

Left: Determining hazard of spontaneous combustion

Right: Establishing explosive limits of bulk cargo in a tanker explosion case

CHEMISTRY

SERVES THE SHIPPING INDUSTRY

▼

BULL & ROBERTS

117 LIBERTY STREET
NEW YORK CITY



By consulting chemical literature the laboratory investigator can often start where others left off

THE FIRM OF BULL & ROBERTS

IMMEDIATELY prior to organizing in 1903 the firm of Bull & Roberts, Consulting Chemists, consisting of Irving C. Bull and Alfred E. Roberts, Mr. Roberts had been Technical Advisor to the President of the Old Dominion Steamship Company. The activities of the firm from its inception, therefore, naturally centered around the chemical problems of the shipping industry. Starting with this practical experience and with the ship operator's viewpoint, Bull & Roberts have built up an unique practice as chemical consultants to the marine industry.

Of the many contributions which this firm has made to the safety and efficiency of various marine operations, two will be mentioned. In

1911, 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, devised gas apparatus for testing air conditions accurately and organized a staff of inspectors trained to pass upon and certify as to air conditions in tanks and holds. Again, in 1930, by taking over the marine rights under the Hall Patents and adapting to marine practice the theoretically sound boiler water conditioning methods which had been so successfully applied in land power stations throughout this country, Bull & Roberts made it possible to operate boilers in marine plants as efficiently and safely as in large land plants. In 1934, the Society of Naval Archi-

itects and Marine Engineers recognized this advance by accepting a paper prepared by Dr. Purdy on "Water Conditioning and Related Problems of Marine Boiler Operation," and today nearly two hundred ocean-going vessels have the conditioning of their boiler feed water under the firm's supervision.

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 and Chemical Engineers, Inc., are utilized wherever needed to supplement our own experience and laboratory equipment in solving exceptional problems.

