June 13, 1967 H. L. ANDREW 3,324,950

PITLESS WELL UNIT

Filed June 11, 1965 2 Sheets-Sheet 1

FIG. 1

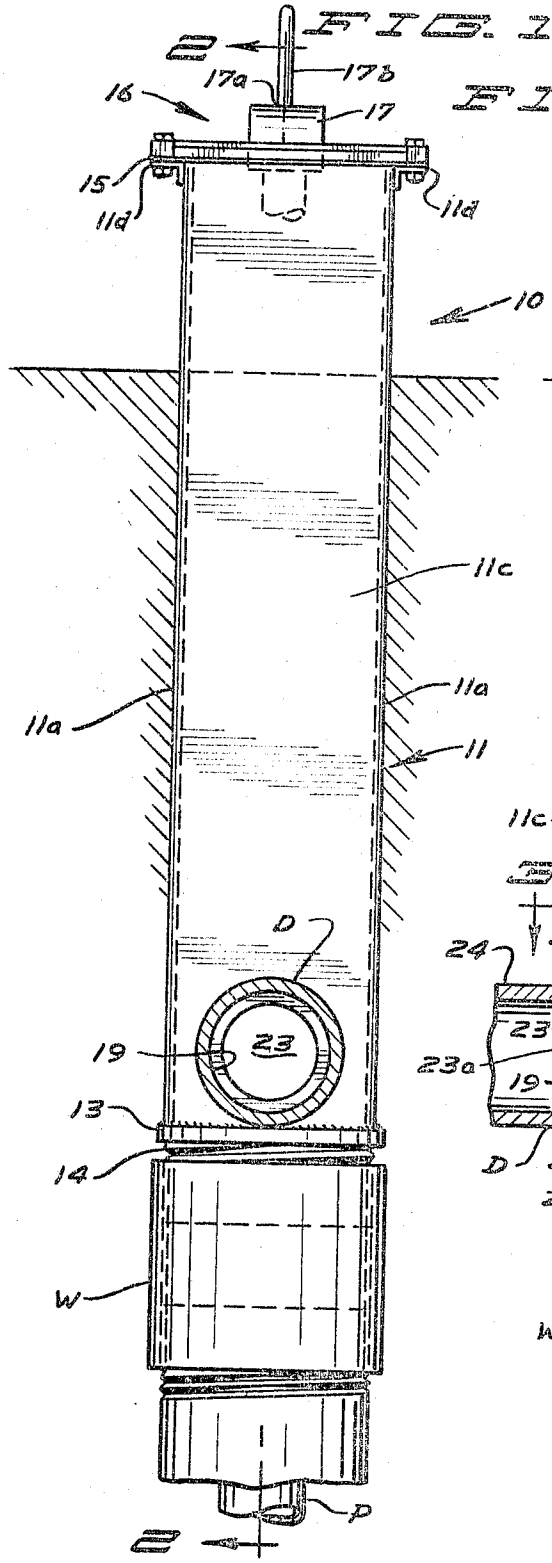
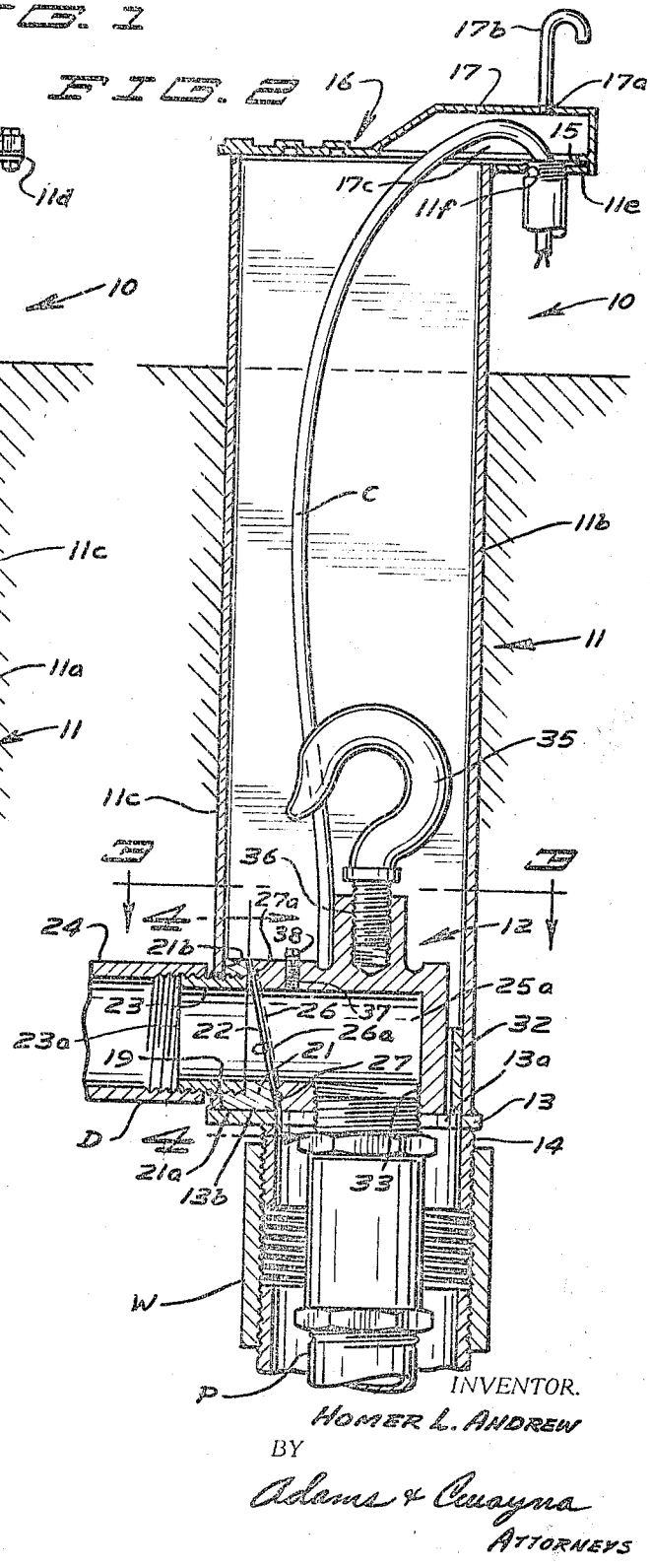


