means of compressed air acting upon the surface of the water in the tank. The three following experiments are supposed to be tried, so that at the beginning of each surrounding conditions are precisely alike, viz., pressure, temperature, quantity of heat or heat energy in the boiler, quantity of water delivered, etc. No heat is to be added to nor taken away from the boiler except as mentioned; the air compressor is to be run by some entirely separate source of energy, as a water power. The loss of heat by radiation is to be ignored. A cubic foot of feed water is to be delivered into the steam space or above the water line, and in the form of a jet or spray, in order to condense as much steam as possible. In this case the feed water absorbs the heat of the condensing steam. The temperature and pressure would change, but not a particle of heat or heat energy would be lost or used in any sense of the word. Heat is a source of energy solely on account of its position in the boiler, and under the conditions of the experiment the only possible loss or escape for the heat is by radiation, and this we are to ignore. We therefore have in the boiler, after the experiment, precisely the same amount of heat energy that we had before the experiment began; in other words, we have the same amount of available energy. In a water power, in order to derive energy therefrom, the water must be allowed to pass through the wheel into the tail race, and in this position the water is absolutely void of energy in so far as the water power is concerned. The boiler is the pond, so to speak, for heat, and the tail race must be some place outside of the boiler; for we could no more have the tail race inside of the boiler than we could have the tail race of a water power in the pond itself. The amount of energy that must be expended in order to force a cubic foot of feed water into a boiler against a pressure of 100 pounds per square inch is about $144 \times 100 \times 1 = 14{,}400$ foot pounds. The same amount of feed water is to be delivered to the boiler, but this time it is to enter below the water line. It is clear that the final results would be the same as described above. In this case the water is to be delivered through an injector which is to be in operation on its own account, and the delivery pipe from the tank is to be the suction pipe of the injector. Now, the injector, according to all the best authorities, returns all the heat used with the feed back to the boiler, and it is a fact that cannot be disputed, so that the final results as to temperature, available energy, etc., are precisely the same as in experiments 1 and 2; in other words, the injector has used neither heat nor heat energy. The mere fact that the steam in passing through the injector is condensed cuts no figure, or no more than in the first case. It is heat and not steam that is a source of energy, and the fact that it remains in the boiler will prove to anyone in his right mind that it is not used in any sense of the word in any of the above cases. In the latter case no energy is required to run the air compressor, since atmospheric pressure is sufficient, if allowed to press upon the surface of the water in the tank. It plainly follows from the above that since the injector uses no heat, it is not an instrument in which heat is used as a source of energy; or in other words, the steam or heat passing through an injector furnishes no energy whatever. In this case there is work done, and none of the medium supposed to be the source of energy is used or lost. Were a perpetual motion possible, it would do the same thing. Why is it that since the injector uses neither heat, heat units, nor heat energy, and therefore cannot assist the air compressor, there is such difference in the amount of energy required to force a cubic foot of water into the boiler in the above cases? A. We find no difference in the amount of work or energy to force a cubic foot of water into a boiler under pressure, whether it is done by the boiler through an injector, or by some outside power. Heat is a potential form of energy, and its conservation in this case is of two methods of utilizing it. By the injector the boiler furnishes the total amount of heat energy to raise the cubic foot of water to the boiler temperature, and has to expend exactly the same amount of energy to heat the cubic foot of cold water pumped in by other means. The assertion that the air compressor uses no energy is an error; air pressure is potential energy in the tank, produced by the energy expended in the air compressor.

(9314) W. J. S. asks: In G. E. Bonney's "Induction Coils," on page 228, it says the secondary wire best adapted for this coil is No. 36 single silk-covered. Does this mean Birmingham wire gage or Brown & Sharpe? I ask you this to make sure that I will be right. A. Bonney's "Induction Coils" is an English book printed in London. There is no reference to the B. & S. wire gage in it. All sizes are to be understood as those of the Birmingham wire gage.

