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## WORKING STEAM EXPANSIVELY.

In page 281, current volume of the SCIENTIFIC AMERICAN, we presented a condensed review of the steam experiments conducted at Erie, Pa., as obtained from the recently published report of the Board of Naval Engineers. These experiments, according to our view of the question, have proven that there is no saving in expansive steam of low pressure—that which is commonly carried on our low pressure steamboats. It is exceedingly important to know this; these experiments are therefore very valuable to the engineering world. We will now give some information on the other side of the question.

The London *Engineer*, in a recent article on this topic, asserts, that while non-expansive engines require 30 lbs. of water per horse power in the hour, there are expansive locomotives and Cornish engines which only require from 15 to 25 lbs. This shows that a saving of fifty per cent may be effected in an engine working steam expansively, when it is properly constructed. We have also seen several statements published by our foreign cotemporaries, respecting a peculiar economical compound class of engines called the "Rowan Patent," which have lately been applied to several British steamers. These have a small high pressure cylinder connected with a large low pressure one; the steam is admitted into the former at 100 lbs. pressure, and is exhausted into the large cylinder, where it is expanded down under 11 lbs., before it is exhausted into the condenser. An American engineer, lately returned from Europe, has assured us that the saving of fuel in these engines is perfectly astonishing; they run with less than two pounds of coal per horse power in the hour, whereas six and seven pounds is the common consumption in other marine engines. These facts are all in favor of working steam expansively.

In a late number of the *Journal of the Franklin Institute*, Robert J. Thurston, engineer, gives his experience, and presents several indicator diagrams in favor of expansion. He states that the most economical engine carrying full pressure, tested by him, is one built at Wilmington, Del., which runs night and day in a warm engine room; its consumption of coal is four pounds per horse-power per hour. On the other hand, he states that an expansive working engine, built at Providence, R. I., only consumes two and a quarter pounds of coal per horse-power. The higher the pressure of steam carried, and the greater the range of expansion, the greater has been the economy of fuel in this engine. These facts are also in favor of expansive working, when the engine is properly constructed for the purpose.

According to the science of steam, as it is understood by intelligent men, it is very unsatisfactory to assert that a great loss is caused by the condensation of steam in cylinders when it is used expansively. The loss of energy in steam is just in proportion to the work which it performs, and if it is allowed to be exhausted at full stroke and at a high pressure, there is a great deal of work thrown away into the atmosphere.

A correspondent—Mason Hearsey—writing to us from Ionia, Mich., on this topic, states that he has tried a great many experiments with his engine, with different pressures of steam, and cutting off at different points of the stroke. When running with steam

at 25 lbs. pressure, no advantage was obtained by cutting off; but when running from 40 lbs. pressure up to 70 lbs., he found a great benefit in working the steam expansively. His engine is quite small, and perhaps the advantage which he obtained in cutting off with high pressure, may have been due to a more free exhaust, and a lower final than initial pressure of the steam. He states that with a short quick stroke, and steam from 30 lbs. upwards, quite a saving is effected in cutting off at half stroke, according to his practice.

## WAR, BUSINESS, AND WOMEN.

During the Revolution, Benjamin Franklin rendered as important and valuable services to the country as any other man, with the possible exception of Washington. At the crisis of the war, Washington wrote to Franklin that unless he could persuade the French government to make an advance of money, it was difficult to see how the army could be kept together; the money came and the war was soon ended. But, in the midst of these important public services, Franklin managed to keep his own property constantly increasing. Washington, too, amidst all the cares of the camp, kept a prudent watch over his private affairs; and there were many other men whose wealth steadily accumulated during that long and wasting war. The thousands of millions of dollars' worth of property which was destroyed by the British government in the twenty years' contest with Bonaparte, was contributed from the profits of business men, profits made mostly during the war and invested in the public funds.

Still, there is no doubt that, as a general rule, business is less prosperous in times of war than in those of peace. If great numbers of men are taken from the labor of producing wealth and set to the work of destroying it, the production of wealth must be diminished; and unless there is a corresponding diminution in the consumption, the accumulation must be at least checked, if not stopped. The plain way, therefore, for a people to carry on a war without diminishing their wealth, is by a general practice of individual economy. One of the most important elements in the military resources of this country is the elasticity in the habits of our people. We can adapt ourselves to circumstances. An American can make himself at home in the drawing rooms of dukes and princes, or he can sleep on straw and live on soldiers' rations.

