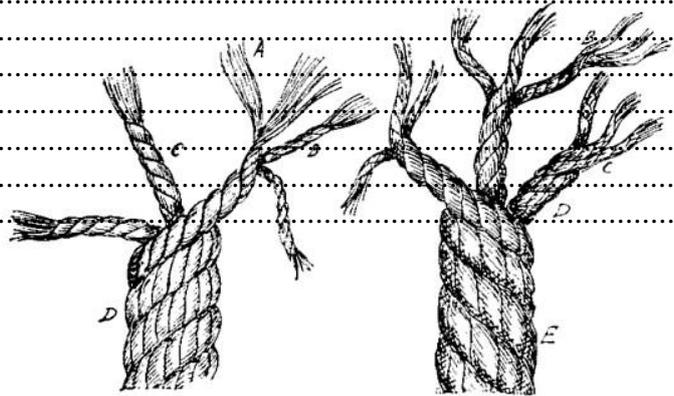


PLUMB BOB LINES

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Dear Reader of the News,
 Dear Fellow Collector,
 I have this topic since a long time on my TO DO-list and you remember, that I asked you 2 years ago for your opinion and knowledge about PLUMB BOB LINES. I got feedback from some of you and I think that this theme is of interest for others, who had no idea about it.

1. INTRODUCTION

If collectors get a new plumb bob, there is often a complete line attached or a piece of the line, or you find a knot inside the plumb bob. Some friends take off the line and put them into a box or into the waste basket and hang the plumb bob with a new cord on the wall.....

2. WHY WE NEED A LINE?

The plumb bob itself is nothing else than a piece of metal. If the mason, surveyor or anyone else will use it, he needs a connection to the earth by a line. Now the plumb bob is suspended on a hook and can hang and swing freely and point to the middle of the earth. Ready to work.

The point to fix the line can be the hand of a mason or a hook under a tripod.
 The plumb bob is now connected by the line with the "gravity-system of the earth".

THE PLUMB BOB SYSTEM:

- FIX POINT (hook)
- CONNECTION (line)
- PLUMB BOB (weight)

3. WHAT REQUIREMENTS DO WE HAVE for the line?

- strong enough to hold the weight (safety)
- Resistant to water (waterproof), heat and environmental influence (oil, chalk, sun, etc.)
- No change of the length while hanging
- Flexible to wind up on a reel, spool or the body of the plumb bob
- No twist, if it is in position
- Thin to have a low resist by the wind, especially of long lines (bridge builders, mining surveying)
- Thick to be better seen by surveyors

- Adapted to the diameter of the hole in the cap of the plumb bob
- No kink or ravel
- Cheap
- ...

You see that some of the points are CONTRARY, so it is clear, that we can't use ONE LINE FOR ALL PLUMB BOBS

4. DIFFERENT TYPES AND MATERIAL

Type:

- BRAIDED LINE
- CHAIN
- CORD
- FIBRE
- PIANO WIRE
- THREAD
- TWINE
- WIRE
- WOVEN LINE
- YARN
-

Material:

- BRASS
- COPPER
- FLAX
- HEMP
- IRON
- LINEN
- NYLON
- Other synthetic material
- SILK
- STEEL
-

5. WHAT INFORMATION DO WE GET FROM OLD BOOKS AND CATALOGUES?

In catalogues usually the plumb bobs are sold **without a line**, but in special cases (built in reel, chalk line combination, special winding system etc.) they are sold **WITH A LINE**. Than you can be sure that the line is adapted to the requirements of the plumb bob.

Let's have a look in come catalogues.

We got a good overview from the catalogue **STRELINGER 1895** (digitized by Google):

LINES AND CORD.

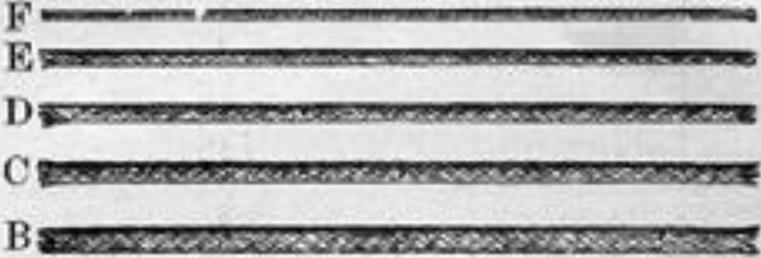


FIG. 983.

