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(Illustrated articles are marked with an asterisk.)

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THE PRESIDENT'S MESSAGE.

The dignified conservatism, the studied moderation of the President's message, is what is most needed at the present juncture in our national affairs. Many of the troubles with which the country is oppressed have sprung from over-speculation and an unfortunate disposition to boost the wheels of progress by artificial means, legislative or otherwise.

It is possible that the trade of the country has suffered from overmuch legislation; that the change from pillar to post, the perpetual seesaw from one policy to another, is largely answerable for the present stagnation. We need a rest—at least from legislation of the radical and sweeping kind.

This is certainly a very remarkable and encouraging showing, and it is fully in line with the conservative spirit of his address that the President should implicitly suggest that for the present at least legislation affecting our foreign trade relations should be left in statu quo.

In this connection we would suggest that the most effective means for opening foreign markets and establishing active commercial relations is that which we outlined in a recent issue, and which is now being carried out by the National Association of Manufacturers. This organization, it will be remembered, is establishing exhibition warehouses for the display and sale of American products of various kinds in the South American states.

The tone of the message is equally conservative in matters of foreign policy. In spite of the diplomatic success which has attended the Venezuela negotiations, the subject is dismissed with a modest reference; and while the language in speaking of our relations with the Spanish government is dignified, it deals with the question of the hour in a moderate and conciliatory spirit, which the more rash and impetuous spirits in Congress would do well to carefully consider.

THE UNDERGROUND TROLLEY AND THE THIRD RAIL IN ELECTRIC TRACTION.

Two powerful transportation companies which have been carrying out experiments in electric traction have recently taken steps to extend their electrical equipment to new divisions of their systems. The New York, New Haven and Hartford Railroad Company, whose trial of the third rail system on the Nantasket line has been closely watched by the electrical world, is intending to lay a third rail at various points on its property during the coming year.

The Metropolitan Company is one of those which has been making careful tests of the compressed air motor; it is also the owner of the Broadway cable road and the electric underground trolley road on Lenox

Avenue; the compressed air experiments having been carried out on the last named branch. The company is, therefore, in a good position to judge of the relative performance of these three forms of mechanical traction, and there is food for thought in the fact that in the meeting of the directors in which it was determined to make the above mentioned change the weight of opinion was in favor of using the electric trolley in preference to the cable or compressed air.

In view of its cheaper first cost and uniform success in operation, it is not surprising that the underground trolley is to be chosen in preference to the cable for the new equipment, but that it should have competed successfully against the Hoadly compressed air motors is a fact which will surprise those people who have been impressed with the claims of economy which have been made by the company for the recent application of compressed air. The present costly experiments—there are five compressed air motors in operation and two more shortly to be so—were not undertaken until the engineers of the company had made an exhaustive examination on the spot of the various self-contained motors, gas, oil, and compressed air, in European cities.

The announcement that the New Haven Railroad is intending to make a further application of electricity to its steam roads will be taken as evidence that the present Nantasket electric line has given better results than the steam-equipped road. If this be the case, electric traction has taken another step in the direction of its application to the trunk roads of the country, and this goal for which electrical engineers are striving is brought within measurable distance.

At a recent discussion of electric traction under steam railway conditions, at the American Institute, New York, Mr. Charles K. Stearns stated that the chief object in view in equipping this line was to demonstrate that an electrically equipped road could be operated as satisfactorily in regard to the facility of handling large numbers of passengers on time as a steam road, and that it could be proved beyond a doubt. The line has now been in operation for two seasons. In 1895 there were 6'86 miles of double track equipped with special trolley wire, and the train schedule called for 150 trains a day.

Another much talked of substitution of electric for steam traction is that which has just commenced operation on the Brooklyn Bridge. In place of the switching engines at each end of the road, one car in every train is equipped with an electric motor, and handles the train from the time the cable is dropped before entering the station until it is picked up again on the return journey. A third rail is used, which is placed on the outside of the track, and is laid continuously across the bridge, electric traction being used for the whole trip during the hours of lighter travel at night and in case of slipping of the cable.

