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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

SUPERHEATED STEAM.

Every engineer knows that the improvement in steam-engine economy witnessed during the last thirty years has been due primarily to the constantly increasing higher steam pressures employed and to the introduction of compound and multiple-expansion engines. To be sure, many mechanical details, such as valve gears and governors, have been perfected; but the fact remains that whatever progress has been made is due to the utilization of higher pressures. That improvement, it must be admitted, has probably reached its limit. Such is the increased cost of building more than a triple or quadruple engine, that the very slight increase in economy produced by an additional cylinder hardly proves remunerative. Moreover, certain limitations have been imposed by boiler design, limitations which have prevented the attainment of pressures greater than 250 pounds.

It is because the present system of steam engineering is incapable of any great advancement that we may expect a more general return to the use of the superheater. We use the word "return" advisedly; for, whatever may be the general impression among engineers, the employment of superheated steam dates back very nearly three-quarters of a century. As far back as 1828 a certain Capt. McGregor, in order to compete with the record established by a rival Cornish engine, whose cylinders had been insulated with sawdust, constructed a jacket of brick around the cylinder of his engine and the steam pipe, with an air space between the brickwork and the iron. In the open space he built a fire; and by the heat generated he increased the duty of his engine from 41,000,000 to 63,000,000 foot-pounds per bushel (86 pounds) of coal. The great Richard Trevethick himself made many an interesting experiment, which convincingly proved, to him at least, the great reduction in coal consumption to be effected by the utilization of superheated steam. Every great engineer has, at some time, conducted experiments of more or less value. Men of the stamp of Ericsson, Hirn, Isherwood, and Faraday were able to show an increase in economy varying from 20 to 27 per cent. Such, indeed, was the impetus given by their researches that superheated steam was very widely introduced in marine engineering in the two decades extending from 1850 to 1870, and this, notwithstanding the great difficulties encountered in lubrication, and notwithstanding the fact that the material of which the superheaters were made was unable to withstand intense heat for any length of time. The lubricant of those early days consisted, not of our present mineral oils, but of animal fats, which obviously were anything but commendable lubricating agents. But even animal oils proved of sufficient service with the low pressure of 50 pounds and the temperature of 100 deg. Fah. given to the superheated steam of that day. It was when the high-pressure, compound engine was introduced, that the development of the superheater was checked. The greater economy of the new engine, compared with the low-pressure, single-expansion machines that had been theretofore used, the consequent saving of space and weight, both of them important on shipboard, and the reduction of the temperature in superheating the steam to a point at which the difficulties of lubrication were overcome—all these contributed to the abandonment of the old-time low-pressure, superheated steam engine.

Ever since the days of James Watt, engineers have realized that the principal loss of efficiency in the steam engine is due to the condensation of steam in the cylinders. Assuredly, the most obvious way of overcoming the difficulty is to superheat the steam. This, moreover, would be one of the simplest methods of increasing the economy of the steam engine, still lamentably low, despite the progress of recent years.

To those who are at all familiar with the history of steam engineering in the past century, may be commended a paper by Prof. Storm Bull, recently read before the Western Society of Engineers, and published in the current issue of the SUPPLEMENT, in which the subject is discussed with a fullness that cannot here be emulated.

It is rather remarkable that the improvement of the superheated steam engine has been undertaken chiefly in Germany. Many readers will doubtless recall the astonishing results obtained about nine years ago by Schmidt with a boiler and engine of his own design—results which showed that with superheated steam a consumption of steam of only 10.4 pounds per indicated horse-power was possible, and that the amount of coal used per indicated horse-power per hour could be reduced to 1.3 pounds. Schroeter has lately published results of equally interesting tests of a 250-horse-power steam engine. The difficulties which were encountered many years ago in the construction of superheaters that would not readily wear out have in a large measure been overcome. The problem of lubrication has also been solved with the introduction of suitable mineral oils. With these technical advancements, therefore, the outlook for the superheated steam engine is certainly bright.

STATE REGISTRATION OF UNITED STATES TRADE MARKS.

The status of the trade marks which have been registered in the United States Patent Office is indeed peculiar, for under the decision of the United States Supreme Court, which was rendered in the case of Warner vs. Searle & Hereth Company (195 U. S. 191), decided November 30, 1903, many registrations fail to afford the protection which, when filing their applications for registration, the registrants desired.

The authority of Congress to pass laws governing trade marks, and the right to their registration, as well as its authority to legislate on all other questions, is derived from the Constitution; and only when a law is founded on some provision of the Constitution which expressly authorizes, or by way of implication gives power to carry into efficient operation those powers expressly given, is the law constitutional. In all other cases, the law is unconstitutional and of no effect. Examining the Constitution, provisions can be found under which Congress is in certain cases authorized to enact laws for the registration and the protection of trade marks; but Congress is not authorized to register all trade marks, which are used in trade in the United States, and any general law for the registration of trade marks, which are the property of citizens of the United States and citizens and subjects of other nations, would, of course, be invalid. The early national trade mark law of the United States attempted to authorize the registration in the Patent Office of all trade marks by their lawful owners, and, as it exceeded the authority vested in Congress, it was declared unconstitutional in the trade mark cases, 100 U. S. 82, which were decided on November 18, 1879.

