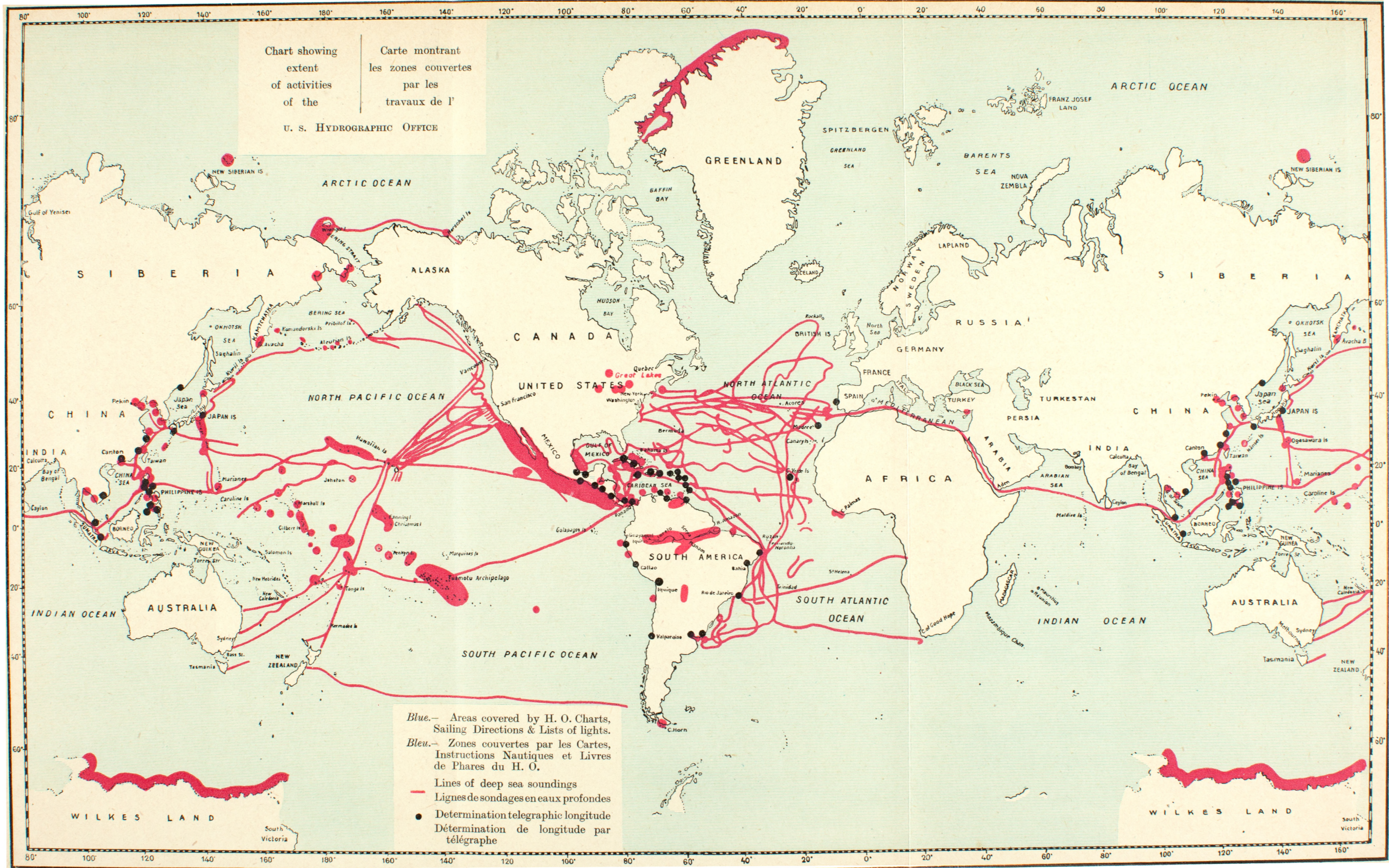


Chart showing  
extent  
of activities  
of the  
U. S. HYDROGRAPHIC OFFICE

Carte montrant  
les zones couvertes  
par les  
travaux de l'

U. S. HYDROGRAPHIC OFFICE



THE HYDROGRAPHIC OFFICE  
OF THE UNITED STATES NAVY.

by

REAR ADMIRAL W. S. CROSLY, *Hydrographer, United States Navy.*

(Reproduced from "THE MILITARY ENGINEER" for July-August 1927).

The average traveller who makes an ocean voyage, sailing through storms and heavy seas, is little aware of the vast amount of work that has been done to produce the accurate navigational charts, *Sailing Directions*, *Light Lists*, *Notices to Mariners*, *Pilot Charts*, *Mine Warnings*, iceberg reports, and complete service for maritime security that are needed to make such a voyage safe and expeditious.

These charts and the other necessary publications are produced in all countries by the hydrographic offices of the respective navy departments. In accordance with our statutes, the UNITED STATES HYDROGRAPHIC OFFICE supplies these charts and sailing directions for all areas except the United States coastal and territorial waters, which are supplied by the Coast & Geodetic Survey, Department of Commerce.

The Hydrographic Office is the only manufacturing plant within the Navy department. It is located in the Navy Building, Washington, D. C. This office exists primarily to supply United States Navy vessels with all necessary text-books and charts to insure their safe navigation in all waters of the world. In addition, the Hydrographic Office supplies all of its literature except such as is necessarily confidential, to the merchant marine. The statutes require that this be furnished at the cost of printing and paper.

For this latter purpose, agencies, fifty-seven in the United States and Islands, and nineteen in foreign countries, have been established with firms which serve mariners in other respects.

HISTORY.

By law, the functions of the Hydrographic Office are to make topographic and hydrographic surveys in foreign waters and on the high seas and to collect and disseminate hydrographic and navigational data; to prepare and print maps and charts relating to and required by navigation; and to prepare and issue navigators, "*Sailing Directions*" or "*Pilots*", "*Light Lists*", "*Pilot Charts*", and navigational manuals, periodicals, and radio broadcasts for the use of navigators of the Navy and of commercial lines.