The success of the New Haven trials raises the question

as to when we may look for the application of electricity to the heavy and fast traffic on our trunk roads. The most that can be said is that they give additional cause to hope that the inherent difficulties of the problem are not insurmountable. The third rail system of transmission gives promise of a reduction in the first cost of transmission, and the possibilities of economy in the use of the alternating current have yet to be put to a practical test.

On the other hand, we must bear in mind, with regard to the New Haven trials, that it is a far step from comparatively light local traffic at moderate speeds to the fast, long distance runs with heavy trains, which are being made with increasing frequency and at accelerating speeds by our leading roads.

#### ARMORED TORPEDO BOATS.

Naval experts, in writing the history and pointing the lessons of the late war between China and Japan, have complained of the scarcity of results having any practical value to the student of naval warfare. This was chiefly due to the incapability or cowardice of the Chinese and to the unprepared state of their navy, which was both undermanned and short of ammunition.

In cases where the Chinese did stand by their guns and fight their ships with any show of courage, as in the case of the two battleships which bore the brunt of the Japanese onslaught at the Yalu, the lessons of the war are numerous and valuable.

In the main it is to the Japanese that we must turn for object lessons, and thanks to their skill and pluck, they are many and valuable, particularly in those operations of the war in which the torpedo boat was engaged. One of the notable features of the various attacks made by these little craft was the performance of a special type of boat named the Kotaka, which differed from the ordinary torpedo boat in having armor protection. She was built about eleven years ago by Messrs. Yarrow & Company, of London, and embodied some novel ideas, the chief of which was the application of an extra thickness of plating to protect the engines and boilers. The Kotaka was selected to lead two important and hazardous torpedo attacks, and whereas the unarmored boats suffered severely from the rapid fire guns of the enemy, the Kotaka came through with comparatively little damage. The occurrence was significant, and it has again directed attention to the question of giving armor protection to torpedo boats. The Santa Fe, which we illustrate in our SUPPLEMENT of this week, is one of four armored torpedo boat destroyers which the builders of the Kotaka have in hand for the Argentine Republic. The value of armor to a torpedo boat is unquestioned, and it would be placed upon every craft of this kind were it not for the fact that its weight reduces the speed by at least a knot, and speed is the absolutely essential quality in a torpedo boat or a destroyer. On the other hand, it is reasonable to argue that as between a 27 knot boat unarmored and a 26 knot boat with armor, the chances of running through the belt of fire and getting home a torpedo are in favor, and strongly so, of the slightly slower but protected boat.

In making her rush upon a battleship she is, it is true, one twenty-seventh longer under fire; but against this it must be admitted that she has a fifty per cent better chance to keep all but the heavy rapid fire shells out of her engine and boiler rooms and preserve her machinery intact until she shall have run in close enough to launch her torpedo.

Torpedo boat attack is largely in the nature of a forlorn hope. It is a gamble against chance, in which enormous risks are run for an enormously valuable stake. The little craft will probably be discovered by the time she is within half a mile of the ship, and if she makes the dash at full speed, it will take her about a minute to run in within firing distance. During this time she will be advancing in the teeth of a terrific fire from six pounder and one pounder rapid fire guns and from the machine guns. The darkness of the night, the excitement and haste of the gunners and the smallness of the target will cause most of these shells to miss the mark; but the hail of bullets from the gatlings and maxims will be a more deadly peril, and should these guns be once trained full upon the torpedo boat, they would tear their way through the thin plating like paper and probably with fatal effect.

It is likely that the machine gun will prove to be the most effective weapon in stopping a torpedo attack. It pours out a stream of bullets so dense that it may be likened to the rush of water from a nozzle, and when it strikes upon dirt, sand or a body of water, it causes a continuous splash, which enables the gunner very quickly to bring the stream to bear upon the target. In the confusion of a night attack and by the uncertain electric light, the machine gun fire will probably be the first to find the mark, and when once the leaden stream is playing upon a torpedo boat it will be easy to keep it there. If, then, by a slight sacrifice of speed a torpedo boat can be rendered secure against machine gun fire, good policy would seem to suggest that the sacrifice be made.

