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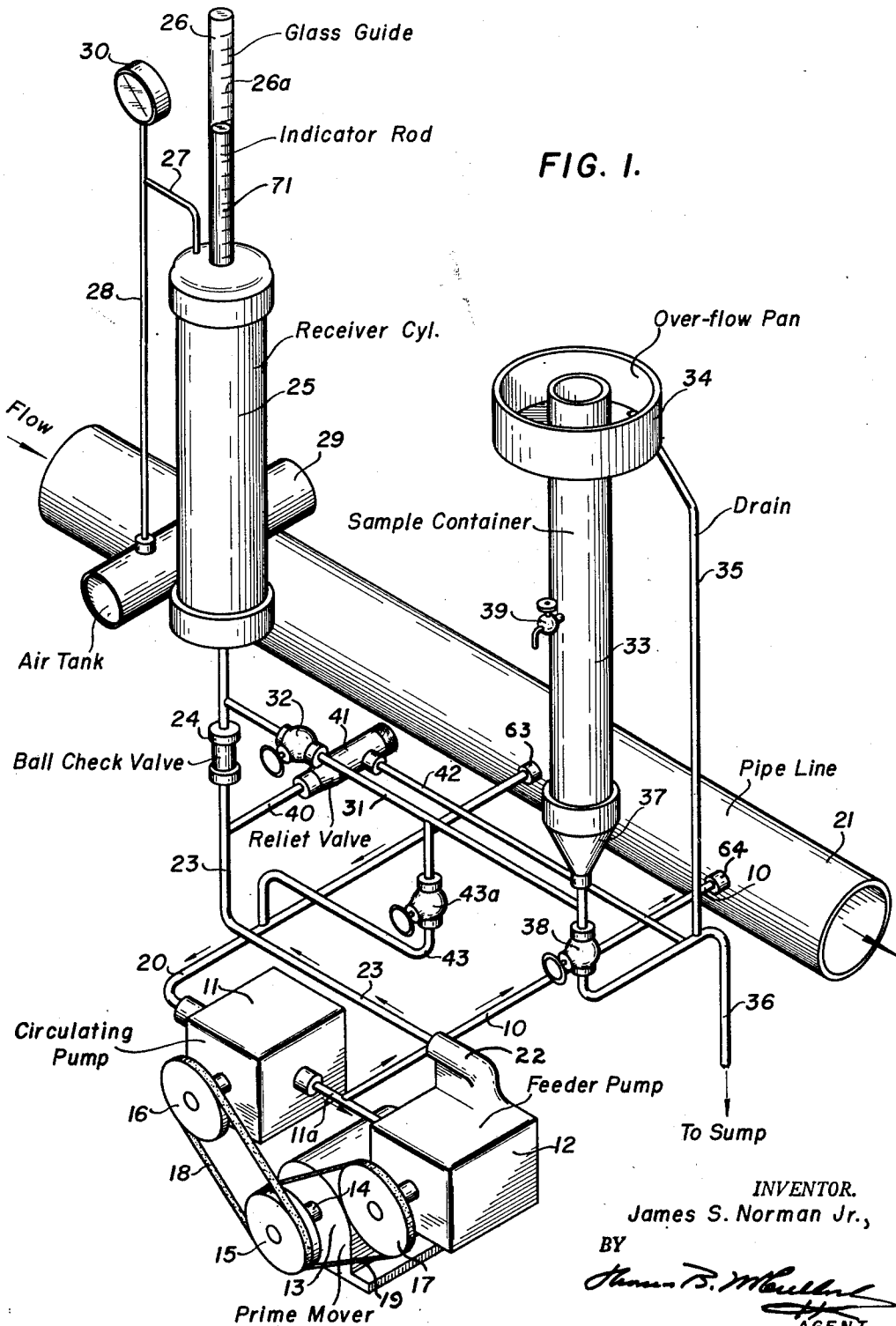
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APPARATUS FOR OBTAINING SAMPLES FROM FLOWING STREAMS

