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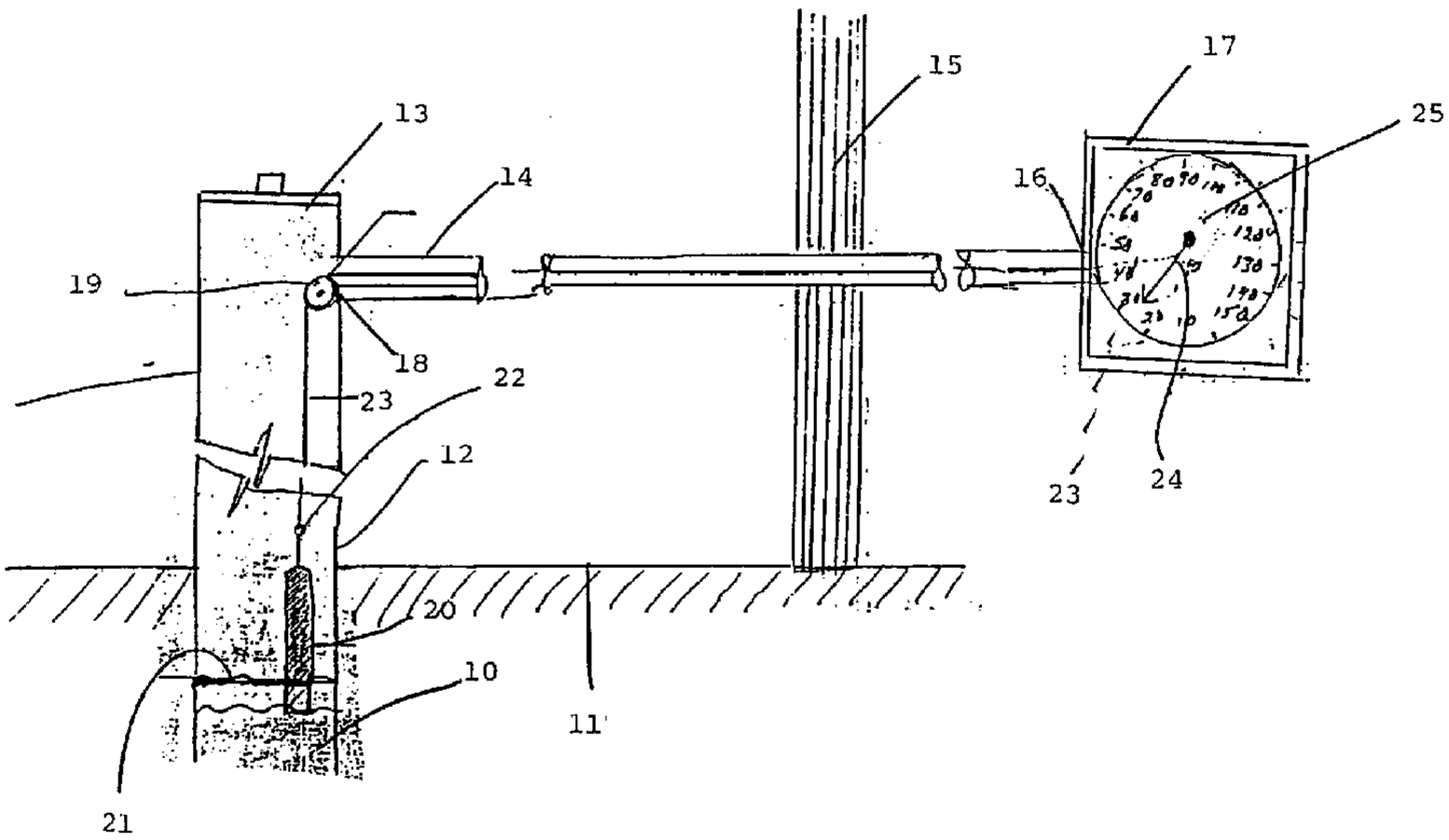
(54) **INDICATEUR DE NIVEAU D'EAU**

