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CIVIL ENGINEERING.

Propelling by Steam Power on Canals. By W. COSSAGE.

My attention has been directed to a paragraph in the *Mining Journal* of the 21st ultimo, relating to the claims of Mr. H. Davies, of Norbury, near Newport, Salop, to the credit of being the first to apply steam power *successfully* to the traction of boats on canals, in which it is stated that "Captain Carpenter, 'long before Mr. Davies had been heard of,' introduced steam traction on the Grand Junction Canal." As I am in a condition to speak exactly to the facts of this case, I trust you will permit me to do so, and thus enable the public to judge as to whom the merit of having practically effected this important application is really due.

In the year 1841, Captain Carpenter applied to the Birmingham Disk Engine Company (of which company I was then acting as director,) to furnish the Admiralty with a disk engine of five horse power, and suitable gearing for driving a set of his patent stern propellers, to be fixed in the pinnacle-boat of her majesty's frigate *Geyser*, of which vessel Captain Carpenter was then commander. Mr. Davies, being at that time the superintendent of the Birmingham Disk Engine Manufactory, prepared drawings of such gearing as he thought suitable for connecting the engine with the propellers, and these were approved of by Captain Carpenter. The whole of the work, except the propellers, was subsequently executed by the Birmingham Disk Engine Company

agreeably with these drawings, and under the superintendence of Mr. Davies. Up to this time, Captain Carpenter had not applied *any* steam engine to drive his propellers on board a boat. This boat being completed, I was present at numerous trials of her capabilities, in which we found, that, on the river Thames, where the width and depth of water are great, she accomplished a speed of nearly seven miles per hour; also, that she could tow a gun-boat conveying a large number of soldiers, at a speed of about four miles per hour. I also attended an experiment made with this boat on the Grand Junction Canal, in the presence of Sir F. B. Head, and other gentlemen interested in canal navigation, and we found that, working singly, and without cargo, she steamed a distance of about five miles on that canal, at the rate of nearly five miles per hour—and, in returning, she took in tow one loaded boat, and with this accomplished a speed of three and three-quarter miles per hour. Thus, a distance of nearly ten miles was *steamed* by Captain Carpenter's boat on the Grand Junction Canal, during one-half of which the boat was alone and without loading, and during the other half one loaded boat was towed. This is the extent of steam traction performed by Captain Carpenter on the Grand Junction Canal, and it was deemed so promising of further important results, that the directors of this canal company presented Captain Carpenter with a handsome gratuity, in acknowledgement of his exertions on behalf of canal interests. Consequent upon this experiment, the Birmingham Disk Engine Company fitted up a boat for Messrs. Pickford & Co., with a disk engine, and a set of Capt. Carpenter's stern propellers, with a view to this being employed in their carrying trade—all the arrangements adopted being approved by Capt. Carpenter. In the mean time, Mr. Davies became more fully convinced, from the above trial of Capt. Carpenter's boat on the Grand Junction Canal, of the correctness of an opinion he had entertained from the first, and which he had repeatedly expressed to myself and others, that the employment of stern propellers on canals (in which the width and depth of water are comparatively small,) was wrong in principle, and he, therefore, constructed a boat having screw propellers placed on each side of it near the bows. These two boats, viz., the one belonging to Messrs. Pickford & Co., fitted with Capt. Carpenter's propellers, and the one belonging to Mr. Davies, fitted with screw propellers placed according to his views—were each furnished with a disk engine of five horse power, and the result of numerous comparative trials made with these will be collected from the following letter addressed by R. S. Skey, Esq., the general agent of the Birmingham and Liverpool Junction Canal Company, to the *Midland Counties Herald*:—