Prior to the enactment of the law of June 21, 1866, the functions of the Hydrographic Office and of the Naval Observatory were performed under the same direction and in the same office, the Depot of Charts and Instruments, and the early histories of these two organizations are so interrelated that they are one.

In 1809 the first recorded efforts to establish a government agency for the aid of navigators began, and these efforts continued with almost every session of Congress; gradually until 1832

small bits of legislation were permitted which would provide a certain amount of government assistance to mariners and from then on the assistance became more marked.

The Hydrographic Office really began in 1830 as a sort of depot which was to furnish to the Navy all instruments and literature available for its use, although the sources of supply for the Depot were varied and widely scattered. The Depot gradually grew in size, personnel, and importance until in 1834 it was removed from its location on G Street to a site near the Capitol where it remained until 1842. At this place a Naval officer erected a small observatory at his own expense and in 1835 the work of chart production was begun by the installation of a lithographic press; immediately thereafter ocean surveys began, all of which were carried on by Naval officers. These surveys included waters of the United States as well as those in other parts of the world.

The first combined depot and observatory worthy of the name was built at the present site of the Naval Medical School, Museum of Hygiene, in the space between 23rd and 25th Street, N. W., and from E Street, N. W., to what is now Potomac Park. That new building was occupied in 1844. The records show that this land was taken over for the use of federal public buildings in 1791 and was originally designed for a fort and barracks.

Thereafter, due largely to the personal ability and efforts of Lieutenant MAURY, United States Navy, recognized as the one who really laid the foundation for the systematic work of the Navy Department in hydrography, success was achieved in improving the output of the Depot.

Lieutenant MAURY collected data and made charts for the first time which have resulted in the present "*Pilot Charts*" so widely known and sought after by all mariners on the world. In 1851 Lieutenant MAURY compiled a whale chart.

During this period the first books called "*Sailing Directions*" or "*Pilots*" were prepared and issued; these have increased in number and importance until the Hydrographic Office now issues fifty-eight of these volumes covering all waters of the world beyond the United States.

The collection of the data for these publications was generally confined to vessels of the United States Navy but all other sources of information were utilized as they still are. The correspondents with the present Hydrographic Office number about six thousand, furnishing information of value concerning currents, winds, unusual phenomena and other materials of interest and value to mariners.

Lieutenant MAURY's work on hydrography resulted in an international conference in Brussels in 1853 proposed by him for the purpose of securing a uniform system for observations at sea. Since that time similar international conferences have been held and as late as October, 1926, one was held in Monaco, at which twenty-four nations were represented. The United States of America were represented by the Hydrographer and the other nations represented by their hydrographers or by other naval officers.

In 1866, the Hydrographic Office was established by law in the Navy Department, the Act reading in part as follows:

There shall be a Hydrographic Office attached to the Bureau of Navigation in the Navy Department, for the improvement of the means for navigating safely the vessels of the Navy and of the mercantile marine, by providing, under the authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instruction, for the use of all vessels of the United States, and for the benefit and use of navigators generally.

SECTION 2. That the Secretary of the Navy be, and he is hereby, authorized to cause to be prepared, at the Hydrographic Office attached to the Bureau of Navigation in the Navy Department, maps, charts, and nautical books relating to and required in navigation at the cost of printing and paper, and to purchase the plates and copyrights of such existing maps, charts, navigators, sailing directions and instructions as he may consider necessary, and when he may deem it expedient to do so, and under such rules, regulations and instructions as he may prescribe.

The Hydrographic Office may be likened to any large enterprise which not only manufactures, distributes and sells its own products, but actually does its own scientific research work. The chart attached to this article shows the extent of its activities throughout the world.

### ADMINISTRATION.

The Division of Administration has charge of the procuring, collecting, and routing of information, and the maintenance of files, archives, and library; all matters pertaining to finance and supplies, such as budget estimates, appropriations, requisitions, expenditures, printing allotment, and office and field supplies; administrative supervision of branch hydrographic offices and field parties; conduct of relations with the International Hydrographic Bureau and other sources of hydrographic information; the sale of Hydrographic Office charts and publications and the accounts with sales agents; and supervision over the civilian personnel in the office and in the field.

Owing to the fact that branch hydrographic offices are located in the principal ports of the United States, the seafaring people of the United States are more or less familiar with the broad scope of work done by the Hydrographic Office. Letters are received from all the continents asking for information and offering various sorts of suggestions and ideas.

Recently a correspondent from Brussels conceived the idea to "blow up" the Aleutian Islands in order that the waters of the Japanese warm current and Pacific warm tide might warm the Arctic Sea and prevent the formation of ice in that region, and also melt the Alaska glaciers. His idea might have been a good one had he continued on, and suggested where to blow the Aleutian Islands.

Another correspondent proposes to build bridges connecting Spain and Morocco; the islands of Japan and Korea; Italy and Sicily; England and France; Cuba and Haiti. He was referred to the Hydrographic Office to get the depths of water between the above named places. Still another of our friends writes for information concerning methods to be used in constructing and building an island in the ocean where people of all nationalities may come to live and enjoy "health and happiness". A large number of letters are received annually from people who believe the earth is flat, present facts why it is flat, and want our explanation as to why we believe it is round. All letters are courteously answered in the Division of Administration.

### SERVICE OF MARITIME SECURITY.

It is the duty of the Division of Maritime Security to publish to the maritime world, promptly and accurately, all possible information of value for safe navigation. This information is received from two general sources, government and private, and is classified as either permanent or ephemeral. Information from both sources is given the same consideration. That pertaining to anything attached to the ground is considered as permanent at least for the time being, and includes reports concerning aids to navigation, such as lighthouses, light vessels, shoals and wrecks. All other reports are classed as ephemeral, and include such items as currents observed, location of icebergs, derelicts, drifting obstructions, and miscellaneous facts of interest to navigators.

Charts, sailing directions, lists of radio aids to navigation and lights show the fixed navigational aids, as well as the fixed navigational dangers. These permanent records are kept corrected to date by items published in the "*Notice to Mariners*", which is issued weekly. Only permanent information is published in Notices to Mariners. If urgent, it is also broadcast by radio or published in the "*Hydrographic Bulletin*" and "*Daily Memorandum*".