FIG. 2



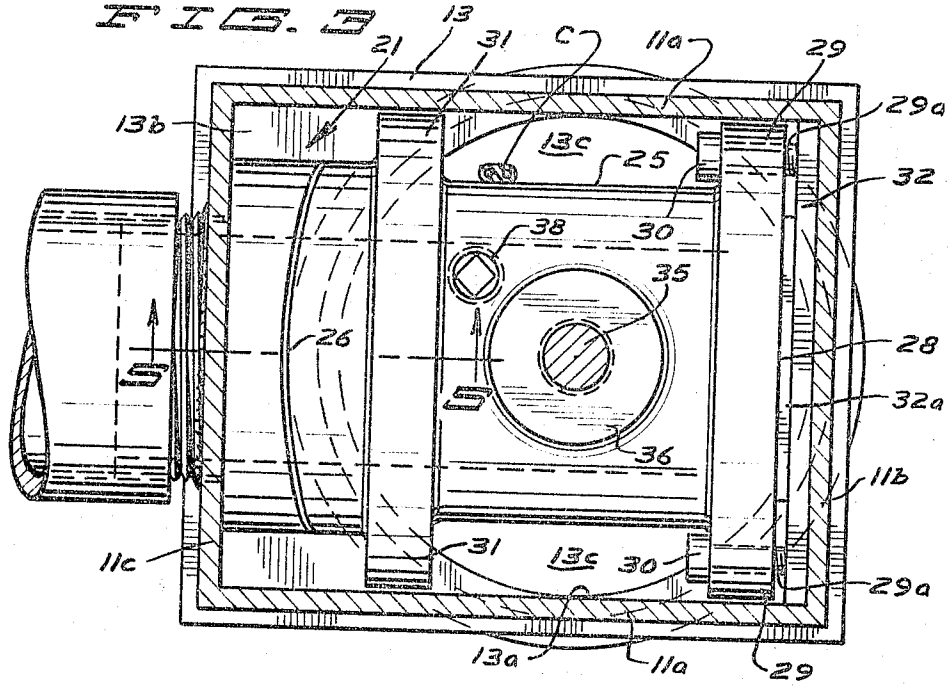
INVENTOR.
HOMER L. ANDREW
BY
Adams & Cuoyna
ATTORNEYS

