A NEW FORCE IN HYDRAULICS.

A correspondent of the Winnipeg Commercial describes a test of an apparatus invented by Captain Powers, of Vancouver, by which he claims that he can produce an auxiliary power by utilizing the flow of water through a pipe driven lengthways through the hull of a steamer. A boat built for the purpose, the Evolve, 35 feet long, had an eight inch pipe set in her hull from bow to stern below the water line, and inside the pipe were six wheels on the principle of paddle wheels, but with flat blades, and placed at an angle of 45 degrees. These wheels were so placed as to turn an outside wheel to which a belt could be attached. The little vessel was driven ahead at five knots an hour and the revolutions of the outside wheel counted. In one minute the wheel turned 225 times. Captain Powers claims by this to have discovered a new force in hydraulics. He claims that without retarding the boat he can utilize the power secured from the motion of the boat through the water, or rather the tube through the water to generate sufficient power to electrically light a big ship or to save coal by using it as an auxiliary power. W. Taylor, foreman of the Albion Iron Works, where the little vessel was built, and who was in charge at the time of the experiment, states that Captain Powers has yet to prove that his apparatus offers no additional resistance to the engines. Captain Powers says he will prove there is no resistance, and is now getting his testing apparatus ready to do so.

CONCRETE BRIDGES AND THEIR ADVANTAGES.

A. W. Campbell, C.E., good roads commissioner for Ontario, describes, in the Municipal World, a bridge of concrete construction recently built across the river Thames between the counties of Middlesex and Elgin, at the joint expense of these counties, which is characterized by him as such a splendid sample of modern bridge design and construction, that we transcribe it for the information of engineers and others who may have to do with such works. The bridge is a single span of two hundred and forty feet. The abutments are made of cement concrete with wing walls of the same material to retain the earth approaches. The superstructure is of steel. The roadway is sixteen feet wide, and the flooring is cement concrete laid on expanded metal. Cement concrete or stone masonry is now being pretty commonly used in the construction of highway bridges, and in order that no perishable material requiring frequent and expensive renewals will enter into the construction, cement concrete is also being used for the flooring. These materials have been used to a considerable extent in Western Ontario, and where good practice and experienced workmen have been employed excellent results have been reached. The use of cement concrete by municipalities in Canada is of quite recent date, consequently people skilled in the manipulation and use of this very sensitive but substantial material are scarce. Mistakes are made and the use of such material often condemned by those in charge of the work not being sufficiently posted in its use to see that the work is properly done, and in order to gain this experience, it is well that successful work should be visited and information obtained from those who have had charge in order that no failures will result, and that all moneys expended in this class of substantial work should be profitably managed. When timber of the best quality was cheap and plentiful, wooden bridges were more economical, but with the growing scarcity of timber, increased price, poorer quality, more durable, even if more expensive materials, will be found to be the cheapest, and of necessity must be employed. Wooden bridges supported on piles do not last more than eight to ten years. during which period a considerable amount has to be expended in repairs. Cement concrete piers and abutments, if well built, should last at least a century, while the steel superstructure with proper attention should last half that time. Although the initial cost of a wooden bridge may be only one-half that of a steel and concrete, the latter will in the end be the cheapest; in addition it will be safer, less liable to collapse, and will be more convenient for traffic. Well-made concrete is cheaper and fully as durable as stone masonry, but just as the cost of masonry varies at different localities, in accordance with the cost of stone, length of haulage, labor, etc., so the cost of concrete will vary according to the cost of gravel or broken stone used, length of haul, cost of cement and labor. For piers and abutments the average cost of concrete is five dollars per cubic yard as compared with stone masonry at about twelve dollars per cubic yard. Generally speaking concrete costs about one-half that of stone masonry. While attention has been given to the building of the substructure of suitable material, and while much attention for years has been given to the use of iron and steel in superstructures, the flooring has usually been made of wood. This being perishable, the cost increasing and the quality degenerating, has reduced the life of such material, and has proven the maintenance so expensive that municipalities have been compelled to look for some more substantial material. Cement concrete is now being used as successfully in the flooring of bridges as in the building of sidewalks in cities and towns, and where materials have been selected, where the proportions have been carefully measured, and where the mixture has been properly made and the material carefully and successfully laid, cement concrete is an absolute success, and none need hesitate to adopt it for this purpose. Where cement floors are used the bridge must be designed of a slightly greater strength to provide for the additional dead load. The cement concrete is supported on a net work of expanded metal placed over the joist. The floor should be about six inches in the centre, gradually tapering off to four and one-half inches at the sides. The surface layer of one and one-half inches in thickness should be composed of one part of cement to two parts of sand and crushed granite, the sand being sufficient to fill the voids. The remaining portion should be composed of one part of cement, two of sand and three of broken stone, granite or lime-stone. The cost of cement concrete floors when first undertaken in Ontario was about forty cents per square foot, but this, however, has been reduced to about twenty-five cents per square foot. Concrete increases considerably the dead weight of the bridge, but this more than compensates for all the extent to which it distributes the live load. With a plank floor the weight of every vehicle passing is transmitted to the individual members of the bridge, causing a constant jar and distortion that is very trying to steel. With concrete, on the other hand, a more staple and continuous mass is created, and the weight of the vehicle is consequently spread over a much greater area. In this way the injury to bridges is much less with the concrete than with the plank floor.

STORING OF COAL BENEATH WATER.

The manager of the Alexandra docks at Newport gives some interesting particulars in regard to tests of the value of coal stored under water, a system now under consideration by the British Admiralty. Four qualities of coal were tested, the best Monmouthshire coal, which is one of the best, if not the best coal in the world for stoking purposes; coal which had been three years under water; coal which had been ten years under water, and coal recovered by mudmen outside the mouth of the Usk River, drifting from the wrecks in the Bristol Channel, and which is distinguished as river coal, and has probably been under water for considerably more than ten years. In value of raising steam and actual working results these coals came out in this order: First, river coal; second, coal that had been ten years under water; third, fresh coal, and fourth, coal that had been three years under water. Comparing their values with Welsh coal, river coal was 4 per cent. better, and coal that had been ten years under water 1.8 better. Coal that had been three years under water had lost 1.6 per cent. of its working power. The oldest coal gave the best results in steam raising, prompt and sustained fire, and ideal consumption per square foot. But, as in practice, it is not likely that coal will be stored for more than three years, the broad working conclusion is deduced that coal can be stored from two to three years under water, with a loss of not more than 2 per cent. of its steam value. Mr. Churchward, the engineer of the Great