American Merchant Marine

An Expert Analysis of an Important Economic Problem

By Francis T. Bowles

THE writer of the following article needs no introduction to the readers of the SCIENTIFIC AMERICAN. He will be recognized as formerly, for several years, the Chief Constructor of the United States Navy. Recently, in the face of close competition from the leading yards of Great Britain and the Continent, he was successful in securing to America a \$22,000,000 contract for two Argentine battleships. His article is a lucid and highly authoritative contribution to a discussion of supreme national importance.—EDITOR.

It has been officially estimated that citizens of the United States pay for the transportation of their over-sea commerce, including freight, passenger fares and mails, the sum of \$229,100,000 annually. This estimate is on a low basis of freight, and it is believed that the actual amount paid is nearer \$300,000,000. Practically the whole of this business is in the hands of foreigners, and this expenditure is paid to them and must be considered as an item against the United States in the balance of trade, on account of which we must export products of the United States in payment.

Sound Economic Reasons for Protection.

There is, therefore, entirely apart from the military value of sea power, a substantial economic reason why the United States should become a carrying nation. The experience of sixty years of free trade in ocean transportation has conclusively shown that it is not profitable to American capital under present conditions and requires protection or some form of government aid or subsidy. A comprehensive system of such protection, which will admit of development of either cargo or mail steamers as the necessities of trade require, should include:

First. Mail compensation to steamers such as is provided and now authorized under the ocean mail act of 1891.

Second. Remission of the head tax of \$4 on immigrants arriving in American vessels, which would be a substantial advantage to American mail steamers.

Third. A discriminating duty applicable to vessels of all types, but especially adapted to the development of cargo vessels under individual ownership. A method of applying a discriminating duty which would not disturb the free list, and would not appreciably affect the market of value of imported merchandise or materials would be to enact a law providing that on all goods imported in American vessels on which the *ad valorem* duty exceeds 41 per cent, there would be a reduction of 5 per cent, and on all goods on which the *ad valorem* is 41 per cent or less, or which are non-dutiable, the importer should receive an importer's certificate available only for the payment of duties at the Custom House and equal in value to 2.05 per cent of the value of the goods so imported.

The average rate of duty under the present tariff is understood to be 41 per cent *ad valorem*, and 2.05 is 5 per cent of 41. These figures may not be exact, but they are intended to be sufficient to create a demand for American cargo boats in the foreign trade, by enabling the shipper to pay such vessels a higher rate of freight on homeward voyages, and enough higher to overcome the handicap of higher cost of vessels and operation under the American flag. They are probably sufficient for the purpose on all except some low-priced bulky cargoes.

On outward voyages the American would be obliged to take the competitive rate.

If, then, all our imports were carried in American vessels and half the goods were free or non-dutiable, this proposed law would be equivalent to a 10 per cent reduction in the tariff.

The total value of imports in the United States for the year ending July, 1910, was \$1,562,000,000. If, under the operation of the laws proposed above, citizens of the United States should acquire the carrying of, say, \$500,000,000 worth, or about one-third of this amount, in American vessels, it would probably be necessary to acquire under the American flag about 500 additional vessels, of various types, which might have the average tonnage of the foreign steam vessels entering our Atlantic ports, or about 3,000 gross tons. It would probably take ten years to build these vessels at a cost of about \$200,000,000 if built in the United States. They would employ on board about 40,000 men, and would be earning from \$80,000,000 to \$100,000,000 gross annually. The total cost for the annual charge on the United States at that time under the laws proposed would be approximately \$10,000,000

a year, and during the ten years in which this business was being acquired might have amounted to \$50,000,000.

This, in a broad way, is the problem which we are considering in the acquisition of a merchant marine in the foreign trade.

The Free-ship Fallacy.

It has been proposed to build up the merchant marine in the foreign trade in the hands of American citizens by permitting them to buy ships built by foreigners and place them under the American flag, and that is a question which should be faced and discussed on its merits. At present the law forbids the use of foreign-built vessels in the coasting trade, and American citizens are not permitted to register foreign-built vessels for the foreign trade, though they may own and operate them under a foreign flag. Treaties of commerce and navigation and United States laws provide that there shall be no discriminating taxes or dues in our ports on foreign vessels other than those imposed on American vessels in the same trade. Therefore, free trade exists in ocean transportation. It is now proposed as a means of developing American shipping to extend free trade to the purchase of vessels.