June 13, 1967 H. L. ANDREW 3,324,950

PITLESS WELL UNIT

Filed June 11, 1965 2 Sheets-Sheet 2

FIG. 3



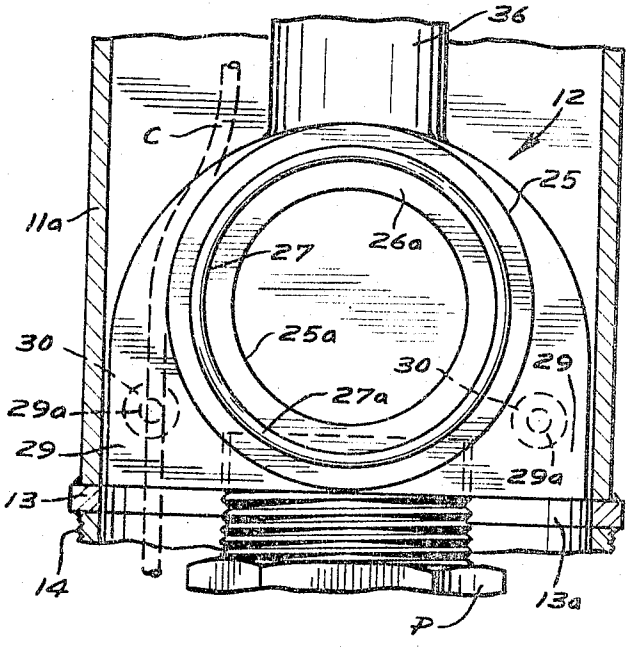
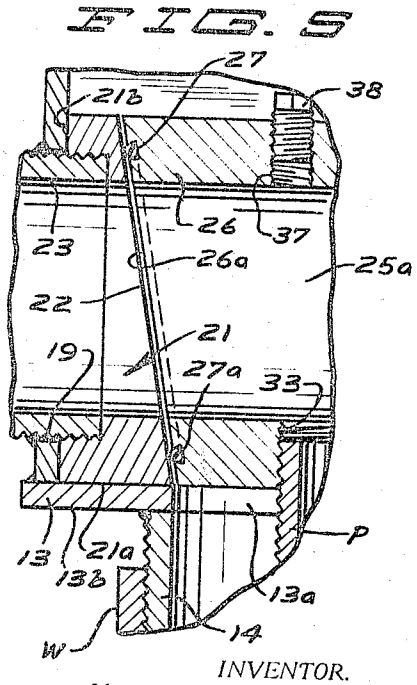


FIG. 4

FIG. 5



INVENTOR.
HOMER L. ANDREW
BY
Adams & Cuayna
ATTORNEYS

United States Patent Office 3,324,950 Patented June 13, 1967

3,324,950

PITLESS WELL UNIT

Homer L. Andrew, Superior, Wis., assignor to Duplex Manufacturing Company, Superior, Wis., a corporation of Wisconsin

Filed June 11, 1965, Ser. No. 463,127
13 Claims. (Cl. 166—85)

ABSTRACT OF THE DISCLOSURE

A distributor head arrangement for a pitless well unit which unit includes a surface pipe attachable to the well casing below ground level and preferably below frost level which surface pipe is provided with a first lateral discharge member to discharge water to a remote location and which discharge member includes a sealing seat within the surface pipe arranged at an angle to vertical. A second member which carries the drop pipe is insertable into the surface pipe and has a reversely disposed sealing seat thereon for sealing against the discharge members sealing seat wherein the weight of the second member carrying the drop pipe will effectively provide the seal between the members and a sealed conduit will be established from the drop pipe, through the second member and into the discharge member

This invention relates generally to well equipment and more particularly to a distributor head for use in a pitless well unit and the structure for positioning the head which distributor head is designed to receive water from the drop pipe to the pump and direct the same to a laterally disposed discharge pipe.

