioned by the contact of a ring shaped cap 24 provided with a flange 25 which encircles the upper rim of the outer cylindrical shell, a gasket or packing ring 26 being interposed to effectually seal the parts at this point. The ring cap 24 is provided in its center with a bore 27 which provides for the protrusion therethrough of the upper wall of the well 14, which protruding portion is provided with threads 28.

A locking ring 29 is threaded upon the threaded portion 28 of the well wall and bears against a gland 30, the compression of which serves to effectually seal the cap 24 against the well wall, and the ring also serves to force down the cap in such a way as to effectively compress the packing rings 23 and 26 and maintain the sealed relation of the parts. It is desirable that the thickness or positioning of the respective sealing rings 23 and 26 be such that the ring 23 will be contacted by the inner face of the cap 24 prior to the sealing contact made on the ring 26, so that as the parts are ultimately drawn to locked relation, the ring 23 will be forcibly compressed to prevent leakage of oil around either end of the filter cage.

The upper threaded end of the well is closed by means of a flanged cap 31 provided in its center with an air inlet orifice 32 which is surrounded by an inwardly extending beveled lip 33 adapted to bear against the upper end 34 of the cartridge 15 which contains the thick charging lubricant, the arrangement being such that as the cap 31 is screwed to closing position, the end of the cartridge

will be indented around the inner margin of the orifice 32 to maintain a close seal at this point. After the loading of the cartridge, the end is perforated in register with the orifice 32 to provide for the admission of air as the contents of the cartridge are discharged. The base 11 at its center is also provided with a discharge passage 35 surrounded by a rim 36, the purpose and arrangement of which is the same as that of the rim 33, which rim bears forcibly against the face of the cartridge and indents the same as indicated.

The convolute or accordion plaited filter tube A of suitable fabric is carried recurrently over the outstanding rims or flanges 19 and intermediately down back into contact with the wall of the filter cage by the provision of draw cords or rings 37 of any suitable character, and the upper and lower ends of the filter tube may, if desired, be held in place by terminal loops, rings or cords 38.

The oil or lubricant to be filtered is admitted into the side wall of the casing through a fitting 38^a with which is connected gauge 39, of any suitable character adapted to register the fluidity or viscosity of the oil, and the oil so admitted will enter the space outside of the filter tube (see Fig. 4). The oil after filtering is discharged through one or the other of two ports 40 located in the base of the structure at such point as to communicate with the space intermediate between the filter tube and the center well, so that the oil after filtering may be circulated back and forth from the space in question. Additional drain holes 40^a may be provided in the base 13 for the chamber 16.

In the construction of Figs. 1 and 2, the center discharge port 35 leading from the base of the well communicates with a transversely extending piston chamber 41 formed in the interior of the transversely extending protuberant shell 42 integrally formed with the base which is provided at one end with an outwardly extending flange 43 threaded on its interior to receive a gland 44 bearing against a packing ring 45 which effects a seal for a stem 46 of a plunger ring 47 which reciprocates within the chamber 41. The plunger ring 47 carries an inwardly extending stem 48 which is cored to receive the stem 49 of a tapered valve head 50, the inner side of which bears against the inwardly tapered face 51 of a plunger 52 provided with ports 53 extending longitudinally thereof.

The valve stem 49 is surrounded by a coil spring 54 which is interposed between the head 55 of the stem and a shoulder 56, the arrangement being such that the backward stroke of the plunger will permit a recession and opening of the valve head 50 and an admission of lubricant through the ports 53 into the annular space intermediate the plunger head 52 and the plunger ring 47, while a forward thrust of the plunger as a

whole will close the valve 50 and force out a charge of lubricant through the valve controlled nipple 57, which lubricant thus discharged is injected into the oil circulating system to boost the quantity or thickness of the lubricant therein contained.