There are thousands of ladies in the country who are anxious to know what they can do to aid the government in the great struggle which is now before us. They can do quite as much as the men. "In war," said Louis XIV., "it is the last guinea that wins." There are to be large amounts of government stocks offered in the market, and these can be bought only with the savings from private incomes. Let the growing fashion of wearing diamonds be given up. Leave to servant girls the display of showy jewelry, which they can buy at "a dollar for your choice," and let the patriotic purpose prevail of practicing economy in every possible form, in order to save money to invest in public stocks. In the present state of chemical science, there is a reasonable prospect of the discovery, at any time, of the art of crystallizing carbon; if this discovery should be made, diamonds would immediately become as worthless as quartz pebbles; but United States bonds are as solid and safe an investment as it is possible to find—in the uncertainty of all human affairs.

## AMERICAN MACHINES AND IMPLEMENTS FOR ENGLAND.

A very interesting paper upon this subject was read before the London Society of Arts on the 3d of last month, by C. W. Eddy, Esq., who has made a tour of the United States, and paid a great deal of attention to our labor-saving machines. He stated that the traveler could not fail to be struck with astonishment at the vast amount of labor which had been achieved—of forests cleared, lands reclaimed, canals and railroads constructed, and cities built, by a scattered population in the brief period of time that has elapsed since the country was first commenced to be peopled. About 5,000 miles of canals have been built, 30,000 miles of railway; and there are half a dozen cities, at least, which rival in magnificence a like number of the capitals of Europe. The merchant

navy of America is not inferior to that of England; and the manufactures, commerce and natural products of the United States are vast, and, in some respects, unequalled. These results have been accomplished in a climate having great relaxing heats in summer, and winters of great severity. The indomitable energy of the people, aided by inventive faculties of a high order, did all this.

We will enumerate several American tools, machines and systems which Mr. Eddy stated should be introduced into England.

They consist of grain cradles, horse-powers, chopping axes, grain elevators, fence augers, spring rakes, unloading hay forks, road scrapers, small grinding mills, light carriages, stone-breaking machines, steam ferry boats with elevating landings, and floating docks.

Hitherto, the prejudice in England against foreign-made machines has been so strong as to prevent their introduction; but this bigotry is thawing away before the genial sun of increasing intelligence.

As most of our agricultural implements may be exported to England without paying duties, our makers should direct their attention to this opening for their articles.

At the close of reading Mr. Eddy's paper, Mr. Anderson, of the Woolwich Government Factory, bore testimony to the extreme ingenuity of the Americans—the skill with which they produced by machinery such articles as a great demand enabled to be manufactured by constant repetition. He considered the organization of workshops—the relations between the masters, the foremen and the workmen—more satisfactory than in England; but said that he had found no factories where the tools for manufacturing were to be compared to those in use in such factories as Maudesley's and Field's, or Penn's.

Mr. Cassell mentioned several examples of ingenious labor-saving machines for domestic use which he had come across during his recent residence in the United States; but he showed that Mr. Eddy's idea as to the superior cheapness of certain American manufactures was erroneous. For instance, a pair of shoes which could be purchased for 11s. or 12s. in London, cost 20s. in New York. Steel and iron goods were protected by a duty of 25 per cent, which had recently been raised to nearly 50 per cent.

## KEEP THE MACHINERY RUNNING.

One of our acquaintances, who is a man of great wealth, and one of the most extensive cotton manufacturers in the country, is so imbued with the patriotic spirit of the times, that he is willing to enter the ranks as a volunteer, and march into the South with the army, leaving his large business to take care of itself as it may. But he is told by the Governor of his State that he can serve his country far more effectually by staying at home, and attending diligently to his mills. There is no doubt about the wisdom of this advice. We are entering upon a great struggle, which will destroy and waste property with terrible rapidity; and the only way in which the nation can be saved from swift impoverishment and exhaustion is by a corresponding production of wealth. Let, then, the various engines and machinery, that so wonderfully multiply our power of producing wealth, be kept in unceasing operation. The proportion which the annual product of wealth in any community bears to the whole accumulated property is surprisingly large. For instance, the people of Massachusetts are worth \$750 apiece in the average; and their average incomes, including the profits of the great merchants and manufacturers, is probably not less than one-quarter of this sum. The wealth of Ohio, if divided equally, would give \$375 to each inhabitant; and the annual product can hardly be less than half of this amount. In all cases the consumption is very nearly equal to the production; and if the richest community in the world should stop producing the means of subsistence, and fall back upon the accumulated property, they would come to poverty and starvation in a single season. The great waste which is now going on in war can be counterbalanced only by a corresponding vigor in production. It is the very worst time for us to lay aside our numerous steam engines and multiplied mechanism.

We do not advise the manufacture of any goods that are not wanted by the community; this is worse than letting the mills lie still; but it is plain that if any