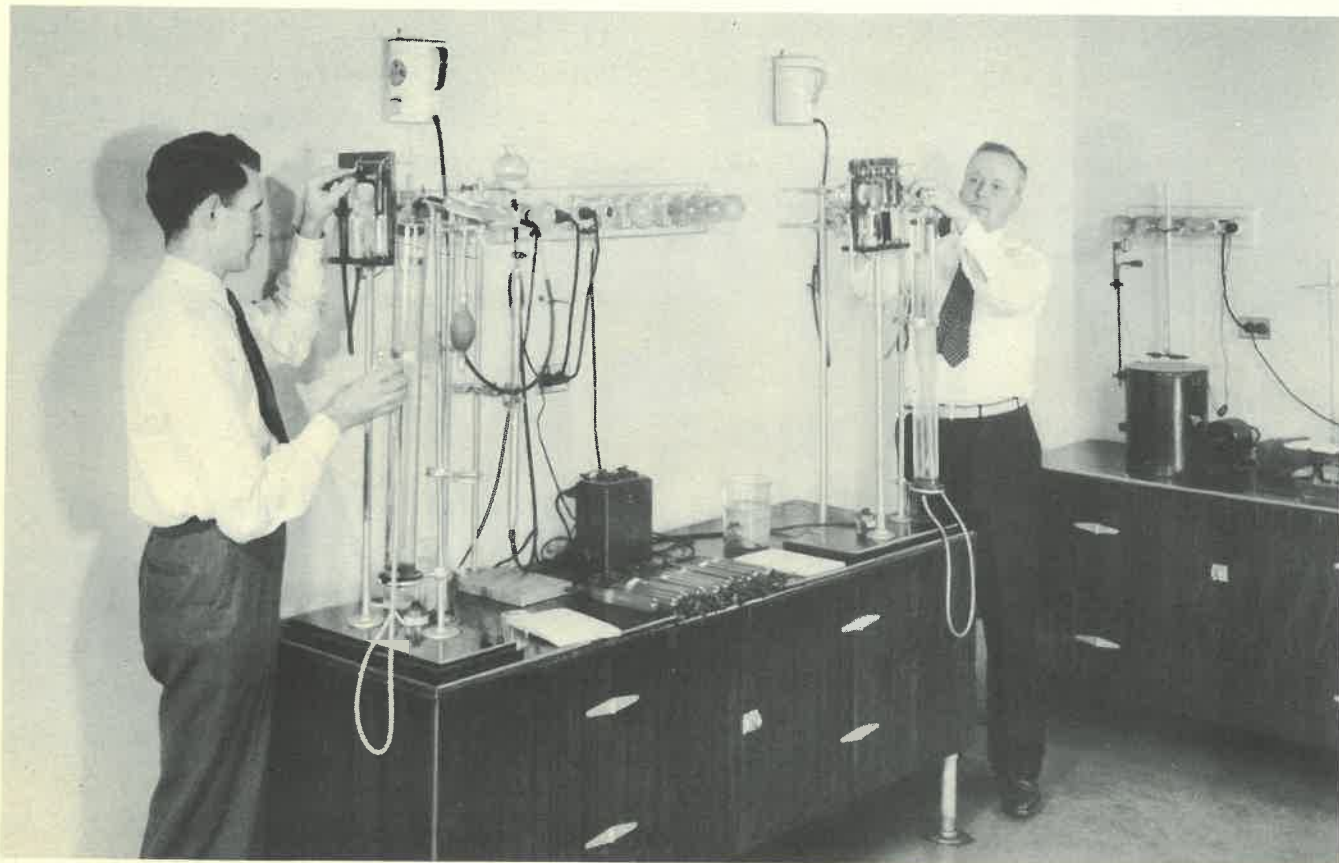
BIOGRAPHICAL NOTES

Alfred E. Roberts, co-founder in 1903, and partner, is a licensed Professional Engineer of the State of New York and is certified as a chemist by the American Bureau of Shipping. He was educated at Wesleyan and Columbia and took special courses in the Cornell Medical School. Prior to entering into partnership with Mr. Bull he had served on the technical staff of the U. S. Experiment Station, Middletown, Conn., Cellulose Products Co., and the Old Dominion Steamship Co. He is a member of the American Chemical Society, the American 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 certified as a chemist by the American Bureau of Shipping. He took his bachelor's and doctor's degrees at Cornell and carried out special research at the University of Lyons, France. Prior to joining Bull & Roberts, he did research work for the Kearfott Engineering Co., Marine Engineers. He holds membership in the American Chemical Society, the Society of Chemical Industry (British), the Society of Automotive Engineers, the Society of Naval

Architects and Marine Engineers (Associate), the Association of Consulting Chemists and Chemical Engineers, 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 at Washington in 1926. Papers written by him on research subjects have been published in *COMPTES RENDUS de L'ACADEMIE des SCIENCES (Paris)*, in the *BULLETIN de la SOCIETY CHIMIQUE de FRANCE*, and in the *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*, while articles on technical subjects have appeared in the *TRANSACTIONS OF THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS*, and in various technical periodicals.

In addition to the partners, the Bull & Roberts staff comprises chemists and chemical engineers and a licensed chief engineer of long practical sea experience. The tools available in their work include an exceptionally complete private library, which is supplemented by the resources of local public and technical society libraries. The laboratory is not only unusually well equipped for general organic and inorganic chemical work, but contains equipment for a wide range of gas and oil analyses and facilities for bacteriological and microscopic investigations.