If it is desired to employ the center well as an additional or supplemental filter, instead of employing it as a container for a special kind of lubricant, the filter in the form shown in Fig. 4 may be employed. In this case, the wall instead of housing a cartridge is employed as a container for layers 58 of suitable filtering material, and the wall of the well near the upper end thereof is provided with a plurality of perforations 59 constituting ports for educting the liquid from the space within the accordion plaited filtering tube to the filter space within the well, and in this case the plunger pump is omitted, together with the ports 40, and the doubly filtered oil is discharged through the orifice 35. In other respects, the arrangement shown in Fig. 4 is similar to that heretofore described, so that further description of this modification is deemed unnecessary.

In operation, relatively thin oil admitted through the gauge fitting 38^a will enter the space outside of the accordion plaited or convoluted filtering tube and will be drawn through the fabric thereof into the annular space exterior of the well, and the filtered oil is discharged and returned through the ports 40. The arrangement of the cage is such as to permit the cage and the filtering fabric to be withdrawn as a unit from the casing by merely removing the upper cap which serves to clamp and hold the cage in position without the requirement for special means of attachment for the cage.

The cage is so arranged that it will be properly centered by contact of the ring shaped lug 18 with the wall of the center well, which in turn is properly positioned and centered by its fit upon the post 13^a upstanding from the base 11. Where the center well is used as a receptacle for heavy oil which may or may not, as desired, be contained within the cartridge, the action of the force pump permits measured charges of such oil to be injected from time to time into the system. The gauge on the side of the casing also indicates the back pressure when the strainer or fabric becomes dirty or clogged.

As the plunger is driven forward, the valve head 50, acting as the head of the plunger, will drive out the charge of heavy lubricant in advance of the valve head, and, at the same time, open up the port 35 into register with the reduced portion of the valve surrounding the stem 48, thereby trapping a charge of oil between the plunger head 52 and the plunger ring 47. On drawing back the plunger, the oil so trapped will pass through the ports 35 in the plunger head into the space in advance

of the plunger head in preparation for the next succeeding forward thrust of the plunger. With the plunger drawn back to this final position, the plunger head will cut across the discharge port 35 thereby sealing the latter against the further discharge of oil.

Where the center well is used for the retention of a supplemental filter, the plunger may be dispensed with and the entire space within the casing employed for filtering purposes. The device as a whole is compact and self-contained, and the various parts are so arranged that they may be readily assembled and fitted together without a requirement for the use of interior connections at points quick of access.

I claim:

1. In a filter, the combination of a casing provided with a centrally disposed well, a filter cage of generally cylindrical formation held in spaced relation to the center well, the cage being provided with outstanding ring shaped ribs and the wall of the cage being provided with longitudinally extending slots to provide communication between the spaces interior and exterior of the cage, a convoluted filter tube recurrently distended by contact with the edge of the ring shaped ribs, means for holding the tube contracted within the spaces intermediate between the space of the ring shaped ribs, the filter being provided with inlet and outlet passages, one of which opens into the space exterior of the filter tube and one interior thereof, substantially as described.

2. In a filter, the combination of a casing provided with a centrally disposed well, a filter cage of generally cylindrical formation held in spaced relation to the center well, the cage being provided with outstanding ring shaped ribs and the wall of the cage being provided with longitudinally extending slots to provide communication between the spaces interior and exterior of the cage, said slots also cutting part way through the ribs, a convoluted filter tube recurrently distended by contact with the edge of the ring shaped ribs, means for holding the tube contracted within the spaces intermediate between the space of the ring shaped ribs, the filter being provided with inlet and outlet passages, one of which opens into the space exterior of the filter tube and one interior thereof, substantially as described.