We know from sixty years experience the result of free trade in ocean transportation, and that since it was established our shipping in the foreign trade has continued to diminish until it is now insignificant in amount, carrying only 8 per cent of our imports and exports. This should lead us to consider with some considerable reluctance the extension of a policy which has already produced such results.

Merchant vessels can be built in England and Germany for prices 40 to 50 per cent less than United States prices, because the cost of labor, materials and manufactured articles going to make up the cost of a United States vessel is higher. The cost of the average merchant vessel to the shipbuilder is nearly equally divided between labor and materials; the materials including a large proportion of manufactured articles, pumps, machinery, electrical and plumbing supplies, all of which are protected by the tariff. The shipbuilder's labor costs are 70 to 100 per cent greater than the foreigners. The material costs are 15 to 20 per cent greater. The tariff permits importation free of duty of shipbuilding materials for vessels in the foreign trade and limits such vessels to not more than two months' service annually in the coastwise trade. This privilege has been used by the shipbuilders and American owners in very few instances.

Why We can Build Battleships Cheaper Than Abroad.

Under present conditions of the amount of shipbuilding available it cannot be anticipated that this relation of foreign to local cost will be materially changed in the next ten years. These facts are not affected by the ability of the United States to compete with foreigners in the building of battleships, that being so in spite of the fact that the American shipbuilder's costs on the hull of the vessel are greater than his foreign competitor; but this handicap is overcome by the ability of the American armor and gun manufacturers, who supply half of the cost of the vessel, but undersell their foreign competitors. It is well known that the cost of operation of steam vessels is lower under foreign flags than under the American, and testimony given before the Merchant Marine Commission was to the effect that foreign costs averaged 30 per cent less than American costs, principally due to less cost of wages. There have been some notable examples of transfer of vessels in the foreign trade from American to foreign flags to take advantage of these conditions.

Foreign-built Ships Would Cost More to Operate.

It is certain that foreign-built vessels cannot be as profitably operated under the American as under foreign flags in the general foreign trade. There are probably some special trades operating to Central America, the West Indies or British North America, in which the conditions of operation would be necessarily local, and in which the lower first cost of a foreign vessel would be an advantage. If foreign vessels were so employed under the American flag it would be simply a special privilege; it would not create new business nor reduce the cost of transporta-

tion; it would not create an American merchant marine.

It is probable that free-trade enthusiasts will not be patient enough to verify these statements, and will favor the treatment of the merchant marine to a prescription of blood-letting by means of a free-ship bill, to see how it works. A free-ship bill would give special privilege to a few short routes. It would give an apparent increase in tonnage in the foreign trade, and would ultimately result in the admission of foreign built vessels to the coast trade and thereby in the inevitable destruction of American shipbuilding and consequently of any real American shipping. This industry, which is now menaced by free trade, has produced the shipping of the United States, which on June 30th, 1910, including all kinds of documented shipping, comprised 25,740 vessels of 7,508,082 tons.

Merchant Marine as Naval Auxiliary.

If we suppose for a moment that the military advantages of sea power made it necessary for the United States to have in the foreign trade a merchant marine of vessels adequate for carrying coal, provisions, troops and to serve as fleet auxiliaries, and that the question was simply how to produce that merchant marine as economically and as quickly as possible without regard to its effect upon American citizens engaged in shipbuilding and its allied occupations, undoubtedly the quickest and cheapest way would be to admit foreign-built vessels to American register and to give them sufficient of the advantages of mail compensation and discriminating taxes to overcome the disadvantage of operation under the American flag. By this means, in acquiring the 500 vessels necessary to carry one-third of our imports under the American flag, we should save possibly \$75,000,000 of the \$200,000,000 necessary to produce those ships in American shipyards and we could reduce by nearly one-half the aid which we would be obliged to give to American-built vessels. By this means we would have answered the military necessity for a fleet of auxiliaries at the least possible expense. But we would not have placed the merchant marine on a sound and continuing basis for development. We would not have accomplished the economic advantage of an actual American merchant marine, nor would we have given our citizens the opportunity to develop and organize the business of shipbuilding and ship owning. On the other hand, we would have simply hired foreigners to perform this work in a slightly more expensive manner than they are performing it now, for a military purpose which cannot commend itself as a necessity.

