Annual Report of the Chief of the Bureau of Steam Engineering of the Navy Department, 1902. Washington, D. C., Gov't Print. 1902. 1 vol. 8vo. Pp. 192; many plates, illustrations and tables of data.

Rear-Admiral Melville, over whose signature this report appears, as for a number of years past, presents to the Secretary of the Navy a statement of the progress of his department of the navy during the preceding official year which, as usual, gives an admirable exposition of the extent to which scientific method and scientific processes and the apparatus of applied science find place in that now complicated and implicated machine, the modern war-vessel.

The inspection and test of materials for the machinery of the navy have come to be so large and important a division of this work that two laboratories, one at Bethlehem, the other at Pittsburg, are occupied constantly in the chemical and physical analysis and tests required by the bureau. The young officers of the navy are given systematic training in this work. Sixty millions of pounds of steel were inspected and tested last year for use in construction.

A large laboratory for engineering is called for, a plan already endorsed favorably by the Department and by the naval committees of Congress. Such an organization has been established by the German Admiralty at Charlottenburg, and it has been found an important auxiliary, both as an aid in work in progress and as affording facilities for important researches in the applied sciences auxiliary to the work of the naval establishment. Experience shows that only systematic and scientifically expert work in investigation can be relied upon to insure the government against serious errors and large wastes and in maintenance of the navy in a maximum state of efficiency. 'The time has come when the Naval Academy should be primarily an engineering school,' and particularly as post-graduate work is coming to be more and more important. The Director of the Laboratory is expected to be one of the members of the old Naval Engineer Corps, several of whom have had large experience, both as practitioners and as members of faculties in technological institutions and in universities sustaining professional engineering schools. Investigations are already imperative regarding utilization of liquid fuels, the availability of the steam-turbine, the form and size of propellers, the special adaptations of electric energy and of electric machinery to naval purposes, the use of the storage battery, the corrosion of boiler- and condenser-tubes, the best forms of water-tube boilers, the use of systems of transmission of energy by use of compressed air, the balancing of marine engines, the adaptation of the gas-engine to marine work, and a multitude of minor matters.

A post-graduate course of instruction at the Naval Academy is urged as an advance of steadily and rapidly increasing importance, mainly in scientific and professional engineering departments. The naval 'War College' and the army schools of artillery and of other branches of the service are examples of already organized courses of this nature. The extension of the system is as important for the navy as has proved to be its long-established operation in civil professional schools for the industries of the nation.

A considerable amount of experimental investigation has been carried on by the Bureau during the past official year, and, in the study of the problem of adaptation of the water-tube boiler to naval purposes and of that of employing oil as fuel, especially interesting and fruitful work has been done. The water-tube boiler is evidently needed as a construction peculiarly well fitted for war-vessels, because of its comparatively small volume and weight for a given power, its safety under the high steam-pressures now coming into use and its fitness for use under emergency conditions of naval conflicts. Several forms are now employed and others are being tested as to safety, durability and reliability, with a view to the enlargement of the limitations now hampering choice. The use of fuel-oils is found to be entirely practicable and economical for general purpose, but there still remains a question whether the structural dif-

ficulties in the application of the system to the war-vessel may not be fatal to employment there.

Incidentally, a fact in sociology and economics comes into view. It was found impracticable to carry on work of research with men employed under the conditions obtaining in civil life and enlisted men were necessarily put on the work. Only men who would obey orders, work when required by the exigencies of the service and faithfully attend to duty, as in army and navy, could be relied upon. The trade-union rules were found to be fatal to efficiency, and the inference seems to have been plain that, in the industrial army as in the public service, effectiveness is not promoted where the rank and file take command.

The workings of the 'personnel bill' are commented upon with the conclusion that Mr. Roosevelt's bill is correct in plan and in principle, but that it has not been executed with either zeal or faithfulness, and that the efficiency of a navy dependent upon technical knowledge and practical experience, conjoined with high scientific attainments, is being seriously jeopardized by this disloyalty to law and to the service. Junior officers, it is stated, are not given either the scientific training or the professional training as mechanical engineers which are essential to the efficient operation of the 'engineer's war-engine,' as the writer has called the modern armored vessel, with its interior crowded with steam-engines and other machinery and electrical apparatus. Without extensive practical experience and a sound scientific education high efficiency cannot be hoped for, and the safety of the nation is too serious a matter to be subject to such risks as are sure to follow lack of zeal or of training in the management of so tremendous an engine of war as the armor-clad or cruiser. An 'emphatic general order' and rigid enforcement is demanded as essential, and immediately.

National ascendency on the seas and permanent safety against foreign aggression can only be insured by a sufficient and an efficient personnel as well as an amply powerful fleet. The navy of the United States, like that of Great Britain, needs men more than ships, to-day, and every proper means should be resorted to to make the service attractive and to secure competent officers, particularly in its departments of applied science.

Admiral Melville retires presently and this is his last official report. It is wise, frank and emphatic in its discussions of the requirements of a 'new navy' in the twentieth century. The influence of this testimony should be powerful and effective. The Chief of Bureau goes out of office leaving behind him a magnificent record of accomplishment, not only in the building up of the navy, but in achievements which, in variety as in importance, have probably never been rivaled.

R. H. THURSTON.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Physical Chemistry, October.—'Solubility, Electrolytic Conductivity and Chemical Action in Liquid Hydrocyanic Acid,' by Louis Kahlenberg and Herman Schlundt. This is a continuation of the researches of the authors on solutions with other solvents than water. Lists of substances soluble and insoluble in liquid hydrocyanic acid are given. In the case of some solutes the electrical conductivity is greater than in water, while in other cases, notably with the acids, it is less. 'The Expansion of a Gas into a Vacuum and the Kinetic Theory of Gases,' by Peter Fireman. An abstract of this paper has already appeared in this journal (SCIENCE, N. S., XVI., 285). 'On the Displacement of Equilibrium,' by Paul Saurel. 'On the Critical State of a One-Component System,' by Paul Saurel.

SOCIETIES AND ACADEMIES.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

AT the 557th meeting of the Society, held on November 8, Mr. C. G. Abbot, of the Astrophysical Observatory, described 'a device to obtain time signals of any desired interval from a clock work of uniform motion.' A chronograph with the attachment was exhibited. Signals at equal intervals of from one half second up to ninety seconds could be obtained. An adjustment was provided by means of which the whole series