(54) **WATER LEVEL INDICATOR**



(57) Puits d'eau foré dans le sol. Le puits ayant un tubage s'étendant sous un niveau phréatique jusqu'au fond du puits comprend un indicateur continu du niveau d'eau. Cet indicateur comprend un flotteur destiné à flotter, ainsi qu'à monter et à descendre sans entraves au fur et à mesure que le niveau de l'eau dans le puits monte et descend. Un tube s'étend vers l'extérieur dans le voisinage de l'orifice du puits, à partir du puits jusqu'à l'intérieur d'une habitation. Il y a un indicateur comprenant un cadran et une aiguille montée sur un ressort qui se déplace jusqu'aux différentes indications sur le cadran. Une poulie se trouve à la jonction du tubage du puits et du tube. Un filament de mesure de faible poids est fourni, un de ses bouts est relié à l'extrémité supérieure du flotteur, ses parties intermédiaires sont mobiles de manière à ne pas frotter ni sur le tubage du puits ni sur le tube, et l'autre bout est relié à l'aiguille. La tension du ressort est choisie de manière à correspondre exactement à la densité immergée du flotteur, de sorte que, lorsque le flotteur monte et baisse, l'aiguille se déplace pour indiquer le niveau de l'eau.

(57) A water well bored into the earth, the well having a well casing extending below a water level to the bottom of the well, is provided in combination with a continuous water level indicator. Such continuous water level indicator includes a float which is adapted to float, as well as to rise and fall unhindered as the level of the water in the well rises and falls. A tube extends outwardly adjacent the top of the well from the well to the interior of a dwelling. An indicator is provided which includes a dial and a spring-loaded pointer which is movable to different indicia on the dial of the indicator. A pulley is provided at the junction of the well casing and the tube. A lightweight operating filament is provided, one end of which is connected to the upper end of the float, the intermediate portions being movable in a frictionless manner with respect to the well casing and the tube, and the other end being connected to the pointer. The strength of the spring is selected to be exactly equal to the buoyant weight of the float, so that, as the float rises and falls, the pointer moves to indicate water level.

ABSTRACT OF THE DISCLOSURE

A water well bored into the earth, the well having a well casing extending below a water level to the bottom of the well, is provided in combination with a continuous water level indicator. Such continuous water level indicator includes a float which is adapted to float, as well as to rise and fall unhindered as the level of the water in the well rises and falls. A tube extends outwardly adjacent the top of the well from the well to the interior of a dwelling. An indicator is provided which includes a dial and a spring-loaded pointer which is movable to different indicia on the dial of the indicator. A pulley is provided at the junction of the well casing and the tube. A lightweight operating filament is provided, one end of which is connected to the upper end of the float, the intermediate portions being movable in a frictionless manner with respect to the well casing and the tube, and the other end being connected to the pointer. The strength of the spring is selected to be exactly equal to the buoyant weight of the float, so that, as the float rises and falls, the pointer moves to indicate water level.

This invention relates to a gauge for remotely determining the level of water in a well. More particularly, it relates to a float operated gauge wherein the up-and-down fluctuations of water level within the well are transmitted to a distantly located indicator by the up-and-down movement of an intermediate flexible transmission member.

At present there is no feasible way of determining the amount of water in a well without going to the well for investigation. However, in a somewhat analogous art, it is recognized that liquid level in a container can be determined by the use of a float upon a pivoted arm which is connected to a flexible wire which passes through a tubular guide conduit and which extends to a distant indicator. The indicator is actuated by the to-and-fro longitudinal movement of the wire. However, in most instances, it has been necessary to employ relatively strong spring means for taking up lost motion in the transmission wire or cable. Moreover, due to the tortuous course through which the guide tube must ordinarily be conducted from the container to the indicating unit, there is frictional resistance to the free movement of the transmission wire or cable, with the consequent tendency for the transmission element to become sluggish or to stick.

The patent literature is replete with patents which attempt to solve such problem, and to provide a continuous measure of the water level. Among those patents are the following.

U.S. Patent No. 1,363,982 patented December 28, 1920 by Augustus W. Jones et al, which provided a liquid gauge, which included float means. Such means, which was responsive to the rise and fall of liquid in the tank, was disposed within the tank containing the liquid. Indicating means were operable by the float means and

were adapted to be arranged at a point remote from the float means. These indicating means were actuated through the rise and fall of the float means through the intervention of an actuating flexible element which was disposed between the arm and an indicator forming a part of the indicating means. Pointers moved to denote the quantity of liquid within the tank. An actuating flexible fine steel wire had one end thereof connected to the arm and had the opposite end thereof connected to the pointer bar. This wire was enclosed by a close wound flexible tubular member, one end thereof being connected to the end of the tubular member, and the opposite end thereof is connected to the case. A convolute member was secured to the arm and encircled the end of the wire which was attached to the arm to prevent buckling of the wire as the arm moved to-and-fro. This was said to eliminate lost motion and to give highest degree of accuracy as a gauge to the device.