Measuring gaseous contamination in tanks down to 0.025%

CHEMICAL PROBLEMS IN SHIP OPERATION

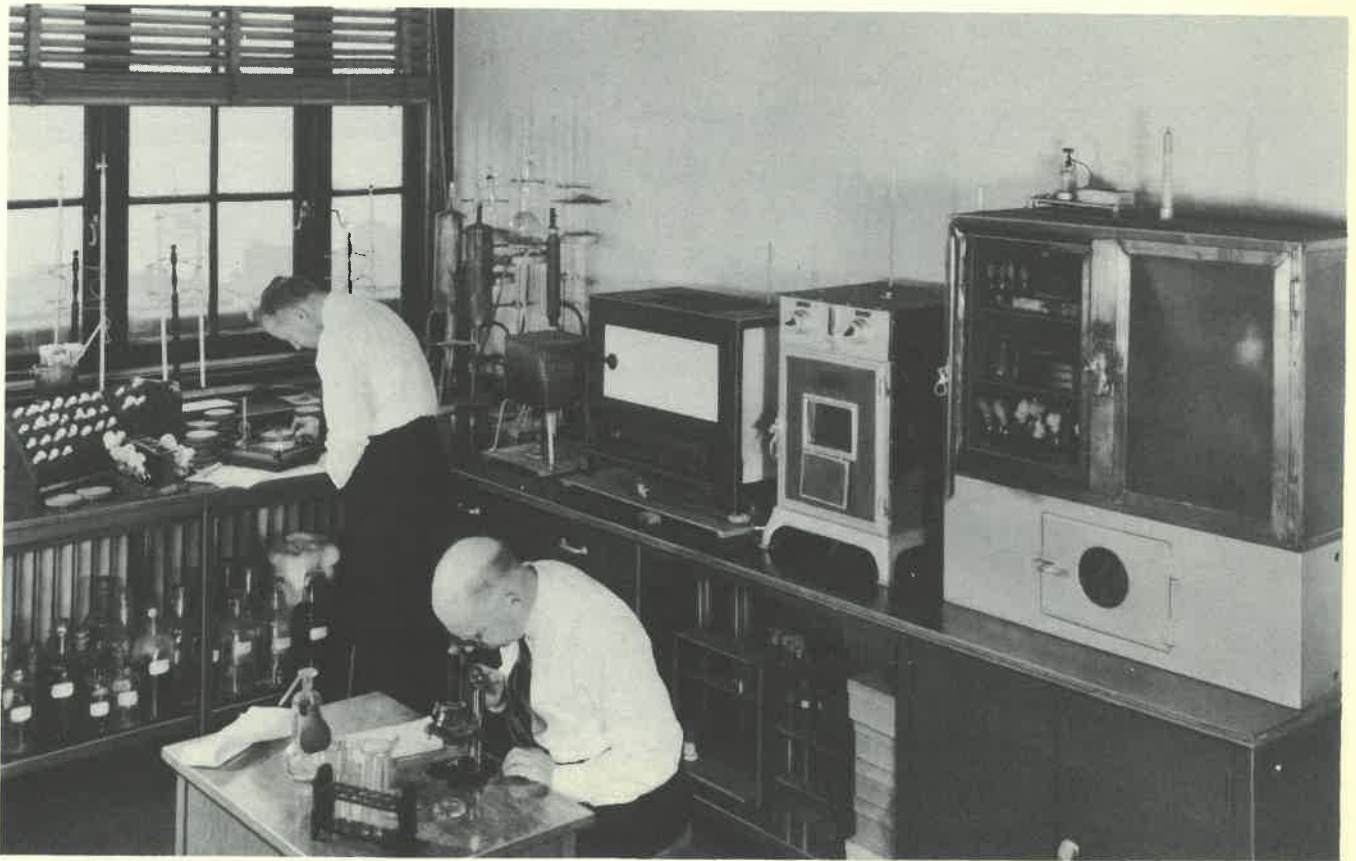
The number and variety of the chemical problems which have been submitted to the Bull & Roberts laboratory show that progressive steamship operators can make profitable use of applied chemical knowledge in many and varied ways.

CARGO STOWAGE as a chemical problem has been studied continuously since the firm was first organized. Our records contain an exceptional fund of information and experience. Transportation by sea offers special problems as compared with shipment by rail, since in land transportation time is a less important factor and shipments are isolated in cars which can be

cut out 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 us and are frequently augmented by our further study and investigation, and we have served large transatlantic and coastal fleets in a similar manner.

CONDENSATION, or "ship sweat", has been studied extensively.

REFRIGERATION, VENTILATION, AIR CONDITIONING and GAS STOWAGE develop new conditions which progressive operators find need investigation.