The most difficult feature in describing lines is to give an adequate idea of the different diameters or thicknesses. The material being yielding it is next to impossible to measure them. In the above cut we attempt to give an idea of the various sizes, but the cut is only approximately correct.

BRAIDED SILK AND LINEN LINES.

Our Braided Silk Lines are made of pure silk; they cost about one-half more than the "raw" silk and are well worth the difference. They come 25 yards on a board; can furnish 100 yards in one piece. The Linen Lines also are the best quality.

Size,	B	C	D	E	F
Silk, 25 yds,	\$0.90	.75	.60	.50	.40 cts.
Linen, "	.30	.30	.25	.25	.20 "

Price on Silk and Linen Lines include postage.

STRELINGER 1895

BRAIDED LINEN LINES.

We also carry in stock Hard Braided Linen Lines, in coils of 50 yards, these are slightly heavier than the regular lines. We can furnish, if required, 1,000 feet in one continuous length. Price, per coil, all sizes, 60 cts.

CHINA, OR "SEA GRASS" LINES.

The Sea Grass Lines are very much liked by engineers and machinists. We have them in two sizes, Nos. 1 and 3; No. 3 being equal in size to the "E" line on opposite page. These come in bunches of $\frac{1}{2}$ Doz. hanks; the No. 1 hank containing 32 feet, and No. 3, 18 feet. Price, per $\frac{1}{2}$ doz. hanks, 50 cts.; per doz. hanks, 80 cts.

COTTON MASONS' LINES.

The Mason's Line is a twisted line, and comes in 100 feet hanks. We have two sizes Nos. 6 and 8; the No. 6 is about $\frac{1}{8}$ inch in diameter and the No. 8 about $\frac{3}{16}$ inch. No. 6, per hank, 20 cts., per doz., \$2.00
 " 8, " " 30 " " " 3.00

BRAIDED CORD AND ROPE.

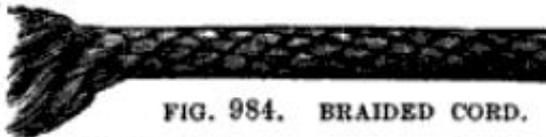


FIG. 984. BRAIDED CORD.

The Braided Cord we carry both in Cotton and Linen, the Linen Cord being used where greatest strength and wearing qualities are essential.

The "B" quality Cotton Cord is the most generally sold, although, in our judgment, the "A" quality is more desirable, being made of finer stock and more closely woven. All sizes up to No. 12 come in 100 feet hanks; larger sizes in 500 foot coils. The prices given below are on 100 foot lengths, but we sell any quantity, small or large.

No.	PRICE PER 100 FEET.					
	6	7	8	9	10	12
Diam.,	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{3}{4}$
B Cot'n,	\$0.50	.60	.75	.85	1.10	1.35
A "	.65	.80	1.00	1.15	1.45	
Linen,	.95	1.15	1.40	1.60	2.15	2.70

CORD GRIP.



The Cord Grip is a substitute for the knot used in hanging sash cord, it will not untie and makes quite a saving in cord. By using the larger sizes for the



FIG. 985. CORD GRIP.

smaller cord they can also be used for splicing in an end, such as would be necessary in the formation of a loop.

No. 8,	dozen,	20 cts;	gross,	\$1.75
" 12	" 30	" "	"	3.00
" 16	" 35	" "	"	3.50

Will be pleased to name prices or furnish information in reference to Manilla, Sisal and Hemp Ropes in all sizes and dimensions.

BRAIDED AWNING LINES.

The following Lines, although known as Awning Lines, are used by Masons, Upholsterers, and for all purposes where a fine, strong line is required. They are put up in hanks of 48 feet each.



FIG. 986.

No.	$3\frac{1}{2}$	4	$4\frac{1}{2}$
Diameter,	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$
Cotton, each,	\$0.15	\$0.20	\$0.25
" dozen,	1.50	2.00	2.50
Linen, each,	.25	.35	.45
" dozen,	2.50	3.50	4.50

We also have this cord in size No. 5, which measures $\frac{5}{16}$ inch in diameter; it comes in 100 feet hanks. Price, per hank, 75 cts.; per dozen, \$7.50.



FIG. 987. WIRE SASH CORD.

