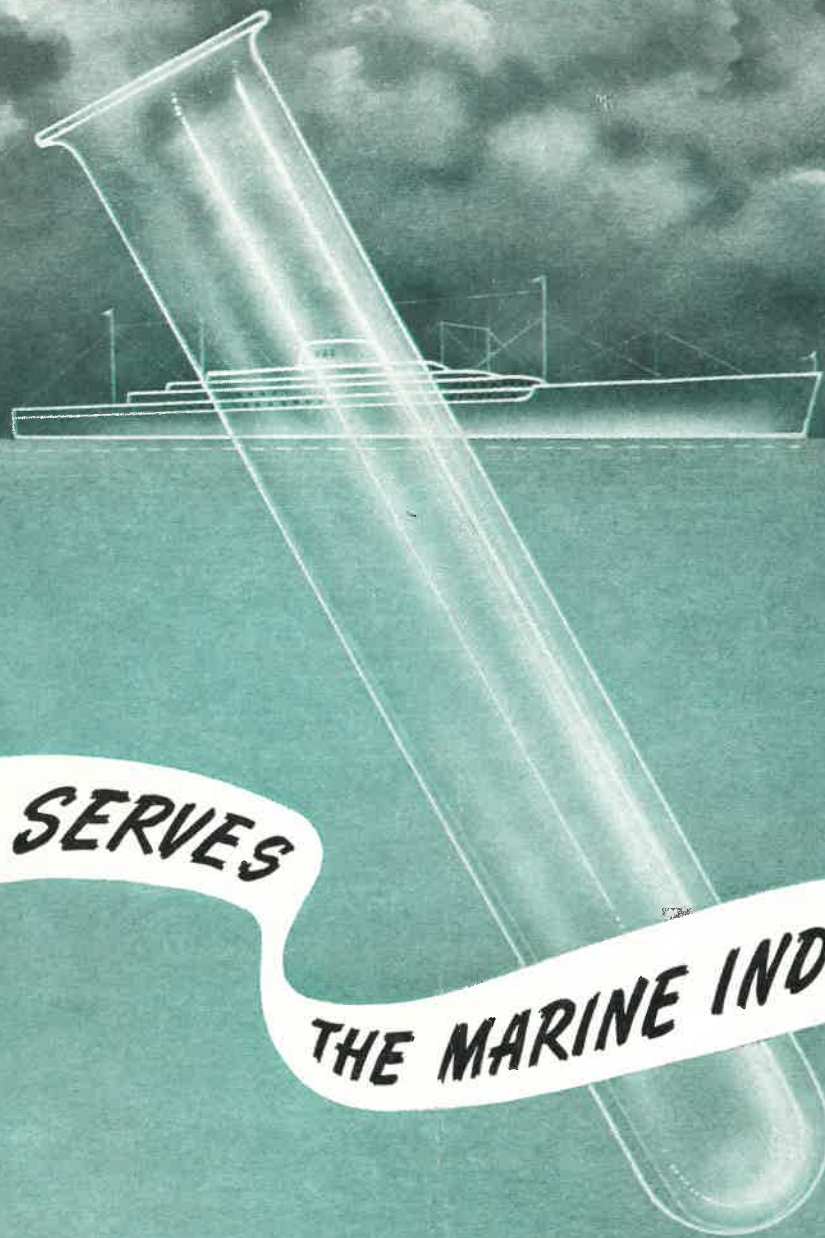


CHEMISTRY



•• SERVES
THE MARINE INDUSTRY

BULL & ROBERTS

1947

Three test tubes are arranged vertically in the center of the page. The background consists of several overlapping, horizontal, light blue textured brush strokes.

BULL & ROBERTS

Since

1903

CHEMISTRY

Serves the Marine Industry

Under the highly competitive conditions of postwar operation, the American Merchant Marine must operate with maximum efficiency, economy and safety. The same technical and scientific skill which has made American Industry preeminent must also support the men who build, operate and manage our ships.

Chemistry serves the marine industry in many ways. It is the object of this booklet to illustrate some of these ways and suggest others. Since the firm was founded in 1903, Bull & Roberts have specialized in applying chemical knowledge to marine problems.

Bull & Roberts are chemists who know ships, and their experience enables them to adapt advances in the science of chemistry to the specialized requirements of ships and shipping.



Service

WORLD WAR I

During the decade prior to World War I, Bull & Roberts set up the first recognized standards for the safety of air conditions in the cargo tanks and fuel bunkers of vessels carrying or burning oil, and devised gas apparatus for accurately testing air conditions.

Then Bull & Roberts organized a staff of inspectors trained to pass upon and certify as to air conditions in tanks and holds. Thus, they were prepared to handle the wartime demand for speed with safety, and, between April 1917 and November 1918, this staff made over 4,600 inspections on board vessels in New York Harbor. The result,— *a perfect safety record.*

1917 TODAY

WORLD WAR II

During the decade prior to World War II, Bull & Roberts developed a boiler water conditioning service, adapting to marine practice the methods pioneered in modern high-pressure stationary plants by Hall Laboratories, Inc. By December 1941, 345 vessels were operating under service agreements. With the experience gained and a staff of trained service engineers already functioning at important Atlantic, Gulf and West Coast Ports, it was possible to meet the demands of the rapidly expanding wartime fleet, insuring the continuity and safety of boiler operation, with over 1,500 vessels operating under the Hall System.