“*Sir*,—In a recent number of your paper, in a paragraph alluding to the introduction of steam power on the Birmingham and Liverpool Canal, I observe it is stated that I, having been invited to witness the performance of a boat fitted up at the Disk Engine Works, on Captain Carpenter's principle, was so struck with the superiority of the plan, as to recommend its adoption. Now this statement is so calculated to mislead those who, like myself, may be interested in the application of steam power to canal navigation, that I must beg the favor of your

allowing me to correct it. Captain Carpenter's plan is to drive the boat by stern propellers of a peculiar form, and all experience has proved that stern propellers, in any shape, cannot be applied with advantage to the tugging of boats on canals. I feared, and Mr. Davies anticipated from the first, it would prove, what for our purpose it certainly was, a complete failure. So strong was Mr. Davies' impression that this would be the case, that he, without waiting for the result of a trial, commenced building for himself a boat to be propelled on a totally different principle. She was fitted with engines of the same power as the boat on Captain Carpenter's principle, and I tried both boats on the Birmingham and Liverpool Canal on the same day, and at the head of the same train. A very short experiment showed so evidently the inefficiency of the one, and the excellence of the other, that we resolved at once to adopt Mr. Davies' principle. Our boats, which were built from his plans, and under his inspection, have nothing in common with the one on Capt. Carpenter's plan, except that disk engines are used in both. We consider these engines to have some considerable advantages for the purpose, but, of course, the kind of engine to be employed is a mere question of cost, space occupied, and fuel consumed. I am anxious the public should know the truth; for much time, talent, and money, have been already sacrificed, as many clever and enterprising men know to their cost, in the attempt to accomplish, by the use of stern paddles, or propellers, that in which Mr. Davies has succeeded by very different means; and I should be sorry if an inaccuracy, which it is in my power to correct, should lead others into similar loss and disappointment.

“ROBERT S. SKEY.

“Canal Office, Audlem, Oct. 10, 1843.”

After the trials above referred to by Mr. Skey, the engine was taken out of Messrs. Pickford's boat, and Mr. Davies was engaged by the Birmingham and Liverpool Junction Canal Company, to carry out his views of steam propelling; and, during the year 1843, he succeeded in accomplishing a complete system of steam traction on their canal, in effecting which Mr. Davies invented and applied a new apparatus for connecting a number of boats together, so as to form a long train, capable of being steered by one man. So complete a change in this mode of conveyance excited great public attention, and some of the local newspapers having attributed to Mr. R. S. Skey, the merit of accomplishing this change, that gentleman immediately addressed a letter to the editor of the *Chester Courant*, published in that paper of the 19th of September, 1843, in which, referring to such report, he says:—“Now, this merit is not mine, and I am anxious to take the earliest opportunity of disclaiming it. The tugs were built, and others are now building, under the superintendence of Mr. Davies, the inventor of the disk engine, who had previously given proof of his fitness for the task, by constructing a boat, against which none of the ordinary objections could be raised. I am happy to give my testimony to his success, which has been so complete, as to induce us to abandon all idea of moving our trains of boats by horse power.”

Amongst other parties whose attention was directed to these per-

formances, Mr. Ellis, agent to the Union Canal Company in Scotland, availed himself of an opportunity to investigate the working of this system, and Mr. Davies furnished him with the model of a boat suitable for their canal, and with details of the connecting and steering apparatus he had invented. Two towing boats were constructed according to this model, and Mr. Davies furnished the propellers which were applied to them. The performance of these boats was highly satisfactory, and drew forth commendatory notices in the *Glasgow Citizen*, and other local newspapers; but, as the merit of the arrangement was attributed incorrectly to some gentlemen of that neighborhood, Mr. Ellis, under the signature of "A Correspondent," addressed a letter to the editor of the *Glasgow Citizen*, (copied into the *Mining Journal* of August 31, 1844,) doing justice to Mr. Davies' claims.

