

# PRACTICAL HINTS FOR HYDROGRAPHIC SURVEYORS.

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## THE SMALL LUCAS SOUNDING MACHINE

and some of its defects in practice when the machine is in use  
for a length of time.

by

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For sounding in boats many countries use the small LUCAS Sounding Machine. An important part of this machine is the depth registering apparatus.

In practice, especially when the machine has been in use for a long time, some small defects may be encountered; with knowledge of its construction, they may often be easily remedied.

A brief description of the working of the apparatus will first be given :-

The wheel *a*, around which the sounding wire runs, is attached to the spindle *b* by the screw *s*. The flat copper plate *t* is of one piece with *b*; to this plate the cog-wheel *c* (12 cogs) is attached by means of a screw around which it may turn. The cogs of *c* run along the cogs of the fixed wheel *k* (29 cogs) and also along the movable wheel *e* (30 cogs); on the spindle of *e*, which passes through a hole in *k*, the flat copper plate *f* is firmly screwed. It carries the movable cog-wheel *g* (17 cogs) running along the fixed cog-wheel *h* (39 cogs) and also along the movable wheel *d* (40 cogs). To the spindle of *d*, which passes through a hole in *h*, is clamped the pointer *l*, which runs round the indicator-dial *p*; this dial is attached to the body of the instrument by the two screws *q*; the intervening space is filled up by the small rings *r*. The whole is closed by the glass plate *m*, locked by the ring *n*.

The number of revolutions of *t* is the same as that of the wheel *a*. When *t* makes one revolution, the wheel *c* is back in the same position. It has made one turn round the fixed wheel *k*, also displacing the movable wheel *e* one cog, or  $\frac{1}{30}$  of the circumference of the latter. The plate *f* (attached to *e*) also makes  $\frac{1}{30}$  revolution. When *f* makes one revolution, the cog-wheel *g* is back in the same position and *d* is displaced one cog or  $\frac{1}{40}$  of its circumference and of course also the pointer *l*. When *a* makes one revolution, thus *l* makes  $\frac{1}{30} \times \frac{1}{40} = \frac{1}{1200}$  revolution.

For a complete revolution of *l*, *a* must make 1200 revolutions. When the indicator-dial is divided in metres and the circumference of *a* is 33.3 cm., as is often the case, the dial must be divided from 0 to  $1200 \times 33.3$  cm. = from 0 to 400 metres.

### CONTROL.

As the wheel *a*, owing to the friction of the sounding-wire, in the course of time wears out, the original circumference of 33.3 cm. is diminished and consequently the indication of the pointer is too much. So, the instrument must be controlled from time to time by running out the wire over an exactly known distance or by measuring in a very accurate manner the circumference of *a*. An error in the measured circumference of 2 mm. would cause an error in the calculated correction of the dial of 3 metres in 400 or 0.8 %.