U.S. Patent No. 1,442,168 patented January 16, 1923 by Maurice Metzger which provided a gasoline gauge, which included an arm which was pivoted at one end within a tank and which carried a float at its opposite end. An indicator was mounted at any suitable point. A flexible connection was provided between the float carrying arm and the indicator. The flexible connection was enclosed in a conduit of suitable construction and always maintained in tension by a spring in the indicator. The float and spring held the flexible connection in tension between them. The spring tended to raise the float and move the needle in one direction. The float tended to drop by gravity and tighten the spring and at the same time moved the needle in the opposite direction. When liquid was placed in the tank, it raised the float and consequently the arm, so that the flexible connection tended to slacken. This slackness was immediately taken up by rotation of a pulley under influence of

the spring so that the needle was moved in one direction over the dial to indicate a rise in liquid level. As the liquid level dropped, the weight of the float depressed the arm and drew on the chain, thus rotating the pulley in the opposite direction and moved the needle over the dial to indicate a lower level.

U.S. Patent No. 1,523,168 patented January 13, 1925 by Clifford M. Cole which provided a gasoline gauge which included a cover plate which was provided with a depending hanger. An adjustable worm was pivotally carried by the hanger and a float was operatively-connected to the arm. A gauge was provided which included a dial plate and an indicator needle. Means operatively connected the arm to the needle. A small flexible connection was provided between the arm and the needle so that the wire, in passing through the tube, conformed to the various bends that may be necessary to be made in the tube. In order to maintain the needle in a zero position, a spring element was connected to one end of the arm and to a stud. The wire of the connecting cable extended from the other side of the arm. By means of the pivotal connection, any movement of the float, up or down, was communicated to the indicator needle by means of the wire.

U.S. Patent No. 1,607,645 patented November 23, 1926 by Robert W. Schulte which provided a gasoline gauge, which included a housing having an indicating needle which was pivotally-mounted therein. The needle was connected to the float arm by means of a flexible wire which passed through the flexible tubing and the tubular float arm support. A light spring was connected to the needle in order resiliently to urge it in an opposite direction from the pull of the flexible control wire to retain the flexible control wire in tension and to prevent loss of motion by a loosening of said wire. The float assembly having a control wire was operatively-

connected to a float arm, the float arm being pivotally-connected to a tubular support which extended through a ring clamped on the filling pipe of a fuel tank. The tubular support had a flexible tube connected thereto which extended to a remote gauge assembly. Pivotally-mounted interiorly of the depressed central portion of the gauge was an indicator needle, the lower end of the needle having engagement with the control wire as it emerged interiorly of the casing. A spring was also connected to the needle and to a plate forming a closure across the rear of the casing in order resiliently to urge the needle to a "normal" position.

U.S. Patent No. 1,707,970 patented April 2, 1929 by William W. Watt which provided a liquid level gauge which included a float within the container, the float being adapted to rise and fall with the liquid level. A pivoted lever of the first order carried the float. The rising movement of the float was transformed into a pulling influence upon a motion transmitting element. A distantly-located, vertically-movable weighted pivoted arm normally tended to descend under the influence of gravity. An intermediate motion transmitting strand connected the weighted indicator arm and the float actuated lever, the strand being subjected to the pulling influence in one direction by the buoyancy of the float and likewise being subjected to the pulling influence of gravity upon the weighted indicator arm. The float was thereby maintained under constant tension. The weighted indicator was thus upheld against the influence of gravity by the buoyancy of the float. Thus, the indicator arm was caused to rise in unison with a rising movement of the float and is permitted to descent in unison with the descent of the float. In such construction, the springs or other take-up means or compensating devices were necessary. The influence of gravity upon the indicator was opposed to the buoyant effect of the float within the

reservoir or container so that the float and indicator operate in opposition to each other both transmitting pulling effect to the intermediate transmission wire or cable keeping such transmission element constantly under tension.