(9315) C. G. McC. asks: Will you kindly give me formulas for the manufacture of dry powder fire extinguisher, at the same time kindly indicating what you consider the most reliable? A. The following formula is copied from our Cyclopedia of Receipts, Notes, and Queries: Common salt, 60 parts; sal-ammoniac 60 parts; sodium bicarbonate, 80 parts. Sal-ammoniac, 100 parts; sodium sulphate, 60 parts, sodium bicarbonate, 40 parts.

NEW BOOKS, ETC.

DISEASES OF A GASOLENE AUTOMOBILE AND HOW TO CURE THEM. By A. L. Dyke and G. P. Dorris. St. Louis: A. L. Dyke Automobile Supply Company. 1903. 12mo. Pp. 232. Price $1.50.

This is the most practical book we have seen on this subject. It will save time, temper, and money. Theory does not enter into the present volume, but the information conveyed is of just such a nature as will prove of value to a man who owns or repairs a machine. A thorough knowledge of its contents would result in far fewer strandings by the roadside. It would not be a bad idea to carry a copy of this book in the tool box. The diagrams are particularly clear. Tires, transmission gear, and batteries also come in for a fair share of attention. Automobilists will read this book with pleasure.

THE NEW INTERNATIONAL ENCYCLOPÆDIA. Edited by Daniel Coit Gilman, LL.D., Harry Thurston Peck, Ph.D., L.H.D., and Frank Moore Colby, M.A. New York: Dodd, Mead & Co. 1903. Vol. xi. 4to. Pp. 1050.

The present volume includes "Larrey to Maximianus II." The quality of the work is very sustained—rather a difficult thing to do in a book of this kind. The same admirable treatment of scientific matters is continued. Many of the articles are very interesting. Thus we find under "Leitmotiv" that it applies to the musical phrases which constitute the basic material out of which Wagner constructed his music-dramas. Then follow musical examples and references to literature. Under "Libraries" we find an able discussion of the history of libraries, types of libraries; then buildings, reading rooms, book shelves, furniture and fittings, library administration, are taken up. This is followed by classification, library schools, library associations and clubs, a bibliography, and an excellent table of library statistics. Our own Congressional Library ranks fifth. It is by its thoroughness that this book commends itself to the user.

SOLAR HEAT. Its Practical Applications. By Charles Henry Pope, A.B. Boston: Published by the author. 1903. 16mo. Pp. 160. Price $1.

Many illustrations are reprinted from the SCIENTIFIC AMERICAN. There is little question that the time will come when solar heat will be utilized to a much larger extent than has ever been done in the tentative experiments which have shown the possibilities of the subject. The author has conducted a number of experiments on solar heat, and in the present treatise he endeavors to trace the history of attempts and successes in the utilization of solar heat.

BUILDING SUPERINTENDENCE. By T. Clark. New York: The Macmillan Company. 1903. 8vo. Pp. 306. Price $3.

This is not a treatise on architectural art or the science of construction, but a simple exposition of the ordinary practice of building in this country, with suggestions for supervising such work efficiently. It is a book which we can specially recommend to the young architect, as well as to those persons not of the profession who are occasionally called upon to direct building operations. It is written in simple language, which can be understood by all.

TASCHENBUCH DER KRIEGSFLOTTEN. V. Jahrg. 1904. Herausgegeben von Kapitän-Leutnant a. D. B. Weyer. München: J. F. Lehmann's Verlag. $1.

This new volume of Capt. Weyer's is, if anything, better than the book which we had the pleasure of reviewing twelve months ago. How well it has answered the purpose for which it was prepared is shown by the fact that the Austrian marine almanac, at one time the only reference book in Germany which officers of the imperial navy had at their command, has been completely displaced. Chief among the subjects that find a place in the book may be mentioned complete lists of the fighting ships of all nations, pictures of the various types of ships of all nations, comparisons of fighting strengths, navy budgets, the shipbuilding programmes of most countries, naval ordnance, organization of navies. Constant reference to last year's volume convinces us that Capt. Weyer's annual is in every way a most accurate reference volume. We have no doubt that this year's work is no less precise.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending February 2, 1904,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents]