I.C.E.S.

Mesh Gauge

OBSERVATOR
ROTTERDAM

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I C E S Mesh Gauge

<u>Introduction</u>

In order to obtain more uniformity and accuracy in measuring meshes of trawlnets, the original Scottish longitudinal gauge has been further developed by Mr. C.J.W. Westhoff of the General Inspection Service of the Ministry of Agriculture and Fisheries in the Netherlands in close cooperation with the Dutch Instrumentmakers Observator Ltd. at Rotterdam.
The resulting gauge has been comprehensively tested in 1961 by the Comparative Testing Committee of the International Council for the Exploration of the Sea (ICES), Charlottenlund - Denmark. For test-results the Prospectus of the ICES-Mesh-gauge of April 1962 is recommended, published by ICES with a statement of relating documentation.

The Comparative Fishing Committee mentions in the final conclusion ("Procès Verbal de la Réunion 1961 de ICES page 59") the following considerations:

Following a request from the Liaison Committee (to the Permanent Commission of the International Fisheries Convention of 1946) an improved version of the interim standard gauge at present adopted by ICES (the 1959 Westhoff gauge) has been tested by three countries (Germany, Netherlands and Scotland) and compared with various other mesh gauges. The results of these tests were reported to the Committee (contributions 72A, B and C), all agreed in concluding that the latest mesh gauge (described in contribution nr. 40) was superior in nearly every respect to any existing gauge, including the present interim standard gauge. The latest gauge provides a high degree of accuracy and is virtually free of observed bias whether or not the operator is experienced in its use.
The Committee agreesthat this new gauge, hereafter to be called the "ICES gauge", should replace the present interim standard for research purposes (see Recommendation B(2)).

Based on these considerations the Consultative Committee of ICES accepted (mentioned as well in the "Procès Verbal", page 62), among others the recommendation Nr. III-B(2) as follows:

Having considered the results of extensive tests undertaken by scientists of Germany, the Netherlands and Scotland at the request of the Liaison Committee, the Comparative Fishing Committee recommends that the latest version of the original Scottish longitudinal gauges as described by Mr. Westhoff in contribution Nr. 40 to this meeting be adopted by the Council as the standard gauge for research purposes in place of the 1959 Westhoff gauge. The Committee also recommends that:

a) The new standard gauge shall hereafter be called the "I.C.E.S.-Gauge".

b) It shall be operated at a pressure of 4 kg, this applying for all materials specified in the Report of the Mesh Selection Working Group and to any other materials, natural or synthetic, used in trawls or seines of types similar to those considered by the Mesh Selection Working Group.

c) The measurement of each mesh shall be obtained by operating the gauge twice in rapid succession without removing it from the mesh, the second reading being taken as the mesh size.

To improve the accuracy as high as possible, the construction has been modified once more.
For this reason, this prospectus is edited, based on the latest data.

Principles of the ICES Mesh gauge:

During the developments and production the following considerations have been taken into account:

An important aspect of research into the selectivity of nets concerns the measurement of mesh size, and in recent years there have been a number of attempts to devise a precision mesh gauge for research purposes. Because the materials of which fishing nets are made elongate under tension, a gauge which gives a precise and objective measurement of mesh size must provide for automatic control of the tension to which the mesh is subjected when measured. A satisfactory gauge must also be quick and easy to operate even under difficult conditions such as those which may arise on board vessels at sea; it should not require any special skill or experience on the part of the operator and the gauge must be free from any personal influence; it should be robust and yet reasonably light in weight; it should be easy to clean and resistant to corrosion; and it should be capable of measuring over a wide range of mesh size. Furthermore, if the gauge is also to be used for official inspection of nets or in connection with the enforcement of mesh regulations, its design should be such as to permit the gauge to be adjusted as exact as possible, certificated and sealed so that its performance, and the measurements obtained from it, are acceptable to the authorities concerned.

It must be stressed that measuring should be done on nets which have been used more than once, after which the knots are pulled thoroughly.
It cannot be expected that knots of new nets or knots of nets which are used only too few times will be pulled enough by a strain of 4 kg. To tie a knot tightly much more strain is needed,even then is a good chance the knot will get loose again afterwards.