Mr. H. Davies has constructed eight towing boats, fitted with disk engines, for the Birmingham and Liverpool Junction Canal Company, and these are now, and have been, for upwards of twelve months, regularly employed in carrying on an extensive traffic on a line of canals extending from Autherley, near Wolverhampton, to Ellesmere Port, on the Mersey, a distance of sixty-nine miles, in which two trains, usually consisting of six, or eight, loaded boats, are started from each terminus of the above line every day, and, by this means, a quantity of merchandize, averaging between two thousand tons, and three thousand tons per week is conveyed by the use of steam power on canals. The average weight of merchandize conveyed in each train exceeds one hundred tons, and the haulage of this for one mile is effected by the consumption of less than one-half cwt. of coal; consequently, the power of hauling one ton of goods one mile is yielded by the consumption of *less than half a pound of coal*. The engine is managed by one man; the train of boats is steered by one man; and the sole additional attendance is that of a conductor, (whose chief duty is to prevent pilferage,) except in passing locks, when extra assistance becomes necessary. An equal quantity of goods could not be moved by horse power, without the continued employment of six horses, with the requisite relays for changing these, and at least twenty-four men on board the boats.

Independently of Mr. Davies' arrangements for applying steam power to this purpose being totally different to those of Captain Carpenter, and others, I feel justified in stating that he is the first person who has applied this power to conveying goods on ordinary canals, to such an extent as can be considered *commercially useful*; for, although numerous attempts have been made to effect this object, yet, as in the instance of Captain Carpenter, these have all been abandoned before they have produced any practical result; therefore, I consider that the merit of being the first to apply this power usefully to canal navigation is due to Mr. Davies, and I feel confident that if the proprietors of this property were to avail themselves of the means thus presented to them, they would soon place their interests in a position very different to that to which the use of this power on railways is rapidly reducing it. I am induced to trouble you with this letter, to do justice to a talented and deserving individual; for, although my

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pursuits are now very different to those of the period referred to, I cannot but feel interested in a matter to which I then devoted much time and attention, and am, therefore, desirous to contribute the information I possess as to the merits of this case.

Swansea, October 16, 1844.

Lond. Min. Journ.

Description of the Roof of the New Houses of Parliament.—From Weale's Quarterly Papers on Engineering.

Of the superiority of iron over wood in the construction of roofs for buildings, the architects of the present day are becoming fully convinced, and the splendid example now set before them by Charles Barry, Esq., should at least induce all who have hitherto been indifferent to the advantages of this material in the essential qualifications of lightness, strength, durability, and safety, in cases of fire, to examine the subject with all the attention it deserves, and the result may be looked for in the more rapid progress of the substitution of iron for wood in constructing the principals of roofs, especially when of large span. Not to the roofs only, but to flooring joists, or girders, the metal material is happily adaptable also, wherever resistance to fire, and great strength, with small section, are primary objects in their construction. Of these valuable properties, the architect of this edifice has wisely and very fully availed himself, and he has, moreover, been, by this selection, enabled to offer facilities for carrying into complete effect the most complicated details of construction in flues, &c., required for the proposed system of ventilation for the extensive pile of building under his care.

But beyond the use of iron in forming the principals of his roofs, Mr. Barry has ventured to a further step, of which those unacquainted with the experience that he is cognizant of might not fully understand the wisdom, but which is thoroughly approved by all practical and scientific persons who have examined the subject minutely. We refer to the coverings of the roofs with cast-iron plates of a thin section, and galvanized by a process now admitted to present the best yet discovered means of protecting iron work exposed to the air and weather from their otherwise injurious effects.

Upon the many substantial advantages thus attained, we are induced to state briefly the impressions we have received from an attentive examination, we might say, most interesting study, of the roofs delineated and detailed in the eight accompanying plates. The cast-iron plates being cast of sufficient size to span the distance between each adjoining pair of principals, dispense with the necessity for any kind of boarding whatever, thus saving not only a great expense, but also diminishing the chances of damage by fire, which would, by destroying this boarding, leave the slates without sufficient support, thus making the whole roof liable to be broken in by their derangement; or, in the case of lead covering, the fire from the boarding communicated to the lead, would speedily reduce it to a liquid state, and create the most disastrous, or fatal, consequences. Again the cast-iron plates allow the formation of ornamental rolls on the