UNIFICATION OF BUOYAGE

by Director J. M. PHAFF.

Special Publications N^{os} 6 and 6 *a* of the International Hydrographic Bureau, produced respectively in August and October 1925, give both a historical summary of the buoyage questions, and tabulations of the buoyage systems of various countries. These have allowed the " Commission Technique pour le Balisage et l'Eclairage des Côtes " which sat at Monaco in November last, to deal with the question at once without traversing what has been said before.

However, since the seamen of the Merchant Marine were represented at these Conferences for the first time, it might have been useful to insert in the discussions the following questions, to which a decisive answer has not yet been given :

1. Who is the competent judge of the system of buoyage, and which system has he a right to demand ?
2. In which way can this system be applied ?
3. Is it possible to unify this system for the whole world ?
4. How is it possible to adapt a uniform system to the existing buoyage system, and which is the best way to promote its introduction ?

As regards 1. — A buoyage system is chiefly characterised by the form and colour of the buoys which are moored at the entrance and on both sides of navigable channels and therefore the form and colour of these buoys should be considered without regard to the way in which they will be placed.

The competent judge of this form and colour can be no other than the seaman, for whose sole benefit and safeguard this buoyage is established and who will suffer if it is illogical or deficient. He has a right to demand that buoyage should satisfy everywhere and in all circumstances the highest demands of visibility, efficiency and simplicity, in order that it can be sighted as soon as possible without mistake. The

safety of his ship and of his crew depends upon this, even his life and that of his men may be at stake if he sights the buoyage too late, or when it gives rise to doubt.

The more unfavourable the atmospheric conditions are, the more dangerous will be the consequences of a mistake. Therefore the buoyage system should not be based on a clear sky and a calm sea, but it should be based rather on hazy weather or on a drizzling rain that falls from an overcast sky, which make the form and colour of buoys more or less uncertain, and on a rough dirty sea, which considerably hinders their recognition. The bottom of the approaches to estuaries and navigable channels which lead to a port is only exceptionally of a hard nature, so that in bad weather the sea assumes a grey, grey brown or grey green colour, and this is often an obstacle to the easy distinguishing of buoy-colours, especially if the paint has already lost its brilliancy.

It is not required, of course, that each buoy should meet the same requirements of visibility. The buoys which are moored at the approach to an estuary or channel or near a detached shoal and which are meant to indicate them, will have to meet far greater demands of visibility than the buoys which are moored in the inner part of a channel and which are not meant to be seen at so great a distance.

Every attempt should therefore be made to give to these outer buoys the form and colour which are most advantageous in every atmospheric condition and in every situation. This depends upon the nature and aspect of the coast and, after the solution of the problem has been found, it is advisable to continue this advantage for the buoys of lesser dimensions which are moored on one side of the channel.

The seaman demands for the other side of the channel a form and colour which are so different from the former side that it is quite impossible to confound them, as this confusion must necessarily lead to accidents.

The difference in form is especially important. The difference in colour only is not sufficient as the effect of sea water, rust, the excrement of seabirds, the reflection that shows at one moment a dark shade and at another the glittering surface of the buoy *etc.* do not always allow the colour to be clearly distinguished, and in these cases the form should be the mariners' guide. The expedient of providing buoys of the same form with topmarks of different shapes, according to the positions of the buoys, is also insufficient because in this way the difference in form is transferred from the big buoy to the small topmark which is often more or less difficult to make out in a choppy sea, and it might be deformed or missing altogether. It is certainly preferable that the differ-

ence in colour should help the difference in form, so that the buoys of the two sides may more easily be distinguished.

As to 2. — It is possible to satisfy the foregoing demands and the experience of the surveyor may contribute to the solution of the problem.

When he extends his soundings so far seaward that the coast disappears, the only way of making a fix will be to moor buoys in suitable places at the limit of visibility of the coast. When steaming seaward, he will try to keep these buoys in sight as long as he possibly can, and, making for the shore again, he will endeavour to pick them up as soon as he can. Therefore the most efficient form and colour for these buoys are of the utmost importance to him, and experience has shown that the best form is an ogival buoy, as it reflects the light which it receives from the top and from every side, and that the best colour is red, or red checkered with white or yellow. Some surveyors prefer black, but the manuals of hydrography advise almost unanimously, for buoys as well as for flags on top of floating beacons, plain red or red and white.

The efficiency of this form and colour can be tested by exhibiting models of various colours and shapes before a background of more or less light grey, brownish grey or greenish grey. On removal from this background, the red or checkered red cone will remain visible longer than the others and, when approaching it, the same shape and colour will come into sight first.

A plain colour is always preferable however, so it may be said that the conical form and the red colour are the most efficient for the outer buoys and for the buoys on one side of the channel. With a view to making the former as visible as possible, large dimensions are given to them and they are provided with a topmark.

In order that the form of the buoys at the other side of the channel be entirely different, the cylindrical or the truncated cone form should be chosen, which latter has the advantage over the former that it even reflects a little light. A spar buoy could also be chosen, but the spar should be thin in order that the buoy may be more easily handled, which sensibly diminishes its visibility.