The principle on which the ICES gauge is designed is that of the Scottish longitudinal mesh gauge, in which the mesh is stretched diagonally lengthwise of the net under constant pressure by two parallel jaws inserted into it;

one of the two jaws slides on a graduated bar from which the size of the stretched mesh is measured. Automatic control of the tension exerted on the mesh when it is stretched for measurement follows the principle, by which one of the two jaws is pivoted against a spring; when the tension between the jaws is just enough to overcome the compression of the spring the pivoted jaw rotates slightly and causes the gauge to lock.

Construction of the gauge

The construction of the gauge is shown in Figure 2.
The two jaws II and IV which have a thickness of 2 mm in conformity with the provisions of the North East Atlantic Fisheries Convention are inserted into the long diagonal of the mesh to be measured. The sliding hinged jaw IV is then pulled steadily away from the fixed jaw II by the handle III, thus stretching the mesh. The handle III is continued to be pulled until the resistance of the stretched mesh against the sliding jaw IV is sufficient to cause the latter to pivot and compress the spring VII.
The moment this happens the pawl V is actuated and engages in the rack on the underside of bar I, thus locking the gauge and preventing any further movement of the jaw IV. Pressure on the handle is maintained so as to keep the gauge in the locked position while the mesh size is read from the position of jaw IV on the scale on the upper side of bar I.

As soon as the pressure on the handles is released, the spring XII begins to return the sliding jaw IV to its closed position, the pawl disengages from the rack, and the gauge is ready for the next measurement. Trials have shown that more consistent measurements are obtained if the gauge is operated twice in quick succession without removing the jaws from the mesh and the second reading taken as the mesh size; this is, in fact, the recommended procedure for using the gauge (see the recomm. (c)).

It will be seen that the tension at which the gauge operates, i.e. the stretching force on the mesh when its size is measured, is determined automatically by the degree of compression of spring VII, which can be adjusted by screw VIII.
The recommended operating tension is 4 kilos (see recomm.(b)) with a tolerance of ± 0,1 kilo.

So that as wide a range of mesh size as possible can be measured by a single gauge, the handle XI, which is held in the palm of the hand, can be fixed in different positions with the total range of the gauge from 20 to 170 mm, which enables it to be used on nearly all types of trawls in common use.

When wider meshes have to be measured (i.e. for experimental purposes) it is possible, to supply on special request, a spare elongation bar which can be mounted on bar I instead of fixed jaw II. At the end of the elongation bar fixed jaw II can be mounted. Thus the range of meshes to be measured can be extended by 60 mm. To the readings on the graduated scale 60 mm exact must be added. (i.e. 20 mm reading means mesh size 80 mm
170 mm " " " " 230 mm).

Testing the test spring:

To check the test spring itself, or to calibrate a new test spring, the apparatus shown in fig. 6 can be furnished on special order. The spring is hung on the hook on the cross bar and loads of 3, 4 and 5 kg applied to it. The length of the spring under each of these loads is recorded and plotted graphically. The resultant graph should be linear. It is important therefore that the spring should be of sufficiently thick wire that deformation does not occur with the heavier test loads.

Tolerance:

From point of view of the construction the teeth of the rack are 1 mm thickness, thus enabling a scale reading subdivided per at least 1 mm.
Testsdone at 22°C have proved that it was possible to determine the force of the hinged jaw, which ratchet V starts locking with a tolerance of 0,1 kg.
In graph 5 it will be seen that this is equivalent with 1 mm difference.
These tests showed an accuracy, which was enough to obtain a variation of the indication of less than 1 mm hence which could not be read from the graduated scale.

Maintenance:

The main components of the gauge are made of stainless steel to minimise wear. Regular cleaning and lubrication of all moving parts is therefore needed (in relation to seawater and sand particles), although it is an important feature of the design that the only points at which friction could affect the accuracy of the gauge (the pivots of the hinged jaw IV and the pawl V) have a very limited movement and are enclosed. If the pawl V should develop wear it can be replaced easily and cheaply.

Although the gauge has been made as robust as is consistent with the need to avoid excessive weight (the gauge weights about 680 gr), it is a precision instrument and it is recommended that it should be treated as such, that is why it is be found advisable to attach the gauge to the wrist of the operator by the leather strap to prevent it being dropped.