3. In a filter, the combination of a casing provided with a centrally disposed well, a filter cage of generally cylindrical formation held in spaced relation to the outer well, the cage being provided with outstanding ring shaped ribs and the wall of the cage being provided with longitudinally extending slots to provide communication between the spaces interior and exterior of the cage, a convoluted filter tube recurrently distended by con-

tact with the edge of the ring shaped ribs, means for holding the tube contracted within the spaces intermediate between the space of the ring shaped ribs, the filter being provided with inlet and outlet passages, one of which opens into the space exterior of the filter tube and one interior thereof, a force pump in communication with the centrally disposed well, and a closing cap for the opposite end of said well, substantially as described.

4. In a filter, the combination of a casing provided with a centrally disposed well, a filter cage of generally cylindrical formation held in spaced relation to the center well, the cage being provided with outstanding ring shaped ribs and the wall of the cage being provided with longitudinally extending slots to provide communication between the spaces interior and exterior of the cage, said slots also cutting part way through the ribs, a convoluted filter tube recurrently distended by contact with the edge of the ring shaped ribs, means for holding the tube contracted within the spaces intermediate between the space of the ring shaped ribs, the filter being provided with inlet and outlet passages, one of which opens into the space exterior of the filter tube and one interior thereof, a force pump in communication with the centrally disposed well, and a closing cap for the opposite end of said well, substantially as described.

5. In a filter, the combination of a cylindrical casing and a cylindrical centrally disposed well, a ring shaped cap for the casing through which the well protrudes, a nut screw threaded onto the protruding end of the well and bearing against the ring shaped cap, an outer closing cap for the well, a base plate upon which the casing and well are both supported, a generally cylindrical filter cage consisting of a tubular body portion surrounding and in spaced relation to the well, and a plurality of ring shaped ribs, the body and ribs being perforated by longitudinally extending slots, a convoluted filter tube of fabric recurrently distended by engagement with the edges of the ring shaped ribs, and means contracting the tube intermediate the ribs, substantially as described.

6. In a filter, the combination of a cylindrical casing and a cylindrical centrally disposed well, a ring shaped cap for the casing through which the well protrudes, a nut screw threaded onto the protruding end of the well and bearing against the ring shaped cap, an outer closing cap for the well, a base plate upon which the casing and well are both supported, a generally cylindrical filter cage consisting of a tubular body portion surrounding and in spaced relation to the well, and a plurality of ring shaped ribs, the body and ribs being perforated by longitudinally extending slots, and the ends of the cage being provided with outwardly extending flanges

clamped in sealed relation between the cap and base plate respectively, a convoluted filter tube of fabric recurrently distended by engagement with the edges of the ring shaped ribs, and means contracting the tube intermediate the ribs, substantially as described.

7. In a filter, the combination of a cylindrical casing and a cylindrical centrally disposed well, a ring shaped cap for the casing through which the well protrudes, a nut screw threaded onto the protruding end of the well and bearing against the ring shaped cap, an outer closing cap for the well, a base plate upon which the casing and well are both supported, a generally cylindrical filter cage consisting of a tubular body portion surrounding and in spaced relation to the well, a plurality of ring shaped ribs, the body and ribs being perforated by longitudinally extending slots, a convoluted filter tube of fabric recurrently distended by engagement with the edges of the ring shaped ribs, means contracting the tube intermediate the ribs, and a force pump carried below the base plate and in communication with the interior of the well for injecting measured quantities of the contents of the well, substantially as described.

8. In a filter, the combination of a cylindrical casing and a cylindrical centrally disposed well, a ring shaped cap for the casing through which the well protrudes, a nut screw threaded onto the protruding end of the well and bearing against the ring shaped cap, an outer closing cap for the well, a base plate upon which the casing and well are both supported, a generally cylindrical filter cage consisting of a tubular body portion surrounding and in spaced relation to the well, a plurality of ring shaped ribs, the body and ribs being perforated by longitudinally extending slots, and the ends of the cage being provided with outwardly extending flanges clamped in sealed relation between the cap and base plate respectively, a convoluted filter tube of fabric recurrently distended by engagement with the edges of the ring shaped ribs, means contracting the tube intermediate the ribs, and a force pump carried below the base plate and in communication with the interior of the well for injecting measured quantities of the contents of the well, substantially as described.

