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WORKING STEAM EXPANSIVELY.

The result of the experiments at Erie on the working of steam expansively, a brief statement of which we published on page 6 of the present volume, seems to have led some of our cotemporaries to the conclusion that the long established and universal opinion on this subject is all a delusion. It will be impossible to determine what lesson these experiments really teach until we get a full statement of them from the engineers of the Commission, with the able and learned discussion of the experiments which we have no doubt will accompany their report; but we shall be very much surprised if Chief Engineer Isherwood and his associates draw the broad inference which we have mentioned above. Indeed, it seems to us impossible that this sweeping conclusion can be established by any one series of experiments with one engine or one pair of engines.

The pith of the whole matter of expansion is just here: After the flow of steam into the cylinder is cut off, that which is already in the cylinder will continue to exert a pressure as it expands, constantly decreasing until it comes down to the pressure of the atmosphere; in condensing engines, still lower. Now, a certain amount of pressure on the piston is necessary to overcome the friction and inertia of the engine and its connections, and it is only the pressure above this which is available in driving the machinery. Consequently, a card may show considerable pressure on the piston, and the whole of this pressure may be exerted in overcoming friction, leaving none for useful effect. Of course, the point in the expansion where the useful effect of the pressure ceases will vary with different engines, and with an infinite variety of circumstances. It is manifest, too, that the higher the pressure the greater would be the amount of expansion that would yield profitable results.

From the meager accounts yet published of the experiments at Erie, we draw the conclusion that, with engines constructed precisely like those there used, working with 20 lbs. pressure in the boilers and cutting off at .354 of the stroke, with resistance such as was there overcome, there is no gain compared with cutting off at $\frac{3}{14}$ of the stroke. This inference follows by strict necessity from those experiments—this, and no more. It may be philosophical to keep the mind open for further light on all subjects whatever, but the fact that there is economy in working steam expansively has been proved by such a vast mass of evidence that it will take a corresponding amount to overthrow it. The idea of regarding it as overthrown by a single set of experiments seems to us preposterous.

CAST IRON RIFLED CANNON.

The London *Engineer*, of January 4, states that Mr. Bashley Britten had repeatedly made good practice with cast iron cannon which had been rifled, and submitted by him to the British government as far back as 1854. Experiments with such cannon have been recently conducted by Mr. Britten, on a scale of such magnitude as to test the question in the most thorough manner. Two 9 pounders, four 32 pounders, and three 68 pounders have been fully tested. These were ordinary cast iron service guns, taken at random from the military store, and rifled without being strengthened by any addition of bands, &c. The work of rifling one gun can be executed in about ten hours, at a cost of only five dollars. Elongated projectiles, weighing 15 lbs., were fired from the 9 pounders, 48 lbs. were fired from the 32 pounders, and 90 lb. projectiles were fired from the 68 pounders. The charge of powder was only one-half of that employed for common guns, being only 5 lbs. for the 32 pounder, and 7½ lbs. for the 68 pounder. Fifty four rounds were fired from the 9 pounders; three hundred from the 32 pounders, and the same number from the heavy 68 pounders. Four of the guns were submitted to very severe tests, to ascertain what they would stand. The 32 pounders were fired with ten rounds of service shell of 48 lbs.; then ten rounds with shells each 72 lbs.; then ten rounds of solid shot 96 lbs. each. The 68 pounders were submitted to three similar courses of ten rounds each; two of the courses were with shells of 90 and 135 lbs., and one with a solid shot of 180 lbs. Not one of these guns was injured by these trials. An ordinary smooth bore cannon, firing round shot with a charge of 10 lbs. of powder, and having an elevation of 10¾ degrees, has an average range of 2,700 yards. The same gun when rifled, and firing a 48 lb. shell with a charge of 5 lbs. of powder, at an elevation of 10 deg., had an average range of 3,300 yards. The precision of the rifled gun was also imcomparably superior to the smooth bore; the deviation of the latter ranged from 14 to 40 yards, while that of the former was between 0 and 3 yards. It thus appears, that by rifling common and smooth-bored cast iron guns, their efficiency is more than doubled, with smaller charges of powder. With such guns, the shells and shot must be elongated to obtain the results desired.

FIVE THOUSAND VOLUNTEERS WANTED.

Reader! we ask you to examine carefully the number of this journal which you now hold in your hand. Look at the fine quality of the paper upon which it is printed; look at its superb typographical appearance; look at its spirited engravings; look at the great variety of the useful and entertaining matter which it contains, and then decide whether it is worth four cents or not. If there is any doubt lingering on your mind, put fifty-two numbers together, reckon up the number of pages, and look once more at its costly engravings; then sweep over its solid contents, and figure up once more, and see if the whole volume is not worth almost $2. If you are not satisfied with the investment, call a meeting of your neighbors, open the books and examine the subject a little more in detail, and if $2 is too much, make up a club of 20, and thus procure the paper one whole year for $1.40; or, if you cannot get 20 names, get 10, and you shall have it for $1.50. If it is not worth this sum to read, you can almost get back the whole amount by selling it for waste paper; or, it can be made into bed blankets, and one night's sleep under its warm covering, will fill your head with all sorts of grand discoveries for carrying on the affairs of the material universe, and possibly you may invent some appliance to save the Union. Thus will your pockets be filled with rocks, your head with information worth a great deal to you in all the affairs of life, and millions will rise up and call you blessed.

