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ANWEISUNGEN ZU DEN BEOBACHTUNGEN gegeben von der KOMMISSION
ZUR UNTERSUCHUNG DER DEUTSCHEN MEERE, KIEL, 1871.

INSTRUCTIONS
GIVEN BY THE COMMITTEE
FOR THE INVESTIGATION
OF THE GERMAN SEAS
ON THE SUBJECT OF OBSERVATIONS

KIEL

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1871

No. 1.

Recording and submitting observations

Every observer is provided with the necessary forms for recording observations, prepared like a pocket book and enclosed in a binder with pencil. Space is provided for one month's observations in each book.

Immediately after the end of the month, the observer is to send the monthly book to the Committee in Kiel and will see to it that he is in possession in advance of a monthly book for the new month.

The observer should enter his name, the designation of the station, the year and month of observation on the front of the monthly book.

Initially, 3 different monthly books will be issued, namely:

- a. for water temperature, state of the water, wind and weather,
- b. for determination of salt content and current,
- c. for data on fisheries.

Every book has a page of blank paper on which unusual observations can be recorded.

In book a., 3 sets of spaces are provided for each day so that measurements can be taken 3 times every day.

The water temperature at the surface must be recorded at every station; different numbers of observations are made in deep water at different stations. Against the entry "Fathoms", it should then be stated at what depth in fathoms the observations were made.

Special instructions are issued as to how observations are made.

In book b., likewise, 3 spaces are provided for each day. Here again, in the spaces designated "Fathoms", it should be stated from what depth in fathoms water was taken to determine weight or at what depth the current was observed.

As a rule, books a and b are enclosed together in a small binder with a black cover.

There is a vacant space for each day in book c. These have a red cover.

No. 2.

Determination of the temperature

Each observer is issued with 2 thermometers. The first is in a wooden case and is intended for reading atmospheric temperature and that of the water surface and for use when taking hydrometer readings. The other, shown in the adjacent illustration, is enclosed in hard rubber, fitted with a lead sinker, cork, fathom line and buoy, is intended for reading temperatures in deep water.

A single temperature observation each day is sufficient, but it is desirable if atmospheric and surface temperatures can be read 3 times daily at the same time as state of the water, wind and weather.

1. Atmospheric temperature. The thermometer from the wooden case should be hung in shadow sufficiently long to show the temperature of the air, care being taken to ensure that the instrument is completely dry. Because at most stations, the 4th and last heading under "Fathoms", is not used, the degrees of temperature (which should always be read as Réaumur, the scale for which is marked R) should be entered under that heading.



2. Temperature of the water surface. The same thermometer is used for checking the warmth of the water at the surface. The instrument should either be held in the hand or fastened to a stick of suitable length, and submerged about a foot beneath the water surface. When the thermometer is taken out of the water, the reading must be taken quickly, taking care to shield the instrument against the wind. The entry in book a. is made under the heading "Surface". If only one observation is made in the day, the time at which it was made must be stated in the same space in brackets under the degrees, for example, + 4.6^o
(11). If several observations are made, they should be carried out at the same time as the wind and the weather, entering the times in the "Wind" space.

3. Temperature in deep water. To measure the temperature in deep water, the thermometer, as shown in the drawing accompanying the kit, is allowed to sink into the water and fastened to the buoy. The fathom line provided will go to depths of 15 to 20 fathoms. The instrument must remain in its position in the water for a full hour. Then it is brought up and the temperature read. Surfacing and temperature reading (R) must be completed in 5 minutes. Entry in book a. is made in the spaces marked "Fathoms", the depth in fathoms being inserted under the temperature, unless the temperature is taken at a station consistently at one and the same depth, which in that event is recorded once.

No. 3

State of the water

The Committee cannot yet supply any device of its own to observe the state of the water. Observers must therefore confine themselves for the time being to reading from a level indicator which may be available. The state of the sea, whose variation with the wind is of special importance, should be observed 3 times daily, at the same time as the wind. In general, only 3 times of day are prescribed for the wind, morning, noon and evening. It is certainly very desirable if a quite regular procedure is followed and the selected times were say 6. 2. 10 or 7. 12. 9. However, since such regularity may perhaps not be possible, the times of observation should be given in brackets in the three "Wind" spaces under the wind direction, which are then also the times of the state of the sea and in some circumstances, of the temperature of the air

and of the water surface. (see instruction No. 2).

Should unusual states of the sea, or unusually rapid changes, occur, such exceptions should be noted on the blank page in book a. (see Instruction No. 1.).

No. 4

Wind and weather

Wind and weather should be observed 3 times a day and entered in book a.

Direction and strength of the wind should be noted.