U.S. Patent No. 2,289,294 patented July 7, 1942 by Leo F. Phaneuf which provided a level indicator for storage tanks, which included a hollow fitting mounted in the reservoir and communicating with its interior. A tubular sheath had one end connected with the fitting and communicated with its interior. A second hollow fitting was located at a distance from the reservoir. The opposite end of the tubular sheath was connected to such hollow fitting so as to communicate with the interior thereof. A float was movably supported within the reservoir. A flexible shaft was completely enclosed within the two fittings, the sheath and the reservoir. Means were provided through which the flexible shaft was adjusted endwise within the fittings and the sheath by movement of the float up and down in response to variations in the level of the liquid fuel within the reservoir. Two indicator elements were carried by the flexible shaft each being disposed within one of the fittings.

U.S. Patent No. 2,289,295 patented July 7, 1942 by Leo F. Phaneuf which provided a level indicator for storage tanks, which included a hollow fitting mounted the reservoir and communicating with its interior, the fitting being provided with a stem extending downwardly therefrom into the reservoir. A vertically-movable slide-bar was supported by the stem. A flexible tubular sheath had one end thereof connected, and communicating with, the interior of the fitting. A second hollow fitting was located at a distance from the reservoir. The opposite end of the tubular sheath was connected to the second hollow fitting so as to communicate with the interior of the reservoir. A float lever was pivotally-mounted upon the stem adjacent

to the lower end of the stem and included a cam-shaped hub through which movement of the lever in response to variations in the level of the liquid fuel within said reservoir acted to move the bar endwise. A spring yieldingly held the lower end of the slide-bar against the cam-shaped hub. Means were provided through which endwise movement of the slide-bar acted to rotate the shaft. Two indicator elements are provided, each being disposed within one of the fittings and being connected with the proximate end of the shaft.

U.S. Patent No. 2,797,577 patented July 2, 1957 by Joseph F. Wilhelm which provided a tank gauge with remote indicator. That remote reading gauge included a transparent tube and an opaque tubular indicator member which was longitudinally-slidable in the tube. A flexible tension member was provided for pulling the indicator member in one direction. Spring means tended to move the indicator member in the other direction with sufficient force to take up slack in the tension member in all positions. The tension member passed longitudinally through the indicator member. The tension member included a plurality of inter-connected, uniformly-spaced, hollow spheres. A set screw was disposed in one side of the indicator member, the set screw having a flat inner end engaging the tension member. The chain was guided from the tank to the tube through copper tubing of indefinite length.

U.S. Patent No. 3,128,784 patented April 14, 1964 by Asbury S. Parks which provided a wide range liquid level control device, which included a housing with a tubular float support arm having one end pivotally-mounted within the housing and its other end projecting into an area in which liquid level is to be determined. A float element which was responsive to changes in liquid level was disposed in that area. A flexible line had one end attached to the float element and extended upwardly to

and through the tubular float support arm, the opposite end of the line extending outwardly from the housing whereby it was accessible from the exterior of the area in which the float element was mounted. Means were provided for attaching the outer end of the line to a fixed point. The float element was thus suspended from the free end of the float support arm.

U.S. Patent No. 3,537,313 patented November 3, 1970 by Louis O. Schorsch which provided a liquid level gauge, which included a float and an elongated float arm carrying the float at one end thereof. A support tube was provided with means to pivotally-mounting the float arm adjacent to, and spaced from, the other end thereof, on one end of the support tube. Means were provided to support and seal the support tube in operable position in an opening in the top wall of a tank. Such means included a resilient grommet having a central passage extending therethrough. Indicator means were provided which include a casing and a movable member for indicating the level of liquid in the tank. A flexible cable housing connected the indicator casing with the other end of the support tube. A flexible cable extended through the cable housing and was connected at one end thereof to the movable indicator member and was connected at the other end thereof to the other end of the float arm. Thus, the liquid level in a tank was shown by a pointer connected with a float by way of a flexible wire which was slidable within a housing of adjustable length. The tube, to which the float arm is pivoted, was supported and sealed in an opening in the tank wall. A coil spring acting on the float arm served to dampen its oscillations due to liquid sloshing around in the tank while another coil spring urges the pointer toward the empty position.

It is clear that none of these patents provided a remote liquid level gauge which was specifically provided for use in, or which could be adapted for use in, a water well to provide a continuous measure of the level of water in the well.

An object of one aspect of the invention is to provide a simple, durable, inexpensive and reliable gauge which may be applied to a well so that the level of water in the well may be continuously monitored.