The colour should be such that the outline of the buoy appears clearly against the sky as well as against the coast, and, since a dark high coast which requires a light colour to contrast with it is exceptional, the choice of a very dark colour, for preference black, which gives most satisfaction in all other conditions, seems to be indicated.

Therefore the reasonable demands of the seaman culminate in a buoyage system with red ogival buoys on one side of the channel and at the entrance, and black truncated conical buoys on the other side.

Deducing the colours of the buoys from the colours of the ship's side-lights without taking other demands into account, does not appear to be logical because the considerations which decide the colour of these lights at night are absolutely different from the reasons mentioned to establish the colours of the buoys for daytime.

Besides, a green buoy is difficult to see in a choppy dirty sea. It is probably for this reason that this colour has been generally adopted for wreck buoys which do not require to be seen at a great distance.

This system may fascinate theorisers, but the seaman sees neither its utility nor its efficiency.

As to 3. — This question may seem somewhat lacking in point, since everybody has already given an affirmative answer, but I doubt whether the difficulties of the problem had been taken into account when this answer was given.

In order to make it decisive, one should have examined the efficiency of the buoyage mentioned, if not in all the seas of the world, at least in the greater part of them, and seamen with such a vast experience are found only very exceptionally amongst the delegates of buoyage conferences.

It appears to be impossible to give an opinion on the subject if the problem is considered from this stand point; the only way to arrive at the answer which should be given to the question appears to be by way of deduction from the existing buoyages which have not been established arbitrarily but which have developed gradually, sometimes during centuries, and which may, and even must, be taken for the most efficient buoyage for the region.

The seaman therefore leaves the bridge and passes into the study where he meets the engineers and he is very pleased to accept the kind help which they are willing to give him.

Admiral NIBLACK has examined the buoyages of 31 countries or political subdivisions; for the buoyage of channels 25 use conical buoys. 17 black can or cylindrical buoys, 10 black conical buoys, *etc.* There is no doubt therefore that the red conical buoy can be accepted everywhere as a standard type for one side of the channel, and the black can buoy seems to be favoured for the other side.

At which side of the channel the red conical buoys are to be placed is a question of suitability and is absolutely immaterial to the seaman,

on condition that a previously established rule be strictly adhered to. Whether it be on the starboard hand when coming from seaward and navigating in the direction of the flood stream or on that hand when going to sea and navigating in the direction of the ebb stream, or the inverse, whether it be on the N. (E) side or on the S. (W) side is indifferent to him as long as the rule does not give rise to doubt.

Unhappily buoyage is no exception to the maxim that there is no rule without exceptions, and these exist in the dubious cases.

If a channel has neither a landward nor a seaward side, if there is no current which corresponds to the rise and fall of the tide or no current at all and if it is impossible to point out a consecutive N. (E) *etc.* side of the channel, the general rule will have to be amended or cancelled for that locality. In such a case, the charts and the sailing directions will inform the seaman what course he has to take.

The discussion of a buoyage system for day time includes a good number of other questions, *e.g.* separation and junction buoys, beacons where ice threatens to carry away the buoys, wreckmarks, topmarks *etc.* for the lateral system, besides the whole cardinal system, but all the details can easily be logically derived from the systems of buoyage for both sides of a channel. It should be remembered that, out of 28 nations, 26 use green buoys for markings wrecks.

Finally, the lights of light buoys should be considered, and these should be well distinguished from the lights of the small number of buoys which are provided with a lantern. The former are meant to act as conspicuous points for the seaman to enable him to lay down his course; therefore they should be visible at a fair distance and have a white character light, the number of occultations of which may vary according to the side of the channel on which they are placed. The latter are meant only to warn the seaman that he is approaching one side of the channel too closely, so it is obvious that these lights need not be so powerful.

It is not necessary to go deeper into the matter because other details do not refer to the questions brought forward.

As to 4. — A uniform system of buoyage must necessarily be a compromise in which the existing systems have been taken into account as much as possible. The introduction of a new system, even if it be perfect, which does not take these into account is condemned beforehand, because the perfect system nowhere exists, and it is impossible to oblige everybody to change his buoyage.

The only way to persuade the greatest possible number of nations

to accept the compromise which will ensue from the discussions is to try to incorporate in it every detail which most buoyage systems have in common, even if this concordance be cast in a form which is not strictly ideal; that which is contradictory to the rules of a rational system should be rejected.

Every advocate of a uniform system should therefore be prepared for sacrifices, to consent to modifications in the buoyage of his country, and to plead with his government to consent to the changes which will ensue from the adoption of a uniform system.

This compromise is not acceptable unless the general cost is reduced to a minimum. No nation will be able to consider the cost which the uniform system will entail and the Committee will not be able to estimate the general cost unless tables have been drawn up of the changes caused by the compromise for each country. So the last word will have to be said by the competent financial authorities.

There will always be nations which cannot apply the compromise on account of local conditions, but it is always feasible to make either the form or the colour of their buoyage agree, as much as possible, with the rules of the uniform system which is recommended. For this reason every detail of the compromise should not be laid down in hard and fast rules from which no one can get away. No contravention should be allowed of the fundamental rules, but those of minor importance should be worded as flexibly as possible and leave some liberty in their application.