Filed July 19, 1951

2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

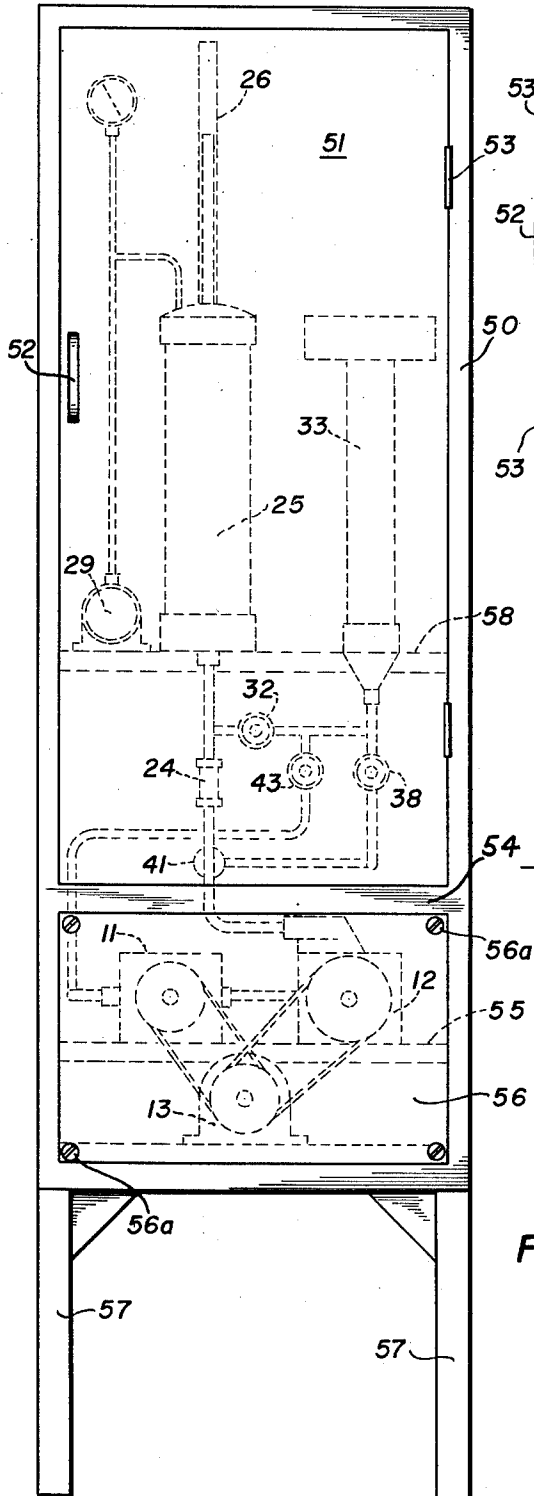


FIG. 2

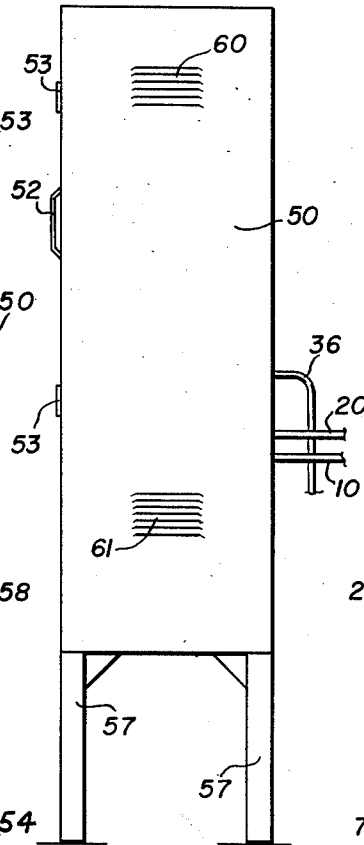


FIG. 3.

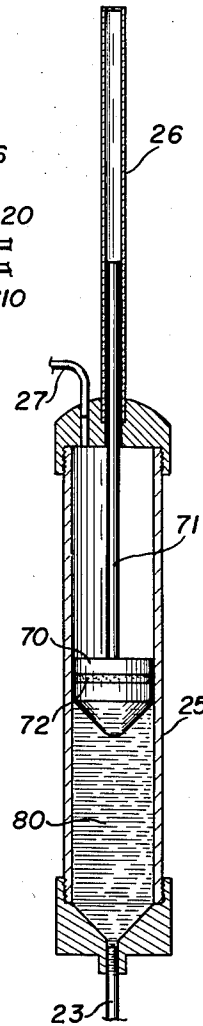


FIG. 4.