Why Kill Our Shipbuilding by Free Ships?

A ship is probably the most elaborate and complex product, and includes within itself the application of the best skill in more mechanical trades than any other single construction which the world uses. Therefore, it is difficult to understand why the art of shipbuilding should be selected for extinction by the application of free trade, when it is probably intended to permit other manufacturing industries to continue to live. It might be fair to treat ships on the same tariff theory on which we are considering other manufactures, namely, to apply an import duty based upon the difference in cost and regulate it from time to time as required. At the present time it would probably be necessary to establish a duty of about \$40 a gross ton on bulk cargo steamers and \$60 a gross ton on combined freight and passenger steamers. The application of duty per ton, which is a recognized and established system of measurement throughout the world, would prevent the dumping in this country of second-hand, worn-out vessels, and it is desirable from that point of view.

The experience of foreign governments with a free-ship policy is instructive. Great Britain is often cited as a bright and shining example. But Great Britain did not adopt free ships until 1849, or, in effect, until 1854, when iron shipbuilding, thanks to large mail subsidies, had become so strongly established in England and Scotland that these British yards could defy the world. Neither then or at any subsequent time did British merchants buy largely of foreign-built ships, except in the four years of our civil war, when the Anglo-Confederate privateers drove 750,000 tons of American sail craft under foreign colors for protection.

France, in 1881, after a long trial of free ships, found herself with a smaller tonnage—914,000—than

it had in 1870—1,072,000 tons. Meanwhile French shipbuilding had been so nearly destroyed that it was difficult to maintain a decent war fleet. This experience drove France to a subsidy policy, under which its merchant shipping has increased from 914,000 to 1,900,000 tons. Germany, while relying on free ships alone, increased its tonnage only from 1,098,000 in 1873 to 1,243,000 in 1881. Ships were bought in England long enough for German engineers to learn the art by access to the best plants, and then, under the leadership of Bismarck, a vigorous policy of imperial protectionism was embarked on in the form of mail subventions and other aids to native shipbuilding, with the result that German tonnage grew swiftly from 1,243,000 to 4,307,000 now. Norway is often pictured as another bright example of free ships; but Norwegian tonnage since 1881 has not increased so rapidly as French tonnage, and Norway of late years has been applying a subsidy policy of its own. Japan tried nothing but free ships until 1894, with the result that it had then only 200,000 tons of merchant shipping. The war with China forced Japan to turn to national aid, and Japanese ships have grown more swiftly than those of any other nation in the world, or from 200,000 tons to 1,544,000. Japan gives bounties to native shipyards and subventions to regular lines.

Free Ships Should be Offset by Bounties to Native Ships.

To grant free ships without any direct aid to home shipyards is a policy abandoned now by all maritime governments. Those nations that allow their people to buy ships abroad either impose a tax on those ships when naturalized, or forbid the subsidizing of those ships, or grant bounties to ships of native construction. These other governments realize that no nation in the world's history has ever succeeded as an owner of ships that was not also a builder of ships, and that to depend upon ships built abroad is to strengthen the resources of the competitor that builds them and to postpone the day of successful competition at home.

It has been the endeavor herein to make clear that free ships will operate undoubtedly to the disadvantage of American labor and also will retard the acquisition of actual sea power by the United States. The development of American shipping and shipbuilding can only result from the same kind of encouragement that has been given by the protective tariff to other manufactures.

American shipbuilders on the coast can expect to reduce their costs of construction only by the organization of their business which is possible by continuous work on vessels of similar types. This has been the experience on the Great Lakes, where large numbers of vessels of similar construction have been built for bulk cargoes at a low cost after the business had become organized by experience.

The coast shipbuilders have insufficient work for their plants and work so various in character and variable in quantity that their organization is unduly expensive and their labor inefficient.