The above cut of Wire Sash Cord is the very best one we could get, and while it is not perfect it will show or give a fair idea of the Cord, which is made of fine wire twisted as an ordinary rope. It is very soft and pliable, and will prove very useful for a great variety of purposes.

Diameter.	Tinned.	Copper.
$\frac{1}{8}$ inch, per ft.,	2 cents;	4 cents.
$\frac{3}{16}$ "	2 $\frac{1}{2}$ "	5 $\frac{1}{2}$ "
$\frac{1}{4}$ "	3 $\frac{1}{2}$ "	8 "
$\frac{5}{16}$ "	4 $\frac{1}{2}$ "	10 "

We can also furnish the above Rope in galvanized or plain iron wire.

CHALK LINES from a RIDGELY CAT No. 37

RIDGELY #37 catalogue

CHALK LINES



No. 185—Actual Size

No. 185—Chalk Lines. Bleached cotton, solid braided, will not kink or ravel. Put up in 20 foot hanks, 12 hanks to a bundle, in one continuous length, total 240 feet per bundle.

Weight per bundle, 6 ounces.

In the catalogue page above and in other catalogues we find a lot of information about the offered plumb bob lines in the 1900s:

- “the line should be **braided** or **woven**”¹
- the **price** for Plumb Bob Cord: “best linen; thin, medium or thick” costs \$ 0.02 and “best braided silk” \$ 0.06 per yard ²
- Different catalogues with **MERCURY PLUMB BOBS**,^{3 4}: “Each Plumb Bob is **furnished with a braided silk line**”

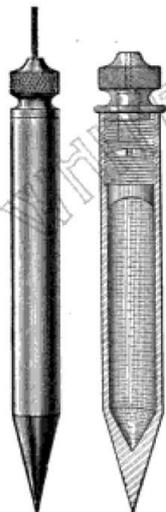
MERCURY PLUMB BOBS.

These Plumb Bobs are made of solid steel rod, bored out and filled with mercury, or quicksilver, which makes them unusually heavy, in proportion to their size, and the centre of gravity low. The cut at the right shows the manner in which the Plumb Bobs are constructed. The comparatively small diameters allow them to be used close to corners and walls, and are not easily affected by draughts of air, as well as allowing them to be carried or packed in small spaces.

The points are hardened, and the bodies and points are ground. The Plumb Bobs are nickel plated, and each is furnished with a braided silk line. The 3½ oz. can easily be carried in the vest pocket.

No. 93.	3½ oz.	4	in. long,	½ in. diam	... Each,	\$0.90
“ 94.	6	“ 4½	“ “	5/8 “	“ “	1.35
“ 95.	12	“ 5½	“ “	¾ “	“ “	1.80
“ 96.	16	“ 6	“ “	1 “	“ “	2.25

WHITE van GLAHN & CO 1902



- “In the matter of bob-cord, **braided fishing line will prove most satisfactory**, as it does not rough up under exposure or show any tendency to twist, thus keeping the bob under constant motion”⁵

- “I use a **braided linen line** which is **made for fishermen** and is found in the sporting goods stores. If I happen to get one which is braided around a core, I simply draw the core, getting some valuable linen thread and leaving a solid braided line to use.”⁶

- For **underground**: “**Braided cotton fish-line**, about 1/32 -inch in diameter, in 7-foot lengths, is used for plumb bob strings. For plumbing short-lifts, up to 150 feet, number 30 tinned iron wire put up in 50-foot spools, is used. For longer distances, number 22 **soft copper wire** in 1-pound-spools is used. If weights heavier than 9 pounds are used, the wire must be of hard copper or of larger diameter”⁷

- “Plumb Bobs: Two sizes were used, a **9 oz. Bob for underground** mine surveying and a **14 oz bob for outside work in windy weather**. An **extra bob** with a flat topped neck for fore and back sights underground was used on these bobs. For shaft plumbing a specially constructed **pair of winged steel bobs 9 in. high 6 in. wide and weighing 11 lb.** Each with No. 20 copper wire was used.”⁸

New for me were the “China line” or “SEA GRASS” LINE and the CORD GRIP to replace a KNOT.

We only find SOME SPECIAL PLUMB BOBS offered and sold WITH A LINE.

The other (simple / common) plumb bobs are sold without a line. For these plumb bobs we don’t find a proposition what type or diameter should be used for it.