Wind direction is designated in accordance with the 16 points of the compass:

N	NNE	NE	ENE	E	ESE	SE	SSE
S	SSW	SW	WSW	W	WNW	NW	NNW

It has already been noted in Instruction No.3 that time of observation must be stated under the wind direction.

Wind strength is expressed in figures placed near the wind direction. The weather is likewise expressed by figures which are entered in 3 day spaces under "weather" in book a. The figures for wind strength and weather have the following meanings:

Wind strength*	Weather	
0 calm	completely clear	0
1 light squall	clear	1
2 "labre B.S. Kuehlte"	unclear	2
3 "B.S. Kuehlte"	mist	3
4 "M.S. Kuehlte"	overcast	4
5 "1 R.M.S. Kuehlte"	cloudy	5
6 "2 R.M.S. Kuehlte"	gusts	6
7 "3 R.M.S. Kuehlte"	heavy air	7
8 "dicht gereft"	rain	8
9 "Unterfeilskuehlte"	thunder	9
10 storm	hail	10
11 hurricane	snow	11

* (Translator's note: many of the terms used seem to be archaic nautical words no longer featuring in dictionaries. In such cases the original version is given in inverted commas)

No. 5

Drawing water

While the water at the surface can be used directly with the cylindrical glass in the kit for determining its specific gravity, or indeed with any bottle, the cord-bound bottle supplied to observers with lead sinker, cork and fathom line, as part of the kit, must be employed to draw samples from deep water. The adjacent illustration and the drawing supplied with the kit make it clear how the empty bottle should be sunk. When the cork is put into the bottle, the fathom line forms a loose loop at the top of the bottle. Once the bottle is lowered to the desired depth, a short sharp pull draws the cork out and allows the bottle to sink quickly. That this is happening is evidenced by the rising air bubbles. It needs a little practice to push the cork in just enough, it should not be too loose so that water penetrates when it is lowered, nor yet too tight to be released by a sharp pull. In order to try out the former, it is good practice to lower the bottle and bring it up again without pulling out the cork; no water should then have penetrated into the bottle.

The fathom line shows the depth reached when the water is drawn, and this should be noted in book a. for the hydrometer observations

No. 6

Specific gravity of the water

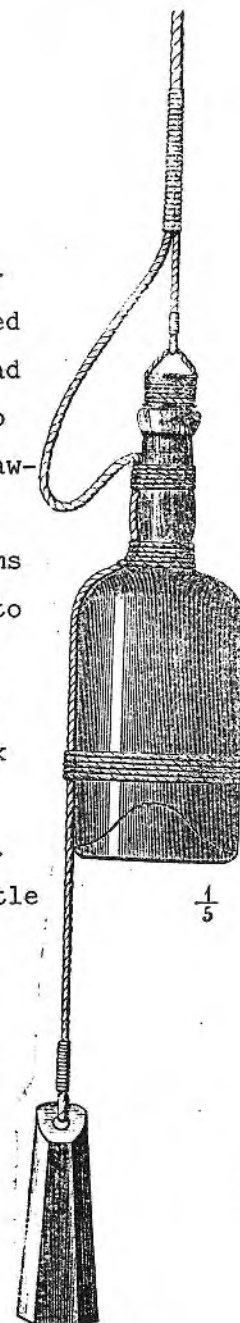
Hydrometer

The specific gravity of the water should be measured at the surface and at least once a day in deep water.

For this purpose, observers receive a kit with a brass hydrometer as illustrated in the adjacent figure*, a glass cylinder and the wooden-cased thermometer already mentioned in instruction 2.

The procedure is as follows. After the water is taken from the surface or by the sampling bottle from deep water, the glass cylinder is filled with it sufficiently to allow the hydrometer to float. Special care is taken to ensure that no air bubbles attach to the hydrometer, - they can be removed by shaking or tapping on the glass. Nor should

* p. 6.



the instrument touch the walls of the glass. The hydrometer is allowed to bob up down a little and then, looking just below the water surface, the precise level on the scale to which the instrument has sunk can be observed.