The ephemeral matter, however, never appears in the "*Notice to Mariners*", but is published in other publications. This practice is a virtual guarantee to the navigator that all items appearing in the "*Notice to Mariners*" are of the utmost importance to him for the purpose of keeping his charts and lists of radio aids and lights corrected.

All publications dealing with navigational waters of the world are subject to daily change and correction as actual physical changes occur within the area involved. Unknown shoals are frequently discovered; known shoals are dredged away; and lights, buoys and beacons are constantly being changed; wrecks occur, and derelicts appear and disappear as dangers to navigation, sometimes drifting as much as 9,000 miles before breaking up. Information is received continually from foreign hydrographic offices, naval vessels, and merchant ship officers.

A similar service of information is maintained for naval aviators. It is disseminated by means of monthly "*Notice to Aviators*," the volume entitled, "*The Naval Air Pilot*", and by

mimeographed memoranda when urgent. With the advances in the art and science of aviation, this service will be of constantly growing importance.

The "*Notice to Mariners*" tells exactly what charts and books should be corrected, what page, and gives the exact phraseology of the change to be made.

The "*Lists of Lights*" give detailed descriptions of the lighthouse structures and painting, candle-power of the lights and their character, height above water, distances of visibility, and the nature and kind of fog signals made in thick weather. The "*Radio Aids to Navigation*" contains all that radio information which is of vital interest to the navigator, such as position of radio-compass stations, signals made by radio beacons, schedule of navigational and storm warnings issued. The "*Daily Memorandum*" gives prompt notice to all those within reach of the most important dangers to navigators and changes in navigational aids. In order that such information may reach ships at sea, the most urgent items are broadcast by radio.

"*Pilot Charts*" were started by Lieutenant MAURY, and they are the result of gradual evolution from the days when little was known about currents and meteorological conditions. They give in great detail the currents, prevailing winds, average force and direction of the winds, average percentage of calms and gales, tracks of severe storms, the probable percentage of fogs for each month, magnetic variation, and the tracks which are best for vessels to follow between the principal ports of the world, as well as other useful information. It is used by mariners of all countries and is probably the most popular chart in the world.

The "*Hydrographic Bulletin*" is issued weekly and is the principal publication for the issue of ephemeral information. It includes also some of the permanent information.

In connection with the preparation of the sailing directions and the steamer routes on the pilot charts, the various routes are investigated in order that vessels may take advantage of existing winds and currents. As more is learned about these factors, the routes are modified from time to time.

#### SAILING DIRECTIONS.

The "*Sailing Directions*" or "*Pilots*" are nautical guidebooks containing information supplemental to that shown on the navigator's charts. The Hydrographic Office publishes fifty-eight different volumes, descriptive of the coasts and waters of countries exclusive of the United States. The volumes are revised as conditions change or the written descriptions become inaccurate or inadequate.

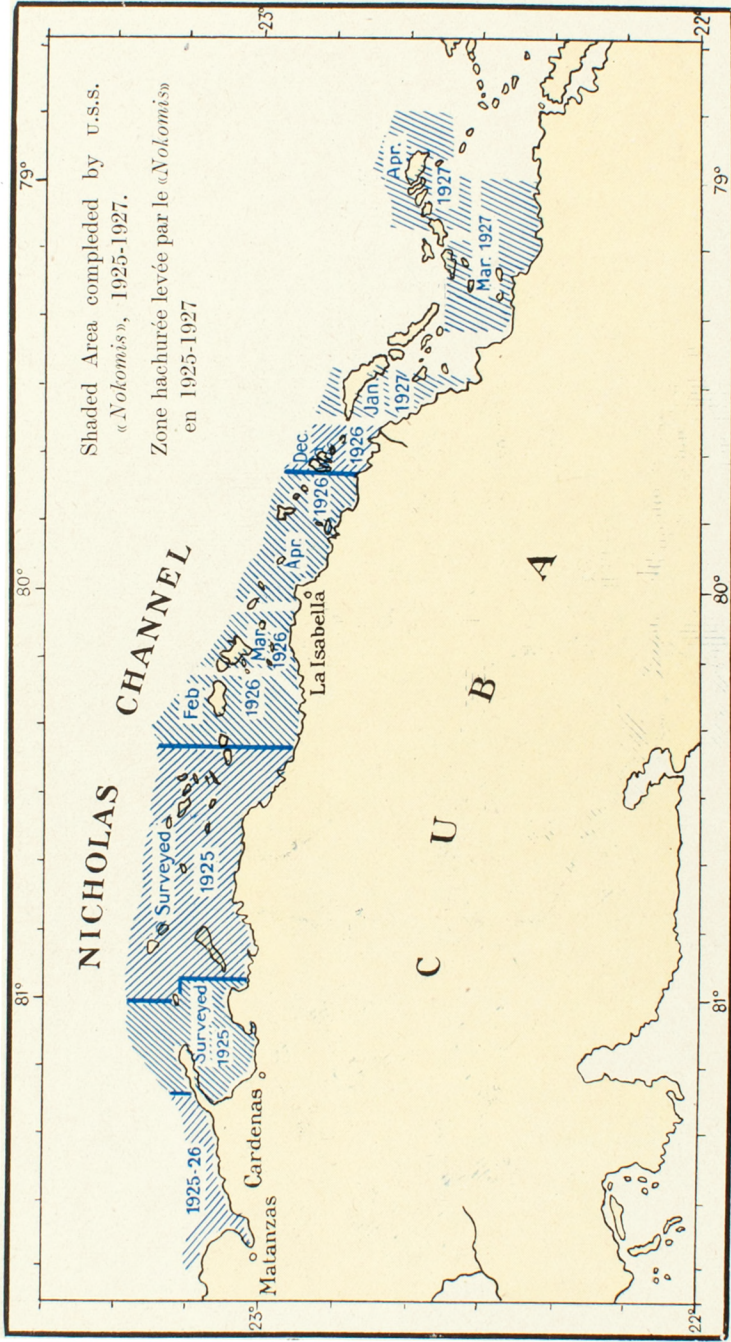
The first chapter of each book is devoted to information of a general nature. Brief paragraphs on the countries whose shores are described are included — subjects such as weights and measures, money, standard time, and communications; these must be compared with the latest authoritative statements to be found in a number of standard publications. The national system of buoyage and lighting, weather and storm signals, port and coastal signals, ice, current, tide, dredging, traffic, quarantine, and other special signals — these are presented in full and must be verified. Special descriptions of the winds and weather and of the currents and tides, those aspects of physical geography that interest the navigator, are examined and a search is made for any later or additional information of this character that has become available since the last edition. Ocean routes are recommended after a study of existing information and the plotting of numerous reports concerning the routes followed by vessels. In the other chapters the coasts, channels and harbors are described in detail, and the reviser compares them mile by mile with the Hydrographic Office charts, with recent large-scale native charts, and with any available notes made by hydrographic surveyors, paying particular attention to bearings and courses for avoiding dangers and entering harbors and checking navigational aids against light and buoy lists.

