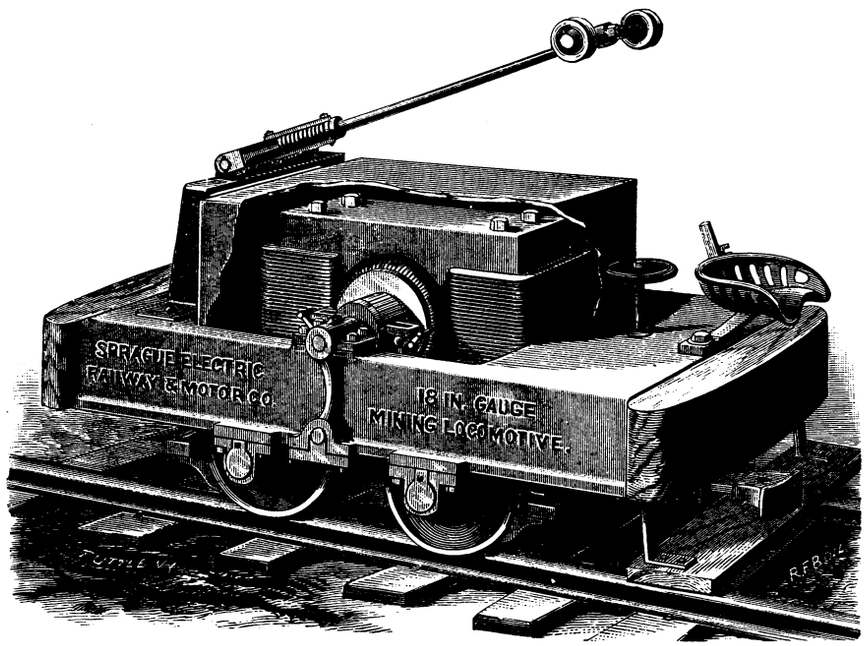
for the treatment of iron and steel by this process. As the plant is small at present, attention is mainly given to small articles, such as steel and iron shingles for roofing, builders' hardware, artistic ironwork, furniture springs, polished parts of steam-engines and other machinery, boiler-tubes, nuts and bolts, water-meters, steam-radiators, and similar easily handled articles; but the intention is to apply the process, on a larger scale, to architectural and structural iron and steel, telegraph wire, and probably to iron and steel plates for boiler construction, ship-building, and similar uses.

As described by Professor Haupt and Dr. Gesner, this process does not produce a magnetic oxide upon the surface of the metal, as is the case in other processes for making iron rust-proof, nor does it alter the dimensions of the articles treated. It changes the body of the surface of the metal into a compound of hydrogen, iron, and carbon, which is designated a double carbide of hydrogen and iron, as determined by analysis. Being an integral part of the metal, it cannot scale or peel off; and it prevents indefinitely the rusting of the metal through exposure to the weather, steam, damp earth, etc. It is also found that cast iron is to some extent annealed in the process, and its pores filled, so that thin cast-iron pipe which before treatment would leak at five pounds pressure per square inch, will stand a pressure of fifty pounds without leakage after undergoing the process. It also improves the quality of steel.

The following is the report of Barton H. Coffey, M.E., of the Henry Warden Iron Works, Philadelphia, on the results of tests to determine the effect of the hydrogen treatment on the physical properties of iron and steel:

"These tests were determined upon to decide if the hydrogen anti-corrosive treatment had any adverse effect, and if so to what extent, upon the strength and resilience of wrought iron and steel suitable for boiler, ship, and bridge purposes. Five test-pieces of iron were cut from a single plate one-half inch thick, and five more similarly from a three-eighth inch steel plate. These were machined to suitable sizes for the standard eight-inch test-piece, giving a section of about .71 of a square inch for the iron and .51 of a square inch for the steel. Three of each of these sets were forwarded to Dr. Gesner for treatment, who retained one and returned the remainder. The tests were made with a 200,000-pound Olsen machine, and the measurements with Brown & Sharpe micrometer gauges, and are believed to be accurate."

The results were recorded upon test-blanks, which it is unnecessary to reproduce here, it being sufficient to summarize the results as given in the report. "The pieces were gauged both before and after treatment, and showed no change. The tests show practically no effect whatever upon the iron, with the exception of a slight decrease in the elongation. As the area is not reduced, it would be impossible, without further evidence, to say whether or no the ductility were affected. At any rate, the ductility being so low, this small reduction, if proved to exist, would be of comparative unimportance in affecting the value of the metal. The steel is benefited. The annealing undergone during the treatment has softened it to some extent. It has lost about five per cent in strength, but gained five per cent in elongation. This metal, as originally, would not have come up to specifications, being insufficient in stretch. The treatment has not reduced the tensile strength below the assigned limit, at the same time it has brought the elongation up to requirements. Pieces of both iron and steel were bent cold to an angle of forty-five degrees without showing any fracture or scaling of the treated surface."