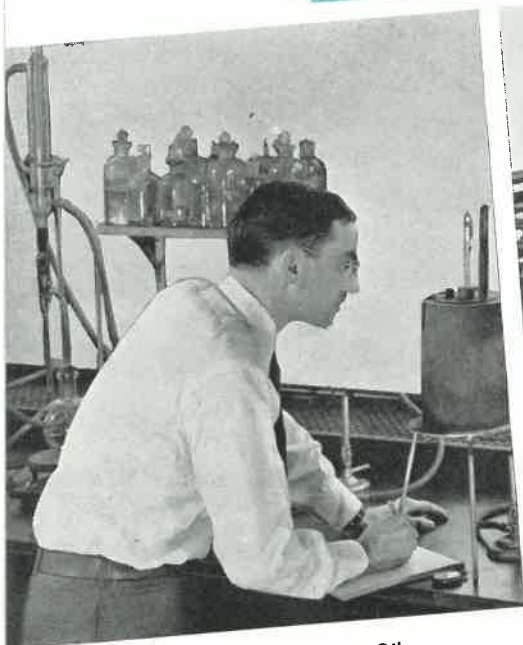
In addition to this service work, Bull & Roberts and their representatives gave freely of their time by cooperating in the instruction program of the Maritime Commission at Kings Point Academy, the Basic Schools and various Advanced Engineering Schools of the U. S. Maritime Service.

As in World War I, Bull & Roberts again expanded their Gas Inspection Service having six Certified Chemists engaged in this work in the Port of New York. While improved methods permitted faster work, safety remained the criterion as is evidenced by the fact that no fire or explosion ever occurred following the issuance of a Bull & Roberts "gas-free" report.

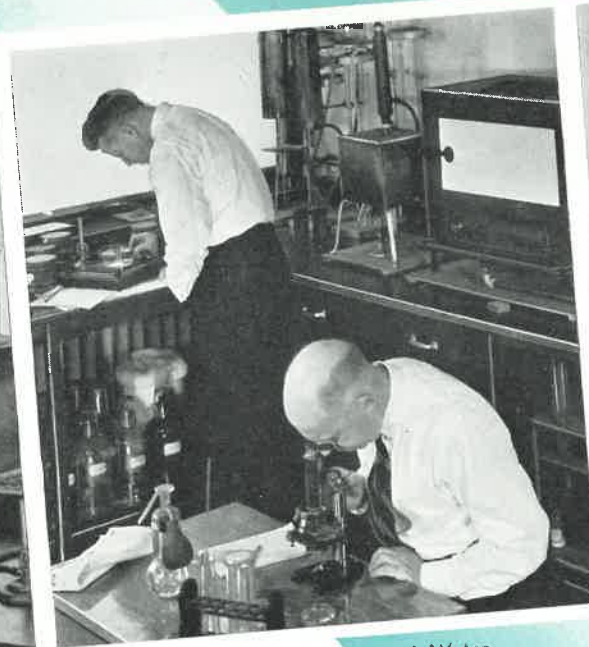
When war loading conditions required the wide use of ballast, the War Shipping Administration, through its General Agents, turned to the "chemists who know ships," and commissioned Bull & Roberts to inspect ballast materials on hundreds of vessels to guard against possible spontaneous combustion, toxic gas and other hazards. In these surveys, careful consideration was also given to the problem of "ship sweat," and to the plasticity of ballast material which might affect stability under load or cause fouling of bilges. Forty years experience with cargo storage hazards, and an exceptionally thorough knowledge of the particular hazards of coal mine refuse (widely used as ballast) supplied a unique background for this work.

In preparation for the concluding phase of the war shipping program, Bull & Roberts was called upon to make extensive field surveys and tests as well as laboratory examinations on which was based a report on corrosion considerations in the selection of Atlantic, Gulf and West Coast Storage sites for surplus ships.

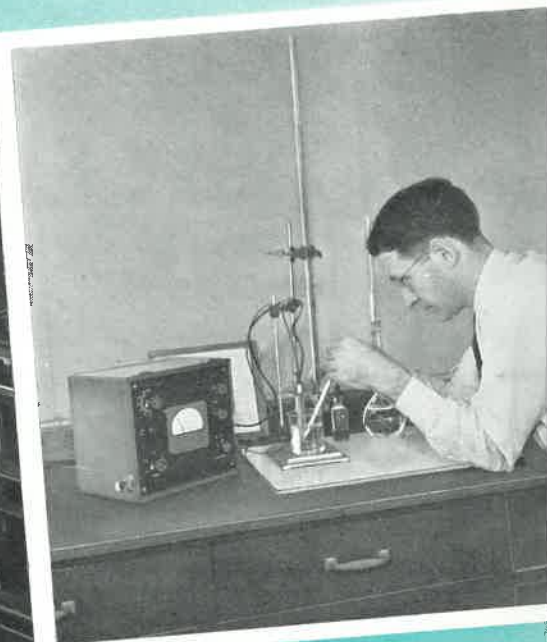
Chemical Problems in SHIP OPERATION



Spontaneous Combustion of Oils



Bacteriological Examination of Water



Electrometric Titration

The number and variety of the chemical problems which have been submitted to the Bull & Roberts laboratory show that progressive steamship operators can make profitable use of applied chemical knowledge in many and varied ways.