#### OCEAN CURRENTS.

In connection with the thousands of correspondents who supply information, the use of "bottle papers" brings much of value. The Hydrographic Office sends to navigators and merchant vessels blank form "bottle" papers upon which instructions, in eight languages, are given which include the putting adrift of the bottle paper in a tightly sealed empty bottle, its recovery

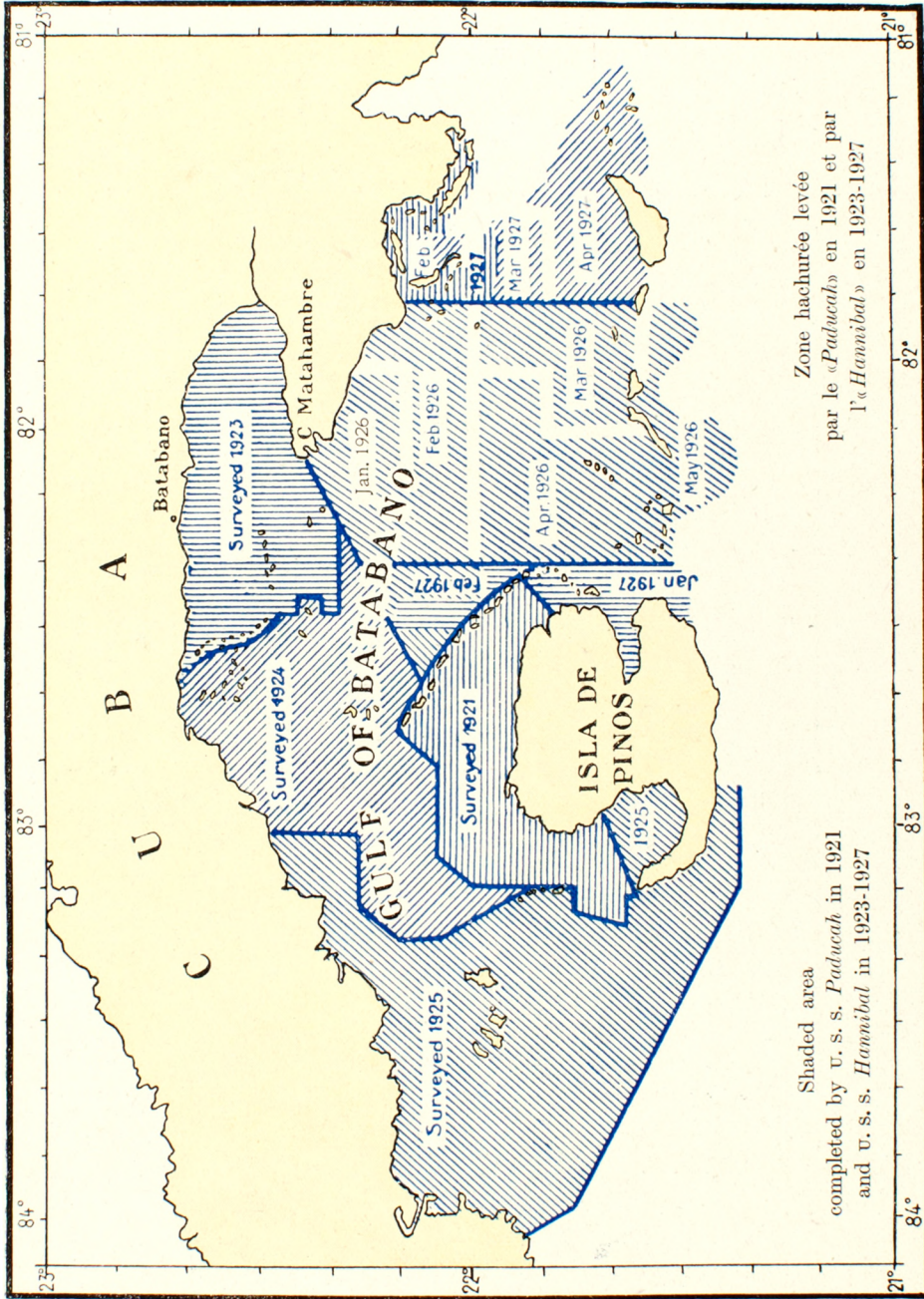
Progress of Hydrography  
NORTH COAST OF CUBA

