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Contents:

(Illustrated articles are marked with an asterisk.)

A REMARKABLE REPORT ABOUT REMARKABLE PUMPING ENGINES.

The Providence *Journal* of March 2 publishes one of the most remarkable reports relating to steam engine performance that we remember ever to have read. The case seems to be as follows:

In February, 1872, a contract was entered into by the city of Providence with George H. Corliss, the well known mechanic, for the construction of a pumping engine to operate a high service level, on the Holley system, forcing the supply of water into the mains as fast as required to supply the continually varying demand. When consumers draw heavily, the pumps and the engine make twenty-five double strokes per minute. At night, and when the least amount of water is required, the engine makes sometimes a single revolution, or even less, per minute. The contract required the engine to be "capable of raising, with ease, five million gallons of water in twenty-four hours" to a hight of one hundred and twenty feet above low water, "under a possible varying head of forty feet on the suction," and to "work smoothly, steadily, and easily, when delivering but one million gallons in twenty-four hours." The engine was to have been completed on October 1, 1872, and its performance was to be determined by a board of experts, making a competition trial with the Worthingtou duplex engine, erected at the Pettacousett station, south of Providence. Should the Corliss prove equal to the latter engine in "practical value," the builder was to receive thirty-four thousand dollars, and "a further sum equal to the estimated annual saving (if any such saving shall be reported by the committee) for ten years," not to exceed a total of fifty-five thousand dollars.

The engine was designed especially for the work by the contractor; and having been but lately completed, the trial has been only recently made, the report being dated February 4 last, and signed by the well known experts Erastus W. Smith, Frederick Graff, and George H. Reynolds, who, after long delay, were finally selected to make the official test. The contract provided that the competition should take place at an average delivery of two millions of gallons in twenty-four hours. The head at trial was approximately eighty-eight feet. The tests were made of forty eight hours duration, and were apparently conducted, with the exceptions to be noted, with the care and intelligence to be expected of experts of high professional standing. The engines were, however, not overhauled, nor were the boilers cleaned, as they should have been to secure the most creditable results. The coal was not screened. The water supplied to the boilers was not measured, and no indicator cards seem to have been taken. Hence we are without any means of judging whether the extraordinary difference of efficiency was due to differences in boilers or in engines. It is not stated whether the engines and pumps were examined to ascertain whether leakage occurred or not. The quantity of water delivered was, however, determined by weir measurement, which probably gave the means of ascertaining pump leakage with sufficient precision.

The results obtained are the following, when raising two million gallons:

	Corliss engine.	Worthington duplex.
Time	48 hrs. 30 min.	48 hrs. 0 min.
Head pumped against	88·2882 feet.	87·9773 feet.
Gallons per twenty-four hours	2,051,563	1,992,649
Leakage of pumps, per cent	3·36	2·51
Coal used, pounds	11,700	5,636
Ashes falling through grates, pounds	1,028	486
Gallons raised, per pound of coal	342·19	689·37
Cost coal per year, at this rate	$7,352·00	$8,650·00
Duty, due pressure noted, foot pounds	25,865,740	53,528,210
" actual, by delivery	25,170,384	50,574,955

Both engines were tested for adaptability to varying rates of speed, and both were found satisfactory. Both engines are stated by the committee to be proportioned for a delivery of five millions of gallons in twenty-four hours, and they were both next tested under this higher load, and also at their slowest speeds, with results thus given:

	SLOW SPEED TRIAL.		TRIAL WITH 5,000,000 GALS. DELIVERY.	
	Corliss	Worthington	Corliss	Worthington
Time occupied, hours	24	10¼	5¾	
Head pumped against, feet	88·16	88·228	118·174	120·299
Gallons raised per day	174,747	805,917	4,687,516	5,268,168
Coal consumed per 24 hrs., lbs.	1,427	1425·75		
Duty, 100 lbs. coal, foot lbs.	8,487,370	$36,878,816		
Cost, per annum	$5,208.58	$1,277.50		
Revolutions, per minute	0·866	7·81	23·23	47·49

On the basis of these trials, an award is made by the committee of the full amount of contract price, thirty-four thousand dollars, to Mr. Corliss. Two of the committee go still further than this, and recommend an additional gratuity of twenty-one thousand dollars, in view of the "great range of capacity" and "special adaptation" of the engine to the peculiar duty demanded of it. The third member demurs, stating that he believes that "the contractor has not accomplished anything valuable that he did not bind himself to do" by the terms of the contract, and that no "annual saving"—which was the condition of this extra compensation—has been shown.

