Railway Electric Lights.

An interesting experiment is now being tried on the Metropolitan District Railway, London, in connection with one of the suburban trains running from High Street, Kensington, to Putney, the carriages of which are lighted by electricity direct. In carrying this out, a Siemens dynamo and a Willans three-cylinder engine are placed in a luggage van which is attached to the train. Steam is supplied to the engine by means of a small boiler, which is also fixed in the van. The carriages are lighted by means of a total of twenty-eight Swan incandescent lamps of 20 candle power each, which give a very brilliant light. The present machinery was designed for a longer train, and, in addition to the lamps in the carriages, there are about thirty in the van which are always lighted when the others are. The object of this is to ascertain the exact cost of working a sufficient number of lights for the longer trains, which are usually fitted with fifty ordinary gas lamps. The experiment is being carried out for Lord S. Cecil, general manager of the District Railway, and Mr. J. S. Forbes, chairman of the London, Chatham, and Dover Railway Company. The first public trial of the light took place recently, and the results were considered very satisfactory. It is, therefore, intended to continue the experiment for some weeks, the train being all the time in regular work. In the event of the machinery proving effective and trustworthy, it is probable that a Willans engine and a dynamo will be placed on the engine of the train, so that steam can be supplied from the locomotive boiler. This arrangement, which has been proposed by Mr. W. F. Massey, of Twyford, will necessarily prove cheaper, inasmuch as the small boiler and the special attendant in the van will not be required. It is anticipated that the cost of lighting a train by electricity direct will be much less than that of oil lamps.

Enameling Cast Iron Ware.

Otto Holrenz, of Beresdorf, has devised a new process for preparing iron vessels for enameling. He sets out with the assertion that the enamel adheres to the white iron better than to gray, because the latter contains a mixture of uncombined carbon (graphite); hence, the articles to be enameled should be cast in iron, the surfaces of which are free from graphite. To accomplish this the mould in which the iron is cast is made of damp sand covered with a substance that will take up carbon and remove it. The best substance for this purpose is sulphur, which combines with the free graphite to form sulphide of carbon, which burns as soon as formed. Holrenz, therefore, dusts the moulds with fine sulphur powder, either alone or mixed with pulverized quartz or charcoal dust. The mixture contains more or less sulphur according to the quality of the iron used, but always has enough sulphur to convert the surface of the iron in contact with the mould into white iron.

The castings thus prepared are not pickled, as was previously customary before enameling, but the first or basic coating is applied directly to iron as soon as it has been mechanically cleaned or scoured.

A similar result is obtained by coating the mould with oil or petroleum, whereby a portion of the graphite is converted into a hydrocarbon, and this burns up when the casting is made.

Finally, to remove the graphite from the surface of an article already cast, it is coated with sulphuric acid of 60° B. and then ignited, when sulphuric acid that has penetrated into its pores acts upon the graphite as the sulphur powder in the mould does upon the fluid iron.—*Deut. Industrie Zeitung.*

Artificial Diamonds.

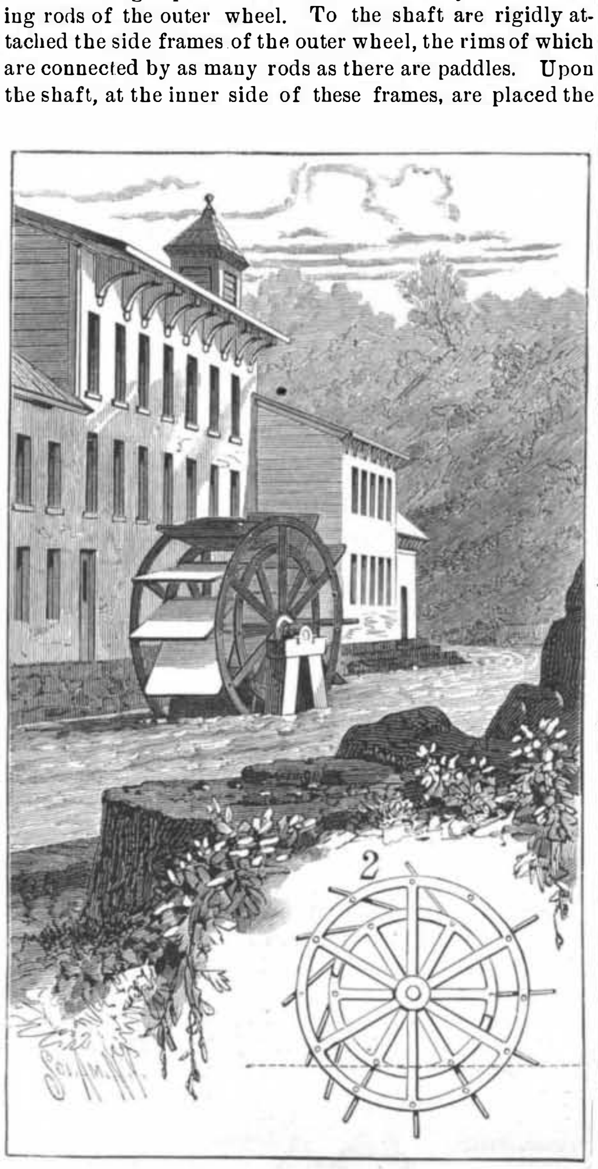
The importation of artificial gems, in which there has always been a large trade, has lately been greater than usual, a new French imitation diamond having proved quite popular. It is made of strass, a variety of flint glass containing more lead and in some cases a smaller proportion of borax, but the glass is subjected to a great heat and then plunged into cold water, whereby it is contracted so the grain becomes very close and fine. It is cut and polished like a real diamond, a leaden wheel with oil and diamond dust being used.