CARGO STORAGE as a chemical problem has been studied continuously since the firm first was organized. Our records contain an exceptional fund of information and experience. Transportation via sea presents special problems as compared with shipment via rail, since in land transportation, time is a less important factor, and shipments are isolated in individual cars which can be eliminated in case of fire. The cargo stowage files of one of the leading inter-coastal fleets, (a recognized pioneer in the scientific investigation of stowage hazards), were originally compiled by Bull & Roberts, and are frequently augmented by further study and investigation. Large trans-atlantic and coastal fleets have been served in a similar manner.

Special studies in cargo stowage problems have been made for insurance groups, as in the case of the spontaneous heating of steel scrap. Bull & Roberts has conducted studies of brine spray cooling systems and accordingly has made recommendations for minimizing corrosion of equipment. Likewise, many cases of condensation or "ships' sweat" have been investigated, and consideration has been given to modern methods of ventilation, air conditioning and gas stowage. Today, improved methods of cargo stowage and handling are important factors in meeting competition.

Relations with passengers and crew give rise to numerous problems. Bull & Roberts frequently has been of service to ship operators in safeguarding passengers' health and in furthering good will and forestalling unwarranted claims by regularly sampling and examining bacteriologically all drinking water tanks on passenger vessels, particularly those engaged in cruise operation to tropical and semi-tropical ports.

In other instances, Bull & Roberts has been instrumental in exposing fraudulent damage to personal effects, so protecting ship owners in law suits. Sabotage by poisoning of drinking water and food, alleged injury from contact with cleaning chemicals and from failure of mechanical equipment, — often have been subjects of investigation.

Bull & Roberts has also served as consultants and analysts to operators, shipbuilders and repair yards, a function assuring clients maximum economy in the selection and purchase of supplies. Some of the problems which our marine clients have turned over to us for analysis or investigation, are suggestive of the wide field covered by this work.

Babbit
 Boiler Compounds
 Boiler Scales
 Blankets
 Burlap
 Ballast
 Brass Polish
 Bristol Board (menus)
 Coal
 Caulking Material
 Cargo Covers
 Cleaning Compounds
 Condenser Tubes
 Corrosion Protective Oils
 Corrosion
 Boilers
 Condenser Tubes
 Cargo Tanks
 Diesel Engine Parts
 Hulls
 Turbine Blading
 Deck Coverings
 Disinfectants
 Emulsions
 Fire Extinguishers
 Fire Brick
 Fireproofing
 Fumigation
 Glue
 Ink, Marking
 Insecticides
 Metal Failures
 Oakum
 Oils (lube and fuel)
 Paint
 Anti-fouling
 Hull
 Inside Enamel
 Boot Topping
 Asphalt
 Packing
 Paint Removers
 Paper
 Rope
 Soap
 Solder
 Solder Fluxes
 Soot (Vanadium content)
 Soot Removers
 Tarpaulin
 Tank Coatings
 Wooden Hulls, decay of
 Washing Powders
 Wood Preservers
 Welding Gases
 Welding Rods & Fluxes
 Zinc Plates



Analytical Balances



Coking Characteristics of Solid Fuels



Photoelectric Colorimeter Trace Analyses

Detecting and Eliminating **OCCUPATIONAL RISKS**

The gases and vapors arising from petroleum products in fuel bunkers and other tanks are both toxic and explosive, and safety codes and other regulations quite properly require that such spaces be tested before being entered, even though hot work may not be contemplated. Bull & Roberts were pioneers in this gas testing work, and at the present time two of the partners and four of the staff are "Certified Chemists." Bull & Roberts devised and, for many years, used non-portable volumetric gas analytical apparatus for this work. With the improvement in design and functioning of portable test equipment, portable testers were adopted which are regularly checked in our laboratory against standard gas mixtures (analyzed with extreme accuracy in volumetric equipment). This is just one of the many precautions, taken by Bull & Roberts, which are responsible for our perfect safety record for this work.

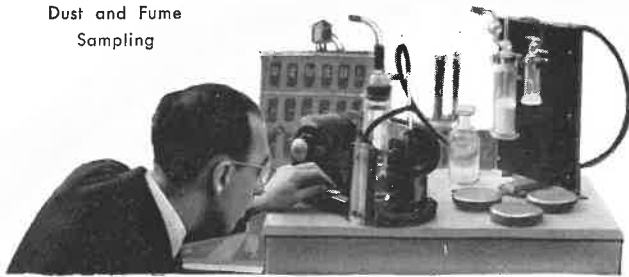
Dangers associated with tanks which have carried bulk cargo such as molasses, latex or whale oil, have received special consideration.