¹ International Correspondance School 1905

² EUGEN DIETZGEN 1911

³ BROWN & SHARP 1905

⁴ WHITE, VAN GLAHN & CO 1902

⁵ CONNECTICUT CIVIL ENGINEERS AND SURVEYORS 1899

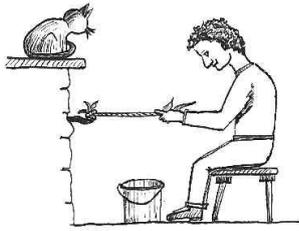
⁶ OHIO SOCIETY OF ENGINEERS 1892

⁷ A MANUAL OF UNDERGROUND SURVEYING 1910

⁸ COLORADO SCHOOL OF MINES MAGAZINE 1917

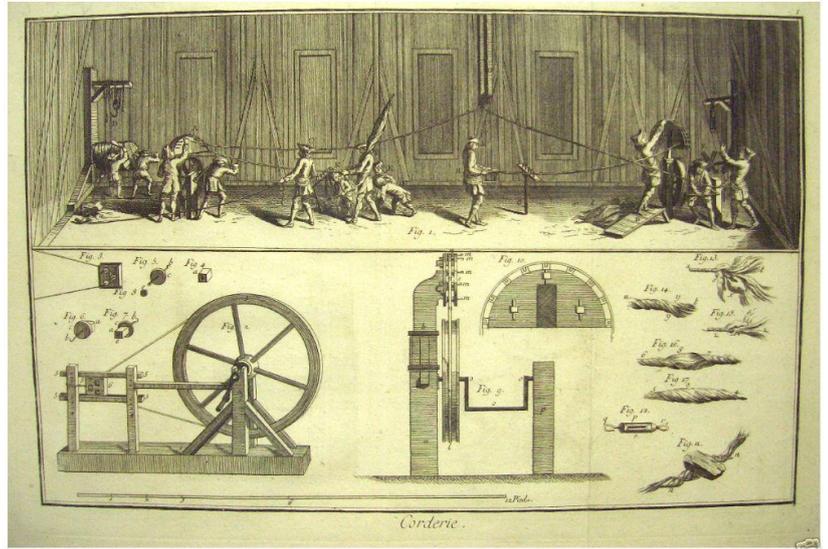
6. HOW ARE LINES PRODUCED?

The plumb line cord or lines can be made by hand or by machines. Unfortunately I could not find a good and short written article about “line making” or “rope making”.



If you know a good publication, please let me know.

Below you find some drawings and pictures showing this trade.



A „corderie“ in France. Rope making.
Drawing by Diderot et D’Alembert. (1772)