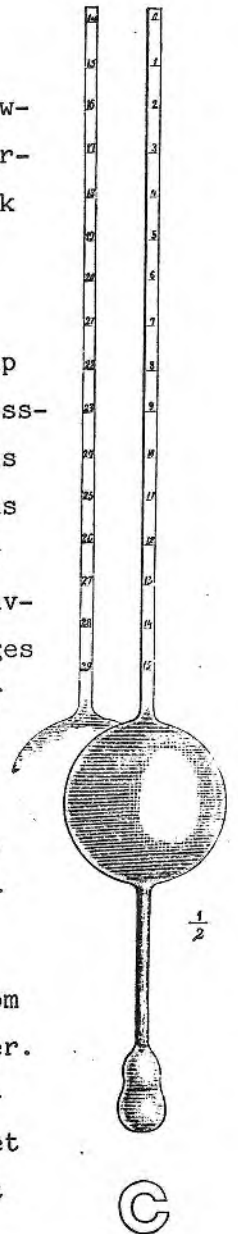
The numbers on the scale signify by how much the specific gravity is greater than that of pure water, e.g. the hydrometer being immersed up to 18 would mean that the specific gravity was 1.018. To make it possible to read even smaller fractions, the space between two figures is sub-divided into 5 parts, of which each represents two ten-thousandths of the specific gravity, and as it is still possible to judge halfway between 2 markings on the scale, a ten-thousandth of the specific gravity can be read. Suppose, for example, that the hydrometer submerges beyond the number 18 and a further full mark on the scale and half of a second mark, then the specific gravity would be 18 thousandths and 3 ten-thousandths greater than that of water, i.e. equal to 1.0183. It is not necessary to enter the specific gravity in book b. in full, it is sufficient to enter the excess over that of water in ten thousandths, - in the example given one would enter only 183.

There are 2 divisions on the long stem of the hydrometer. The one from 0 to 14 or 15 refers to lighter water, the second one to heavier water. In heavy water, the hydrometer would not immediately sink to the division mark. In order to bring this about, the small brass platelet included in the kit is suspended over the lower stem above the weight loading the hydrometer, whereupon the figures in the second division from 14 or 15 upwards apply for this precisely adjusted loading of the hydrometer. Particular attention should therefore be paid to the safekeeping of this small brass platelet.

Given suitable weather and opportunity, hydrometer observations can be made and recorded on the spot. Otherwise, the water can just as well be measured later indoors, taking care to keep it sealed up.

At the same time as the hydrometer reading, observation should be made of the temperature of the water and temperature (Réaumur) entered under t in book b and the ten-thousandths on the hydrometer under s. If a water sample is measured from different depths, the depth in fathoms should be stated against "Fathoms" in the heading.

Only one observation per day is necessary. Only if there is an unusually



big change in wind direction or in the state of the sea is it desirable to make a further determination of the surface water or prolongation of the observation time.

Deep water observations at each station should be made at the deepest point. But if depths exceed 10 fathoms up to 20 fathoms, an additional observation should be made somewhere in between sea bottom and the surface. If depths exceed 20 fathoms, measurements should be made at the surface, at every 10 fathoms and on the bottom.

No. 7

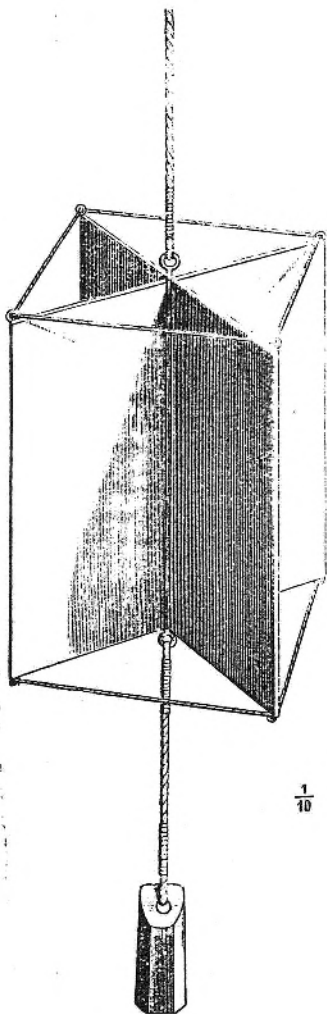
Measuring the current

The current meter issued to observers, which is illustrated in the adjacent figure* and in a drawing accompanying the kit, is used for measuring the current. It consists of two zinc plates which can be laid flat together but which can be unfolded to cruciform shape and held in that form firmly by tying cords together.

This apparatus determines the direction of a sub-surface current. It is lowered on a copper wire fastened at the cross-point of the plates from a fixed position (either a fixed station or a boat which is anchored and swung to a position of rest) and the direction of drift is then observed from the direction of the copper wire. The surface current is immediately recognizable from small floating bodies. The surface current and sub-surface current are entered in book b. Slack waters are characterized by "o" and the direction of flow either simply with "in" or "out" according to whether the current is from the North Sea into the Baltic or vice versa. Or where this may be in doubt, the compass direction must be stated: e.g., from NE to SW. Where possible, the sub-surface current should be investigated down to sea bottom, especially if surface and sub-surface currents are in the same direction. If the direction of currents is opposite, it is sufficient to take the depth where such contrast applies.

Even if the apparatus cannot be used to determine the speed of the current, it can nevertheless be seen from the quicker or slower rate of drift of the copper wire whether the current is strong or weak, and where possible, this should be indicated beside the current directions by adding in brackets the letter (K) for strong (kraeftig) and (S) for weak (schwach).

*p. 8



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