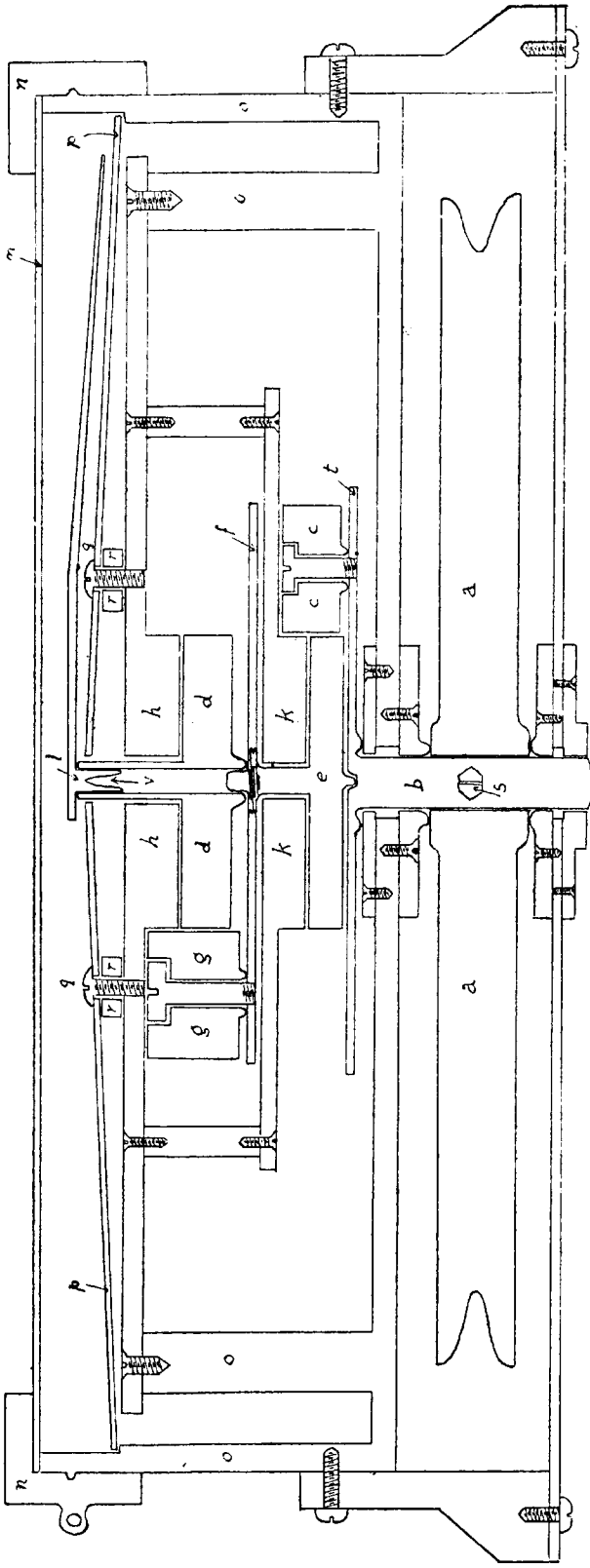


FIG. 1

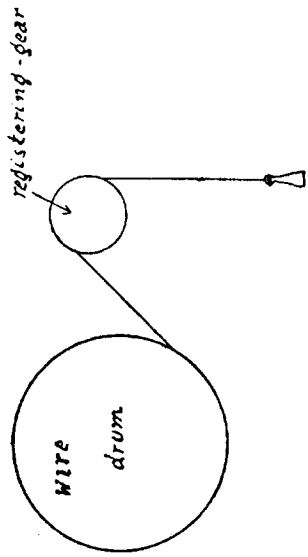


FIG. 2a

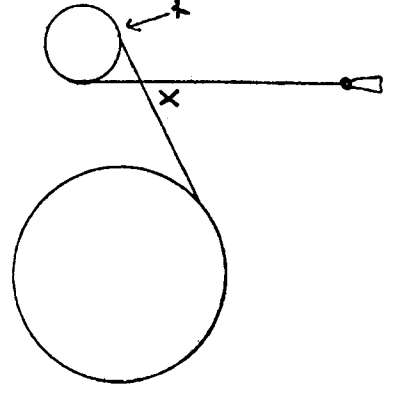


FIG. 2b

## SOME DEFECTS OF OLDER MACHINES.

1. The wheel *a* turns in the right way, but the pointer does not turn.

*Cause* : screw *s* has got loose.

2. The wheel *a* turns when paying out the wire, but does not turn when hauling in.

*Cause* : plate *f* has loosened from *e*.

Nearly always the reason is that the rings *r* are forgotten. In this case the lower ends of the screws *q* may catch the wheel *g*. When paying out the wire, as a rule this gives no difficulty, because — owing to the resistance — *f* is fastened to *e*; but when hauling in the wire, *f* is loosened from *e* and lifted a little, causing an increasing resistance against *q*, which again causes more lift of *f*, so that after a few revolutions, *g* is lifted so much that it cannot pass *q*; the whole gear stands still.

Also even if the rings *r* are not forgotten, this fault may occur. In the course of time the enamel of the indicator-dial scales off in the vicinity of the screws, allowing them to sink down more than originally. In this case the rings must be raised.

3. The pointer is running irregularly.

*Cause* : one or more cogs are worn out or are missing.

This lack cannot be redressed; when it is important, the instrument must be disused.

4. The pointer is slack.

*Cause* : the clinching of the pointer in the spindle *d* is too small. It can be easily remedied by opening the slit *v*.

5. Every moment the wire jumps up from the wheel *a*.

*Cause* : the wire is too stiff.

The best wire is stranded wire, but it may happen that it is not available, so that piano-wire must be used; sometimes this wire jumps up from the wheel *a* and gets entangled between this wheel and the body of the instrument; in this case the wire drum will make a few more turns, so that the wire on it jumps up. Clearing the wire will inevitably cause twisting, which again causes a greater future chance of its jumping up from the wheel *a*. In such a case I have used with success the following method; Instead of leading the wire in the usual way as in Fig. 2*a*, it was led in the way indicated in Fig. 2*b*. The friction of both parts of the wire at *X* is of no practical importance when using piano-wire. In using this method the friction against the outer parts of the instrument is of more importance; so it is recommended to fit a small roller-block at *r* (Fig. 2*b*) when using it for a longer time. In the course of two whole days, sounding every 1½ minutes without the roller-block, no inconvenience was encountered.

Usually the indicator-dial faces to the left. In the application of the above method of leading the wire, it is advisable to alter it to face right, otherwise the pointer would run backwards when paying out. Of course it would be possible to subtract the reading from 400, but this would possibly cause mistakes.

## KEEPING IN ORDER.

It is advisable to clean the gear every two months with gasoline, afterwards re-greasing in the normal way. Desiccation of grease may cause the gear to seize up.

## ADVANTAGE OF ARRANGEMENT.

The advantage of the arrangement of the gear is that small wearing-out of the cogs has no direct influence on the accuracy of the readings, because the operation does not depend on the dimensions of the cogs, but on their difference in number. It is only when the wearing of the cogs is so great that one of them breaks off, that an error in the reading on the dial occurs. In such a case the instrument should be disused.