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## LIQUID AIR PROMOTION AGAIN.

We had occasion some months ago to refer to the unblushing attempts which were being made by so-called Liquid Air Companies to entice the public into the purchase of their stock. The storm of criticism which was leveled at these concerns by the technical press of the country caused the promoters to take to cover, with the welcome result that for the past few months the columns of the daily press have failed to be disfigured with the familiar liquid air advertisements.

It is evident, however, that "the snake was scotched, not killed," and that liquid air victims are as easily caught as liquid air profits are readily realized by the promoters. Not content with the Boston experience, the liquid air conspiracy has again taken the field, this time choosing New York city as the center of its operations. It is evident that the organizers of the latest "Company" are satisfied that the name of "Tripler" is one to conjure with in drawing the dollars from the pockets of the unsuspecting and all-too-little-informed investor. We have never hesitated to give Mr. Tripler every credit for his perseverance and mechanical ingenuity, and as the first gentleman to manufacture liquid air in commercial quantities in this country he deserves all praise. But when he lends his name to such a ridiculous and impossible statement of the uses to which liquid air may be put as appears in the latest advertisements of the company which bears his name, he is evidently tearing down with his left hand the reputation he has built up with his right.

We are compelled to take up this subject in our columns in order to answer the large number of correspondents who have written to this office asking for advice before they subscribe to the stock of a concern so full of alluring promises of profit. It is our conviction that liquid air has never made a dollar for its investors along the lines which are indicated in the advertisements of such companies as the one in question. We recommend any of our readers who are contemplating the purchase of liquid air stock to read carefully the contribution, on the accompanying page, from Mr. Hudson Maxim, who by the way, is quoted in the prospectus as one of the consulting engineers of the Tripler Liquid Air Company. Of the many claims made, there is one which is alone sufficient to stamp the whole scheme as being either of a very dubious character, or based upon a complete ignorance of the elementary laws of physics. In answer to the claim that "the use of liquid air in the generation of power on land and sea will reduce the cost to one-half of that now paid," Mr. Maxim shows that the "Teutonic" would have to carry for a seven-days' voyage more than enough liquid air to float the vessel itself, and that the cost for a single trip across the ocean would be a mere nominal sum of \$174,560, this being the amount that it would cost to save about a half of the coal bill.

While it may be possible to find a commercial use for liquid air in the field of explosives along the lines indicated by Mr. Maxim, it would require a veritable boom in the sale of liquid-air cartridges to pay for the trip of one liquid-air-propelled "Teutonic." While it does not come within our province to advise correspondents who have written us whether they should or should not invest in liquid air companies, it is strictly within our province to warn them that many of the claims that are made by these companies are impossible and ridiculous.

## THE CONSTRUCTION OF WARSHIPS AT GOVERNMENT NAVY YARDS.

A hearing on the question as to whether it is expedient that warships should be constructed at the Brooklyn Navy Yard is now being held before the House Committee on Naval Affairs. An influential committee of Brooklyn citizens, in which is included the former master machinist of the Brooklyn Navy Yard, is presenting a very strong case in favor of such construction, and there is no denying that the proposal thus put forward of the highest importance, touching as it does the whole question of the future growth and efficiency

of our navy. Chief Naval Constructor Hichborn is favorable to the construction of naval vessels in the Government's yards, and in this he is earnestly seconded by Naval Constructor Bowles, who for many years past has been an earnest advocate of this policy. Mr. Bowles has had personal supervision of the building of some of our most important ships, and is particularly well qualified to judge of the somewhat complex question as to whether the Government yards can compete successfully with the well-equipped establishments at Philadelphia, Newport News, and San Francisco.

Before presenting the arguments in favor of the construction of vessels in the Government's yards, it is necessary to consider the rather disconcerting fact that the warships already constructed at the navy yards have cost considerable more than those which were built by private firms. If we take the two battleships, "Texas" and "Indiana," we find that the former which was constructed at the Norfolk navy yard, cost per ton of finished vessel, \$819.97, whereas the "Indiana," built by the Cramps, if we include a claim for damages due to delay in supply of armor of \$483,000, cost \$724 per ton. The increased cost of the government-built vessel is explained by the abnormal conditions under which she was constructed, conditions which were so adverse as to render it surprising, not that the difference in cost was so great, but that it was not greater. In the first place, when, in 1889, the "Texas" was ordered built at Norfolk, that navy yard was practically without tools to do the work. Not a single vessel had been constructed there for twenty-five years, and at no time in its history had a ship been built there of iron or steel. The existing plant was merely such as was necessary for the construction of wooden vessels, and anyone who has visited a shipbuilding yard of the latter type will understand how serious a task confronted the naval constructor who was told to go ahead and build an intricate modern battleship in such a place, and with such a "plentiful lack" of facilities. The problem was not merely to build a ship, but to build the necessary tools as well—a complication which enormously increased the cost of the vessel.

In the second place, to these technical difficulties were added others of a political nature. On the day on which the construction of the "Texas" was begun, the naval constructor in charge received notice that eleven new foremen had been appointed on the work and it was found that not one of these political heelers had the slightest knowledge of the art of shipbuilding. If matters were unfavorable at Norfolk, they were even worse at the Brooklyn yard, where in 1888, the construction of the "Maine" was commenced; for it was a hotbed of political corruption, and was even more devoid than Norfolk of facilities for the construction of a modern warship. At both these yards the creation of a shipbuilding plant and the education of a large body of mechanics and foremen, coupled with the exasperating delays of a cumbersome system of red tape in the administration of the yards, was answerable for costly delays in the completion of the two ships, seven years intervening in the case of the "Maine," from the date of laying her keel to the date of her first commission. In view of these facts it is surprising that the government-built vessels should have come as close in cost as they did to the ships built in private and well-equipped yards which were entirely free from the encumbrances above noted.