9. In a filter, the combination of a cylindrical casing and a cylindrical centrally disposed well, a ring shaped cap for the casing through which the well protrudes, a nut screw threaded onto the protruding end of the well and bearing against the ring shaped cap, an outer closing cap for the well, a base plate upon which the casing and well are both supported, a generally cylindrical filter cage consisting of a tubular body portion surrounding and in spaced relation to the well, a plurality of ring shaped ribs, the body and

ribs being perforated by longitudinally extending slots, a convoluted filter tube of fabric recurrently distended by engagement with the edges of the ring shaped ribs, and means contracting the tube intermediate the ribs, a gauge secured to the side of the casing and in communication with the interior thereof for indicating the condition of the oil entering outside of the filtering tube and the base plate being provided with a port for the discharge of the filtered oil from the space intermediate the filtering tube and the well, substantially as described.

10. In a filter, the combination of a cylindrical casing and a cylindrical centrally disposed well, a ring shaped cap for the casing through which the well protrudes, a nut screw threaded onto the protruding end of the well and bearing against the ring shaped cap, an outer closing cap for the well, a base plate upon which the casing and well are both supported, a generally cylindrical filter cage consisting of a tubular body portion surrounding and in spaced relation to the well, a plurality of ring shaped ribs, the body and ribs being perforated by longitudinally extending slots, and the ends of the cage being provided with outwardly extending flanges clamped in sealed relation between the cap and base plate respectively, a convoluted filter tube of fabric recurrently distended by engagement with the edges of the ring shaped ribs, and means contracting the tube intermediate the ribs, a gauge secured to the side of the casing and in communication with the interior thereof for indicating the condition of the oil entering outside of the filtering tube, and the base plate being provided with a bore for the discharge of the filtered oil from the space intermediate the filtering tube and the well, substantially as described.

11. In a filter, the combination of a cylindrical casing and a cylindrical centrally disposed well, a ring shaped cap for the casing through which the well protrudes, a nut screw threaded onto the protruding end of the well and bearing against the ring shaped cap, an outer closing cap for the well, a base plate upon which the casing and well are both supported, a generally cylindrical filter cage consisting of a tubular body portion surrounding and in spaced relation to the well, a plurality of ring shaped ribs, the body and ribs being perforated by longitudinally extending slots, a convoluted filter tube of fabric recurrently distended by engagement with the edges of the ring shaped ribs, means contracting the tube intermediate the ribs, and a force pump carried below the base plate and in communication with the interior of the well for injecting measured quantities of the contents of the well, a gauge secured to the side of the casing and in communication with the interior thereof for indicating the condition

of the oil entering outside of the filtering tube, and the base plate being provided with a port for the discharge of the filtering oil from the space intermediate the filtering tube and the well, substantially as described.

12. In a filter, the combination of a cylindrical casing and a cylindrical centrally disposed well, a ring shaped cap for the casing through which the well protrudes, a nut screw threaded onto the protruding end of the well and bearing against the ring shaped cap, an outer closing cap for the well, a base plate upon which the casing and well are both supported, a generally cylindrical filter cage consisting of a tubular body portion surrounding and in spaced relation to the well, a plurality of ring shaped ribs, the body and ribs being perforated by longitudinally extending slots, and the ends of the cage being pro-

vided with outwardly extending flanges clamped in sealed relation between the cap and base plate respectively, a convoluted filter tube of fabric recurrently distended by engagement with the edges of the ring shaped ribs, means contracting the tube intermediate the ribs, and a force pump carried below the base plate and in communication with the interior of the well for injecting measured quantities of the contents of the well, a gauge secured to the side of the casing and in communication with the interior thereof for indicating the condition of the oil entering outside of the filtering tube, and the base plate being provided with a port for the discharge of the filtered oil from the space intermediate the filtering tube and the well, substantially as described.

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