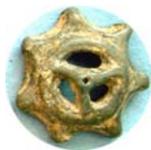




WR PLUMB BOB NEWS

2008-05
March 31, 2008



Information for plumb bob collectors

Edited by Wolfgang Ruecker Germany

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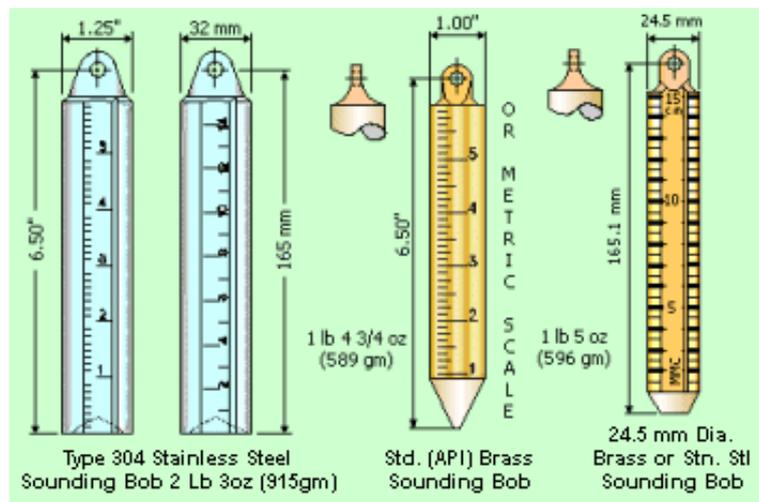
THEME

DEPTH MEASUREMENT with PLUMB BOBS

- OIL TANK GAUGING
- SOUNDING WEIGHTS
- DEPTH MEASURING OF WELLS

Every collection of plumb bobs has an item like this: BRASS, CYLINDRICAL, FLAT BOTTOM or a SHARP TIPPED and **WITH NOTCHES** like a ruler in cm or inches.

These “plumb bobs” are not for determining verticality; rather they are intended to measure depth. Most of us know that these bobs are for tank gauging, but few of us know the details of how they are used. These tools are still standard equipment in the military and oil industry.



The standard mechanism:

- 1.) Take up reel on which to coil the wire or metal tape. (the plumb line shall we say)
- 2.) The connection of the wire or tape to the weight. In some cases this connection is a snaffle hook, to allow removal of the weight as in the illustration, or is sometimes a rivet or cable clamp, for a more permanent connection.
- 3.) The weight or “bob”, graduated in units of measure.

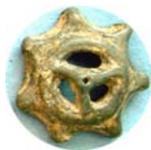




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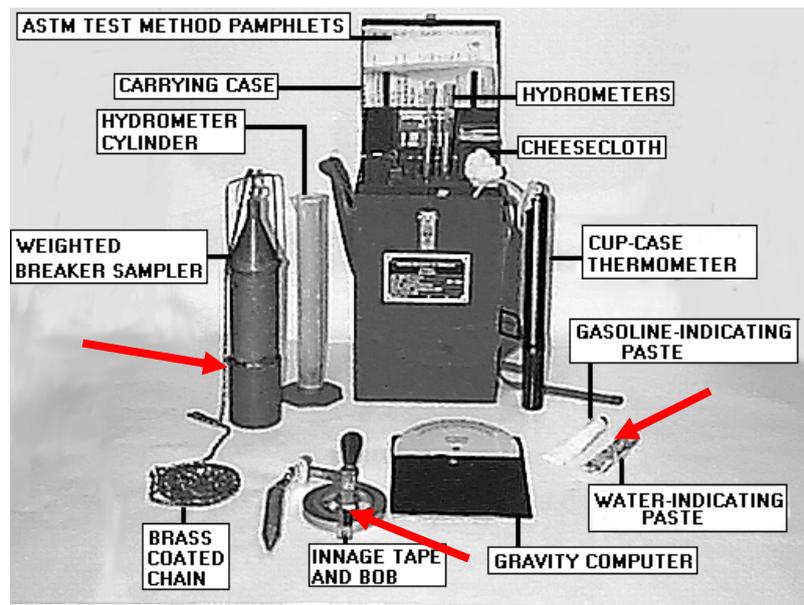
The illustration can be found at:

<http://www.globalsecurity.org/military/library/policy/army/fm/10-67-1/CHAP3.HTML>

This illustrates the various components of a testing kid.