These artificial diamonds are called "heliolas," and are graded to conform to carat sizes of real diamonds, selling at from $20 to $50 per gross. A very small bit of foil is used as a backing, attached to the center of the back, reflecting the light into the heart of the stone. Such imitation "diamonds" are largely used for theatrical and fancy dress purposes, and in rolled plate jewelry of every form, besides being sometimes worn, it is said, by ladies owning real diamonds, and others whose financial condition has compelled them to part with their real gems. It requires the skill of an expert to determine the difference between the genuine stone and the new imitation.

A RECENT French law makes revaccination incumbent upon every student received into the lyceums and colleges. Since the experiment was made at the Lycee Louis le Grand not a single case of variola or varioloid has appeared.

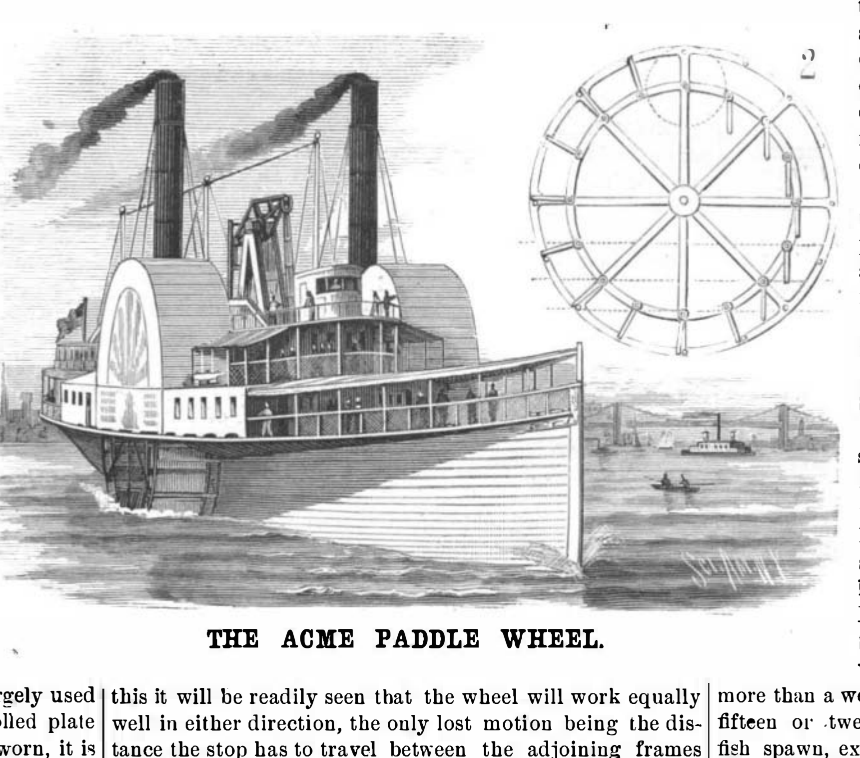
THE DUPLEX TIDE WHEEL.

The wheel shown in our first engraving will work with equal efficiency in both directions. The plan is simple, and permits all the parts to be easily and yet strongly and durably constructed. It consists of a rigid outer wheel and a loose inner wheel provided with stops, to limit its movement, and with hinged paddles held to their work by the connecting rods of the outer wheel. To the shaft are rigidly attached the side frames of the outer wheel, the rims of which are connected by as many rods as there are paddles. Upon the shaft, at the inner side of these frames, are placed the



THE DUPLEX TIDE WHEEL.

side frames of the inner wheel, the rims of which are connected by rods, and which are kept at the proper distance apart upon the shaft by collars united by bars or by a tubular washer. The inner wheel moves freely upon the shaft, but its movement is limited by blocks (shown in Fig. 2) attached to the rims of the frames of the rigid wheel, and which engage with the spokes of the inner wheel. To the connecting rods of the inner wheel, which is made smaller than the other, are hinged the inner edges of the paddles, which project between the rods of the outer wheel. From this it will be readily seen that the wheel will work equally well in either direction, the only lost motion being the distance the stop has to travel between the adjoining frames when the current is reversed.



THE ACME PADDLE WHEEL.

THE ACME PADDLE WHEEL.

Our second engraving represents a feathering paddle wheel, in which the blades are pivoted at their inner edges to the frame, and are held to their work by stops placed in the frame radially beyond the pivots, thus leaving the blades free to revolve in a full circle as shown in the sectional drawing. By this arrangement, when the wheel is revolved in either direction the paddle will revolve in the opposite direction until it is immersed, when it will be pushed through the water by the bars, thereby propelling the vessel in the opposite direction. With slow motion the paddles will dip edgewise into the water, as indicated in Fig. 2; with extreme speed the centrifugal force will carry them outward in a straight line from the shaft. In this case they meet a countercurrent nearly equal in velocity to that of the outer rim of the wheel, and will then feather to this current until acted upon by the bars. By reversing the motion the paddles will arrange themselves to their work in the opposite direction in one-half a revolution of the wheel. The wheel may be immersed in the water nearly to the main shaft and yet it will retain its propelling power, and for this reason it is adapted for seagoing as well as river and coast steamers. In Fig. 2 the dotted line shows the path which the paddle is free to traverse. Instead of one line of paddles there may be two or three arranged upon pivots in concentric circles. The inventor has found by experiments that this wheel is greatly superior to the ordinary rigid paddle wheel.

These inventions have been recently patented by Mr. C. L. Petersen, whose address is P. O. Box 2705, Boston, Mass. Patents applied for in England, France, Germany, and Canada.

Steel Spring Motors.

At a recent meeting of the Engineers' Club of Philadelphia, Mr. Wilfred Lewis read a paper upon the "Resilience of Steel," reviewing some of the means employed for the storage of energy, and showing the place occupied by steel among them.

Among the means now employed, compressed air, hot water, and the storage battery were cited from an English writer as being about equal in value, and as giving out about 6,500 ft. lb. of work per pound of material used.

Steel springs, according to the same writer, were said to yield about 18 ft. lb. per pound. In this connection the project of using steel springs as a motor for street cars was referred to as the most hopeless of all possible means of locomotion.

To test the accuracy of this statement in regard to steel, several experiments were made by the writer upon tempered specimens, both for tension and flexure. Contrary to expectation, the highest results were shown by the flexure of a small spiral clock spring weighing 2,040 grains, which gave out, when wound up, about 45 ft. lb. of energy, or in other words, 154 ft. lb. per pound.

The transverse strength of this steel within the elastic limit was found to be about 300,000 lb. per square inch, and its modulus of elasticity about 30,000,000. Such extraordinary strength, with such a low modulus, was so far beyond conjecture that it seemed to give a new hope for the success of the project referred to; but after making the necessary allowances for weight of car and efficiency of driving mechanism, it was found that not more than about 20 ft. lb. per pound of car would be available for locomotion. It was therefore improbable that such a car could ascend a hill over 20 feet high.

It was also a matter of doubt whether larger springs could be made to show results which would even approach these figures, and on this account the experiments about to be tried might be looked for with some interest.

Indian Fish-Egg Food.

We are indebted to Messrs. Fulda Brothers, of San Francisco, for a fine specimen of the fish-egg food prepared by the native Indians of British Columbia. The specimen received consists of a small branch of cedar, the leaves of which are thickly coated with dried fish eggs. Our correspondent says the eggs of the specimen sent are from a small fish that abounds in the waters of Vancouver's Sound, and are collected by making a mattress of cedar twigs and sinking them in shallow places until the fish have deposited their spawn, when the twigs are raised and the spawn allowed to dry. When wanted for use, they are simply soaked and eaten.

In this connection we will give the following item from a correspondent of the Chicago *Tribune*, who tells about fish and fishing in Sitka Bay, Alaska:

Drop a hook in any of these immense stretches of inland waters, and especially amid the Alexandrine Archipelago, and in a moment a fish will be at the bait. Rock cod, halibut, weighing from 40 to 150 pounds, salmon, fill all the streams and bays; and the herring! A fish story here will be apropos. During the spring of 1881 the writer was in Sitka, and was a witness to one of the most wonderful sights in the bay of Sitka. For more than a week the water of the bay, covering an area of fifteen or twenty square miles, was as white as milk with fish spawn, extending as far as the eye could see. The herring were so numerous that people were gathering them from the water along the beach with their hands and filling baskets with them. The Indians placed spruce boughs in the water, and when these were taken out not a particle of the original green but what was covered with a thick coating of eggs. An Indian in a canoe, with a stick about seven feet long, and for a distance of about two feet studded with nails, points outward, plied the water with this crude implement, each dip in the water bringing up from two to seven fish, and filling his canoe in somewhat less than forty-five minutes.