An object of a further aspect of this invention is to provide a device in which the level indicating means may be located at any position relative to the well.

An object of yet another aspect of this invention is to make a float assembly and a gauge assembly interconnected by means of a flexible control mechanism to form a single unit, the float mechanism being positioned in a well and the indicating mechanism being positioned remote from the well.

An object of a further aspect of the invention is to provide a liquid level gauge having a minimum number of operative parts.

According to a broad aspect of this invention, a continuous water level indicator is provided in combination with a water well bored into the earth, the well having a well casing extending below a water level to the bottom of the well, the continuous water level indicator comprising: a) a float adapted to float as well as to rise and fall unhindered as the level of the water in the well rises and falls; b) a tube extending outwardly adjacent the top of the well from the well to the interior of a dwelling; c) an indicator including a dial and a spring-loaded pointer movable to different indicia on the dial of the indicator; d) a pulley at the junction of the well casing and the tube; and e) a lightweight operating filament, one end of which is connected to the upper end of the float, the intermediate portions being movable in

a frictionless manner with respect to the well casing and the tube, and the other end being connected to the pointer; wherein f) the strength of the spring is exactly equal to the buoyant weight of the float, so that, as the float rises and falls, the pointer moves to indicate water level.

By one variant thereof, the float, which is adapted to float as well as to rise and fall unhindered as the level of the water in the well rises and falls, comprises an upright cylindrical float member.

By another variant thereof, the tube which extends outwardly adjacent the top of the well from the well to the interior of a dwelling extends outwardly perpendicularly outwardly from the well casing. Such tube may include at least one right-angled bend therein between the well casing and the dwelling, where each right-angled bend is provided with a filament-guiding pulley.

By a further variant thereof, the lightweight operating filament comprises nylon fishing line, preferably where the nylon fishing line is connected to an eye which is secured to an upper portion of the float.

By yet another variant, the spring-loaded pointer is in the form of a pointer, the rotatable shaft of which is fitted with a recoil spring having the defined strength.

In the accompanying drawings,

Fig. 1 is a central, longitudinal schematic view of the water level gauge of the present invention; and

Fig. 2 is a modification thereof.

As seen in Fig. 1, a well 10 is bored in the earth 11 and includes a casing 12 projecting above the ground. The casing 12 includes a cap 13. Projecting angularly outwardly from the casing 12 is a conducting tube 14. Conducting tube 14 passes

through a basement wall 15 of a building and is connected at its inner end 16 to a gauge 17.

The casing 12 is provided with an ear, or other equivalent means 18, by means of which a freely-rotatable pulley 19 is mounted. Within the well is a float member 20 which is adapted to float at the level 21 of water in the well 10. The float member 20 includes an eye 22 by means of which a very light weight, flexible filament means, e.g., nylon fishing line 23 is attached. One end of line 23 is thus secured to eye 22, entrains around pulley 19 and then passes through conducting tube 14 to be connected to one end of a pointer 24 within gauge 17. The shaft (not seen) of the pointer 24 is provided with a spring-loaded recoil (not seen) of particular characteristics which will be explained hereinafter. The gauge 17 is provided with a face dial 25 calibrated, as desired, to show meters, feet, gallons, litres, etc.

As shown in Fig. 2, the conducting tube 214 need not directly pierce a wall. Thus, it can have corners 215, 216, provided that a freely rotatable pulley 217, 218, is fitted at the change of direction.

It is essentially that the line 23, 223 be placed so as to be out of contact with the side walls of the conducting tube 14, 214, so as substantially to eliminate friction.

In use, the tension of the spring (not shown) is adjusted so that it is exactly equal to the buoyant weight of the float. Thus, downward movement of the float as a result of a lower water level will pull the needle in a substantially-force-free manner to indicate a lower number on the dial face. Conversely, any upward movement of the float will cause the spring to move the needle in a substantially-force-free manner to indicate a higher number on the dial face.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. Continuous water level indicator in combination with a water well bored into the earth, said well having a well casing extending below a water level to the bottom of the well, said continuous water level indicator comprising:

a) a float which is adapted to float as well as to rise and fall unhindered as the level of the water in the well rises and falls;

b) a tube which extends outwardly adjacent the top of the well casing from the well to the interior of a dwelling;

c) an indicator including a dial and a spring-loaded pointer which is movable to different indicia on the dial of the indicator;

d) a pulley at the junction of the well casing and the tube; and

e) a lightweight operating filament, one end of which is connected to the upper end of the float, the intermediate portions of said filament being movable in a frictionless manner with respect to the well casing and the tube, and the other end being connected to the pointer;

wherein f) the strength of the spring is exactly equal to the buoyant weight of the float, so that, as the float rises and falls, the pointer moves to indicate water level.