For us are of interest only (red arrows):

- **INNAGE TAPE AND BOB** and
- die **WATER-(or OIL) INDICATING PASTE**, and
- the **WEIGHTED BREAKER SAMPLER**,



There are three basic operations that are conducted by tank gauging:

1. How much liquid is already in the tank? (INNAGE)
2. How much more liquid can be put in the tank? (OUTAGE)
3. When the liquid is oil, how much water has displaced oil in the bottom of the tank?

Gauging - A process of measuring height of a liquid in a storage tank usually using a weighted graduated steel tape and a brass bob.

Alternate Innage Gauge - The INNAGE is obtained by subtracting the measured distance between the surface of the liquid in the tank and the official reference height of the tank. (Established at the time the tank is installed.)

Alternate Outage Gauge - The OUTAGE is obtained by subtracting the measured height of the liquid in the tank from the official reference height of the tank.

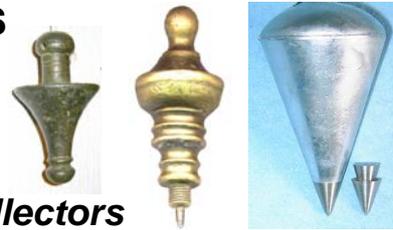
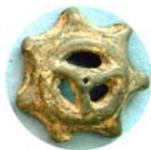
Innage Gauge (Dip, Sounding) - The height of the liquid surface from the bottom of the tank (or datum plate).

Outage Gauge - The distance from the liquid surface to the top of the tank (or reference point).



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HOW MUCH OIL IS IN THE TANK? (SHELL INNAGE.)

Important points are:

- the PRODUCT LEVEL and
- the PRODUCT TAPE CUT.

Also

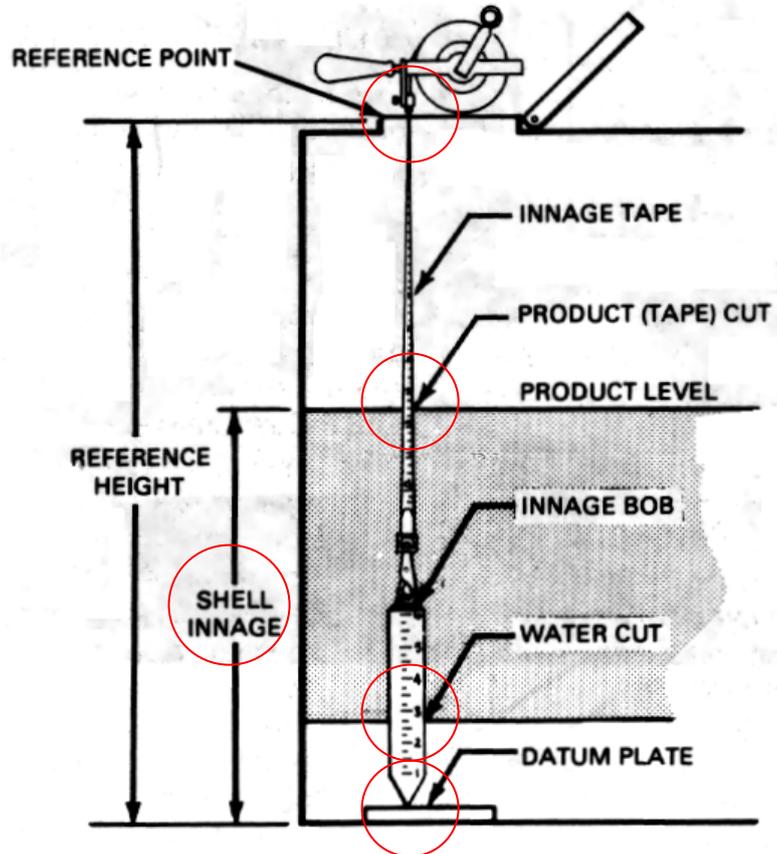
- the WATER CUT between the water at the bottom UNDER the oil and the oil. (Water exists in every oil tank, and because it is heavier than oil, sinks to the bottom of the tank) and
- the lower DATUM PLATE that is fixed at the bottom of the tank.