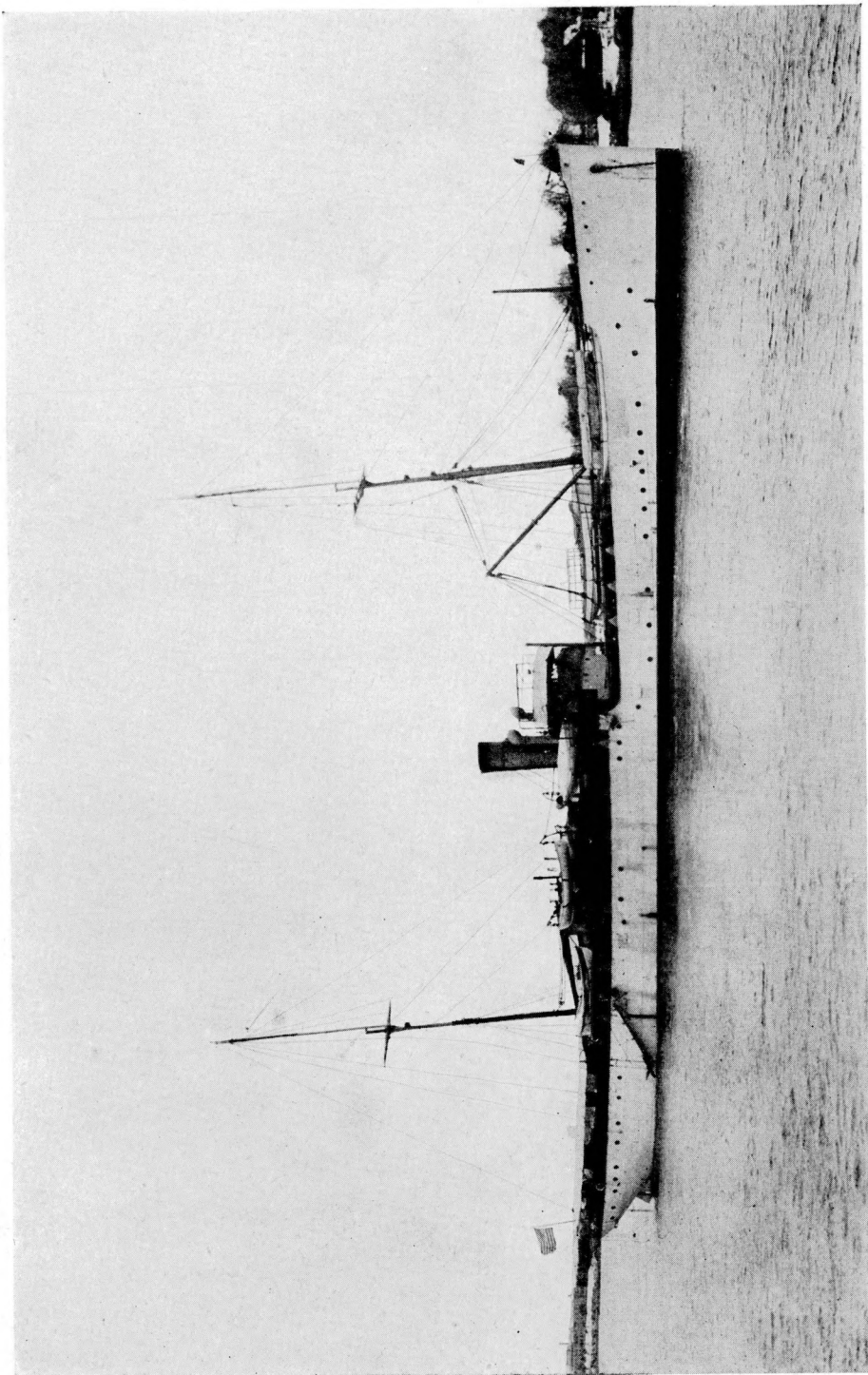
Avancement de l'Hydrographie  
COTE NORD DE CUBA



Progress of Hydrography  
SOUTH COAST OF CUBA

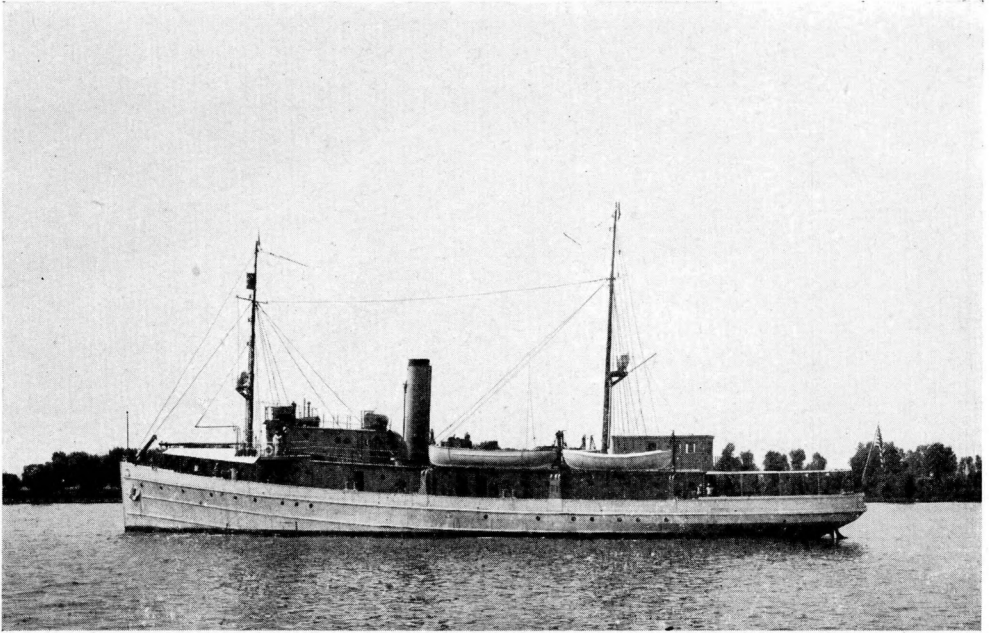
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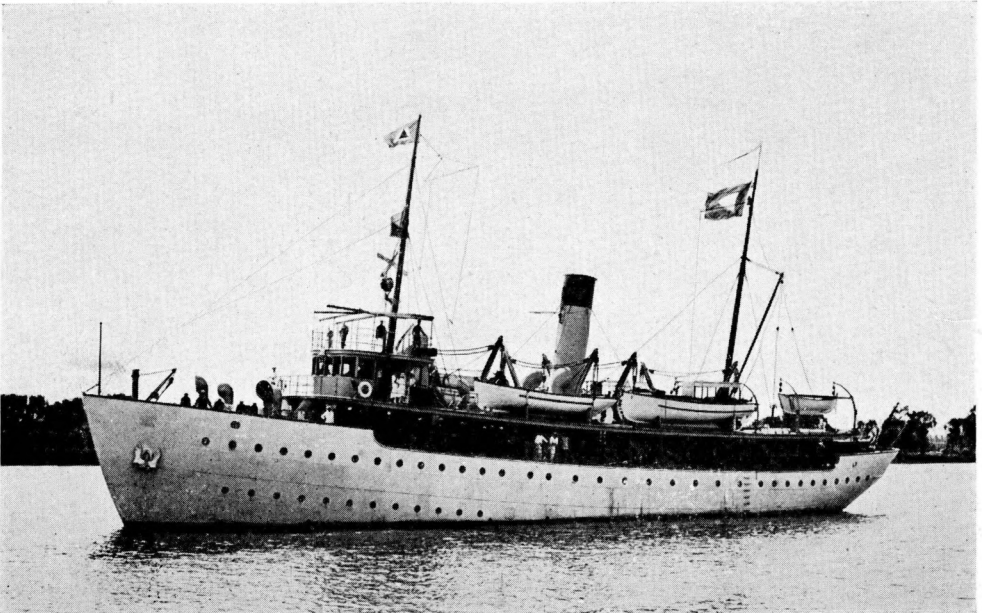