We think this one of the most remarkable instances of inconsistent report that has ever come under our observation. A competitive trial shows an engine, at average duty, to have less than half the efficiency of another. At maximum duty, where both engines should have done most creditable work, and under which conditions the committee should have carefully determined the duty, whatever the terms of the contract, in order to obtain, in the only satisfactory way, a knowledge of the real value of the machines, no duty test is made. At a minimum performance, one machine making but 0·866 revolutions (!) per minute, and the competing engine 7·81, a duty test *is* made, and the results, which have not the slightest value as indicating their comparitive efficiencies, are placed on record. No marked superiority of either engine is shown in "adaptability" to the Holley system. No effort is made to determine how much of the astonishing difference noted is due to discrepancy in apportionment of boiler power, although the committee notice and refer, in their report, to an excessive disproportion. Yet, despite the terrible failure of the engine examined, the builder is not only given full contract price, but a majority of the board of experts recommend the full amount of extra compensation which was to be allowed if any annual saving was found to be effected, etc.

We cannot believe that the trials were conducted as they should have been, for such low duty can hardly be given where there is not something very wrong in the condition or in the management of the engine. Even the performance of the Pettacousett engine is lower than should have been expected. Comparing its 53,000,000 duty with the 70,000,000 reported of the little Worthington engine at Phœnixville, or with the splendid work done by the Leavitt engine at Lynn, Mass. (103,000,000), as given by Messrs. Worthen, Hoadley, Kirkwood, Hermany, and Davis, we must believe that something went decidedly wrong at Providence. We hope to hear of a new and a more satisfactory trial, in which the real value of both engines will be brought out by more careful management on the side of their constructors, and shown by some expert of established reputation, who will be disposed to do the work in such a manner that the real merit of the competing machines will be ascertained, and who will make a just award without fear or favor.

We cannot feel that, in the present case, either constructors or experts have done themselves full justice. The former are well known throughout the country as experienced and skillful mechanics, and the latter are equally well known as experts of unimpeachable high character, personally and professionally. We should feel much regret if the one party should suffer in consequence of mismanagement on the part of their subordinates, or if the other should be injured by an evident excess of charity.

A CONGRESSIONAL PATENT DISCUSSION

On the 28th day of June, 1859, McClintock Young obtained a patent for an improvement in harvesting machines, which, under the law then in force, expired fourteen years from that date. The patentee then had the right to apply for an extension of seven years, which privilege he exercised six months previous to the expiration of his time. The case lay in the Patent Office until the 27th of June, 1873, when the Acting Commissioner was asked to grant the extension, the matter having been fully adjudicated to that effect. The official postponed his decision until the arrival of the Commissioner, who, returning on the 28th, signed and issued the necessary documents. Young then sold his extension to McCormick, to whom the original patent had been assigned for $10,000, for an additional sum of $5,000; but before the latter consideration was paid, some lawyers raised the question as to the validity of the extension, on the ground that the patent expired on June 27, and that the extension should have been as of that date instead as of the following day. Under the law no extension could be granted after the expiration of the original patent, and hence the point at issue arose, whether or not the same occurred on June 27 or June 28. The Commissioner held that June 28 was the proper date; but in order to avoid litigation, a bill was recently introduced in the House of Representatives to remove all doubts on the subject and to confirm the validity of the extension by giving to it the same binding effect as though it had been signed by the Commissioner on June 27, 1873.

We hardly think that the most penetrating scrutiny would ordinarily perceive any deep, dire, and hidden signification underlying this very simple statement of fact. To the average intellect, it appears that a poor inventor comes before Congress and asks that body to rectify a mere clerical error on the part of one of its officials, in order that he may receive the small sum offered him as a reward for his labor and not be deprived of the same through the expenses of tedious litigation. He cannot afford to take the matter to the courts and wait for a decision, even if such were the proper course; but, armed with a written opinion of the Commissioner directly in his favor, simply requests our representatives to quiet a legal quibble raised as to his undoubted right to his own justly earned property.