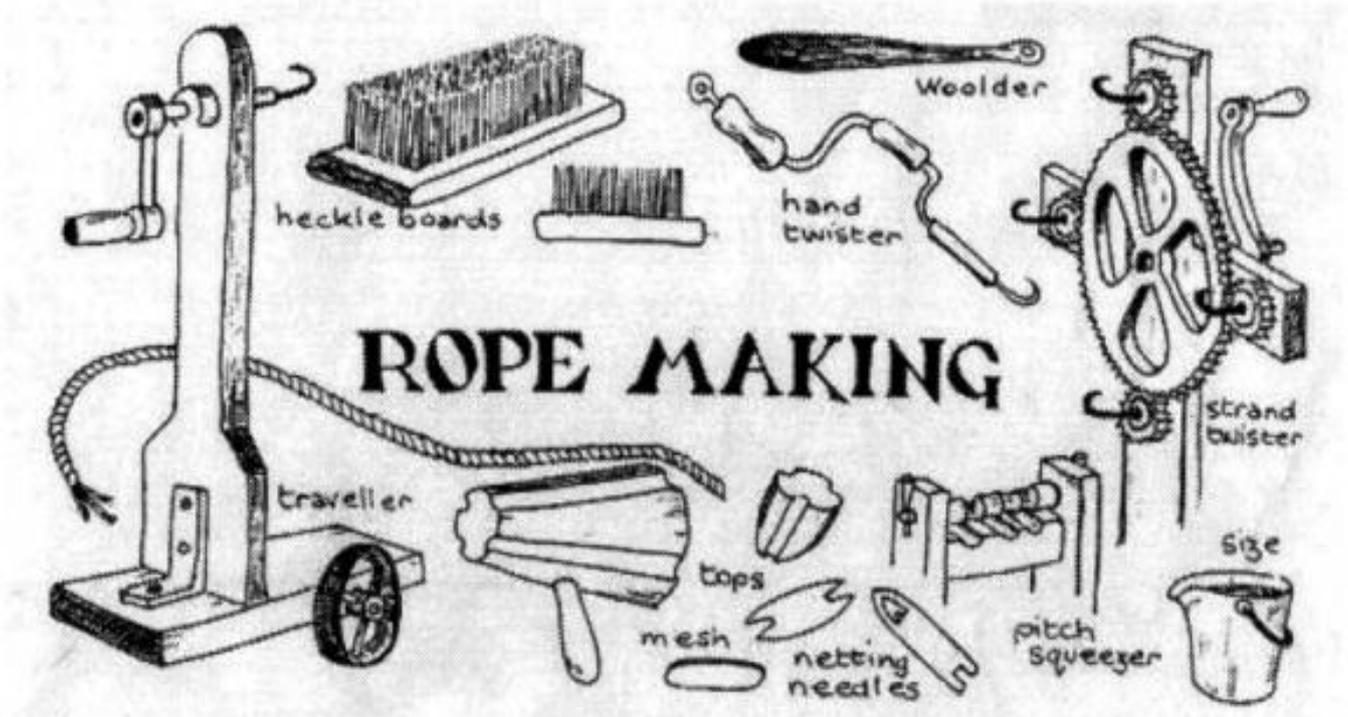




Plate 7

Fig.14



Fig.15

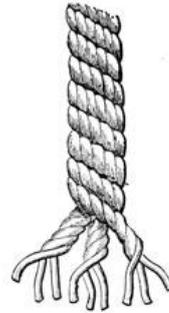


Fig.16

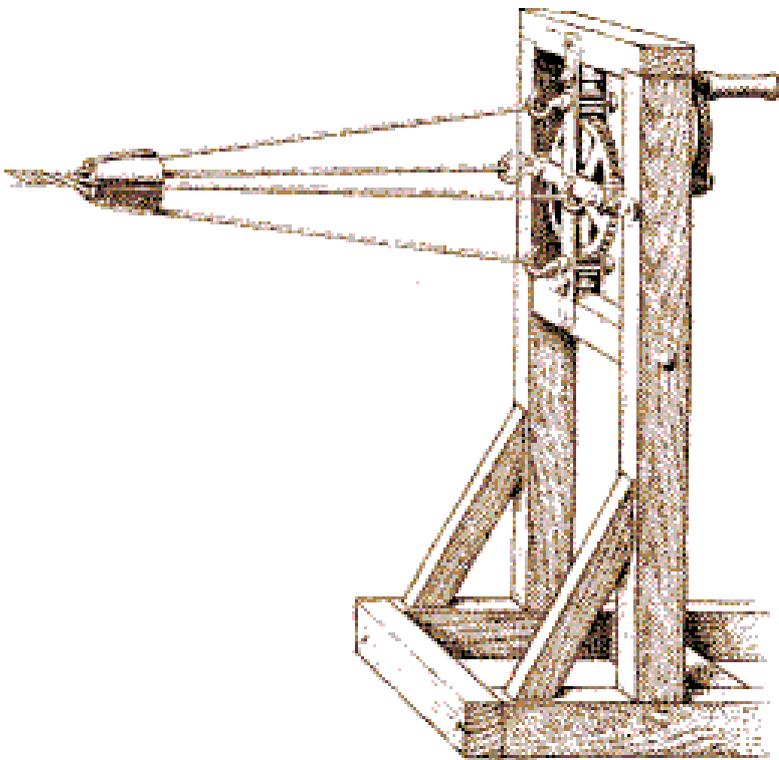
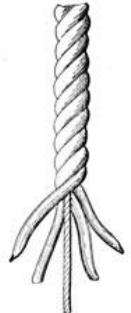


Fig.18

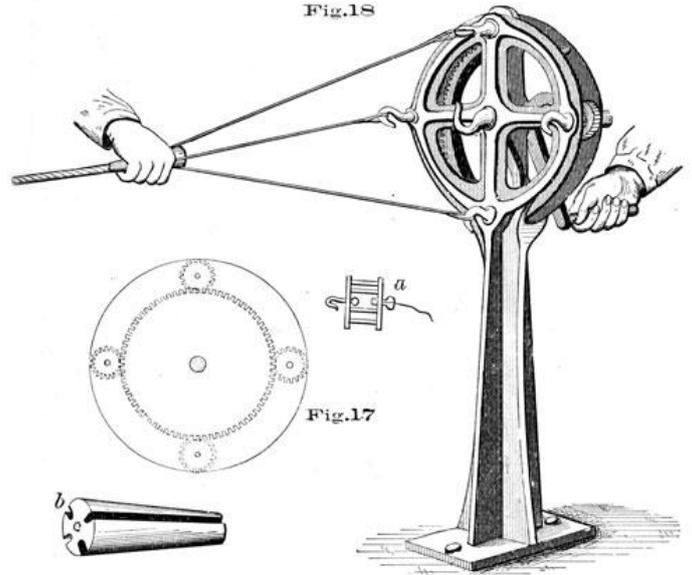
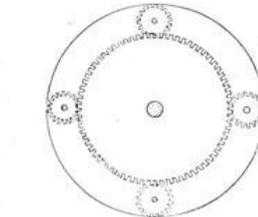
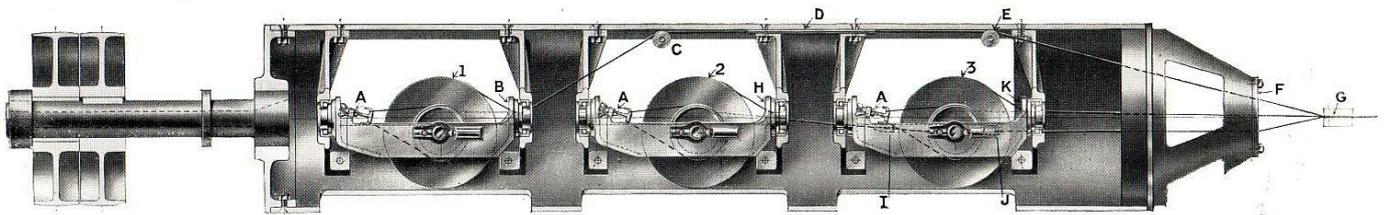


Fig.17



SECTIONS SHOWING POSITIONS OF WIRES AND CORES IN
LARMUTH'S PATENT HIGH-SPEED STRANDING MACHINES.

The sectional Illustrations below are for convenience shown with 3 Bobbins only, owing to the length that they would be if a larger number were included, they can however be taken as illustrating all sizes of Machines, and with any number of Bobbins, if the additional Bobbins are assumed to be placed between Bobbins No. 1 and No. 2 in the Illustration.



MACHINE WITH CENTRAL WIRE OR CORE CARRIED ON FRONT BOBBINS.

7. MY QUESTIONNAIRE 2008

I asked in 2008 the readers of the NEWS some questions about THE PLUMB BOB LINES: **Below some answers.**

Thank you to all who answered.

A. When you get a plumb bob with a line. What are you doing with the line?

- I let the line **in place** (It is a “foot print” of human use of this tool)
- **I cut the line** off and replace it by another line to hang it on the wall
- I make a practice of **affixing some sort of string on all my bobs**, whether it comes with the bob or not... because I mark my bobs in my inventory by putting a tag on the string with my identification number written on the tag.
- Like everyone else I have tons of string that **I have saved** along with the string holders that came with it. A lot of them home made. Some commercial.
- The first thing I do is **hold it by the line** to see how the bob looks & to see if it is plumb.

B. What did you learn about the lines from your plumb bobs?

- There is a **huge variety of materials** and twisting
- As a user of plumb bobs for their intended purpose I know and **appreciate the value of a bob not to spin.**
- Some carpenters used to work with the plum bob **line as a chalk line.**

C. What type do you use to hang the plumb bobs for display?

- I hang them with a **leather cord**
- I always like the **fine braided line**
- I use **fishing reel backing line** to hang my bobs.
- I use a lot of **different** cords, strings, small wire & even one chain. Sometimes I use the one that came with if it look original & I replace the ones that are wore out
- When I hang Ottoman plumb bobs for exhibition **I prefer to use flax string** (Flax is a very strong and cheap material. Due to

the nature of the raw material the thickness of the string is not uniform, being in the range of 1 to 2 mm, this string suits perfectly.)

D. What do you know about the fabrication of braided lines?

- **Nothing**, but I have noticed many different kinds
- I know **nothing**
- Woven by **rope making machines**
-

E. What do you know about the diameters of lines in relation to the hole in the cap of the plumb bob?

- The **diameter of the line** must be close to the diameter of the hole
- If you calculate the surface area of a plumb bob line you get the **surface area** of a pack of cigarettes for a long line.
- I like to have the line **a little smaller than the hole** but not to small that the bob has movement (back & forth) in the hole
- In the Ottoman levels Type 5 (Tèrazi) I have noticed that the diameter of the hole for hanging the small plumb bob can be as small as 1 mm or less. In this case, a selected flax string or maybe a thin cotton string was used.

F. What influence has the line for the quality of the measurement?

- Line is very important. The line is in connection with the plumb bob stability and consequently with the **accuracy of the measurement** / result
- I was in the survey business for about 40 years. We always used a **fine line under a transit** that usually sat over a tack
- And **in the field we would use a heavy line** for 2 reasons. First we needed the strength and wearability and the second we could see it at a greater distance. (Accuracy for highway survey and such was really not dependent on the size of the line.)
- You don't want the line **out of center in hole** because the point of the bob will not be plumb with the line.
- The problem with thin strings is that they can be easily **tangled**, but if you need a long line you may not have another

alternative. For the Ottoman Type 3 or 4 (plasterers bobs) do not need a length of string longer than 3 or 4 meters (10 to 15 feet). Thus, builders prefer to use cordon made of **cotton which does not get tangled**. The diameter of the hole on the top of the bobs and that of the spacers is in the range of 7 to 8 mm, so cordon must be near that.

G. **Do you have any pictures or drawings about this theme?**

- Yes, attached

H. **Do you have any sources where I can find information?**

- Unfortunately **NO**
- I found some spools of braided line that I had shopped from TAIWAN at great expense; however, their fines line wasn't fine enough for some of my applications. I was also waxed, I believe so that it could be used to stitch leather.

I. **What do you want to know about this topic?**

- I look forward to read your special issue soon.
- Boy, would like to know about braided line!
- **Where can I buy some braided line?**

General answers:

- Your questions are very good.
- I wish I could answer them. (But this is why I like this topic).
- I would like to build a display of samples about 25 cm each.

You see there is some knowledge, but also a wish to know more. I hope I could answer some questions and help with this small article.

8. PIANO WIRE

I bought a ring of piano wire to see how it looks like. Piano wire was used by mining surveyors. This wire cannot be used by common trades or collectors.

On a piano wire with a diameter of 0.7 mm. you can hang a plumb bob weight of 150 kg (over 300 lbs.) A diameter of 1 mm is good for 300 kg (660 lbs).

A German maker⁹ of PIANO WIRE wrote:

“The following text should give a basic knowledge about string materials to make the decision easier. First of all is naturally that the string should not break. Harpsichord strings are available in a big spectrum of tear resistance. The tear resistance (Rm) is dependent on:

- The type of material (iron, brass, copper, ...)
- the alloy within a type of material (CuZn28, CuZn15, ...)
- the way of production (diameter reduction, intermediate annealing, surface quality, ...)

There is no big problem to determine the tear resistance technically. Unfortunately it tells us only something about the point where it is already too late and the string is broken. In the practice there will be made a security subtraction of e.g. 20% or one tone below the tearing limit. Of course these are arbitrary assumptions and also years of experiences are of no use if the new bought material does not have the absolutely same physical properties as that material used before. That's why we invested much time and money in the string testing. You receive a detailed test report (without surcharge) to the string roles we deliver. The test report includes e.g. the load deflection curve and practical hints for using the material...”