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APPARATUS FOR OBTAINING SAMPLES
FROM FLOWING STREAMS

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The present invention is directed to apparatus for obtaining a sample from a flowing stream. More particularly, the apparatus has to do with a sampling device for obtaining samples from flowing streams such as pipe lines.

The invention may be briefly described as a sampling apparatus which comprises, in combination, a first and second pump connected in series to said flowing stream with the first pump adapted to take suction on the flowing stream and the second pump adapted to take suction on the first pump discharge. The apparatus includes means connected to the first pump discharge to return a greater portion of the sample to the flowing stream. A pressure-tight sample receiver containing a piston member arranged therein having a piston arm extending into a housing arranged on said receiver is fluidly connected by a first conduit to the discharge from the second pump. A sample container open at a top end is adapted to be fluidly connected to the sample receiver. A second conduit connects the sample container adjacent its open end to a third conduit which is connected to a closed bottom end of the container. The third conduit is arranged to discharge into a sump. A fourth conduit containing a relief valve fluidly connects the first and second conduits while a fifth conduit containing a valve means connects the sample receiver to the sample container. The first conduit has a restriction means arranged therein to resist flow from the sample receiver to the second pump.

The invention will be further described by reference to the drawing in which

Fig. 1 is an isometric view of the apparatus;

Fig. 2 is a front view of the apparatus arranged in a housing enclosing same;

Fig. 3 is a side view of the device of the present invention showing external means for connecting the apparatus to the flowing stream; and

Fig. 4 is a sectional view of the sample receiver of Figs. 1 and 2.

In the drawing identical numerals will be employed to designate identical parts in the several figures of the drawing.

Referring now to the drawing, numerals 11 and 12 designate first and second pumps which are adapted to be operated from a common prime mover 13 which may be an explosion proof electric motor having a shaft 14 carrying a pulley wheel 15. Pump 11 has a pulley wheel 16 and pump 12 has a pulley wheel 17 which are arranged to be driven from pulley wheel 15 of prime mover 13 by drive belts or chains 18 and 19, re-

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spectively. The suction of pump 11 is connected by line 20 to a flowing stream, such as in a pipe line 21. The discharge 11a of pump 11 is connected to the suction of pump 12 and through a T arrangement 10 to line 21. The discharge 22 of pump 12 is connected by a conduit 23 containing a check valve 24 to a sample receiver 25 which will be described in more detail hereinafter. The sample receiver 25 has a housing 26 arranged thereon which is marked on an interior or exterior surface thereof spaced calibrations 26a. The sample receiver 25 is connected by conduits 27 and 28 to a source of compressed gas 29. The conduit 28 is provided with a gauge 30 for indicating pressure on the air or gas tank 29 and on the sample receiver 25.

The conduit 23 is connected by a conduit 31 containing a valve means 32 to a sample container 33 which has an upper end open to the atmosphere and which increases in size at its upper end to provide an overflow cup or pan 34. The overflow cup 34 has an overflow line 35 connected thereto which discharges into a conduit 36 which is connected to a lower end 37 of the sample container 33. The conduit 36 is provided with a valve means 38 for controlling flow through conduit 36. The conduit 36 discharges into a sump, not shown, from which the oil may be recovered if desired. The sample container 33 is provided with a petcock 39 for withdrawal of sample therefrom. The conduit 23 connects to line 36 by a conduit 40 which connects to a relief valve 41 which, in turn, connects by conduit 42 to line 36 which allows discharge from conduit 23, on buildup of excess pressure, into conduit 36 and thence to the sump not shown.

A by-pass line 43 containing a valve 43a serves to connect line 20 for withdrawing a spot sample directly from pipe line 21 to line 31 and thence to container 33 allowing sample receiver 25 to be by-passed.