The mesh-gauge is furnished in wooden case complete with:

- one wrench for loosening nut IX
- one screwdriver to adjust spring VII
- one leather string, fastened to grip III
- one test-spring with strain-length characteristic graph.

On special demand a magnifior X can be mounted to obtain a better scale-reading.

The mesh-gauge is furnished in wooden case complete with:

- one wrench for loosening nut IX;
- one screwdriver to adjust spring VII;
- one leather string, fastened to grip III;
- one test-spring with strain-length characteristic graph;
- one standard measure (Fig. 7).

On special demand a magnifier X can be mounted to obtain a better scale-reading.

ICES has prescribed for normal sea-fish trawls a measuring pressure of 4 kg and the spring in the ICES gauge is designed for pressures of this order.

If however for certain twine types, used by other fisheries, another strain should be directed (i.e. 3 to 5 kg) it is possible to use the same spring after adjustment by means of screw VIII. Only in case of important variations a new spring must be mounted. This can be done quite easily in the instrument.

Testing the gauge

A very important feature is the possibility to check the Mesh-gauge on its accuracy in a quite simple way.
Thus assuring any moment that pawl V locks when pressure exerted by jaw II and IV reaches a value of 4 kg.

To test the gauge, a short, rather rigid spring (fig. 3) is used. It is provided with an eye at each end of sufficient size to allow it to fit easily over jaws II and IV. This spring is of a known length when under a tensile load of 4 kg (e.g. see graph nr. 5).

The eyes of the test spring are fitted on jaws II and IV and the gauge is operated in the normal way (fig. 4). When the pawl engages in the rack and locks the gauge, the length is read off on the scale. This length should correspond with the predetermined length of the spring under a load of 4 kg. If the length from the scale is less than the predetermined 4 kg length of the test spring it means the gauge is not applying sufficient pressure; similarly, if the length is greater, the gauge is applying too much pressure.

As an example, suppose the predetermined length of the test spring under 4 kg is 107 mm and the scale reading at which the gauge locks is 105 mm. This means the gauge is exerting less than 4 kg probably due to relaxation of the main spring inside the instrument. This should be corrected by removing the mark at IX and adjusting the setscrew at IX until, under test with this particular test spring, the gauge locks at 107 mm.

In order to be quite sure that the correct adjustment has been made, the test should be repeated a few times and the average of the readings taken as correct. Finally the setscrew must be secured again.

As an added safeguard, two test springs could be used, each having somewhat differing load/elongation characteristics. This would enable the gauge to be checked at two points on its range, thus enabling to make a cross-check of the Mesh-gauge and of the test springs. For this purpose a second spring can be supplied on special request.

Moreover the scale reading and the width of the jaws can be checked by a simple standard measure to be sure that the jaws are not deformed (i.e. by a heavy shock). When jaws are deformed the reading of the scale and the strain of the spring both can be correct at the same time the measurement of the mesh is incorrect.