The use of pitless well units or what may also be termed underground discharge units for wells is known in the prior art. A pitless well unit generally comprises a surface pipe which extends into the ground with means contained therein below ground level for directing the fluid delivered from the pump and through the drop pipe to a laterally disposed discharge line. To provide for assembly and installation a separable connection must be made at this right angle turn and with the available single seal pitless units this connection is difficult to reach and requires working in a limited as well as blind area. It is also likewise difficult in these standardly available units to provide proper vertical hanging of the drop pipes so as to eliminate shearing stresses from unaligned suspension arrangements.

The pitless well unit as provided herein eliminates the blind alignment required to accomplish this fluid directive connection of prior systems in that a guiding surface for the fluid directing apparatus is provided within the surface pipe and the turning structure is further provided with a self aligning seal for connection to the lateral distribution portion of the unit thereby substantially eliminating seal alignment problems.

The pitless well unit as provided herein further provides a positive support structure for the drop pipe and pump connected thereto such that the drop pipe and pump will be substantially mounted on the same axis and mounted in substantially a vertical condition to prevent side shearing forces and which through this proper positive alignment will provide sufficient room around the drop pipe along its entire length for the passage of electrical cables to the pump.

Another advantage obtainable through using a pitless unit of this type when used in conjunction with a high capacity submersible pump is that the guiding surfaces of the surface pipe will retain the fluid directing structure in its desired position holding the same against twisting torque of the pump to eliminate distortion and dislocation of the seal between the fluid directing unit and the lateral discharge pipe.

It is therefore an object of applicant's invention to provide a pitless well unit which incorporates a surface pipe having guiding surfaces therein whereby the fluid directing or discharge section will be guided into proper position within the surface pipe to eliminate blind alignment with the other portions of the fluid distribution system.

It is another object of applicant's invention to provide a pitless well unit wherein the fluid directing section or distributor head of the unit contained within the surface pipe of the unit is securely held against twisting caused by the torque of the pump attached to the head through the drop pipe.

It is a further object of applicant's invention to provide a pitless well unit wherein guiding and alignment surfaces are provided on the individual members to insure axial and substantial vertical suspension of the drop pipe and pump supported thereby to eliminate shearing forces on the pipe.

It is a further object of applicant's invention to provide a pitless well unit wherein the surface pipe is provided with a completely sealed cover structure for sealing the well and which cover structure is removable for exposing the electrical wire and connections necessarily carried in the surface pipe without requiring their initial removal or disconnecting.

It is a further object of applicant's invention to provide a distributor head or fluid turning structure having a maximum of vertical support points thereon which points are arranged to be supported by the surface pipe unit and the well casing itself and which support points are further arranged to permit clearance and access to the well for the admission of electrical cables thereto or for inspection of the well itself such that no additional passages must be provided in the unit.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the several views, and in which:

FIG. 1 is a view through a ground section showing a typical installation of a pitless well unit;

FIG. 2 is a vertical section taken substantially along line 2—2 of FIG. 1 illustrating a pitless well unit embodying the concepts of applicant's invention;

FIG. 3 is a horizontal section taken substantially along line 3—3 of FIG. 2;

FIG. 4 is a section taken substantially along line 4—4 of FIG. 2 particularly illustrating the sealing surface of the distributor head;

FIG. 5 is a portion of FIG. 2 drawn to an enlarged scale and particularly illustrating the sealing surface of the unit.

In accordance with the accompanying drawings the pitless well unit of this invention generally designated **10** includes a surface pipe unit designated **11** and a fluid distribution portion for directing fluid from a vertical to a horizontal line generally designated **12**. Surface pipe **11** includes in the form shown a substantially rectangular longitudinal extending housing consisting of spaced parallely arranged sides **11***a* and spaced, parallely arranged ends **11***b*–**11***c*. The right angular relation of the side and end members **11***a*–**11***b*–**11***c* is to provide a rectangular surface interiorly of the surface pipe **11** and the exterior configuration may be in any desirable shape.