Guaging Storage Tanks Using Tapes And Bobs

These procedures are commonly used to monitor the contents in large, fixed storage tanks.

Procedure for Innage gauging.

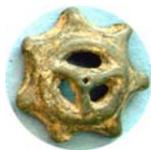
- • Place product-indicating paste on the tape where product cut is expected. Place the unmarked side of the tape against the metal rim of the guaging hatch, in this diagram, the reference point.
- • Lower the tape and bob into the tank until the bob is a short distance from the bottom. To determine this, compare the length of the unwound tape with the reference height of the tank.
- • Unwind the tape slowly until the tip of the bob touches the tank bottom or the tape is not lowered so far into the tank that the bob tilts and causes the tape to go slack To ensure accurate gauging, compare the tape reading at the reference point with the reference height of the tank.
- • Withdraw the tape quickly, and observe the product cut. Record the cut as the innage gage. If the cut is hard to read, put product-indicating paste on the tape. (Grease or light lubricating oil may be used instead of the paste.) Gage the tank again. It is usually easier to see the product cut on the back of the tape.





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PROCEDURE FOR OUTAGE GAUGING

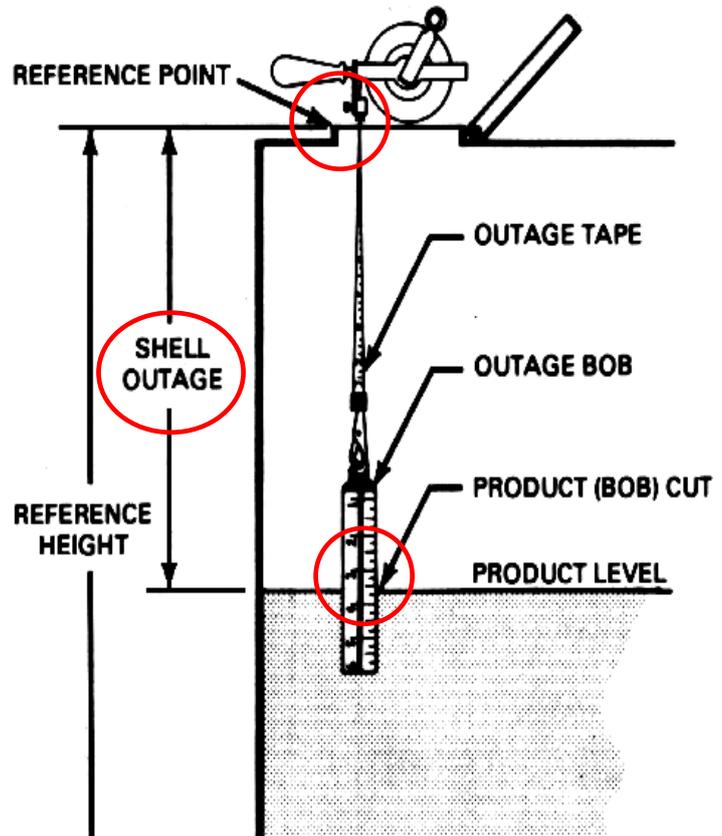
How much liquid can be put in the tank?

Important for us:

- the upper REFERENCE POINT and the LIQUID/PRODUCT LEVEL and the visible line on the tape (PRODUCT TAPE CUT).

The free space in the tank you find by measuring of the free height (SHELL OUTAGE) on the tape minus the length of the plumb bob that dived into the liquid.

OUTAGE GAGE using innage tape and bob. To get an outage gage or ullage using the innage tape, and bob, refer to Figure above and follow the steps below.