You say, "These are dull times." Well, admitted; but better times are coming, and you cannot afford, for the sake of a dollar or two, to be ignorant of what is going on in mechanical and industrial pursuits. Blot these elements of power out of existence, and we should speedily sink into the condition of China. What we now propose, is to raise a volunteer company of 5,000, who will come forward and send us their names and subscriptions for one year. Our books are now open, and clerks are ready with pen and ink to enroll the names. Who, among all our readers, will be the first to send in a club of 10 or 20 names? Friends of the SCIENTIFIC AMERICAN! will you not lend us a hand, and thus place us under renewed obligations to you. We mean to keep on working for your edification, instruction and benefit, and shall not relax a muscle in our endeavors to make our journal as good as the times, and, we think, a little better.

WE are indebted to Hon. Warren Winslow, M. C. from North Carolina, for a copy of the Patent Office Reports; also, for a copy of the Report of the Commercial Relations of the United States with Foreign Nations.

WHAT BECOMES OF WEALTH?

A boot and shoe dealer has hanging in his store a pair of boots worth $7. They constitute a portion of his wealth, and a portion of the wealth of the world. A man buys them and begins to wear them; by friction against the pavements, little particles of the leather are rubbed off, and thus separated from the rest of the sole. Every particle that is thus removed takes out a portion of the value of the boots, and when the boots are entirely worn out, the seven dollars of wealth which they formed is consumed. The wheat, corn, &c., which was raised by our farmers last summer is being eaten up. No particle of matter is destroyed by this process, but the value which was in the grain is destroyed.

As, while men are wearing out clothing and eating up food, they are generally busily employed in producing wealth of some kind, the wealth of the world is not usually diminished by this consumption, but it is changed. This applies, however, only to personal property; town lots and farms generally retain their value, but the personal property is in a state of perpetual destruction and renewal. As the several particles of water which constitute a river are forever rolling away to the ocean, while their places are being supplied from the springs and fountains, so the movable wealth of the world is constantly being consumed to gratify human wants, and constantly being renewed by the restless activity of human industry.

Boiler Scale Preventor—Self-acting Blow-off.

The incrustations formed in steam boilers are principally composed of the carbonate of lime, which is held in solution in all hard and sea waters. When hard water is maintained in a boiling condition, its lime slowly separates and comes to the surface in the form of a white scum, which gradually attaches itself to the sides of the boiler and becomes a hard scale. By frequently blowing off the water at the surface, such incrustations can almost entirely be prevented, and a self-acting apparatus for this purpose is certainly far more simple, safe and economical than hand blow-off pipes or chemical substances fed into the boiler at stated intervals. On page 252, Vol. XIV. (old series), of the SCIENTIFIC AMERICAN, we published an illustrated description of the self-acting surface blow-off patented by James H. Washington, No. 36 Fawn-street, Baltimore, Md. At that time it made a very favorable impression upon our mind, and we have since learned that its utility has been fully demonstrated. It is now used in the boilers of Cromwell & Co.'s line of steamers, running between New York and Baltimore; and Mr. John Baird, engineer-in-chief, states that it is a valuable invention for keeping the boilers clean. One has been used on the steamship *Vanderbilt*, and Mr. J. German, chief engineer, has also expressed an equally favorable opinion of its merits. It is employed in several other steamers, including the *Baltimore*, the *Mount Vernon*, the *R. R. Cuyler*, the *S. R. Spaulding*, and the *S. B. Virginia*. The united testimony of the several engineers of those steamers is that it is simple and durable, and is very effective in keeping the boilers clean by preventing the formation of scale. The boilers of every steamship should be provided with some such apparatus for blowing off, as incrustations, being non-conductors of heat, cause a great waste of fuel, which can be avoided by preventing the formation of scale.

EUROPEAN PATENTS.—The proprietors of the SCIENTIFIC AMERICAN have long been engaged in procuring foreign patents, and offer their services to obtain patents in the following countries: Great Britain, France, Spain, Cuba, Belgium, Holland, Denmark, Russia, Prussia, Hanover, Sardinia, Wurtemburg, Lubeck, Baden, Brunswick, Bremen, Frankfort, Hesse Cassel, Homburg, Nassau, Oldenburg, Waldeck, Sachsen Coburg Gotha, Sachsen Weisen, Lieppe Detmold, Schaumberg, Macklenberg, Schwerin, Strelitz, and other departments of the Zollverien—also Norway and Sweden.

STEEL BELLS.—Many inquiries have been made of us in regard to these bells, and, so far as we are able to learn anything in regard to them, they are well spoken of. Our readers will find Messrs. Naylor & Co.'s advertisement of these bells in another column.

AN electric telegraph is about to be laid from Beirut to Damascus. The engineers have already arrived. Work on the French carriage road to Damascus has been resumed, and is prosecuted with great vigor.

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