A support plate **13** substantially closes the lower end of the surface pipe **11** and is securely fastened to the side and end members thereof. An aperture **13***a* is provided through such support plate **13** and is of a size sub-

stantially equal to the internal diameter of a well casing nipple **14** which is securely attached to plate **13** in axial alignment with aperture **13***a*. Aperture **13***a* is in the form shown arranged tangent to end **11***b* of pipe **11** such that the axis of the aperture **13***a* and the passage through well casing nipple **14** is offset rearwardly with respect to the axis of the surface pipe unit **11**.

As is commonly known and as shown in FIGS. 1 and 2 the surface pipe unit **11** is mounted within the ground with the upper portion thereof arranged above the ground to provide access to the interior thereof. In the form shown a removable cover section **16** is provided on the uppermost extending end of surface pipe **11** and in order to provide fastening and attachment means therefore a plurality of ears **11***d* are arranged on the sides **11***b*–**11***c* of pipe **11** and an outwardly extending lip **11***e* is arranged on the end **11***a* of the surface pipe **11**. As shown in the figures the upper surface of lip **11***e* is in substantially coplanar relation with the upper ends of the elements forming the surface pipe **11** such that a gasket **15** may extend completely therearound to receive and seal against.

Cover element **16** is provided with a goose neck structure **17** extending outwardly from one end thereof to be in overlying alignment with lip **11***e* to provide covered passage **17***c* thereunder. This passage in combination with an aperture **11***f* through lip **11***e* provides means for introducing electrical cables into the otherwise sealed unit. A vent opening **17***a* may be provided in the goose neck **17** and an inverted air vent **17***b* attached thereto.

As shown in the cross sectional views of FIGS. 2 and 5 an aperture **19** is formed in end member **11***c* of surface pipe **11** in closely spaced relation to closure flange **13** and is arranged to overlie the frontmost section of plate **13** such that the opening **19** is adjacent the larger remaining support surface **13***b* of plate **13** which larger support surface results from the aperture **13***a* being offset with respect to the center of plate **13**.

A discharge seat is arranged within opening **19** and in the form shown this seat consists of an arcuate member **21** arranged interiorly of the surface pipe **11** such that the lower arcuate edge **21***a* thereof is substantially resting on support portion **13***b* of plate **13**. Side **21***b* of seat **21** abuts with the interior surface pipe end **11***c* and is designed to conform to this interior surface and abut closely therewith as best illustrated in FIGS. 2, 3 and 5. A discharge pipe member **23** is threadably received into the surface abutting side **21***b* of the seat **21** and extends outwardly therefrom through aperture **19** to provide a connective end for a discharge pipe D which may be attached thereto and directed to a remote discharge.

To facilitate manufacture and assembly the entire discharge seat member **20** including the extending nipple section **23** is fixedly attached as by welding or the like to side **11***c*.

The other side **22** of discharge seat **21** is as shown in FIGS. 3 and 5 offset with respect to vertical to provide a guiding and seating surface. This sealing surface **22** provides a particularly positioned seat which permits a member to be seated easily thereon by pushing the member downwardly onto the upwardly disposed seat.

To provide for flow of water through seat **20** a fluid conducting passage is formed through both the nipple section **23** and the seat **22**.

A second removable member which is in effect a fluid directing member and which is termed hereinafter as a distributor head is designated **12** and includes a substantially cylindrical body portion **25** provided with an internal passage **25***a* extending at right angles therein such that it will provide a fluid turning directive to fluid flowing upwardly thereto to laterally discharge the same through seat **20**.

One end **26** of the distributor head body **25** is reversely tapered with respect to the discharge seat **21** to provide a mating and sealing surface **26***a* when the distributor head **12** is inserted into the pipe **11** and against the discharge seat sealing surface **22**. A seal housing such as O-ring groove **27** is formed circumferentially on seating surface **26***a* and an O-ring **27***a* or other sealing device is contained therein. This O-ring **27***a* construction is purely for portions of illustration and it should be obvious that other sealing devices could be easily arranged between the members **12** and **20**. Distributor head seal taper serves also to protect the seal itself from abrasion as it is lowered into position against the discharge seat **20**.

The other end **28** of the distributor head body **25** is provided with a pair of laterally extending ears **29**—**29** wherein the dimension across said ears is substantially equal to the distance between the interior sides **11***a* of the surface pipe **11**. A pair of threaded apertures **29***a* may be provided through said ears for receiving adjustment members such as cap screws **30** whose purpose will be explained hereinafter. A second pair of radially extending ears **31**—**31** are formed in forwardly spaced relation with respect to the ears **29**—**29** and as shown in FIG. 3 the longitudinal spacing between such ears **29** and **31** will position the ear sets respectively outward from the edges of casing receiving aperture **13***a*.

As particularly illustrated again in FIGS. 3 and 4 the radially extending ears **29**–**31** have a substantially flat portion formed on the bottom thereof to permit the head **12** to be supported by and to rest on the plate **13**. In this manner it is obvious that the entire weight of the distributor head **12** rests solidly on the plate **13** and prevents lateral shifting of the distributor head **12** within the surface pipe **11** the radially extending ear elements **29**–**31** extend laterally outward to be guided by and held by the internal surfaces of the sides **11***a* of surface pipe **11**.

It should be obvious from the structure as thus far described that if the distributor head **12** is inserted vertically into the surface pipe **11** it will be guided downwardly therethrough by the internal guiding surfaces **11***a* abutting with the laterally extending ears **29**–**31** until the flat bottom portion of the ears rests upon the plate **13**. These laterally extending ears then bring the sealing surfaces **26**–**22** into laterally aligned position.

To facilitate the insertion of distributor head **12** into the surface pipe **11** the overall longitudinal length of the distributor head is slightly less than the length between the seal surface **22** and the end **11***b* of surface pipe **11**. In order to take up this additional length a shim plate **32** is provided and inserted between the rear end **28** of head **12** and the end **11***b* of surface pipe **11**. When the shim plate **32** is in position, an additional shim **32***a* of required thickness is inserted between shim plate **32** and head **12**. The cap screws **30** will secure the shim between the head **12** and shim plate **32**. This provision means to compensate for construction variations in the inside dimension of the surface pipe. This predetermined setting will position head **12** against seat **20** with precise predetermined pressure at time of fabrication.

This adjustable preinstallation feature permits the insertion of the distributor head **12** into the surface pipe unit **11** without requiring precision fabrication in a welded surface pipe. The shim plate **32** further provides a flat guiding surface on head **12** that corresponds with the surface guiding surface on head **12** that corresponds with the surface pipe **11** for accurate guidance. This adjustable positioning with the forward projection of seal surface **22** at the top of distributor head **12** and with positive support against the surface of support plate **13**, obviously permits installation of distributor head **12** into surface pipe **11** in guided relationship to said surface pipe without positioning and without damage to the yieldable seal **27***a* and without hooks and clamps to hold and maintain head **12** in positive communication with seat **20**, head **12** being located in sealing position by the inherent confinement of the rectangular surface pipe configuration.

The body portion **25** of the distributor head **12** is as

stated substantially cylindrical in shape intermediate the ear structrues **29**, **31** and as illustrated in FIGS. 3 and 4 the diametric dimension of the cylinder portion **25** is less than the dimension across the outstanding ears **29** and **31** and is also less than the dimension of aperture **13***a* through plate **13**. This difference in dimension provides a clearance area designated **13***c* on either side of the cylindrical portion **25** such that power cables C or the like may be inserted into the well casing W and which likewise allows access to the well itself.

In order to bring fluid up to the distributor head **12** and particularly to the fluid passage **25***a* a passage **33** is formed in the downwardly disposed portion of cylinder body **25**. This passage **33** is provided to receive a connectable drop pipe P which will extend downwardly into the well casing W and which will receive water from a submersible well unit at the lower end thereof. As illustrated in FIG. 2 these well casing connections W and drop pipe sections P are coordinated with respect to the aperture **33** such that drop pipe P will extend substantially along the longitudinal axis of the well casing W. This central location and maintenance of this central location prevents any bending or side shearing effect on the drop pipe P as the drop pipe will not abut with the sides of the well casing W along its entire length and will hang in substantially the same vertical line as the casing W. A clearance area is then provided between the pipe P and casing W which permits a cable C to pass downwardly to the pump without fear of damage due to contact with the drop pipe P or casing W.