The Current Supplement

ALMOST exactly three centuries have passed since Kepler discovered the laws of planetary motion. The simple and ingenious empirical process that led Kepler inevitably to the discovery of the true form of planetary orbits is not generally known. This process is described very clearly in the opening article of the current SUPPLEMENT, No. 1843. Madame Curie describes in detail how pure radium chloride is separated from the barium chloride with which it is associated. The French Senate recently passed a law which was approved by the Chamber of Deputies fourteen years ago, and which will make the legal standard time in France 9 minutes and 21 seconds slower than Paris mean solar time. The reasons for selecting this interval of 9 minutes and 21 seconds, the reservations by which a complete and formal adoption of the meridian of Greenwich has been evaded, and the advantages and disadvantages obtained, are admirably discussed in the current SUPPLEMENT under the title, "International Standard Time." The fourth installment of Mr. Walter V. Turner's splendid paper on "The Air-Brake as Related to Progress in Locomotion" is presented. A life-saving service for the rescue of miners in time of disaster is the first important step taken by the United States Bureau of Mines in an effort to reduce the appalling loss of life in American coal mines. The service is described in an excellently illustrated article. The distinguished German biologist, August Weismann, writes on Charles Darwin. Mr. A. D. Morehouse, Office Engineer, Drainage Investigations, contributes an instructive paper on "The Reclamation of the Southern Louisiana Wet Prairie Lands." Under the title, "Eugenics and Genetics," Mr. G. Clarke Nuttall presents a thoughtful article on some old problems called by some new names.

Correspondence

WITH particular pleasure the Editor inserts the following letter. It is timely, as the expression of an opinion opposite to some of those embodied in Mr. Bowles's able article; moreover, in his concluding sentences, Mr. Noble sounds the keynote of these correspondence columns. We believe that they should be, and are, a "most effective method of education." The Editor makes no claim for infallibility, either in his selection of material or in those pen-chats which are known as the editorial columns. He gives you his ideas, and asks for yours. If you have opinions on current topics which you think will be valuable to the public, send them in. Don't be too harsh a judge of your own literary qualifications. Many an acceptable writer has discovered himself as the result of a letter, written with much diffidence to the Editor, that was published with hearty approval.

So let it be understood that, if you have something worth while, which you would like to say to the hundreds of thousands who read the SCIENTIFIC AMERICAN, you are invited to send it in for our sympathetically critical reading.—EDITOR.

The Merchant Marine and Preferential Duties

To the Editor of the SCIENTIFIC AMERICAN:

As I have already occupied some of your valuable space on the subject of our merchant marine, I do not feel entitled to any more in response to your invitation to discuss the subject. I should, however, be pleased to know that you have considered the following:

I do not feel at all certain that preferential duties will work as well to-day as they did prior to 1810, nor am I convinced that the preferential duties were the real cause of our prosperous ocean carrying trade at that time. It seems to me that it was due vastly more to the fact that European wars were keeping European merchant vessels from competing with us, and perhaps even more to the fact that there was then no high protective tariff to make the cost of labor much greater here than in Europe. As a matter of fact, did not our shipping industry continue to prosper (in the main) until the passage of the Morrill Act in 1861? And is not its decline almost exactly proportional to our prosperity in the inland protected industries?

The objection to preferential duties, it seems to me, lies in the fact that they will not apply themselves directly to the object sought, and to that alone; also that they will tend in many instances to build up our shipping industry in the least desirable directions and fail to build it up in the most desirable directions. Thus, a five per cent remission of duties will encourage American vessels in the carrying of those commodities only on which we have a tariff, and probably on those only on which our import duties amount to the most *per ton*. For it is not to be presumed that foreign nations like Great Britain are going to let us capture all or the bulk of their carrying trade even with us. If they let us regain our share (one-half) we should be well satisfied. But the trouble with preferential duties will be that they will encourage the carrying in American bottoms of practically all the imports from just such countries as England and Germany, because the remission of duty per ton on such high-class products as come from these countries will be most tempting to American vessels, while it will have practically no effect on importations from such countries as Canada and South America. Hence, instead of finding a market for our manufactured products, which is what we want, we shall be providing a market for foreign manufacturers, just what we do not want.