But several acute and far reaching minds in the House are not to be deluded by any such specious argument as this, it must be investigated and examined, over twelve columns of fine print in the *Congressional Record* and some hours of valuable time. This is an attempt to embarrass the entire agricultural population, to reduce the rural granger to penury and want; to impose a grinding monopoly on industry, no matter if it is through a little improvement on a well known machine, the whole patent right of which is to bring the inventor $15,000. Besides, reason our astute legislators, this is not the hat case, or the planer extension, or the sewing machine job, and there are no poor widows or lobby agents or other skilled talent to explain things to our satisfaction. It is only a poor man who asks for his own; therefore we will call his bill "dangerous legislation," assume (whether rightly or not) that his patent wound up on the 27th, and show that we are utterly opposed to Congressional extensions by considering that he asks us for one, no matter whether the facts substantiate the view or not; we will persistently perceive only the McCormick machines, even though they are not before us and have nothing to do with the subject, so that we can indulge in heroics over the vast amount paid by the public for the same, and by this means we shall advertise ourselves in the eyes of the people and glorify our names before the SCIENTIFIC AMERICAN and other journals that make disagreeable remarks about monopoly jobs.

In the end, however: after these ingenious special pleaders had suggested enough buncombe and nonsense, had questioned and cross-questioned the supporters of the measure, and made them state the case over nine times, had wasted hours of valuable time where minutes would have amply sufficed, pushing aside business of the highest importance, the completion of which the country urgently requires: on a vote being taken the opposition were fortunately found in the minority, and so the bill was passed.

DANGERS OF NURSERY EXPLOSIVES.

Recently, in this city, the front of a toy store on Broadway was blown out, and several persons badly injured, by the explosion of percussion wafers—bits of paper having a small quantity of explosive material upon them. The wafers were used for firing off toys termed "parlor artillery." The toy consists of a small barrel provided with a hammer, under which the wafer is fired, a ball of rubber being thrown out of the barrel on pulling the trigger.

The sale of explosive toys, no matter in what form they may appear, should be discouraged. We have seen children severely burned by the apparently harmless pulling crackers, through accidental explosion. Explosives have no place in the nursery.

AMERICAN SODA.

One hundred and eighteen thousand tuns of crude soda at fifty dollars per tun is reported as about the annual importation of this salt, used, as our readers know, in the manufacture of soap, glass, and other articles of general consumption. This will convey some idea of the importance of the great and wonderful natural deposits of carbonate of soda, which have been found in the West, six hundred miles beyond Omaha, and forty miles north of the Union Pacific Railway. Deposits of soda are here found in all stages and conditions. In some cases, alkaline lakes are encountered, the water saturated with the carbonate. One especial deposit, of many acres in extent, consists of a crust of carbonate of soda more than six feet deep, under which is a strong alkaline liquid. This great deposit lies there, waiting for people to come and take it away. In quantity there is enough to supply the wants of the world for an age. In quality it is superior to the crude article now manufactured, as it contains twenty per cent more of carbonate of soda; while in cost it is very cheap, as it may be delivered in New York, when the railway to the deposits is opened, for thirty dollars per tun. The soda trade is evidently destined to change. Instead of employing vessels to bring the product here, we shall soon fill them with improved cargoes of the article to go abroad.

THE GREAT LAVA FLOOD OF OREGON.

Professor Joseph LeConte, of the University of California contributes to the *American Journal of Science and Arts* the results of observations made by him during a geological tour in Eastern and Central Oregon. He states that probably the most extraordinary lava flood that ever occurred once covered the greater portion of Northern California, and Northwestern Nevada, nearly the whole of Oregon, Washington, and Idaho, and ran far into Montana on the east, and British Columbia on the north. Derived from streams originating in fissures in the Coast, Cascade and Blue Ranges, it covered an area of 300,000 square miles to an average thickness of 2,000 feet. The whole Cascade range is composed of lava, tier upon tier from top to bottom, forming a depth in some places of 4,000 feet. The order of events which occurred in the region of the Columbia river is graphically depicted