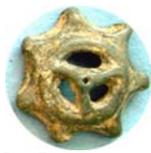
- • Lower the tape and bob into the tank until the bob touches the surface of the product.
- • Wait until the bob stops moving. Lower the tape slowly until the bottom of the bob is 2 to 3 inches below the surface of the product. Record the reading on the tape at the reference point as the tape reading.
- • Withdraw the tape quickly, and record the product cut on the bob as the bob reading. **It is the cut is hard to read, put product-indicating paste on the bob** and gage the tank again.
- • To get the outage gage, subtract the bob reading from the tape reading. For example, if the tape reading is 6 feet 4 inches and the bob reading is 2¼ inches, the outage gages is 6 feet 1¾ inches.
- • To convert the outage gage to innage gage, subtract the outage gage from the reference height of the tank.



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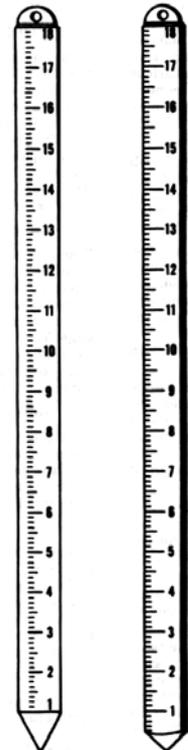
Note: “outage” and “ullage” are interchangeable terms in different reference sources.

We can get **three markings**:

- 1) on plumb bob: cut AIR/OIL
- 2) on plumb bob: cut OIL/WATER
- 3) on tape: cut AIR/OIL

You can use also a **rod** instead of tape + plumb bob. They are looking like a very long plumb bob with a hole at the top. Typical measuring rods you can see in the drawing right.

For further information see,
“WR PLUMB BOB PATENT NEWS 2007-37“.





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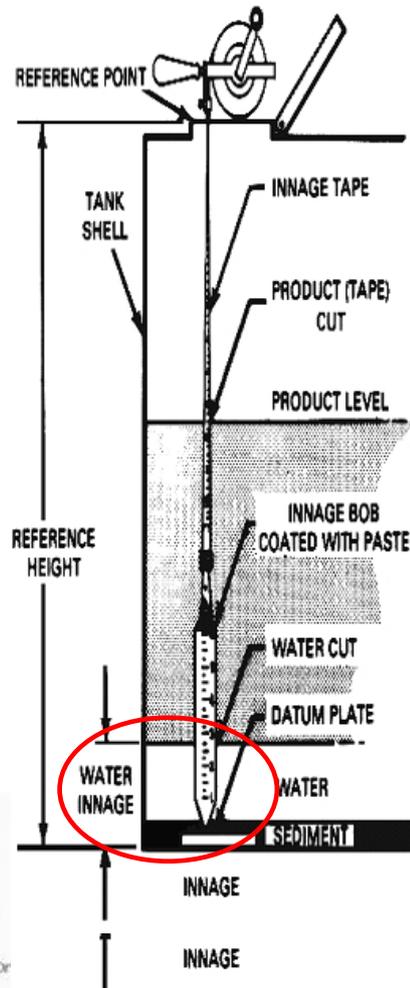
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The third measuring is:
- **WATER UNDER THE OIL.** (WATER INNAGE)
At the bottom we find sediment and water.

To measure bottom sediment and water, do the following:

- Apply a thin, even coat of water-indicating paste to the portion of the gage stick or plumb bob that will be at the interface of water and product. Do not apply an excessive amount of paste. This increases the time it takes for the water to react with the paste.
- Leave the gage stick in position for 5 to 30 seconds for heavier products.
- Take the gage stick from the tank, and look at the water cut on the scale. The water should either remove or discolor the paste on the portion of the scale that was in the water. Record the water cut as either water innage or outage.



AD for WATER FINDING PASTE:



Packaged in 3 oz. Tubes Only



Packaged in 2.25 oz. Plastic Jars Or



KOLOR KUT WATER FINDING PASTE is golden brown in color and turns brilliant red upon contact with water. This product will successfully gauge water content in all petroleum and hydrocarbons as well as sulfuric acid, nitric acid, hydrochloric acid, ammonia, soap solutions, salt and other chloride solutions.