Likewise, to those countries from which we would import more high-class commodities, viz., European countries, we should also export low-class commodities like cotton, wheat, and corn. For in order to get the full benefit of the remission of duty on the incoming traffic in high-class commodities from Europe, our American vessels would be compelled to go to those countries laden with such commodities as those countries will purchase, which will be the low-class commodities named, and the competition for the carrying of these commodities would have its effect in increasing their export. We would then be in the foolish position of having one law (Canadian reciprocity) to encourage the importation of these commodities and another to encourage their exportation!

Again, the European countries from whom we would thus take the carrying trade (if they took no retaliatory measures) would be compelled to seek South American trade for their vessels, and in so doing would even more rapidly than now develop valuable commercial relations with those countries, the very countries about which we ought to be the most solicitous.

But we may depend upon it that European countries will never stand idly by and allow us to manipulate

things in this way. They will retaliate, with the effect that our remission of duties will represent so much money dumped into the ocean, with no permanent effect in building up our own merchant marine.

Instead of intruding our vessels into European ports where they are not wanted and for a trade that we do not want, let us devise some means for securing berths for them in South American ports, where we have a natural right and will have a hearty welcome, and let us encourage the trade that we do want, and must make some special effort to secure, and thus increase our influence where it is alike most needed and most profitable to us. Why build the Panama Canal, and then pass laws that will practically forbid American vessels the use of it?

Finally, it is a humiliating comment on American intelligence that we can be induced to pay indirectly for a thing that we will not pay for directly. What we want is to receive considerable education in the matter of our duty as a great world power, whose liberty-fostering institutions are destined to leaven the whole lump. I congratulate you upon having adopted one of the most effective methods of education, that of taking the people into your confidence and inducing them to study this subject and to express themselves. I certainly hope that you will be flooded with as many and as opposing views as this country can produce and you can find room to print.

Hettinger, N. D.

N. J. NOBLE.

Stability of Cofferdam Around the "Maine"

To the Editor of the SCIENTIFIC AMERICAN:

I noticed in your paper a publication of the general outline of the cofferdam which it was proposed by the United States Government to build around the wreck of the battleship "Maine," and it seems to me that there are two points of possible failure of a structure of this kind which have not been discussed.

One is the fact that each of the single structures is an aggregation and not a unit, and that failure is liable owing to the lack of frictional resistance between each of the individual piles, and it seems that failure is possible by the structure collapsing like a line of blocks, each pile sliding on the other.

Second: It seems that if sufficient frictional resistance between the piles is provided by riveting straps across the piles, joining them together, there is danger of collapse of the inside toe of the structure, because of the lack of longitudinal support of the individual piles at that point. For illustration: If we take an ordinary tin can, such as tomatoes or other vegetables are preserved in, and cut the head out of one end of it, then place this can on the floor in a vertical position, if weight is placed upon the can and the same is slightly tilted, the portion in contact with the floor will collapse.

This seems to me to be the position of this cofferdam, particularly in view of the filling which is being used in the cylinders, which filling consists of soft mud, which is pumped into the cylinders and which must remain for some time in a semi-fluid state, thus offering nothing in the way of resistance to longitudinal pressure. This condition might to a certain extent be improved if the filling within the cylinders was made of a mixture of clay and fine stone, which for some reason seems to form a very solid mass.

In a case in my own experience, where clay was being used to stop a leak in a cofferdam where timber was placed against an inclined ledge, the clay failed utterly until a certain amount of finely broken stone was dumped in, then the mass became very firm and all leaks were permanently stopped; thus it seems to me that a mixture of this kind would increase the stability of these cylinders. Certainly if the cylinders with their filling were monolithic and the foundations under them firm, there would be no question as to their efficiency; but the further they depart from this condition the more liable they are to failure, and therefore it seems to me that every reasonable effort should be made to approach this condition as nearly as possible.

New York, N. Y.

E. C. MOORE, C. E.

How Deserts are Formed

THERE is a popular idea that deserts like the Sahara are the bottoms of ancient seas which have been lifted above their original elevation by geological forces. This notion is an erroneous one. It is absolutely certain, high authorities contend, that the sands of all the great deserts have been formed on the spot by the disintegration of the solid rocks on which they rest. Desert sands correspond in all respects, so far as their mode of origin is concerned, to the dust and sand that accumulates on our high roads in summer. All deserts are situated where the winds from the ocean, before reaching them, are exhausted of their moisture by passing over mountains or across extensive tracts of land.