2. The combination of claim 1 wherein said float, which is adapted to float as well as to rise and fall unhindered as the level of the water in the well rises and falls, comprises an upright cylindrical float member.

3. The combination of claim 2 wherein said lightweight operating filament comprises nylon fishing line, said nylon fishing line being connected to an eye which is secured to an upper portion of said float.

4. The combination of claim 1 wherein said tube which extends outwardly perpendicularly from said well casing.

5. The combination of claim 4 wherein said tube includes at least one right-angled bend therein between said well casing and said dwelling, each said right-angled band being provided with a filament-guiding pulley at said right-angled bend.

7. The combination of claim 1 wherein said lightweight operating filament comprises nylon fishing line.

8. The combination of claim 1 wherein said spring-loaded pointer is in the form of a pointer, a rotatable shaft of which is fitted with a recoil spring having said defined strength.

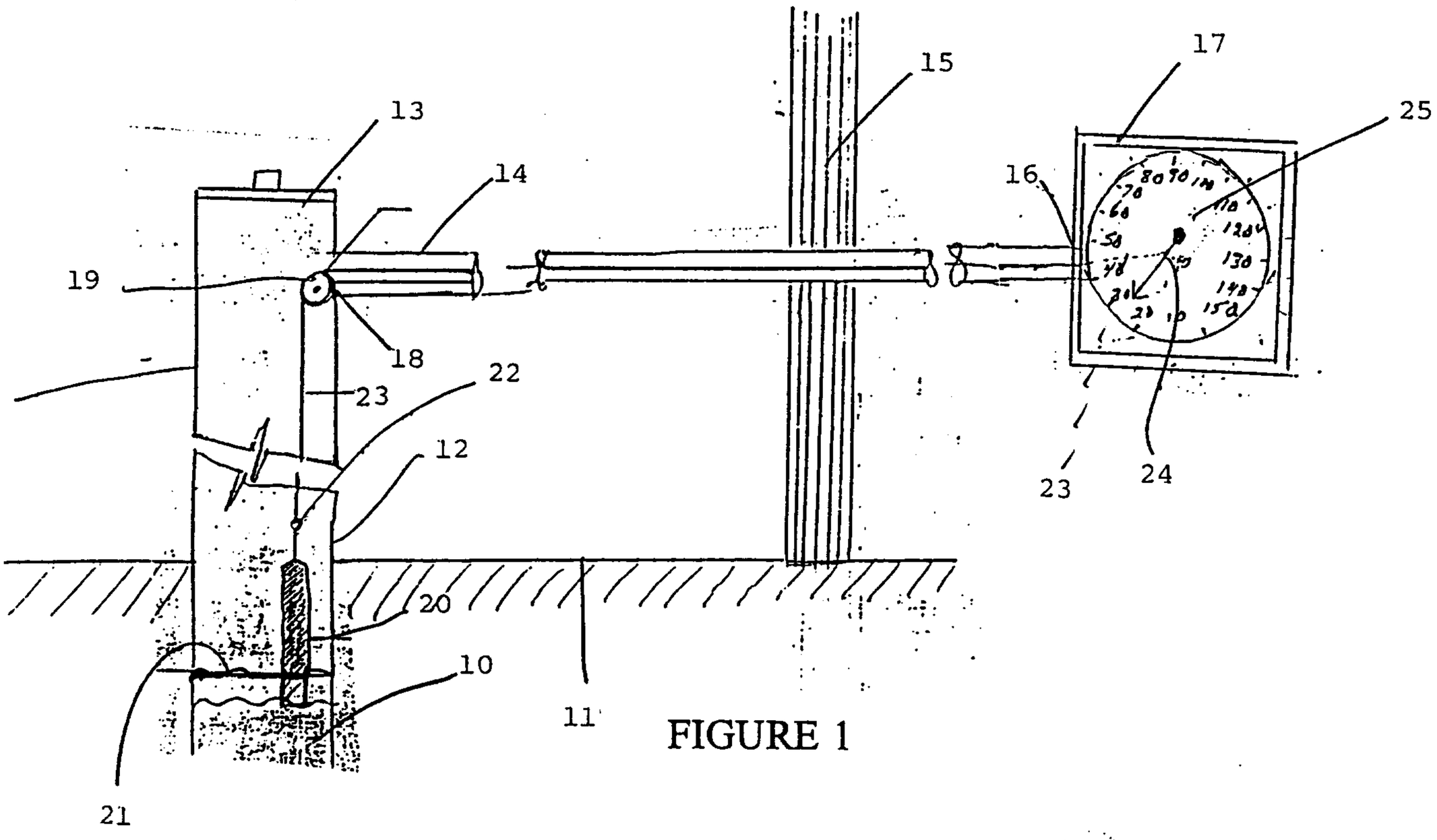


FIGURE 1

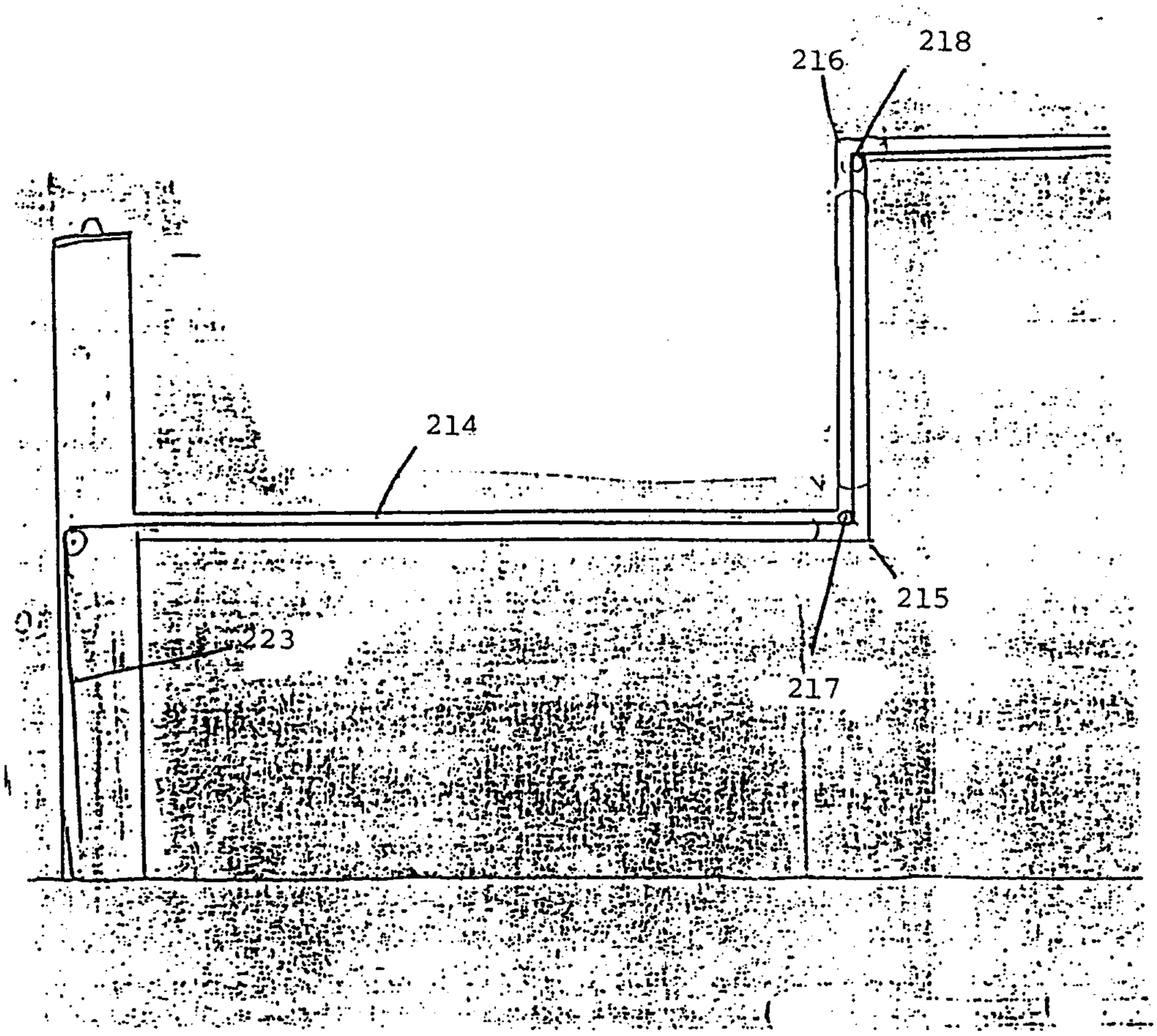
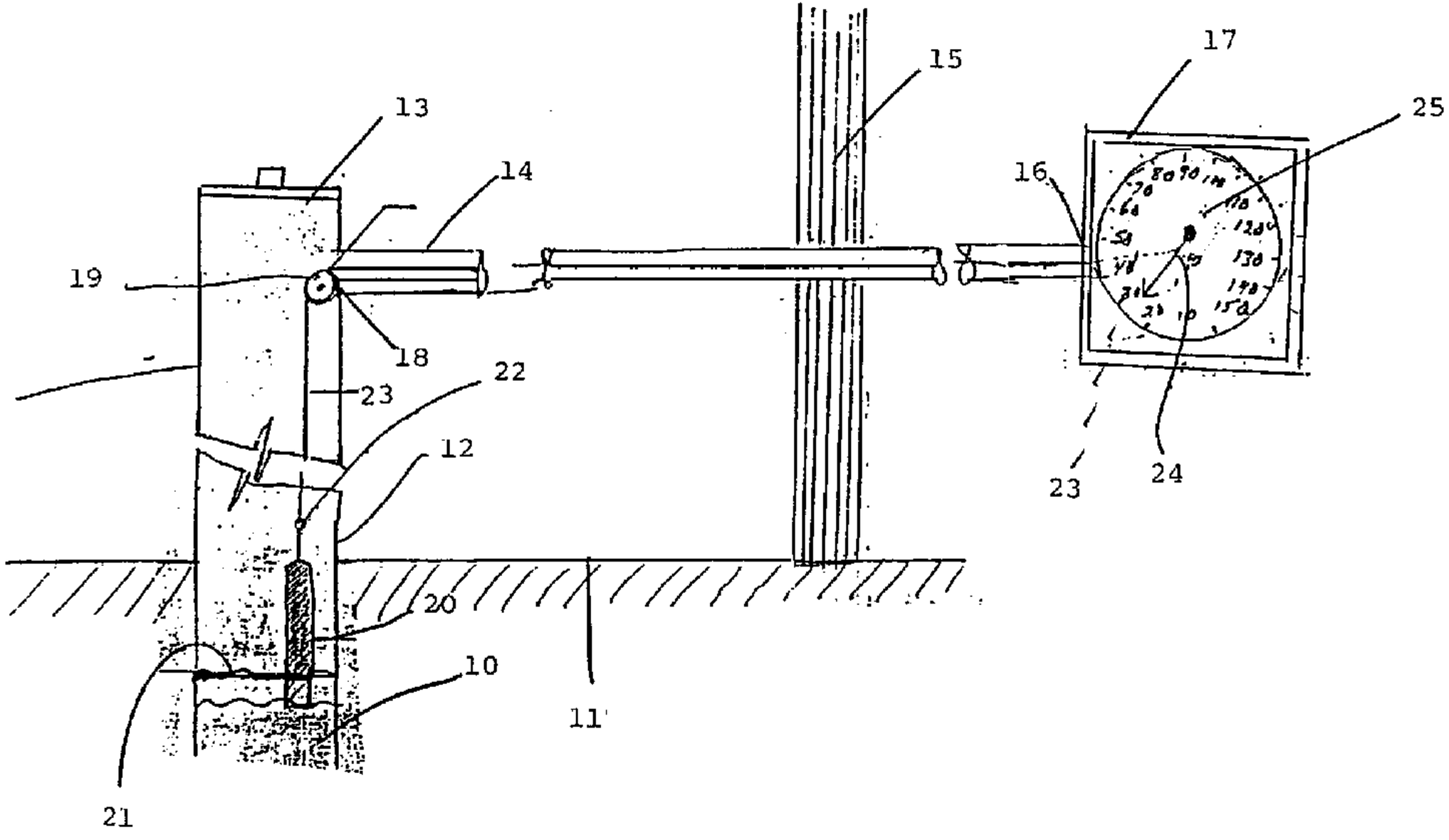


FIGURE 2

Marcus + Associates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