The above considerations show that speed is a relative term—that is, its value is relative. It is a quality

which may easily be overrated. Of all the elements which go to make up a warship, whether great or small, it is the most showy and attractive; and rightly or wrongly, it has come to be the element to which most importance is attached. In a torpedo boat or a torpedo boat destroyer speed is, of course, of the first importance; but even here, as we have shown, its value may be largely modified by the degree of vulnerability of the ship.

The half inch armor of the Santa Fe would, of course, be penetrable by the one and the six pounder shells, but it would prove sufficient to stop the murderous hail of bullets from the machine guns. The effect of armor protection upon the crew of a torpedo boat would be to contribute to that coolness and nerve which are indispensable to a successful attack. There is no branch of the service which is so full of hardship, even in time of peace, as that which places a man beneath the hatches of a torpedo boat; and if in the supreme moment of attack the wearied crew felt that they were sheltered from the most deadly fire of the enemy, they would do better work than if they dashed in with certain death staring them in the face.

#### Notes from the Report of the Secretary of the Interior.

We gather from the annual report of the Secretary of the Interior that the actual public domain is now 1,849,072,537 acres. There are still vacant more than 600,000,000 acres, not including Alaska. Up to June of this year the total amount of land disposed of was 946,000,000 acres. Of this vast area, 326,000,000 acres have been disposed of since 1883, or within thirteen years. Since the passage of the Homestead Act, in 1862, 162,892,032 acres have been taken up by settlers. There have been distributed in the form of land grants to railroads 83,784,705 acres, and 1,945,045 acres have been patented to wagon roads. There are yet due to railroads and wagon roads under their various grants 114,736,639 acres. The four national parks aggregate in area 3,272,960 acres. The total area of the Indian reservations is 84,418,562 acres and of military reservations 1,397,691 acres. The secretary recommends the waste land "should be taken up by actual settlers, to whom every encouragement should be extended if they are of a character to assimilate with our people and become valuable citizens. Our law makers, however, might well consider the question seriously before disposing of any more large areas of the public domain. If the rate of disposition of the last thirteen years is continued for thirteen years to come, there will be little of the public domain outside of Alaska remaining in the possession of the government at the expiration of that time."

The secretary strongly recommends to Congress that provision should be made for reclaiming the vast stretches of arid land which occur in the Western States. He is of the opinion that 100,000,000 out of the total 500,000,000 acres of arid land might be reclaimed by systematic irrigation. He also urges that steps be taken for the preservation of our public parks, a question which cannot be too urgently brought before the notice of Congress.

On the question of pensions, we learn that there are now about 970,678 persons on the pension list, who draw about \$140,000,000 per year. The object of the department, says the secretary, "has been to constitute the pension list a roll of honor," rather than to aim at any special economy, and it has sought to defeat the designs of impostors and at the same time to give full heed to the claims of the truly deserving. The total sum disbursed by the government and the cost of disbursing it during the last thirty-one years is \$2,034,817,769.16. What this sum really amounts to is evident when we learn that it is short only \$346,712,525 of being equal to the high-water mark of the interest-bearing public debt.

With regard to the present standing of the Indians, we learn that they now occupy 85,000,000 acres of land, and the secretary urges that they should be guarded from becoming victimized by unscrupulous speculators. He recommends that three citizens, two of them civilians of different political parties and one an army officer, should constitute a commission to conduct the affairs of the Indian Bureau. There has been no outbreak or disturbance of any kind during the year. An earnest effort is being made to render the Indians independent and self-supporting. The appropriation for the entire Indian service, for the year 1897, is \$7,189,496. The total Indian population of the United States, without including the New York Indians and the five civilized tribes, is 177,235, among which there are 38,000 children eligible for the schools. During the year there were 293 Indian schools, with an average attendance of 19,121 out of an enrollment of 23,393 pupils. This does not include the pupils among the five civilized tribes or the Indians of New York.