Referring now to Fig. 2, it will be seen that the assembly is mounted in a housing or cabinet 50 provided with a door 51 for access thereto which may easily be opened by handle 52. The door 51 is hingedly mounted by hinges 53 to the cabinet 50. The pumps 11 and 12 are arranged in the lower part of the housing defined by a shelf 54 and a lower shelf 55. The pumps 11 and 12 and the motor 13 are arranged as shown in the housing 50 and access thereto is provided by a removable plate 56. The plate 56 is affixed to the cabinet 50 by removable screws 56a. The whole housing or cabinet 50 may be mounted on legs 57. The sample receiver 25 and the sample

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container 33 are suitably mounted on a shelf member 58.

Referring now to Fig. 3, it will be seen that the upper and lower portions of the housing or cabinet 50 may be ventilated by louvered vents 60 and 61. It will be further seen by reference to Fig. 3 that only two external connections are required for the sampling unit proper. Lines 10 and 20, respectively, may be connected to the pipe line 21 by suitable union connections 64 and 63, respectively. It is understood, of course, that the motor 13 will require some energizing medium and means will be necessary for electrical connections or other energy sources to be made thereto.

Referring now to Fig. 4 in which a detail of the sample receiver is given, it will be seen that a piston member 70 having a piston arm 71 is arranged in the sample receiver 25 and that the piston arm 71 extends upwardly into the housing 26 which suitably may be constructed of a transparent material, such as Lucite, Plexiglas and other transparent material such as is common on the market. The piston member 70 is provided with a sealing means, such as an O-ring 72, to provide a seal between the piston member 70 and the walls of sample receiver 25. The housing 26 may suitably have calibrated on an interior or exterior surface thereof suitable indicating means 26a so that the upward travel of the arm 71 will indicate the depth of liquid in the sample receiver 25. It will be preferred to have the indicator markings or scale 26a on the exterior surface of the housing 26.

The apparatus of the present invention operates in the following manner: It is desired to obtain a representative sample from the pipe line 21. The pumps 11 and 12 would be started by energizing prime mover 13. Suction would be taken by line 20 on pipe line 21 and the discharge from pump 11 divides into two streams, the major portion discharging back into pipe line 21 by line 10 while a minor portion is drawn into pump 12 which would pump a certain small predetermined amount of sample at a continuous rate by line 23 into sample receiver 25. The pressure exerted by pump 12 would be greater than the pressure exerted by air tank 29 which would cause the piston member 70 to travel upwardly as liquid, such as crude oil 80, as shown in Fig. 4, rises in the sample receiver 25. As the piston arm 71 travels upwardly in the transparent housing 26 the progress of the sample may be observed and the amount of sample therein followed. The relief valve 41 is provided as a protective measure in the event the size of the sample receiver is not correlated properly with the rate of sampling or in case the device is neglected beyond the normal sampling time. Valve 32 in line 31 is then opened, allowing the sample to be transferred by line 23 and line 31 to sample container 33 by virtue of the pressure on receiver 25 from tank 29. The check valve 24 resists flow-back to pump 12 in line 23. As the sample rises in sample container 33 it overflows into overflow cup or pan 34 and the excess is discharged by lines 35 and 36 to a sump or sewer not shown. It is a simple matter then to determine the gravity of the oil in container 33 by inserting or maintaining a suitable hydrometer therein. If it is desired to obtain a sample (for any reason) from container 33, such as during transfer of oil from receiver 25, this may be done by manipulation of petcock 39.

Two pumps are required in the practice of the present invention. The pump 11 may be called a circulating oil pump and pump 12 is of the type

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of a chemical feeder, such as one of the Manzel type. The pump 11 is designed for taking suction on the pipe line while the pump 12 is designed to pump into the sample receiver 25. It is desirable that the discharge pressure of the pump 11 be sufficiently high to discharge into the high pressure pipe line stream while the discharge pressure of the pump 12 should be sufficient to fill receiver 25 and to open relief valve 41 when the receiver 25 becomes full. A suitable discharge pressure for pump 12 is 100 p. s. i. The relief valve 41 may be designed to open at about 115 p. s. i.

Under some circumstances, it is desirable to take a spot sample from a pipe line and the like. Under these conditions the apparatus is employed to allow flow from line 20 into line 43 containing valve 43a which connects into line 31 and thence to sample container 33. It will be seen that flow can be had to sample receiver 25 and to sample container 33 simultaneously by the arrangement of the present invention.