HANNIBAL





GUIDE



SURVEYOR

on some shore and its mailing to the office from which it was sent. A study of many thousands of such papers enables the office to predict with considerable certainty what may be expected in different parts of the many oceans in the way of currents and these become of record, distribution and use on the monthly and quarterly pilot charts.

The results of these bottle papers have been interesting and show drifts of from 5 to 15,000 miles, covering periods of time from two days to six years. It is interesting to note that one bottle, thrown overboard southeastward of the Cape of Good Hope, was recovered on the West Coast of Chili, having drifted about 8,800 miles, about one-third of the distance around the world. Another drifted from southeastward of Cape Horn to the west coast of North Island New Zealand — about 10,250 miles.

Many interesting letters are received from persons who have recovered bottle papers. One from a man in Australia apologized for delay in forwarding the paper, stating that his wallet containing the paper was stolen from him. The thief was caught in a week, but the paper was not released until after the trial, being held as part of the prosecution evidence.

#### NAUTICAL RESEARCH AND SURVEY EXPEDITIONS.

In the exercise of its statutory functions "for the improvement of the means of navigating safely the vessels of the Navy and the Mercantile Marine", the Hydrographic Office is required to keep pace with the progress of knowledge and the application of science in nautical astronomy, in surveying, in mathematical cartography, and in those branches of geophysics of which account must be taken in navigation, such as the variation of the compass, the tides, the winds, the currents, the physical properties of oceanic waters. Of American institutions, the Hydrographic Office alone has the statutory obligation of producing manuals and epitomes of the methods and mathematical tables required for the practice of navigation — a designation which now embraces aerial navigation as well as marine navigation.

It is not only in matters strictly nautical that the scope of research in this institution must take account. Being a national repository of accumulating surveys and observations of the facts of Nature, the demands of the cognate sciences require a conspiring interest on the part of marine hydrography to supply elements of knowledge derived from the field of oceanic observations, as when the meteorologist looks to the oceanographer for the distribution of temperature in the sea; or the artilleryist for the refraction of the atmosphere above it or the density of its waters; or the geologist and seismologist for the configuration of the oceanic basin and the conformation and topography of their submerged tracts.

At this time the Hydrographic Office has at its disposal three surveying expeditions headed by the *U. S. S. Hannibal*, now employed in surveying the south coast of Cuba, the *U. S. S. Nokomis*, now surveying the north coast of Cuba and the *U. S. S. Niagara* which has been engaged in a survey of Venezuelan waters. Attached to these expeditions are house boats, lighters, sub-chasers, surveying boats, and airplanes. These activities, during a survey covering about seven months, include practically all hours of daylight and some hours of darkness; also the encountering all kinds of sea and weather. In this respect the surveying expeditions constitute a valuable school for naval personnel, in addition to producing charts which can not be improved upon by any known agency. The remaining five months of the year are used to work up the data for use in the HYDROGRAPHIC OFFICE at Washington.

The illustrations show the areas which have been surveyed by the *U. S. S. Hannibal* and *U. S. S. Nokomis* survey expeditions during the recent seasons. As each monthly report comes in from the commanding officer of an expedition, cross-hatched lines are placed upon the chart to indicate the surveyed areas covered by each report. This enables the Hydrographic Office to keep accurate track of the progress of the expeditions. The use of aircraft is proving of great value. Loening amphibian planes, which are able to land either ashore or afloat, have been adopted for this duty.

Generally speaking, the planes make reconnaissance flights with surveying officers as passengers for the purpose of getting a better view of the area to be surveyed. This is of great importance because the information gained saves much time later in locating signal and base lines, and gives the "lay of the land" and other preliminary information of immense value. Planes are also successfully used for quick transportation of personnel and supplies over areas rendered inaccessible by reefs, lagoons, marshes, and mountains, thus saving many tedious detours

After signals have been erected and base lines measured, planes again ascend and photograph the terrain, generally from an altitude of about 10,000 feet. The developed photographs are made to overlap at prominent points. A group arrangement of the photographs, called a mosaic, makes valuable information readily available for charting.

### CHARTS.

Nautical charts based upon hydrographic survey data are produced as follows: First, the desired limits and scale of the projected chart are determined. These will depend upon the character and importance of the area to be charted and to some extent upon the completeness and precision of the survey. Surveys are usually plotted on larger scales than those of the charts to be constructed therefrom. In reducing the survey sheets to the chart scale, characteristic soundings are selected and details generalized in such manner as to present the most useful and accurate chart for the use of the navigator.

By means of a unique instrument invented and designed by the personnel of the Hydrographic Office, an engraving of a nautical chart is made directly on a copper plate without the necessity of making a drawing of the chart. This instrument, known as the pantograver, operates on the pantograph principle and produces the engraved plate directly from photographic negatives of the smooth survey sheets. From 75 to 90 per cent of the engraving of a chart can be done with a pantograver and the remainder finished by hand engravers. A description of this new instrument may be found in the *Hydrographic Review* (Vol. IV, No 1, May 1927, p. 36).

The engraved chart plate provides a permanent base from which accurate and sharply defined copies may be printed to serve as originals for photolithographic reproduction which is of the same accuracy as the engraved plate. Reproduction of chart originals for lithographic printing is accomplished as follows: The original is photographed on large glass negatives which after being retouched by negative cutters, are photo-printed on a sheet of sensitized zinc. The zinc chart plate thus produced is treated chemically, placed in a lithographic offset press and copies printed as required. The prints thus made are the base of the chart and are printed in black.