Bull & Roberts, recognized experts in the field of toxic gases and vapors, have been consulted in special problems associated with salvage operations. Typical of these special problems is the case of the barge which had carried frozen cherries refrigerated with solid carbon dioxide (dry ice). When stevedores entered the cargo hold to discharge the cargo, casualties resulted. Bull & Roberts were called in to investigate, whereupon ventilation procedures were recommended and continuous tests of the air were made by chemists during the subsequent discharge of the cargo to assure safe working conditions. Another example of this air test method is the case of one of the largest American-flag passenger vessels, when it became necessary to discharge the cargo after hull damage due to grounding; Bull & Roberts' chemists continuously tested the air in the hold which contained cyanide as part of the cargo, since there was danger of cyanide fumes if the water entering the hold had reached this cyanide cargo. Prior to commencement of salvage operations on the "Normandie," Bull &

Testing for Petroleum Gases and Vapors



Dust and Fume
Sampling

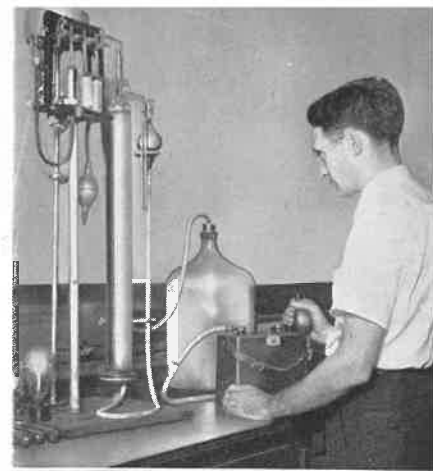


Roberts made very complete air and water tests in and about the hull. As in most salvage cases, it was necessary to guard against gas hazards arising from the decomposition of organic materials and the reduction of oxygen by such decomposition as well as by burners, torches, the operation of engines, etc. In the case of this vessel, there were additional hazards resulting from the organic material entering the ship from the slip as two large city sewers emptied nearby.

As a result of Bull & Roberts' investigation and recommendations, various gas testing equipment and procedures were used throughout the salvage of the vessel as a constant precaution against gas hazards.

The hazards of silicosis and zinc-fume fever attending certain welding operations have been investigated in a number of studies — some carried out for manufacturers of welding wire, others for one of the large local ship-yards which was called upon to do extensive welding of galvanized sheets.

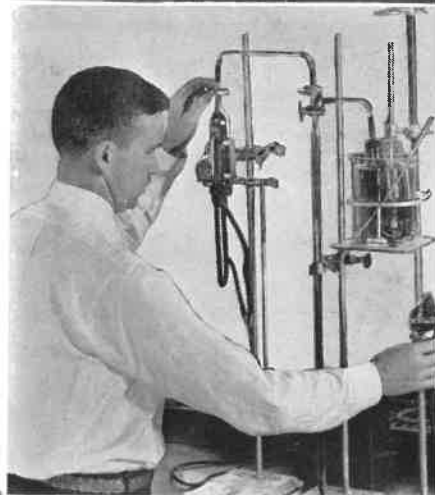
Calibrating
Gas Testers



Volumetric
Gas Analysis



Studying Explosive
Limits



Oxygen Testing



CHEMICAL SERVICE

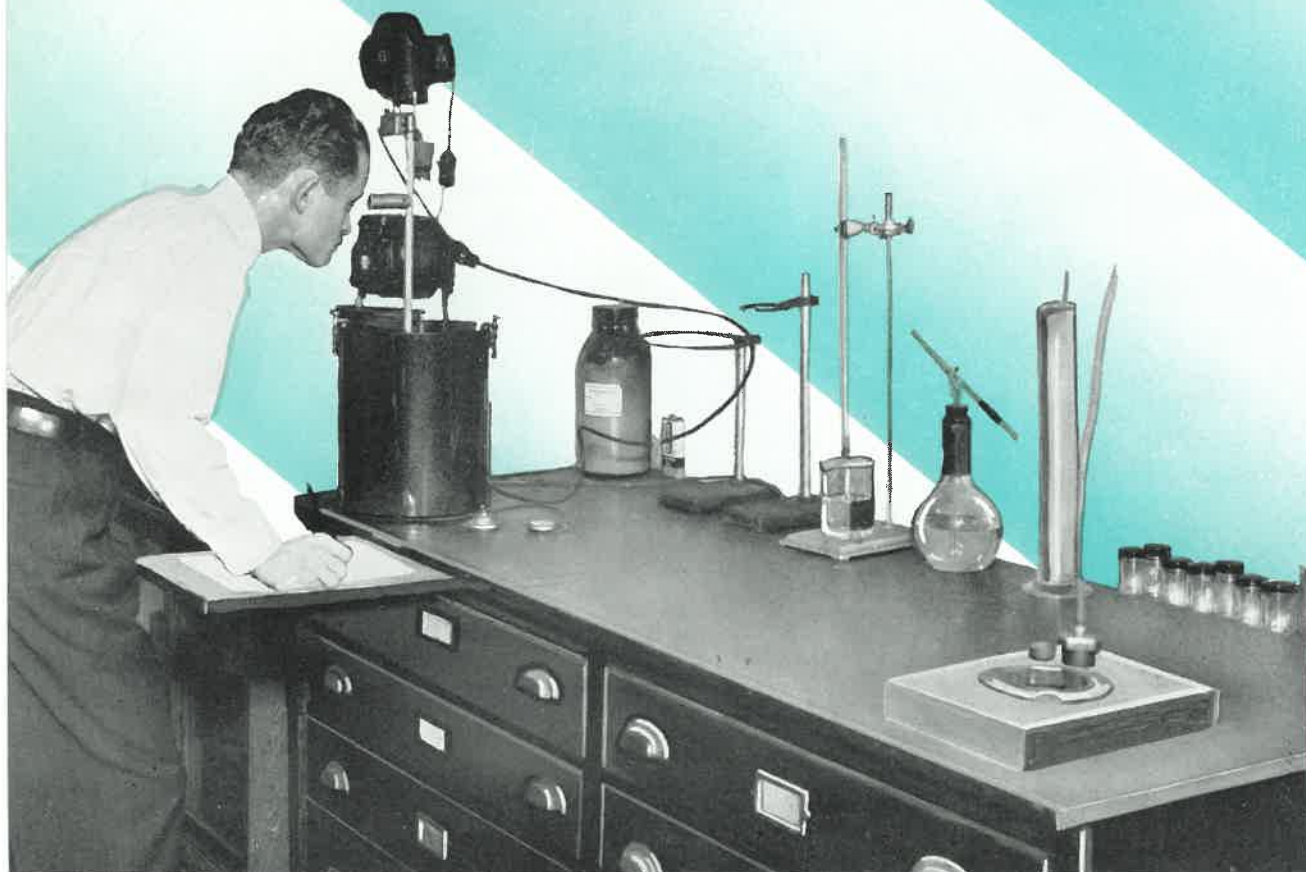
for Ship Designers
and Consultants...

To Naval Architects and Marine Engineers contemplating postwar vessels of advanced engine room design, we believe that our marine experience coupled with Hall Laboratories' experience with the most modern stationary plants may be of assistance in advising relative to the design and layout of the steam-water cycle. Operating experience with a very wide range of marine boiler installations, confirms our belief that early consultation with the designer would be very helpful in assuring proper provision for boiler water conditioning through adequate provision for treatment, testing and sampling.

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Ship
Service
Records



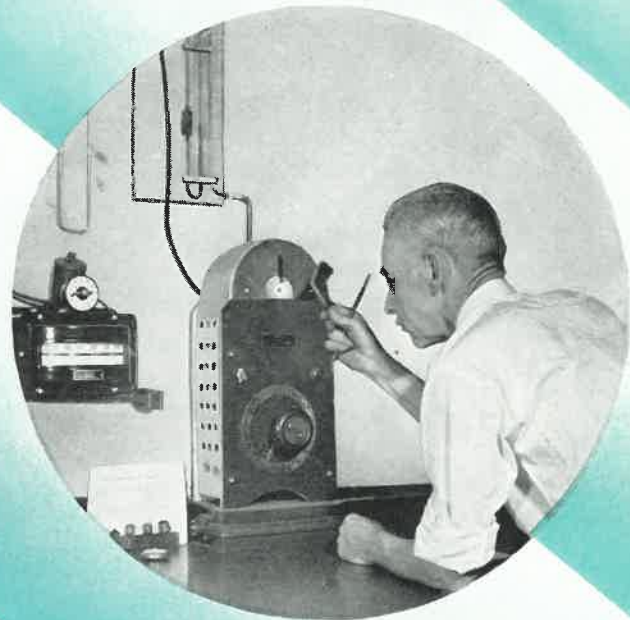
Determining Heating
Value of Fuels

New Products and Equipment

Bull & Roberts' long and varied experience in the marine field enables the firm to be of assistance in investigating the value and possible usefulness of many types of products and equipment which manufacturers or potential users contemplate introducing to the marine field.

For example: Monsanto Chemical Company, some years ago, retained our firm to investigate the use of anhydrous sodium sulfite (Santosite) for the removal of dissolved oxygen in marine boiler operation. With the generous cooperation of one of our clients who gave us permission to make tests on a vessel of their fleet, we made the first quantitative study of the chemical removal of dissolved oxygen from a high-pressure marine boiler feed system. The results of this investigation were summarized in the November, 1935 issue of MARINE ENGINEERING AND SHIPPING AGE.

Patented procedures for the removal of slime from marine condensers have also been investigated.

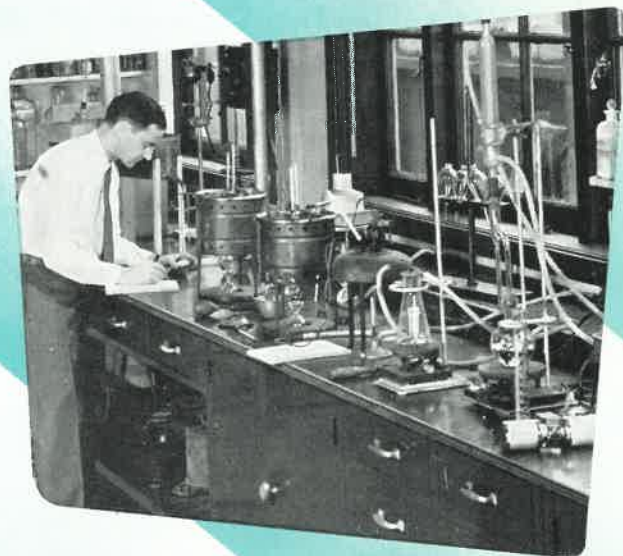


Determining Ash Fusion of Coal

Fuels and Lubricants

Bull & Roberts is fully equipped for the sampling and testing of fuel oil, coal and lubricating oils. Mr. Shields of our firm, is a recognized authority on the handling and utilization of coal in both marine and stationary power plants as well as in its sampling and testing. In the course of a survey of coal moving overseas for the account of the Association Technique de l'Importation Charbonniere and of UNRRA during August and September, 1946, Bull & Roberts sampled and analyzed over 3,000 cars of coal at New York, Philadelphia and Baltimore. Similar services both in car sampling and mine surveys, are being currently performed for coal producers in order to certify to the suitability of their coals for export purposes.

Spontaneous heating and fires in coal bunkers have been investigated as well as the susceptibility of commercial coals to self-ignition, and the degree of spontaneous heating to be expected from coal mine refuse when used as ballast.



Petroleum Testing



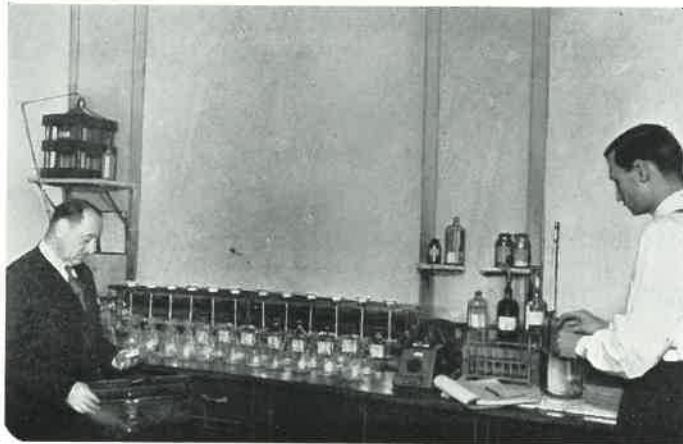
Preparation of Coal Samples

Boiler Water Conditioning Service

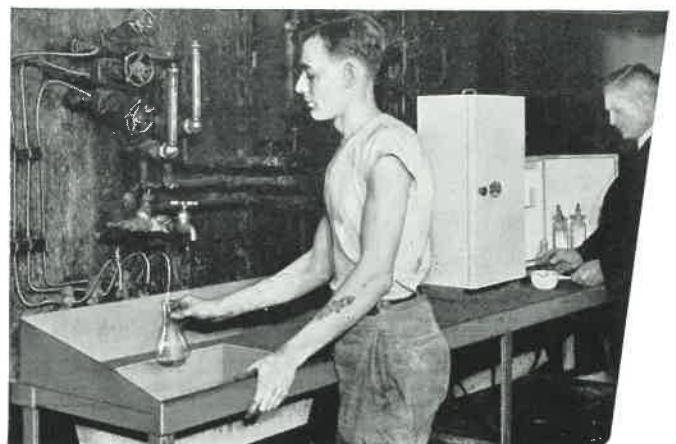
Preparing Testing Reagents



Ship-Side Delivery of Water Conditioning Supplies



Laboratory Testing of Boiler Water Samples



Water Testing in Ship's Fire Room

In 1929, following a study of the results of the Hall System of Water Conditioning in large local public utility power plants, Bull & Roberts became convinced that, if adapted and made available to the marine field, it would be a scientifically sound and practical method of water conditioning. We therefore obtained from the Hall Laboratories, Inc., the rights to apply principles of the Hall System to marine boiler operation. The first marine installations were made in the winter of 1930. The wide acceptance of the Hall System in the marine field, which resulted in over 1,500 vessels operating under our wartime service contracts, has justified our appraisal of its merits. Service under these contracts is now

available at all important Atlantic, Gulf and Pacific Coast ports, with the treating chemicals being purchased as required on a commercial heavy chemical basis in the manner pioneered by us.

A summary of the developments in the field of water-conditioning, and a discussion of our experience will be found in a paper presented before The Society of Naval Architects and Marine Engineers in November, 1944. Reprints of this paper will be sent on request. ("Water Conditioning and Related Problems of Marine Boiler Operation -2," by A. C. Purdy.)