Different size sample containers may be used for obtaining different size samples. For example, for a sample covering a 24-hour period a two-gallon sample receiver 25 may be used. If a sample is required every two hours a smaller receiver 25, such as one holding two pints, may be employed. In short, the sample receiver may vary in size depending on the period of time the sample is to be taken.

The nature and objects of the present invention having been completely described and illustrated, what I wish to claim as new and useful and to secure by Letters Patent is:

1. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, a circulating pump, a sampling pump, a sample receiver, and a sample container, said circulating pump being adapted to take suction on and discharge to said flowing stream and to discharge a sample thereof into said sampling pump, said sampling pump being connected to said receiver and adapted to regulate the flow of sample thereto, and conduits connecting said pumps with said sample receiver and said sample receiver with said container.

2. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, a circulating pump, a sampling pump, a sample receiver, and a sample container, said circulating pump being adapted to take suction on and discharge to said flowing stream and to discharge a sample thereof into said sampling pump, said sampling pump being connected to a lower end of said receiver and adapted to regulate the flow of sample thereto, and conduits connecting said pumps with said sample receiver and said sample receiver with said container, said conduit connecting said receiver with said container being provided with valve means to control the flow of fluid therethrough.

3. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, first and second pumps connected in series to said flowing stream with the first arranged to take suction from and discharge into said stream and the second arranged to take suction from said first pump, a sample receiver, a first conduit fluidly connecting the sample receiver to the second pump, a sample container adapted to be fluidly connected to the sample receiver, a second conduit connected to said sample container adjacent a top end, a third conduit connected to a bottom end of said sample container and to said

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second conduit, a fourth conduit fluidly connecting said first and second conduits, and a fifth conduit connecting said sample receiver and sample container, said first conduit having means arranged therein to resist flow from said sample receiver to said second pump.

4. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, first and second pumps connected in series to said flowing stream with the first arranged to take suction from and discharge into said stream and the second arranged to take suction from said first pump, a sample receiver, a piston member in said sample receiver, a first conduit fluidly connecting the sample receiver to the second pump, a sample container open at a top end adapted to be fluidly connected to the sample receiver, a second conduit connected to said sample container adjacent its open end, a third conduit connected to a closed bottom end of said sample container and to said second conduit, a fourth conduit fluidly connecting said first and second conduits, a relief valve in said fourth conduit, a fifth conduit connecting said sample receiver and container, and a valve means in said fifth conduit, said first conduit having means arranged therein to resist flow from said sample receiver to said second pump.

5. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, first and second pumps connected in series to said flowing stream with the first arranged to take suction from and discharge into said stream and the second to take suction from said first pump, a pressure-tight sample receiver, a housing arranged on said sample receiver, a piston member arranged in said sample receiver having a piston arm extending into said housing, pressure means adapted to exert a force on said piston, a first conduit fluidly connecting the sample receiver to the second pump, a sample container open at a top end adapted to be fluidly connected to the sample receiver, a second conduit connected to said sample container adjacent its open end, a third conduit connected to a closed bottom end of said sample container and to said second conduit, a fourth conduit fluidly connecting said first and second conduits, a relief valve in said fourth conduit, a fifth conduit connecting said sample receiver and container, and a valve means in said fifth conduit, said first conduit having means arranged therein to resist flow from said sample receiver to said second pump.

6. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, first and second pumps connected in series to said flowing stream, the first pump adapted to take suction from and discharge into the flowing stream and the second pump adapted to take suction from the first pump discharge, a pressure-tight sample receiver, a first conduit fluidly connecting the sample receiver to the second pump, a substantially transparent housing arranged on said receiver, a piston member arranged in said sample receiver having a piston arm extending into said housing on said receiver, a sample container open at a top end adapted to be fluidly connected to the sample receiver, a second conduit connected to said sample container adjacent its open end, a third conduit connected to a closed bottom end of said container and to said second conduit, a fourth conduit fluidly connecting said first and second conduits, a relief valve in said fourth conduit, a fifth conduit connecting said sample receiver and con-

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tainer, and a valve means in said fifth conduit, said first conduit having a check valve arranged therein to resist flow from said receiver to said second pump.

7. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, first and second pumps connected in series to said flowing stream, the first pump adapted to take suction from and discharge into the flowing stream and the second pump adapted to take suction on the first pump discharge, a pressure-tight sample receiver, a first conduit fluidly connecting the sample receiver to the second pump, a substantially transparent housing arranged on said sample receiver, a piston member arranged in said sample receiver having a piston arm extending into said housing on said receiver, a sample container open at a top end adapted to be fluidly connected to the sample receiver, a second conduit connected to said sample container adjacent its open end, a third conduit connected to a closed bottom end of said container and to said second conduit, a fourth conduit fluidly connecting said first and second conduits, a relief valve in said fourth conduit, a fifth conduit connecting said sample receiver and container, a valve means in said fifth conduit, said first conduit having a check valve arranged therein to resist flow from said receiver to said second pump, a housing enclosing the pumps, conduits, and the sample receiver and container, and external connecting means for connecting the suction and discharge of said first pump to said flowing stream.

8. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, first and second pumps connected in series to said flowing stream, the first pump adapted to take suction from and discharge into the flowing stream and the second pump adapted to take suction on the first pump discharge, a pressure-tight sample receiver, a first conduit fluidly connecting the sample receiver to the second pump, a substantially transparent housing provided with indicator means on a surface of said housing, a piston member arranged in said sample receiver having a piston arm extending into said housing on said receiver, a sample container open at a top end adapted to be fluidly connected to the sample receiver, a second conduit connected to said sample container adjacent its open end, a third conduit connected to a closed bottom end of said container and to said second conduit, a fourth conduit fluidly connecting said first and second conduits, a relief valve in said fourth conduit, a fifth conduit connecting said sample receiver and container, a valve means in said fifth conduit, said first conduit having a check valve arranged therein to resist flow from said receiver to said second pump, a housing enclosing the pumps, conduits, and the sample receiver and container, and external connecting means for connecting the suction and discharge of said first pump to said flowing stream.

9. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, a first conduit connected to a flowing stream, first and second serially interconnected pumps connected to said first conduit, the first pump being adapted to take suction from and discharge into the flowing stream and the second pump being adapted to take suction from the first pump discharge, a pressure-tight sample receiver, a second conduit fluidly connecting the sample receiver to the second pump, a substan-

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tially transparent housing arranged on said sample receiver, a piston member arranged in said sample receiver having a piston arm extending into said housing on said receiver, a sample container open at a top end adapted to be fluidly connected to the sample receiver, a third conduit connected to said sample container adjacent its open end, a fourth conduit connected to a closed bottom end of said container and to said third conduit, a fifth conduit fluidly connecting said second and third conduits, a relief valve in said fifth conduit, a sixth conduit connecting said sample receiver and container, a valve in said sixth conduit, a seventh conduit connecting said first conduit with said sixth conduit at a point downstream from said valve therein, and valve means in said seventh conduit, said second conduit having a check valve arranged therein to resist flow from said receiver to said second pump.

10. Apparatus for obtaining a sample from a flowing stream which comprises, in combination, a first conduit connected to a flowing stream, first and second serially interconnected pumps connected to said first conduit, the first pump being adapted to take suction from and discharge into the flowing stream and the second pump being adapted to take suction from the first pump discharge, a pressure-tight sample receiver, a second conduit fluidly connecting the sample receiver to the second pump, a substantially transparent housing arranged on said sam-

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ple receiver, a piston member arranged in said sample receiver having a piston arm extending into said housing on said receiver, a sample container open at a top end adapted to be fluidly connected to the sample receiver, a third conduit connected to said sample container adjacent its open end, a fourth conduit connected to a closed bottom end of said container and to said third conduit, a fifth conduit connecting said second and third conduits, a relief valve in said fifth conduit, a sixth conduit connecting said sample receiver and container, a valve in said sixth conduit, and a seventh conduit containing a valve means connecting said first conduit with said sixth conduit at a point downstream from said valve therein, said second conduit having a check valve arranged therein to resist flow from said receiver to said second pump, and a housing enclosing the pump, conduits, and the sample receiver and container, and external connecting means for connecting said first conduit and said first pump discharge to said flowing stream.

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