In the lithographing of charts a flat colour tint is used over the land areas. This is printed in the same manner as the base design using ink of any desired color. The plate for a land tint is prepared by blue-printing the chart design on a zinc plate using the same negatives as were used for the base plate. A ferropussiate solution is used for this purpose instead of the bichromate sensitizing solution used in photo-printing the base plate. The print thus obtained will not work up and print in the lithographic press, but serves as a guide to the lithographic draftsman who fills in the entire land area with lithographic tusche. The land plate is then etched and prepared for the press in the same manner as the base plate. Similarly, plates are prepared for tinting water areas blue out to the 3 or 5 fathom curves.

As it is impossible for this government to attempt the survey of all foreign waters, the Hydrographic Office is dependent upon the hydrographic offices of other nations for much of its data from which it produces charts. Charts and data obtained from other governments are studied by experts who are in possession of the latest available information concerning them. These experts produce sections of charts which are united into a mosaic from which lithographic plates are produced by photographic methods. Foreign nomenclature and scales of measurements are converted into Hydrographic Office standards.

On Hydrographic Office charts printed by lithography the color scheme adopted is black for the base, buff tint for the land, blue tint for water areas out to the 3 or 5 fathom curves, green tint over areas dry at low water and orange circles at lights. The green color over dry-at-low-water areas is obtained by an overlay of the blue and buff tints.

### BATHYMETRIC CHART.

Until the completion of the development of the sonic depth finder by Dr HARVEY C. HAYES Ph. D., at the Naval Research Laboratory, Bellevue, D. C., in 1922, all ocean depths were obtained by the tedious and slow method of wire soundings. This new instrument gives instantaneous and accurate reading of depths between 100 and 3,000 fathoms.

Contemporaneously with the development of the sonic depth measurer, seismological societies in the United States were making a study of the earthquakes on the West Coast of the United States. To study the earth movements in California, it is necessary to know where the zones of structural weakness are. Some of these can be plainly seen, others of them can only be found by inference from the adjacent geological structures. Knowing where the zones of weakness are located, it then becomes comparatively easy to discover both the source and the direction of progression of underground movements.

In connection with this study of earth movements in California, there was prepared for publication by the Seismology Society of America, with the cooperation of many different agencies, a fault map of the land area most liable to earthquake disturbances on the West Coast. As the observations in 1922 accumulated and the map grew, it became clear that many of these faults led to the seashore and no doubt continued beneath the sea.

The Carnegie Institution of Washington having learned of the sonic depth finder, requested the Hydrographic Office to have soundings taken off the coast of California with this apparatus. The Navy Department desiring to be of every possible assistance in furthering this important scientific research fitted out the *U. S. S. Hull* and *Corry* with the sonic depth finder and the bathymetric chart was the result.

This is the first successful contour map of a zone of deep sea soundings ever made. The chart represents the configuration of the ocean floor in the region, showing the submerged hills, valleys, cliffs, and precipices. The study of the inaccessible ocean depths appear now to be of high precision.

#### RADIO — STATIC — STORMS.

For many years those interested in radio telegraphy have known that there is a connection between static and storms. Experiments have been conducted in various parts of the world to locate the approximate center of a disturbance by use of radio compasses suitably placed. Last year an officer of the United States Navy was able, because of his position as navigator of an actively cruising ship, to perform further experiments which were conclusive in this connection and definitely showed that much knowledge not now possessed will become available when suitable instruments are developed.

This officer was ordered to duty in the Hydrographic Office for the purpose of further investigation, compilation and study. His detail for this purpose has been amply justified and mariners will eventually have the advantage of additional valuable information concerning storms, particularly those dangerous hurricanes originating in the vicinity of the West Indies.

The forecast officers at the Weather Bureau concur in the view that the greatest weather forecast benefits anticipated by the triangulation of static centers are (1) possible ability of reaching out over the ocean areas, locating and tracking storms which develop beyond permanently located barometer reading stations, and (2) filling in the gap between the regular 8 a. m. and 8 p. m. maps and consequent forecasts by following a storm, definitely located by this or other methods; (3) making static forecasts for the benefit of communications for the routing of messages so as to avoid interference.

The definite association of mild static with certain types of high-pressure atmosphere, and of heavy static with low and changing atmospheric structure, is the basis for this static forecast work. The static forecast will be of direct assistance in weather forecasting. Hurricanes, secondaries and hailstorms have been located or followed with some success by present equipment which is in the laboratory stage of development.

It must not be supposed that the information of this sort becoming available to a navigator has replaced those indications which we have for years been taught to respect. It will merely be an additional safeguard if properly applied, thereby tending to make navigation safer. The success of this research work, however, is dependent upon the continued development of a practical type of static recorder, a problem now in the hands of Radio Research-Engineers of the Bureau of Engineering, Navy Department.

#### INTERNATIONAL ICE PATROL.

During the months of March, April, May, and sometimes June, an important valuable function of the Hydrographic Office results from its connection with the International Ice Patrol.

This patrol resulted from the sinking of the *S. S. Titanic* in 1914 after collision with an iceberg in the North Atlantic. By international agreement, the patrol ships are supplied by the United States Coast Guard, and they take station when vessels crossing the North Atlantic indicate by reports that icebergs are getting far enough south to constitute a menace to safe navigation on the North Atlantic steamship lanes. The reports are received in the Hydrographic Office where they are analyzed and plotted on a chart prepared for the purpose and issued weekly to mariners as a supplement to the "*Hydrographic Bulletin*". On recommendation from the Hydrographic Office, the ice patrol vessel takes station in the neighbourhood of the Grand Banks, until it is mutually agreed by the headquarters of the Coast Guard and the Hydrographic Office that further patrol is unnecessary. The ice patrol vessel makes daily broadcasts by radio and in accordance with a schedule previously arranged and widely published, of ice conditions as known to the commanding officer of that vessel, it being the custom for the ice patrol vessel to "*stand watch*" over the bergs furthest south, at the same time keeping informed of the other bergs in the neighbourhood. In addition to the periodical broadcasts arranged by schedule, much local information is furnished to passing vessels by the ice patrols by both radio-telegraphy and radio telephone.