DIRECTIONS FOR USE
Place a thin film of **KOLOR KUT WATER FINDING PASTE** on a clean gauge line or rod approximately where water level is expected to appear. Lower tape into tank until bottom is reached. Level will appear by positive contrast of colors. Instantaneous in gasoline, diesel, kerosene and gas oils. Heavy oils require a few seconds.



KOLOR KUT GASOLINE GAUGING PASTE is light pink in color and turns red upon contact with gasoline, diesel, naphtha, kerosene, gas oil, crude oil, jet fuels, and other hydrocarbons. A most effective product level indicator.

Store at temperature range of 35° F to 115° F for preservation of product.



KOLOR KUT MODIFIED WATER FINDING PASTE has been designed for use in Methanol, Ethanol enriched fuel systems. Alcohols are soluble in fuels in all proportions when they are water-free but relatively small amounts of water can cause separation of alcohol from the fuel. The mixture settling to the bottom of the storage tank contains a high concentration of alcohol and cannot be detected by most water detection pastes.

KOLOR KUT MODIFIED WATER FINDING PASTE changes from dark brown in color to bright red on contact with water. Phase separated alcohol solutions with as little as 6% water will turn the paste yellow. This product is designed for use in reformulated and oxygenated fuel systems. After testing, it seems that alcohol or deicing agents in fuels have very little effect on the performance of the



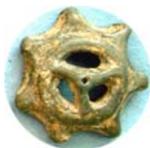
Kolor Kut® is a Registered Trademark of Kolor Kut Products Co., Ltd.



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Some times ago I got a
GIANT PLUMB BOB
(picture right).
D = 80mm, L (total) = 430
mm, L (body) = 330 mm, wall
= 5 mm, Material brass.

Sure, I knew that it was not a
real "born" plumb bob, even
when you could use it
But I did not know exactly
what it is. During the research
for this issue I found the
answer. It is a SAMPLER.
Shown in the picture on page
2 as „WEIGHTED
BREAKER SAMPLER“.

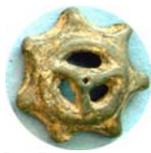




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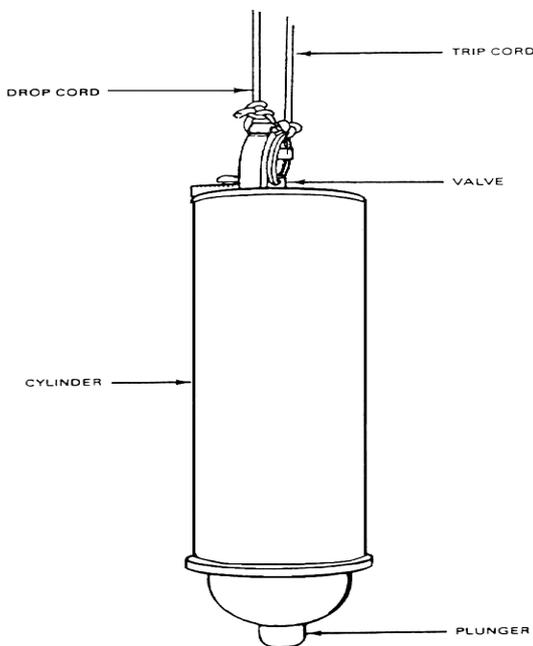
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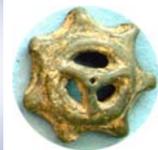
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Sample Thief (Bacon Bomb)

Obtains samples from storage tanks, tank cars and drums. When the thief strikes the bottom of the tank, a plunger assembly opens to admit the sample. The plunger closes again when the bomb is withdrawn, forming a tight seal. Samples can be taken at any depth with the use of a secondary trip line, or extension rods may be added for obtaining samples at levels of up to 18 (46cm) off the bottom. Special models include a 4 oz (118mL) 'pencil' model for sampling through small diameter pipes and openings, and clear acrylic samplers with plated brass plunger and end pieces. Modified samplers can be supplied for special applications