On the subject of bond-aided railroads the secretary draws attention to the fact that the Central Pacific Railroad is in default to the government, and he states that on January 1 next \$2,432,000 additional of its indebtedness, together with thirty years' interest thereon, will fall due and must be redeemed by the govern-

ment. The secretary points out that Section 5 of the Act of 1862 provides that on the refusal or failure of a company to redeem its bonds, the Secretary of the Treasury may take possession of all lands which at the time of said default shall remain in the ownership of the company.

With regard to the Nicaragua Canal, the secretary points out that the act chartering the company requires it to make a report on the first Monday in December of each year to the Secretary of the Interior. A preliminary statement by the company shows that no work has been done since August, 1893. The Maritime Canal Company entered into a contract with the Nicaragua Canal Construction Company for the construction of the canal, but the latter company became financially embarrassed in August, 1893, and subsequently made an assignment of its construction contract and all its assets to the Nicaragua Company, a corporation chartered by the State of Vermont. The latter company "has not yet found itself in a position to resume the work of construction under its contract."

The secretary recommends, in reference to our national parks, that liberal appropriations be made for the completion of the road system, and that an experienced landscape architect be appointed whose skill and taste would enable him to design a comprehensive and harmonious plan for the improvement of the parks. He considers that it is undesirable that works of art should be created in the parks, but that modern ingenuity should be exercised in promoting the comfort and facility of the sightseers. It is also recommended that all private land within the limits of these parks should be acquired by the government.

#### The Scientific American Supplement.

Occasional inquiries from our subscribers as to what is the relationship existing between the SUPPLEMENT and the SCIENTIFIC AMERICAN suggest that this would be a timely occasion to give some account of the origin and present scope and purpose of the younger publication.

The SUPPLEMENT dates from the year of the Philadelphia Centennial Exhibition, 1876. The pages of the SCIENTIFIC AMERICAN proved quite inadequate to contain as full a treatment of this national event as the editors desired to give, and it was determined to start a sort of "overflow" publication, which should appear simultaneously with the regular journal, and carry such matter as was crowded out of its columns. The SUPPLEMENT, as the new paper was called, served also for the publication of longer and more technical papers than were considered available for the SCIENTIFIC AMERICAN. The demand for the paper was so great, and it proved so popular, that at the close of the Exposition it naturally occurred to the proprietors that there was a permanent field of usefulness for such a publication, a conviction which was strengthened by requests from many of its subscribers that its issue should not be stopped. The decision to continue the SUPPLEMENT as a regular weekly publication has been justified by its increasing popularity and by the high character of its readers.

In order to fully meet the varied tastes of the many readers of the SCIENTIFIC AMERICAN, it is necessary that the articles should be limited in space, and it is therefore not possible, however great may be their intrinsic interest or however valuable their contents from a scientific standpoint, to publish in its columns long or continued articles.

Nor is it possible in this paper to furnish space for the proceedings and discussions on the papers read at the meetings of the numerous scientific, engineering, electrical and other associations which frequently assemble in this country and abroad.

But the SCIENTIFIC AMERICAN SUPPLEMENT is devoted not only to the publication of the proceedings of these various associations, but every issue contains descriptions, accompanied with illustrations, of important engineering and mechanical work going on in Europe as well as at home, and every weekly issue contains several columns of miscellaneous items, embracing electricity, engineering, new inventions, recipes; in fact, so varied are the subjects summarized which appear in these columns, that one year's numbers of the SUPPLEMENT comprise a year book of facts on all subjects appropriate to a paper devoted as this is to the higher branches of scientific thought.

The SCIENTIFIC AMERICAN is principally confined to the industrial development of this country, but in the SUPPLEMENT this work is extended and reviews the latest and most important scientific achievements of Europe and elsewhere. The SUPPLEMENT extends and amplifies the work of the parent paper, and those readers of the SCIENTIFIC AMERICAN who wish to receive the complete work can procure the SUPPLEMENT under the favorable conditions of our combined rates, published elsewhere, even though their subscription for the parent paper has already been paid.

PROF. RAMSEY, after a series of exhaustive experiments, reports that there is every reason to believe that the elements helium and argon are non-valent; that is, are incapable of forming compounds.