To facilitate lifting of the distributor head **12** and drop pipe P from the surface pipe **11** and also to facilitate insertion and assembly of the unit a lifting member such as hook **35** may be threadably inserted into a boss **36** arranged on the periphery of the cylindrical portion **25**. This lifting device **35** is in the form shown and is ideally located longitudinal with respect to drop pipe receving aperture **33** and drop pipe P. This longitudinal alignment of course permits longitudinal insertion of the pipe P into the casing W.

The device as illustrated and as previously stated permits the distributor head **12** and the distributor seat **20** to be placed in proper relation while eliminating the usual requirement of fastening about the periphery of the sealing device. A number of various devices as known in the prior art have been employed around the periphery of the seal to provide means for connecting the separable sealing members, to hold them in register, to give them support and provide support for the drop pipe load and to guide them in blind location into operating position. Such devices are completely eliminated through this invention and one seal member moves into exact register with the other without repeated efforts to make the blind connection. This design further eliminates the need for searching for the blind connection while providing a seal compression effect due not only to the confined and spaced relation of the sealing members but also due to the weight effect of the drop pipe P exerting a downward force against the tapered sealing and seating surface.

The device as herein described further prevents rotation of the distributor head **12** which rotation would tend to separate the sealing faces and which rotation is produced due to the torque developed by the pump. Rather distriubtor head **12** being in contact with the guiding surfaces of the surface pipe **11** through the laterally extending ears **29–31** is prevented from such rotation. This retardation of rotation and positive mounting structure for a pitless well unit will permit this unit to be used with large capacity pumps and heavy drop pipe equipment.

It should be obvious that the device as described herein relates primarily to the directing of water received from the drop pipe of a well to a remote laterally directed discharge point. As such, some of the common fittings such as check valves, air bleeders and air supply valves provided in wells have not been illustrated. It should be understood however that these fittings would be included when this fluid directing device is installed in a well. Further with the device of this invention these fittings could be installed either within the seat or head portion or the drop pipe and when installed within the head **12** or drop pipe they would be removed with the head **12** and thus their replacement would be extremely simple.

As a provision for such additional fittings a threaded aperture **37** is provided within head **12** and this aperture **37** although shown closed by the removable plug **38** would permit attachment of a fluid or gas sensing device. In actual practice several such openings may be provided in the head **12**.

Clearance passage **13***c* provided about the cylindrical body **25** in combination with the removable cap feature **16** provides a clear entrance to the well without disconnection of the electric cable wires. This construction provides access to the well which may be important for chlorination or testing of draw down of the water level in the well as well as the electrical advantage.

It should be obvious that applicant has provided a new and unique design for a pitless well unit which incorporates a positive support structure for a drop pipe and pump, a positive seal compressing structure which eliminates clamping about the periphery of the seal and a unit which is easily assembled and disassembled on location.

It will, of course, be understood that various changes may be made in the form, details, arrangements and proportion of parts without departing from the scope of the invention, which generally stated consists in the matter set forth in the appended claims.

What I claim is:

1. A pitless well unit for use with a well casing and drop pipe including:

(a) a surface pipe arranged to have one end thereof connected with the upper end of a well casing;

(b) a discharge seat arranged within the lower end of said surface pipe and providing means for attachment to a lateral discharge pipe for discharge of fluid thereto, providing a sealing seat within said surface pipe said seat being angularly disposed with respect to vertical to receive a member thereagainst as inserted from the upper end of the surface pipe; and

(c) a fluid distributor head arranged to engage and receive fluid from the drop pipe to be received within said surface pipe and having a sealing surface thereon to engage the sealing surface of said discharge seat for sealing therewith to facilitate flow of fluid from the drop pipe to the lateral discharge pipe and having support means thereon for support of the drop pipe substantially in axial alignment with the well casing.

2. The structure set forth in claim **1** wherein said surface pipe is provided with internal guiding surfaces arranged longitudinally therealong and said distributor head is provided with corresponding guiding surfaces thereon to permit said distributor head to be received within said surface pipe along said guiding surfaces to be guided onto said sealing seat of the discharge seat.