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SOUNDING WEIGHTS

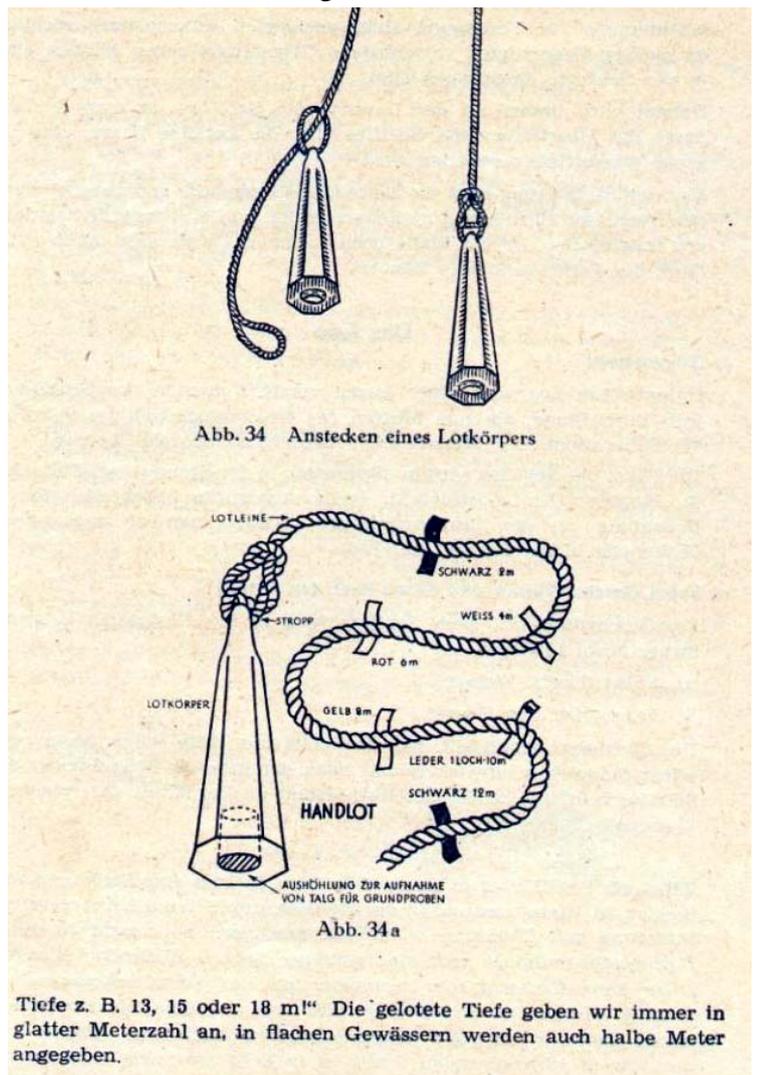
On ships today echo sounding apparatus is used to measure the depth of water beneath a ship. Before the turn of the 20th century, back to antiquity a weight and line were used to determine water depth. A reel was most frequently used to dispense the line. In the German language the same words are used to describe the construction tool, “plumb bob” as to describe a “sounding weight.” Thus, they are part of every European plumb bob collection.

Information about this type you will find on the web site of J. P. OLESON:

<http://web.uvic.ca/~jpoleson/Sounding%20weights/SL%20intro.html>

Title: SOUNDING WEIGHTS AND THE HISTORY OF NAVIGATION IN THE ANCIENT MEDITERRANEAN

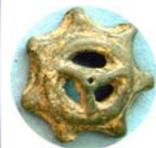
This type of plumb bob has a very special bottom. It is hollow and capable of holding a ball of TALLOW in the recess. When the bob hits the bottom, the sand or gravel sticks in the tallow and when brought to the surface indicates the type of “bottom” on the ocean floor beneath the ship. This information can be compared with information noted on maps. By counting the number of markers passed over the rail of the ship a crewman could determine the depth of the water. The markers (black, white, red cotton or leather pieces) were tied on to the line at metric intervals, or in the English system, in “fathoms”.