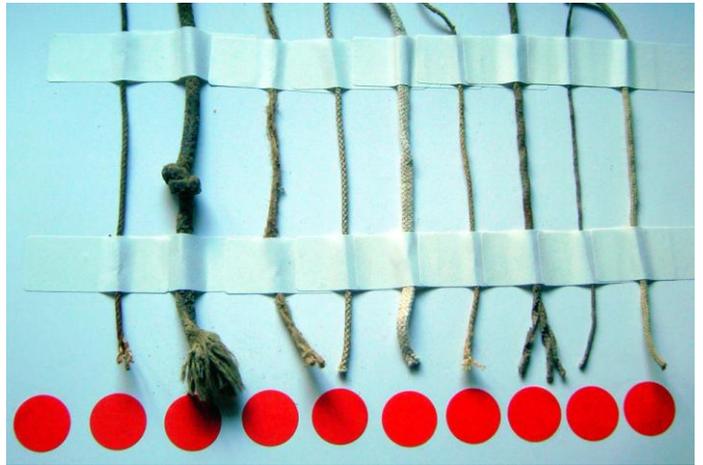
⁹ Marc Vogel GmbH

9. PICTURES FROM FELLOW COLLECTORS



Some thick lines from a French collector. Used by masons. Thanks Alain

Different lines from mason plumb bobs in the Netherlands. Thanks Eric.



You can make you an own display like pictured above. If you know the description, you can mark it.

Picture right: In the upper part of this stand from iron wire you can store your long lines without any problem.



10. CONCLUSION

Searching for information about plumb bob lines I found a lot of sources. Unfortunately I couldn't put all these information together to one "block". So I typed the different information for you and you can make your own mind about it.

There is not one single line used, but a lot of different lines depending of the weight, the use and the measuring quality

11. SOMETHING TO SMILE AT THE END:

The longest plumb bob line you can see on an ad from 1907.

From New York to Miami. 1,100+ miles
Diameter like a railroad track. ☺

STRAIGHT AS A PLUMB LINE
to the Winter Resorts of the
CAROLINAS AND FLORIDA

Just Right
The Climate in the Carolinas, Georgia and Florida.
The service and schedule of the
Seaboard Florida Limited

☑ This Magnificent all Pullman electric lighted train commencing January 7th.

Lvs. New York, daily, 12:25 noon
Ar. Camden " 6:15 a. m.
Ar. Columbus " 7:09 a. m.
Ar. Savannah " 9:15 a. m.
Ar. Jacksonville " 1:00 p. m.
Ar. St. Augustine " 2:10 p. m.

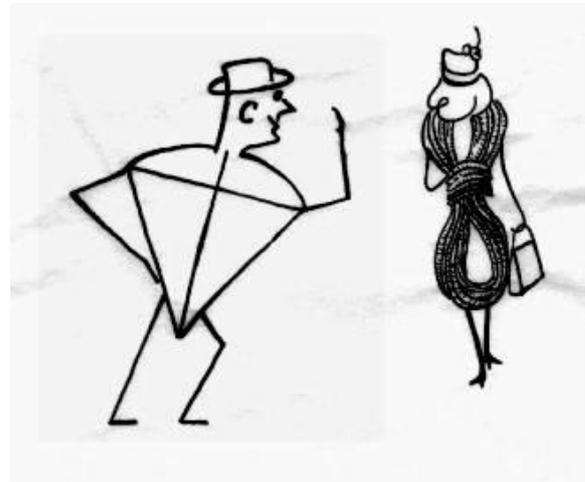
☑ The quickest train service via the shortest route. Two other daily high class trains.

☑ Excursion tickets allowing stopovers on sale until April 30th. Return limit May 31st.

☑ For resort booklet or information apply Northern offices:

Boston, 300 Washington St.
New York, 1183 Broadway
Philadelphia, 1483 Chestnut St.
Baltimore, Continental Trust Bldg.
Washington, 1421 Pennsylvania Ave.

SEABOARD AIR LINE RAILWAY



And last but not least a drawing that I found anywhere.

For me it is a German conical plumb bob that meets its line. The original drawing says something like:

“Mr. Kite” is greeting his wife “Mrs. Line” ☺

12. RELATED PUBLICATIONS

Further information about plumb bob lines you can also find in:

- THE PLUMB LINE CONTINUUM
- WOLF’S PLUMB BOB NEWS 2008-03, 2008-09, 2008-10, 2008-11 and 2009-03

All publications are available on www.plumbbobcollectors.info



I forgot to tell you that lines from banana yarn are made by hand. See picture above.

You can use this line only for/with the special biological “banana-plumb-bob”.



Important: correct results you get in half-moon-nights only. The moon compensates the special shape. ☺

REMARK:

This is an article of the monthly published WOLF’S PLUMB BOB NEWS that is sent on demand as PDF-file attachment by email. FREE.

You can see all former and future publications on my website www.plumbbobcollectors.info

Remarks and contact by email: plumbbobwolf@t-online.de

Thank you for your interest!

Wolf Ruecker