Probably the most arduous duty falling to the lot of any employee of the United States Government is that imposed upon the Ice Patrol personnel. Two ships rotate on this duty, each remaining on station for two weeks. The patrol continues under all conditions of wind and weather, a very large per cent of which are about as uncomfortable as weather gets, except that extreme cold is not encountered; but to offset this lack, the fog, always a menace to mariners, is frequently with them. The personnel of the Coast Guard engaged in this duty deserve all possible consideration and respect from those who may remain on shore as well as the admiration and appreciation of many mariners and passengers whose lives they safeguard.

The officer in the Hydrographic Office in charge of the Division of Maritime Security is called by telephone at all hours when ice reports are received (and this applies to other dangers to navigation similarly reported during the entire year) in order that he may be always informed of menaces and take the necessary action to notify shipping concerned by means of radio broadcasts.

By an agreement entered into by the steamship companies concerned, certain "lanes" have been established across the North Atlantic for the greater safety of the steamships using them. While the Hydrographic Office has no jurisdiction in establishing or changing these lanes, except that of offering advice, it is one of its duties to keep ships informed of the lanes as established and changed from time to time. These lanes are shown on the "*Ice Supplements*", "*Pilot Charts*" and also on some navigational charts.

#### AVIATION CHARTS.

The seaplane activities within the Navy have been growing by leaps and bounds since the World War. With this development has grown a demand for suitable aviation charts. Naval aviators are Naval officers and are familiar with charts, but aviation charts are lacking. It became incumbent on the Hydrographic Office, in accordance with the law, to furnish charts for naval aviation and, about eighteen months ago, after a comprehensive study of the situation, which included existing maps and charts, the office began work on a real aviation chart which was produced in due time and issued to the Naval Service with a request for suggestions as to its improvement. It is interesting to note that while the data on that chart had been obtained by a naval aviator from all possible sources of supply, in all a thousand suggestions were received as a result of the request made. Many suggestions were adopted and put in use; others could not be acted upon because of the necessarily small scale of the chart.

Since the first chart was issued another has been prepared, and the area covered by it was surveyed from the air by the naval aviator in charge of its preparation as well as by an assistant engineer who performed the actual work of compiling the chart. In the same way that "*Sailing Directions*" or "*Pilots*" must be used by mariners in connection with charts, the "*Naval Air Pilot*" has been created for the use of naval aviators. It is a book prepared in loose-leaf form, of a size suitable for use in a plane, and is so constructed that an aviator may take with him, on a known flight, data covering that region only. Judging by the requests for copies of the "*Naval Air Pilot*" which have been received from civilian sources, it has been found useful to commercial aviation as well as to that connected with the Naval Air Service.

In developing the Navy's product, care is exercised to avoid duplicating the work of other government activities. A map has to do primarily with the land; a chart has to do primarily with the water, especially as regards navigation. Aviation charts which include characteristics of the coasts are particularly useful to Naval aviators. In the same way that charts used by Naval officers should have the advantage of criticism of them, with indicated improvement, so Naval aviation charts should have the advantage of criticism by Naval aviators, and the product as planned by the Hydrographic Office will suit those who must use it. No other agency, unless it controls Naval aviation, can properly produce these necessities.

#### *DISTRIBUTION.*

The Hydrographic Office keeps, ready for issue to the Navy and merchant marine, two thousand and eight hundred different navigational charts and eighty publications. In addition there are, ready for issue to our Naval vessels only, nearly nine hundred different British Admiralty charts and seven hundred different Coast and Geodetic Survey charts, and some sixty publications from various sources. This means that there are always on the shelves, ready for issue, two hundred and fifty thousand charts and one hundred thousand publications or books.

The officer in charge of the Division of Distribution is responsible for the plotting of changes on and correction of all charts and publications issued by the Hydrographic Office. In order that the proper corrections may be incorporated in the charts, it is necessary to examine and compare all Hydrographic, Coast Survey, and British Admiralty charts received to make sure that they contain no errors and that all information affecting the safety of navigation is incorporated in the charts. Ten draftsmen are employed to keep these charts corrected to date. Over three hundred and fifteen thousand hand corrections were made on the charts in the year 1926.

The mailing section of this Division is composed of a foreman and nine helpers. Besides filling orders of the above mentioned navigational charts and publications, a million and a half periodical publications of the Hydrographic Office, which include "*Notices to Mariners*", "*Notices to Aviators*", Hydrographic Bulletin, corrections for "*Light Lists*", the "*Pilot Charts*" and others were mailed last year.

#### *BRANCH HYDROGRAPHIC OFFICES.*

Branch hydrographic offices are maintained in the principal ports along the coasts of the United States and six ports on the Great Lakes, and are in charge of the officers of the Navy. These offices contain reference libraries of charts and sailing directions corrected to date covering the navigable waters of the world, also the latest hydrographic information obtainable for the use of ships visiting the ports. Broadcast radio warnings are initiated. Close personal touch is maintained with the visiting seamen, advising them of navigational matters, issuing hydrographic literature and pilot charts, and giving them instructions in navigation.

A vessel, before sailing, may consult the officer in charge, who is himself a mariner, and secure the latest information concerning the next port of call and full details regarding the best routes to follow. Hundreds of inquiries come into the branch offices from masters of vessels and others regarding navigational matters.

A branch hydrographic office is such an ever-present aid to masters of vessels and to shipping interests that it is hard to estimate the actual money value of such an institution. Certainly no important port should be without this valuable practical service.

#### *CONCLUSION.*

It will be readily seen that the Hydrographic Office is accomplishing its mission as defined by the statutes. The production of charts from original survey and from other sources, the study and research in oceanography and nautical astronomy, the collecting and compiling of hydrographic information and the dissemination of the resulting data to navigators of the Navy and merchant marine promptly, accurately and fully, thus enabling ships to navigate the waters of the world safely, economically and expeditiously, is a military and naval necessity to the national defense and a vital national industrial asset to the commerce of the United States.

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