It is the unanimous opinion of our corps of naval constructors that if the yards at Brooklyn, Norfolk, and Mare Island always had one or more warships upon the stocks, it would be possible to turn them out at the same, and probably at somewhat less cost, than that of the ships which are built by contract in private yards. Granting then that the ships could be turned out merely at the same cost, the question arises as to what advantages are to be gained by construction in the Government's yards? The following are the chief advantages among many:

Firstly.—At present the yards are occupied merely with repairs and refitting. As this work is intermittent, the force at the yards is constantly changing, and during the slack seasons more or less of the costly plant is lying idle. To prevent this and to retain the services of skilled operators there is an instinctive tendency to prolong repairs and tide over to a busier season. If there were always two or three ships on the stocks, the whole plant would be regularly employed. It would then be possible to maintain a thoroughly efficient and permanent organization at the yard with considerable resulting economy. At the Brooklyn yard, for instance, it is possible to employ at present 4,000 men in the construction department alone, and with comparatively slight addition to the plant it would be possible to employ 6,000 men.

Secondly.—The construction of warships at the yards would offer a valuable opportunity for training a corps of efficient inspectors for overseeing the construction of government vessels that are built by contract. There is a great demand for young men who are competent to oversee contract work, and they would easily pick up in the government yards the necessary experience.

Thirdly.—The high class of work done in the government yards would act favorably in competition with private work by setting a high standard of workmanship. While it is true that in some of the government-built vessels, as in those constructed by private contract, there have been defects of design, there has never been any complaint of faulty workmanship in the government-built vessels, all of which has proved to be of first-class and thoroughly durable character.

Fourthly.—While it is the belief of naval constructors that ships could be built at least as cheaply under existing conditions, they are satisfied that if badly needed reforms were made in the cumbersome and expensive methods of administration of the yards, it would be possible to effect a still further and considerable reduction in the cost per ton of navy-built ships. One of the most expensive, and certainly the most exasperating of the present red-tape methods, is the regulation which requires that bids shall be asked for the supply of any material, even in small quantities, that may be required at the navy yards. This results in frequent and very costly interruptions and delays in the work. It is a well-known fact that other things being equal the cost of a ship decreases in the exact ratio of the speed with which it can be built; in other words that it pays to "rush" the construction. The quickest built ship will be the cheapest.

Fifthly.—That navy yard construction of warships would have distinct advantages in economy over that carried on in private yards, is due to the fact that there would be no charges for depreciation or interest on the money invested, and that there would be no charges for administration, professional oversight, drafting and clerical work, the expenses of which are carried by other appropriations. Again, the navy yards do not have to reckon in profits, and it would not be necessary for them to add the large percentage which a constructor must include his total estimate of cost.

Sixthly.—By keeping in check any tendency for a combination among the constructors to place their bids at unreasonable figures, the continual turning out of government-built ships, at a reasonable cost per ton, would constitute an excellent safeguard of the interests of the nation.

Lastly, if the proposed measure is carried out, not merely with regard to the Brooklyn yard, but to the others mentioned, the total warship-building capacity would be doubled at a stroke—a consideration which of itself should be sufficient to induce Congress to take favorable action on the question. The enormous increase which is being made in the navies of the Continental powers, whose interests in the great commercial war of the day are bound to come into violent conflict with our own, should be a warning to us to stand ready to double, if necessary, our present rate of output of war vessels. At a comparatively slight expense it would be possible to add the navy yards at Brooklyn, Norfolk and Mare Island to our all too small list of available warship-building yards.

## THE WORK OF THE DIVISION OF CHEMISTRY OF THE DEPARTMENT OF AGRICULTURE.

The work of the Division of Chemistry of the Department of Agriculture, which is under the direction of Dr. H. W. Wiley, is of great importance. The old quarters of the division have been found to be totally inadequate for its increasing labors, the old building was vacated and temporary quarters were found for the force, and much of the material and apparatus as was necessary for the work was transferred to Columbian University during the summer, and the laboratory work was even carried on after the regular laboratories had to be turned over to the students. In spite of the inadequate laboratory facilities for and delay in getting into the new building, a great deal of work was done during the fiscal year ending January 30, 1899. The association known as the Association of Official Agricultural Chemists has been in existence for about fifteen years and is composed primarily of chemists of agricultural experiment stations and agricultural colleges and it also admits to memberships all chemists employed in the control of food products by any State or municipality. The meetings of the association are held under the auspices of the Department of Agriculture and its work has thus assumed a degree of authority which may be regarded as official. The methods of analysis adopted by this association have been legalized by the courts in various parts of the country. The Division of Chemistry co-operates with the association in its valuable work. The reports of the association are issued as bulletins of the Division of Chemistry. The chief work of this kind which is accomplished during the past year was the revision of the entire methods of analyses of the association on all of its subjects, and this bulletin has been recognized as an authority in all parts of the world, and its contents has been reprinted in most of the languages of science. The effect of this organized effort on the part of agricultural chemists has been so pronounced as to induce other nations to follow the example which this country has set. It is to be hoped that Congress will see its way clear to acknowledge the association to be an official advisor of the government, or by recognizing it