AUTOMATIC COMBUSTION CONTROL SERVICE (HAGAN)



Hagan Control Panel
(T-2 Tanker)

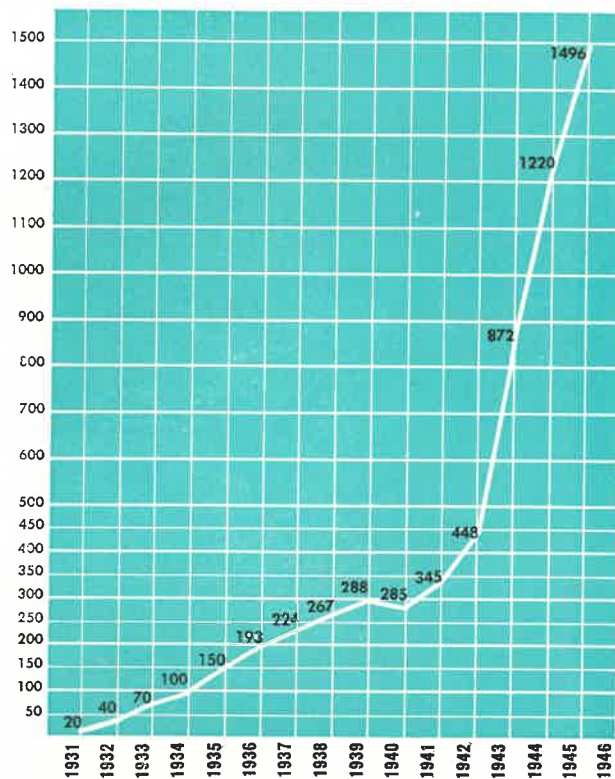
By agreement with the Hagan Corporation in 1946, Bull & Roberts took over the servicing of marine installations of the Hagan Automatic Combustion Control in New York.

This work is handled by licensed marine engineers of long sea experience and a complete line of spare parts is carried in stock for immediate repairs.

"Dual Service Contracts" with attendant economies are available for vessels using Hall System as well as Hagan Control.

HALL SYSTEM

milestones



In February 1930, the first Hall System marine installation was made, introducing to marine boiler practice the methods of controlled phosphate water conditioning covered by Hall U. S. Patent No. 1,613,701. Later in the same year, having experienced difficulties in the use of trisodium and disodium phosphates, Bull & Roberts made the first marine use of sodium hexametaphosphate (Hall U. S. Patent No. 1,903,041). The use of metaphosphate avoided the previous troubles experienced with heater and feed-line scales and permitted control of boiler water alkalinity when using highly alkaline make-up which may result from the bunkering of alkaline shore waters or from the leaching of freshly cement-washed feed tanks.

In 1933 Hall System methods using metaphosphate successfully passed accelerated service tests conducted in a 600 p.s.i. experimental boiler at the U. S. Naval Experiment Station, Annapolis,

Maryland. A copy of the report covering these tests is available for inspection by clients and prospective clients, such disclosure having been authorized by Admiral S. M. Robinson, then Chief of the Bureau of Engineering. Six months after the conclusion of these tests, Dr. A. C. Purdy, a member of the firm of Bull & Roberts, presented the first paper on water conditioning before the Society of Naval Architects and Marine Engineers. ("Water Conditioning and Related Problems of Marine Boiler Operation," Trans. S.N.A.M.E. Vol. 41, pp. 388-411.)

In January 1942, the first Liberty ship, the S. S. "Patrick Henry" entered service with Hall System, and later in the same month Hall System was installed on the experimental high-pressure cargo vessel, S. S. "Examiner," with 1350 p.s.i. boilers.

In January 1943, the boilers used for station heat and power at the U. S. Merchant Marine Academy, Kings Point, N. Y., started operation with Hall System. This installation has since been used as a working model in the instruction of the cadets.

In the following year, 1944, the first Victory ship, the S. S. "United Victory," entered service with a Hall System installation.

In September 1944, the British Standard Institution submitted for criticism a draft of War Emergency British Standard, 1170-1944, entitled: "Treatment of Feed Water and Boiler Water for Marine Boilers." The draft recommended the use of sodium metaphosphate with a phosphate control test. This was the exact procedure that had been introduced into marine boiler practice by Bull & Roberts as early as 1930.

In July 1945, a Hall System installation was made on the ore-carrier "Venore" with 1535 p.s.i. boilers, a new high in boiler pressure in the American Merchant Marine. This installation, as well as its sister ships, the "Marore," "Lebore," and "Feltore" which subsequently entered service, has operated with completely satisfactory freedom from scale and corrosion.

Biographical Notes

PARTNERS

Alfred E. Roberts, partner and co-founder in 1903, is a licensed professional engineer of the State of New York and is an American Bureau of Shipping Certified Chemist. He was educated at Wesleyan and Columbia, and took special courses in the Cornell Medical School. He was a member of the technical staff of U. S. Experiment Station, Middletown, Connecticut, and of the Cellulose Products Company. Just prior to entering into partnership with Mr. Bull, he was serving as Technical Adviser to the president of the Old Dominion Steamship Company. He is a member of the American Chemical Society, The Society for Testing Materials (Committee D-19), The Society of Naval Architects and Marine Engineers (Associate), and The Association of Consulting Chemists and Chemical Engineers.