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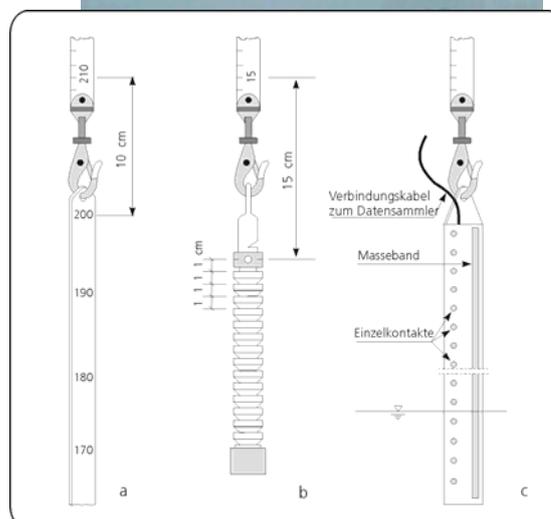
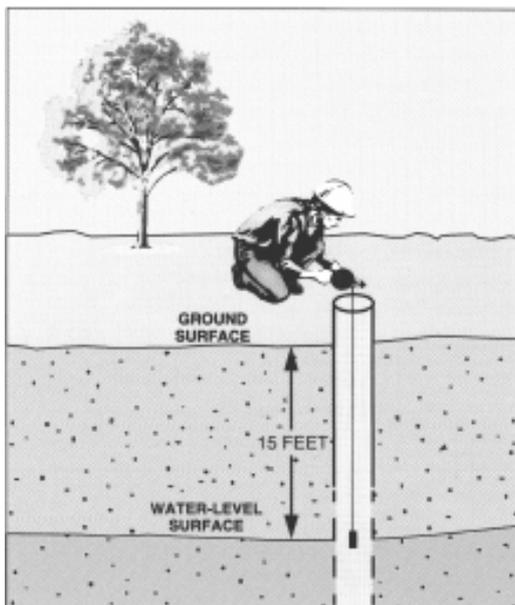
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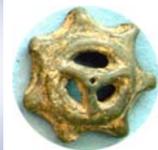
To **measure the depth of a well**, in Germany was used a WELL PIPE. (BRUNNENPFEIFE)

Well measurement device with signal whistle, 10-30m. The complete well measurement device consists of a signal whistle and a measuring tape and a special frame. At the lower end of the measuring tape there is a chain with a locking snaffle hook.

The signal whistle is hollow and has a slit for the whistle at the end. When taking the depth measurement as soon as the weight dips into the water, air is expelled over the slit emitting a "whistling" sound. This signal indicates the water surface and the water level depth can directly be measured on the measuring tape.

Specifications: Well signal whistle:
RANG'S well signal whistle consists of a precise twisted whistle out of nickel-plated messing. .





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If there is too much **background noise** at the measurement point or if the water level needs to be controlled in short periods (well tests), **we recommend** you to use a **Water Level Meter** with an **electric light signal**.

Nowadays the “Well measurement device with signal whistle” was replaced by



WELL CASING DEPTH INDICATOR

Reliable and easy to operate, the Well Casing Depth Indicator uses a magnetic pendulum assembly, making it ideal for measuring the depth at which steel well casing ends. The pendulum is housed in a stainless steel probe that is 6" (152.4 mm) in length and 1.5" (38 mm) in diameter. The probe is attached to marked tape and mounted on a well-balanced reel.

Model 101 Water Level Meter (Flat Tape)

Provides accurate water level measurements in wells, boreholes and standpipes.

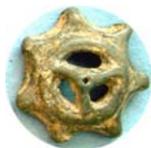
The Model 101 Water Level Meter uses a choice of probe designs, attached to a permanently marked polyethylene tape, fitted on a well-balanced reel. P6 pressure-proof probe is available. Similar to the P2 probe, the simple design is easy-to-clean, and hangs straight in wells. It is powered by a standard 9 volt battery housed in an easy-access battery drawer.



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Recently I could buy in Swiss a small depth measuring machine designed to determinate the depth of a well. Made by EASTMAN Hannover „AG-2 2008“. ALPINA HYDROMETRIE.