THE STOREY ELECTRIC MINING LOCOMOTIVE.

In conclusion, the report says, "The hydrogen process does not affect the value of iron and steel for engineering purposes. The treatment benefits steel by the annealing undergone in the process. The treated surface possesses elastic properties of the highest value."

ELECTRIC LOCOMOTIVE FOR METAL MINES.

WE show in another part of this issue a view of a new electric rotary diamond drill, manufactured by the Sprague Electric Railway and Motor Company of New York, which has shown gratifying results in the tests to which it has been put, and which promises to fulfil a long-felt want in electric mining. On this page we show another special electric mining application; i.e., an electric locomotive. This locomotive is simple, powerful, and compact, and is built with special reference to the rough usage and arduous duties required of such a machine.

The gauge of the accompanying locomotive is eighteen inches, but it can be accommodated to any gauge in ordinary commercial work. In order to protect the machine from damage, all the working parts are completely boxed in, as shown in the view. The speed of the motor is under complete control by a switch which throws the winding of the field into

different electrical combinations, thus varying the speed of the motor without the use of any wasteful resistance. The direction of rotation is also governed by the same switch, so that the operation of the motor is very simple, and it can be put in charge of an ordinary workman.

Any system of conveying the current from the dynamo to the locomotive can be used, either using the rails as one side of the circuit for the return of the current, or else employing a complete metallic circuit by the use of a double overhead trolley wire. In this latter case, a trolley pole, shown in the view, carrying at its upper end two trolley wheels for making running contact with the overhead wires, is attached on the rear of the locomotive car.

This mining locomotive is now being manufactured by the Sprague Electric Railway and Motor Company from designs made by Mr. I. E. Storey. One of the most noticeable advances made in modern mining science is the adoption of electricity as a medium for transmitting power and producing light, and the same wires which supply current to the drill, and, when in such use, are connected in multiple arc across the main current wires.

These drills are manufactured and sold by the Sprague Electric Railway and Motor Company of New York, under patents granted to Mr. I. E. Storey. We understand that the Sprague Company is now at work on, and will soon be able to furnish, a number of special mining applications, among which is an electric percussion drill.

ELECTRIC MINING DRILL.

such applications as the above indicate the growing demand of mining companies for just such apparatus, and the ability of the leading electric companies to supply the need.

ELECTRIC ROTARY DIAMOND DRILL.

THE accompanying view shows a new electric mining rotary drill which has shown good results in experimental work, and which will soon be applied to regular mining-work in several leading mines.

A good electric mining drill has always been desired by miners, and this drill seems to meet all the requirements. It is light, compact, simple, and easy to operate. The motor is completely incased, so that it is impossible for dust, dirt, or stray stones to lodge in the working parts. The whole drill is mounted on an adjustable frame, so that it can be very easily set in any position desired, or set at work at any part of the mine.

The current for operating the drill is supplied at a constant voltage or potential, the number of volts depending on the potential used for transmitting power throughout the mine. If lamps are needed, they can be supplied with current from

THE LATEST THEORIES ON THE ORIGIN OF THE ENGLISH.[1]

WHEN, one is sometimes tempted to ask in sheer weariness, will any man be able to say the last word on that question of the West which bids fair to be as eternal as any question of the East, — the question whether we, the English people, are ourselves or somebody else? That formula is not a new one. Some of us have, in season and out of season, through evil report and good report, been fighting out that question for not a few years. If it is wearisome to have to fight it out still, there is some little relief in having to fight it out in a wholly new shape and with a wholly new set of adversaries. It is an experience which has at least the charm of novelty when we have to argue the old question, who are we, whence we came, from a point of view which might make it possible, with the exercise of a little ingenuity, to avoid ever using the words "Celt," "Briton," or "Roman" at all. On the other hand, the strife in its new form has become more deadly; the assault has become more threatening. Hitherto we have fought for victory, for dominion, for what, if one adopted the high-polite style of a lord mayor's feast, one might call "the imperial instincts of the Anglo-Saxon race." We have had to fight to prove our greatness against people who told us that we were not so great as we thought. Angles and Saxons, we were told, were only one element, perhaps a very inferior element, in the population of Britain. Still nobody denied that we had some place in the world, some place in this island. It might be a very small place compared with that of the Celt who went

[1] From The Contemporary Review for January.