Alvin C. Purdy, a partner since 1927, is licensed as a professional engineer of The State of New York, and is an American Bureau of Shipping Certified Chemist. He took his bachelor's and doctor's degrees at Cornell, and carried out special research at the Universit  de Lyon, France. Prior to joining Bull & Roberts, he did research and development work for the Kearfott Engineering Company. He holds membership in The American Chemical Society, The Society of Chemical Industry (British), The American Water Works Association, The Society of Naval Architects and Marine Engineers (Associate), The Association of Consulting Chemists and Chemical Engineers (of which he is a past president), and The Sigma Xi Honorary Scientific Society, and served as a delegate-at-large to the Seventh Annual Conference at The International Union of Chemistry held in Washington in 1926. He is the contributor of numerous papers to scientific literature, including the transactions of The Society of Naval Architects and Marine Engineers. He was a contributing editor of Osborne's Modern Marine Engineers' Manual, Cornell Maritime Press 1941 and supplied the material for the section on "Feed Water and its Treatment" in Seward's Marine Engineering (The Society of Naval Architects and Marine Engineers, 1942).

Henry M. Shields, a partner since 1943, is the Laboratory Director. He was educated at Westminster College and the Pennsylvania State College. After several years of teaching, and in chemical industry, Mr. Shields entered the field of analytical and consulting chemistry, and owned and operated the Mid-Town Coal Laboratories (1934-1943) which was merged with Bull & Roberts when he became a partner in the latter firm. Mr. Shields is a member of the American Chemical Society and the Association of Consulting Chemists & Chemical Engineers, of which he served as Vice-President.

TECHNICAL STAFF

In concluding this descriptive booklet of our firm, the partners of Bull & Roberts wish to express their appreciation of the loyal cooperation of the members of their technical staff, as well as the laboratory and stock room assistants and office force, who during the war years just past worked long hours and waived vacations to help "keep 'em sailing."

Chemists and Chemical Engineers

Elliott S. Marshall joined Bull & Roberts' staff as a laboratory assistant in 1928. While in our employ, he completed his work for the degree of Chemical Engineer at Brooklyn Polytechnic Institute, and for the past several years he has had charge of all outside service work. Mr. Marshall is an American Bureau of Shipping Certified Chemist.

Wilmot H. Decker joined Bull & Roberts' staff as a laboratory assistant in 1938, and in 1945 he completed his work for the degree of Bachelor of Science at City College. Mr. Decker is an American Bureau of Shipping Certified Chemist and as such inspects and tests ships' tanks and spaces, in addition to conducting testing and analytical work in our laboratory.

Michael Nachay, who holds the degree of Bachelor of Science from City College, joined our staff

in 1943 and has since specialized in the sampling and testing of coal.

Louis Guaracini, who holds the degree of Bachelor of Science from Long Island University, joined our staff in 1945. Mr. Guaracini is a Certified Chemist of the American Bureau of Shipping with several years of gas testing experience in local shipyards. As a member of our staff, he has continued to handle shipboard gas inspections, as well as engage in testing and analytical work in the laboratory.

John E. Westberg joined our staff in 1946 as an assistant to the partners in development and research work. Mr. Westberg, who holds the degree of Bachelor of Science in Chemical Engineering from Cornell, served during the war as Research Engineer on the Manhattan Project working in the field of uranium-isotope separation.

Marine Engineers

Albert Torressen, a licensed Marine Chief Engineer since 1920, joined our staff in 1932. He is now our senior service engineer engaged in servicing marine installations of the Hall System of Water Conditioning.

John R. Sisson, a licensed Marine Chief Engineer, joined our staff in March 1945 after a number of years of sea experience followed by twelve and one-half years' service as an inspector for the Steamboat Inspection Service of the U. S. Department of Commerce.

Edward J. Hayes, Jr., a graduate of the United States Merchant Marine Academy, Kings Point, and a licensed Marine Engineer, joined our staff in 1946 after sea service in several American fleets.

Herman B. Hoehne, a licensed Marine Engineer and licensed Stationary Engineer, joined our staff in 1946 with a background of sea service in various American fleets.

Mr. Hayes and Mr. Hoehne are engineers specially trained to service Hagan combustion control equipment as well as in servicing Hall System installations.

Outport servicing of Hall System installations is handled by trained service engineers and chemists employed by the firms which represent us at important Atlantic, Gulf and West Coast ports:

Boston
Philadelphia
(Baltimore & Norfolk)
Mobile, Alabama
New Orleans
Houston
(and other Texas Ports)
Los Angeles }
San Francisco }
Seattle
(and Portland, Oregon)
Vancouver, B. C.

R. L. Williams
Ash Engineering Company
Oceanic Supply Company
Coastal Engineering Corp.
Maintenance Engineering Corp.
Hagan Corporation
Northwest Filter Company
Northwest Filter Co., Ltd.

CHEMISTRY

Serves the Marine Industry

In addition to the regular staff of Bull & Roberts, special training and facilities from outside sources, particularly those of fellow members of the Association of Consulting Chemists & Chemical Engineers, Inc. and the American Council of Commercial Laboratories, are utilized wherever needed to supplement our own experience and laboratory equipment in solving exceptional problems.



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