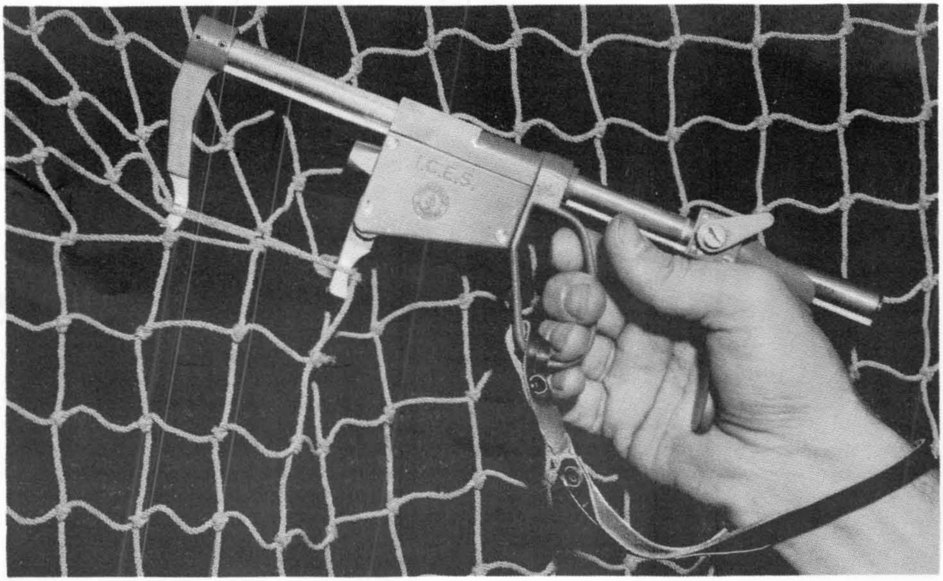

Fig.1

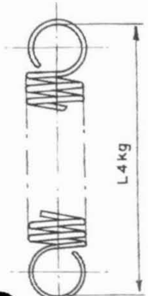

Fig. 3

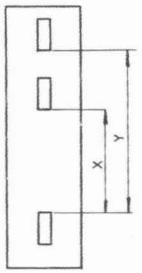

fig. 7

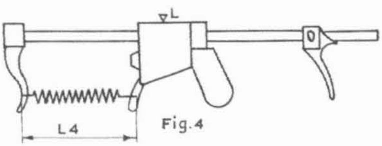

Fig. 4

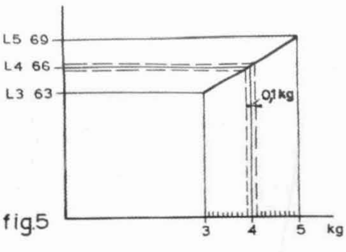

fig.5

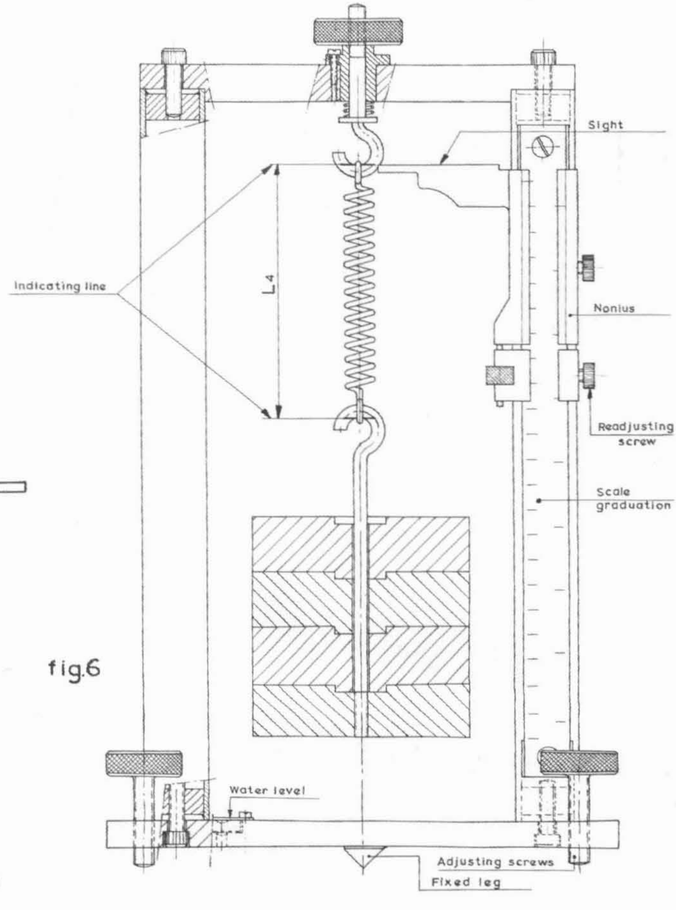

fig.6

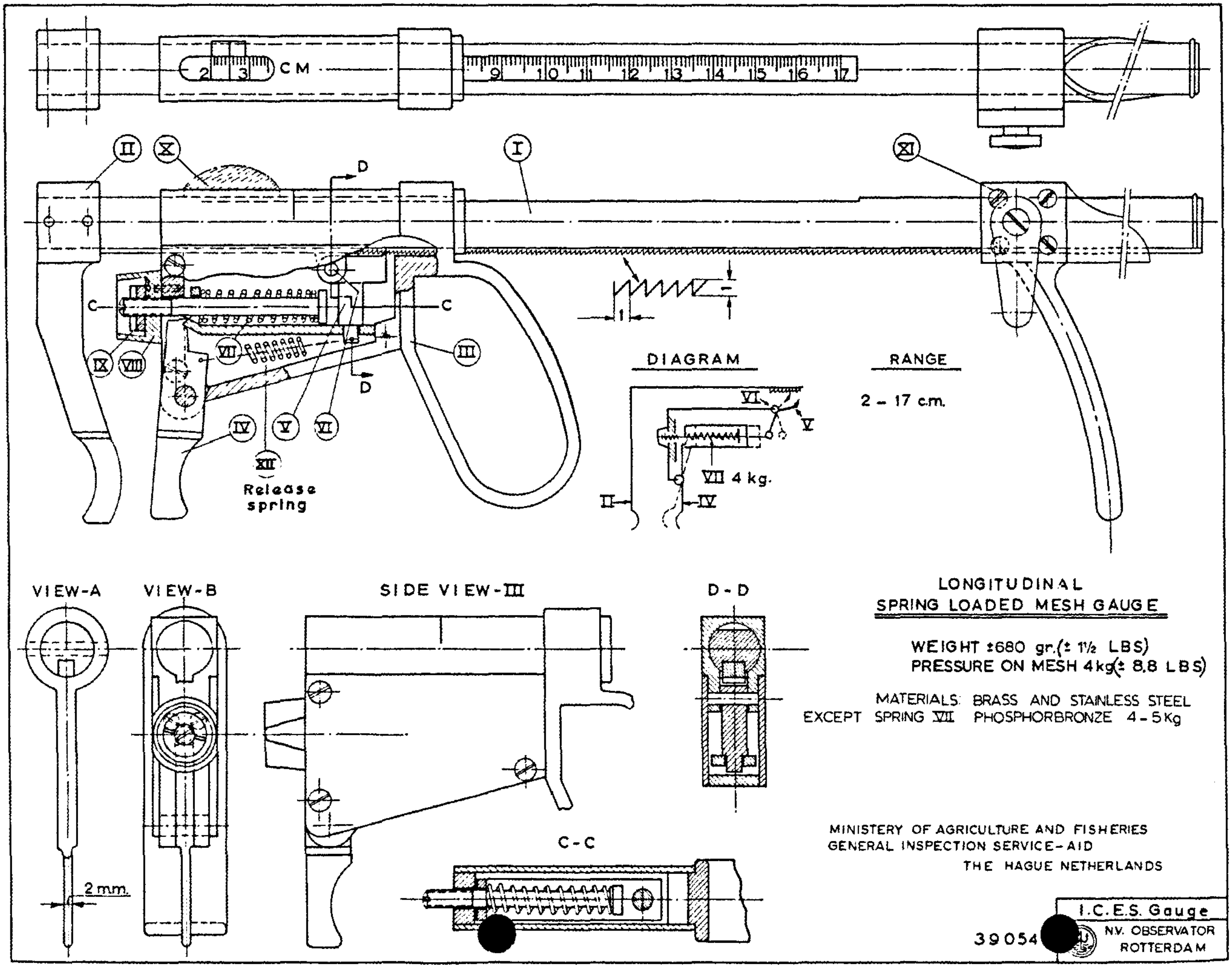

Fig. 2

LEGEND

- I Bar with rack graduation in millim or inches to order
- II Fixed jaw
- III Sliding case with handle, carrying hinged jaw and locking mechanism
- IV Hinged jaw
- V Pawl
- VI Axle of pawl
- VII Spring compressed at 4kg
- VIII Set screw with nut
- IX Case for sealing of set screw (after calibration to be filled with tin and hall marked)
- X Magnifying glass to order
- XI Adjustable handle

As to Fig. 1 the attention is drawn to the fact that the wrong diagonal of the mesh is measured.
Measurement must be done in the longitudinal direction of the net.

Price Mesh Gauge ƒ 450,-- each
" Magnifier ƒ 25,-- "

When ordering quantities, a reduction may be granted on request.