In the www I found no reference this tool. ☹ It is only mentioned in a dissertation of the University Basel / Swiss.

- The machine has a wind up mechanism
- The sinking speed of the weights is stabilized by a regulator (centrifugal governor).
- The rope / cord is made by 3 wires with a diameter of 0,1 mm (makes a total diameter of only 0,3 mm).
- Total length 25 meter.
- Indicator adjustable in cm (black) and m (red)



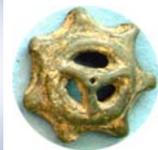
Accessories

- 3 plumb bobs / weights with thread, parking position on the chassis.
- 1 metal plumb bob D = 20 mm, L = 65 mm, weight = 150 gr
- 1 plastic plumb bob (swimmer) red D = 40 mm, L = 82 mm, weight = 150 gr with a hole to take samples of the liquid.
- 1 plastic plumb bob red (swimmer) D = 20 mm, L = 155 mm weight = 150 gr
- Correction index for each type of plumb bob.
- Metal cover
- Removable handle,

Manufacturing date unknown.
c. 1990 ?????

The small machine has a very specific technique, but is made very hardy/ resistant.





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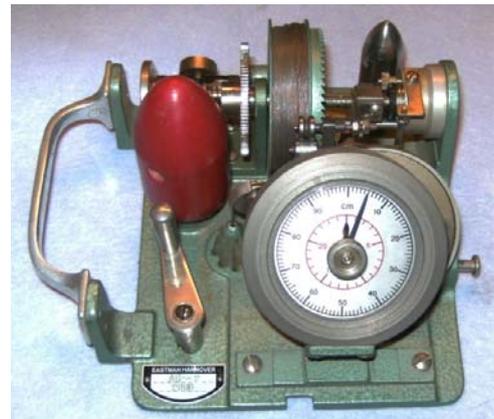
plumbbobwolf@t-online.de

The two plastic plumb bobs (swimmer) have on one side a hole. (45 degrees, 10mm deep and 8 mm D). This hole is to pick up a sample of the water, when the bob touched the water level, or, if it stops and comes up empty can determine the depth of the obstruction in the well casing.

The "Schwimmer" does not really swim, but adjusts the speed of the falling weight.

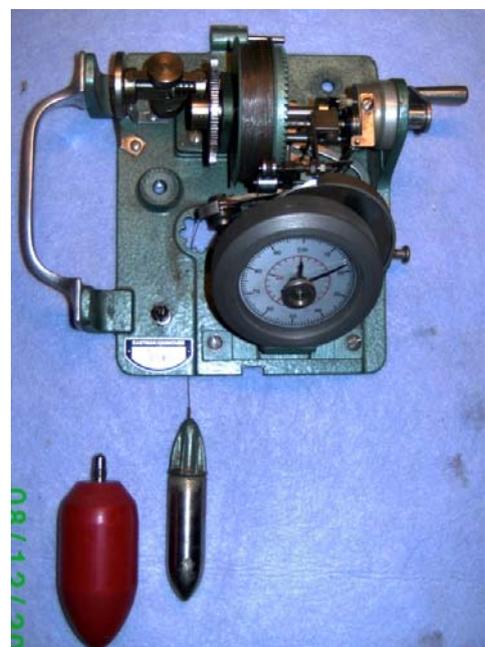


08/12/2007



Einstell - Tabelle			
Schwimmer \varnothing 40 mm		Schwimmer \varnothing 20 mm	
Rohr \varnothing l. W.	Zeiger vor Beginn der Messung auf ... cm stellen	Rohr \varnothing l. W.	Zeiger vor Beginn der Messung auf ... cm stellen
2 Zoll	4 cm	1 Zoll	9 cm
3 Zoll	1 cm	1 1/4 Zoll	5 cm
Messung mit Lotgewicht	5 cm	1 1/2 Zoll	4 cm
		1 3/4 Zoll	3 cm

For the different size and weight plumb bobs they supply a correction sheet that allows you to calibrate according to the diameter of the well casing. It is not entirely clear to me why this is necessary. Perhaps, one of my readers has seen such a device in action!



08/12/2007