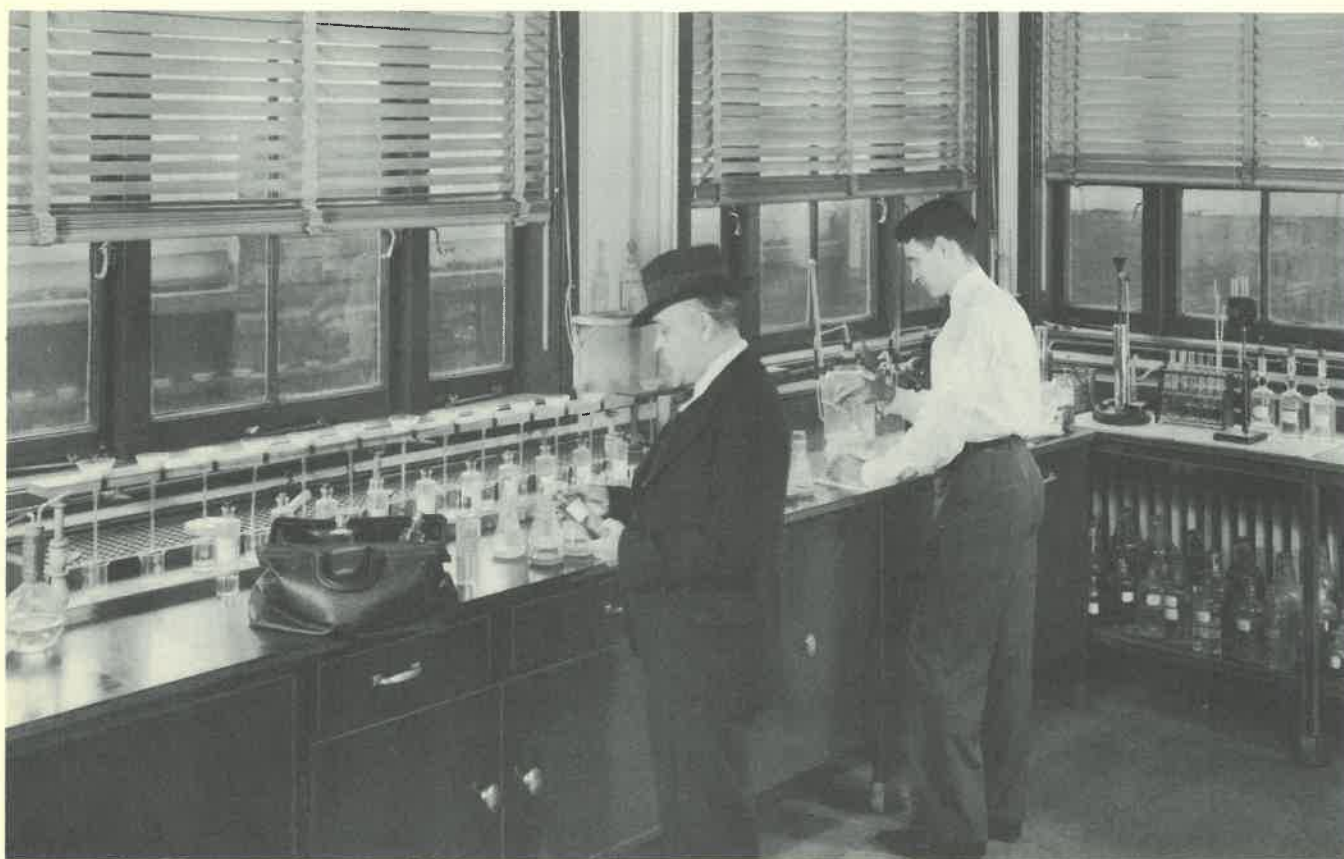


Bacteriological tests to determine potability of water, and to investigate cargo spoilage

RELATIONS WITH PASSENGERS AND CREW involve problems in the solution of which we have been of service to ship operators in a number of cases. To protect passengers' health, to further good-will and to forestall unwarranted claims, we regularly sample and examine bacteriologically all drinking water tanks on a number of vessels and report the findings. Treatment of water in order to prevent unsightly lime-film and lime-stains on high grade china in the operation of mechanical dishwashers on passenger vessels, cleaning of aluminum trays and utensils without corrosion and cleaning interior white glazed paint work without dulling its surface are other subjects upon which we have been consulted.

Fraudulent damage to personal effects has been exposed to protect the shipowner in LAW SUITS. The residues from fires in passenger quarters have been studied to discover the cause, and in some instances the findings have served as conclusive scientific evidence. Sabotage by poisoning of drinking water and food, alleged injury from contact with cleaning chemicals and from failure of mechanical equipment have been the subject of other investigations.

In the PURCHASE OF SUPPLIES subject to chemical specification and control, such as paints, cleaners, deck coverings, etc., we have assisted operators, shipbuilders and repair yards as consultants and analysts.



Service engineer of boiler water conditioning control staff bringing in check samples for test

STEAM PLANT TROUBLES ATTACKED AT THEIR SOURCE

The operating problems of the engine department often involve chemistry, or chemical control is necessary in order to assure the best results. Since 1930, as previously mentioned, Bull & Roberts has conducted a WATER CONDITIONING service based on the Hall Patents, the principles of which have been adapted to marine boiler operation, and today close to two hundred vessels are serviced with the assistance of representatives in the ports of Boston, Philadelphia, Houston and San Francisco. The operating engineers on these vessels frequently consult the Bull & Roberts staff of chemists and marine engineers concerning problems which arise and, in addition, the exceptional experience and research facilities of

the Hall Laboratories, Inc., are available when needed. Marine engineers and naval architects also, are advised concerning the layout of the water cycle with reference to the chemical coagulation and filtration of returns, or the possibility of excluding or removing air from the feed water. With the recent introduction of higher steam pressures, several yards have retained us to advise on boiler water conditioning during the builders' trials and in many cases have arranged for the treatment during trial operation to be supervised personally by a Bull & Roberts engineer.