3. A pitless well unit for use with a well casing and drop pipe including:

(a) a longitudinally extending surface pipe arranged to have one end thereof attached to a well casing and having an aperture through said end corresponding to the diameter of said well casing;

(b) support means on the casing receiving end of said support surface pipe;

(c) a discharge seat receivable into said surface pipe adjacent the casing receiving end thereof providing a sealing seat arranged internally of said surface pipe and provided with means to receive a laterally extending discharge pipe thereon for the discharge of

fluid to a remote location said sealing seat being offset to vertical to present a sealing surface disposed generally upward to receive an article thereon inserted from the upper end of the surface pipe; and

(d) a distributor head receivable into said surface pipe having a reversely disposed sealing surface thereon with respect to said discharge seat sealing surface, receivable thereagainst when inserted from the top of said surface pipe with support means to engage the support means on the lower end of said pipe and means to engage the pipe to receive fluid therefrom and direct the same to the discharge pipe through the distributor or seat.

4. The structure set forth in claim **3** wherein said surface pipe is provided with a pair of parallel oppositely arranged guiding surfaces extending longitudinally therewithin and said distributor head is provided with a pair of parallel mating guiding surfaces to facilitate insertion of said distributor head into said surface pipe and to properly align said distributor head within said surface pipe and against said discharge seat sealing surface.

5. The structure set forth in claim **2** wherein adjustment means are provided between said surface pipe and said distributor head to permit adjustment thereof into proper sealing position with respect to said discharge seat sealing surface.

6. A pitless well unit for use with a well casing and drop pipe including:

(a) a surface pipe having one end thereof arranged to receive and be connected to a well casing and including:

(1) a pair of parallel, opposed guiding surfaces extending longitudinally therewithin; and

(2) a support plate at the lowermost end thereof which support plate is larger than the casing to which the surface pipe is attached in at least one dimension;

(b) a discharge seat arranged within said surface pipe on an internal side of the casing adjacent said parallel sides and at substantially right angles thereto including:

(1) means for connecting a laterally extending discharge conduit thereto for the distribution of fluid to a remote point; and

(2) a sealing surface within said pipe said surface being offset to vertical to present a sealing surface adapted to receive an article inserted longitudinally from the upper end of said pipe;

(c) a distributor head having a pair of outwardly extending guiding surfaces on opposed sides thereof to engage the oppositely arranged guiding surfaces within said surface pipe to be guided longitudinally

therewithin to provide proper alignment of said head with respect to said well casing and said discharge seat sealing surface and including:

(1) a sealing surface disposed oppositely with respect to said discharge seat sealing surface to mate and seal therewith when inserted into said surface pipe; and

(2) means for attaching a drop pipe thereto to receive therefrom and direct the same into said discharge conduit.

7. The structure set forth in claim **6** wherein the dimension across a portion of said distributor head is less than the dimension between the parallelly opposed sides of said surface pipe to provide a passage therearound to provide access to the well casing.

8. The structure set forth in claim **7** and means provided between said distributor head and the interior of said surface pipe opposite the discharge seat to permit adjustment of said distributor head into engagement with said sealing surface of said discharge seat to provide a fluid tight seal therebetween.

9. The structure set forth in claim **8** and a compressible seal provided between the distributor head and discharge seal sealing surfaces.

10. The structure set forth in claim **6** and check valve means provided within said distributor head to permit the flow of fluid from the drop pipe into the discharge line disposed outside of the surface pipe but preventing backflow therethrough.

11. The structure set forth in claim **6** and at least one opening through said distributor head to permit the attachment of devices thereto to permit communication with the fluid flowing therethrough.

12. The structure set forth in claim **6** and said means for lifting and lowering said distributor into said surface pipe.

13. The structure set forth in claim **6** and means on said distributor to prevent said seal from rubbing on the wall of the surface pipe and discharge seat before proper positioning thereof.

References Cited

UNITED STATES PATENTS

2,689,611	9/1954	Martinson	166—88
2,918,972	12/1959	Tubbs	166—75
2,946,385	7/1960	Dicken	166—88
2,960,166	11/1960	Haydin et al.	166—88
3,050,124	8/1962	Ottenbacher	166—88

CHARLES E. O'CONNELL, *Primary Examiner.*

J. A. LEPPINK, *Assistant Examiner.*