CORROSION and its causes and elimination in the steam-water cycle have been thoroughly

investigated. The Monsanto Chemical Co. recently retained our firm to investigate the use of anhydrous sodium sulfite (Santosite) for the removal of dissolved oxygen in marine boiler operation, and, with the generous cooperation of one of our clients, who gave us permission to make tests in a vessel of its 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**. Corrosion studies have also been made in

Diesel plants, and cases of cracked pistons have been investigated.

CONDENSER PROBLEMS arising from slime, scale or corrosion have been studied and the possibilities of saving weight and space by applying the new theories of "drop-wise" condensation are at the present time under consideration.

TESTS ON FUEL AND LUBRICATING OILS are conducted in our laboratory, as also special studies of contamination of bulk cargo by traces of such oils. Occasionally oil tests have special significance, as in a recent case of sabotage in which traces of foreign matter, which had been maliciously added, were isolated and identified.



Testing petroleum products

DETECTING AND ELIMINATING OCCUPATIONAL RISKS

AIR CONDITIONS in tanks which have carried petroleum products and the spaces adjacent to them are inspected and tested before men are permitted to enter for cleaning or hot work. Special dangers associated with tanks which have

carried bulk cargo, such as molasses, latex or whale oil, have received special consideration.

The hazards of SILICOSIS and ZINC-FUME FEVER attending certain welding operations have been studied for clients.

CHEMICAL SERVICE FOR SHIP DESIGNERS AND CONSULTANTS

Problems of corrosion and questions as to the fireproof character of materials of construction, or as to treatments to be applied to them, are submitted to us by naval architects and marine engineers. We have also made specific gravity determinations of waters with extreme accuracy, in order to provide data for displacement calculations.

MARINE SURVEYORS and AVERAGE

ADJUSTORS investigating cargo damage often call upon us for chemical analyses and advice, thus supplementing their own practical observations with definite chemical evidence. Our service in this field is supplementary to, rather than competitive with, the recognized functions of surveyors and adjusters, since we do not attempt to appraise losses or to estimate salvage values and costs.

EXPERT TESTIMONY IN COURT CASES

LAWYERS IN ADMIRALTY frequently employ members of our staff as consultants and court experts. As pioneers in testing air conditions in petroleum carrying tanks, we early acquired a unique acquaintance with the health and explosion hazards of petroleum gases and vapors, and we have served as consultants and experts in some twenty important cases involving fires or explosions aboard oil-carrying vessels.

Similarly our special knowledge of the spontaneous heating and other hazards of various commodities carried as cargo has led to our frequently

being retained as chemical experts in cargo damage and personal injury suits. Our testimony on chemical subjects has also been used to define "rusting" in customs hearings and to settle disputes relating to the character of cargo covered in charter agreements.

We have served as experts in a number of PATENT SUITS, some in the marine field, such as those involving sludge pumping, others in the general field of chemical patents, as for example the Belais white gold and Ellis paint remover cases.

FEEES AND CHARGES

Definitely established fees are quoted for certain recognized tests and analyses. The inspecting, testing and certifying of tanks with respect to air conditions therein is handled in this manner. For boiler water service, standard fees are charged, determined by the size and operation of the installation, but independent of the amount of chemicals used in treatment.

Most of the other problems which are presented to us, however, involve special study and investigation. Generally in such cases the most desirable plan is for the client, after consultation with us as to the nature of the problem and the time probably needed for its solution, to appropriate a fixed sum. If the work is extensive, prog-

ress reports can be submitted after each definite step, so that the client may stop or extend the investigation as the results, in his opinion, may warrant. Charges are based upon the character of the investigation and the training and experience required of the men by the work.

Instead of charging for each test or investigation, the firm may be retained as consultants on a quarterly or yearly fee, to handle such work of a specified nature as the client may present. This arrangement has been found by several steamship operators to work very satisfactorily in dealing with questions involving cargo stowage, damage claims and the purchase of supplies which are subject to chemical specification.