In that case, Justice Miller carefully considered the constitutional provisions and the trade mark laws passed by Congress, and, in his opinion, he stated that of the two provisions of the Constitution under which counsel claimed that Congress was authorized to enact general laws for the registration of trade marks, the first was the clause which authorized Congress to enact laws "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their writings and discoveries;" and the second clause was that which, in connection with the granting clause, is as follows: "The Congress shall have power to regulate commerce with foreign nations, and among the several States, and with the Indian tribes." The first clause was held not to refer to trade marks, for neither originality, invention, discovery, science, nor art is in any way essential to a trade mark, nor was it made so under the laws for their registration. Considering the second clause, the Justice stated that "while commerce with foreign nations means commerce between citizens of the United States and citizens and subjects of foreign nations, and commerce among the States means commerce between individual citizens of different States, there still remains a very large amount of commerce, perhaps the largest, which, being trade or traffic between citizens of the same State, is beyond the control of Congress." As the law did not attempt to limit the right to registration to those cases when the applicant had a foreign trade or a trade with citizens of another State or with an Indian tribe, Congress exceeded the authority vested by the Constitution, and the laws were invalid.

Having before it the decision of Justice Miller, Congress enacted in 1881 another law for the protection of trade marks, which law is now in force, but because of the decision in the case of Warner vs. Searle & Hereth Company, it is not of the value which Congress intended to give it. The law of 1881, unlike the old law, authorizes the registration of trade marks in

the Patent Office, only in cases where the applicant uses his trade mark in commerce with foreign nations or with the Indian tribes, and it therefore comes within the express terms of the Constitution, and the validity of the statute has not by the courts been questioned. The difficulty arises because of the construction which is given to the statute. In his decision construing the statute, the Justice states that as the law of 1881 was enacted to avoid the unconstitutional features of the old law, and as it expressly limited the right of registration to those marks which were used in commerce with foreign nations or with the Indian tribes, he held that a trade mark registration under the provisions of the law was not infringed unless the defendant injured the registrant's trade because of his use of the mark while engaged in foreign commerce or in trade with the Indian tribes. When the person copying the registered trade mark does not engage in commerce with a foreign country or with an Indian tribe, he cannot be held to have infringed the registered trade mark; for otherwise it would be possible for a registrant to secure the privileges which Congress previously attempted to confer under the general law, and which it was held that under the Constitution could not be done. It is therefore impossible for the owner of a trade mark to prevent, under the United States registration statute, its infringement, when the infringer is doing business in only one State, for Congress cannot enact a law protecting a trade mark in such a case; and where the infringer uses the mark in commerce between the States, the infringement cannot be prevented under the national registration laws now in force, for they do not provide for the protection of trade marks in interstate commerce, although the Constitution authorizes Congress to enact laws for the registration and protection of trade marks, which are used in commerce between the States. It is expected that Congress, at its next session, will amend the federal trade mark statutes, and, among other changes, there will undoubtedly be found one which will provide for the registration of trade marks, which are used in commerce between the States. Until that amendment is made, and in all cases where the proprietor of a mark wishes to be sure that his trade mark is protected, by all the provisions of the law, against infringement by persons engaged in business in only one State, it is advisable to comply with the trade mark registration laws which have been enacted by the legislatures of many of the States.

While the protection afforded by a United States registration has been, by the decision referred to, limited, it is nevertheless important for manufacturers to secure the registration under the federal laws, for the Patent Office is an office of record, to which persons all over the world refer for evidence of the ownership of trade marks in the United States. The rights of seizure under the United States statutes and the remedies afforded for the infringement of marks are also of considerable value where the infringer is engaged in foreign trade.

When the proprietor of the trade mark and the infringer are citizens of different States, the federal courts have in many cases jurisdiction, independent of the Patent Office registration, but the rights of the parties are then founded on the common law, and not on the statutory registration.

ON THE STATE OF THE CARBON VAPORIZED IN GLOW LAMPS.

Glow lamp filaments, as is known, are composed chiefly of amorphous carbon, by calcination of a vegetable fiber, which, on being brought to a white heat in the vacuum by the electric current, will yield a trace of carbon vapor, the condensation of which on the walls of the bulb in most cases results in lining the glass with a brown coating producing a gradual darkening of the lamp.

In a paper recently read before the French Academy of Sciences, Prof. Berthelot examines the state of this vaporized carbon at the lowest possible temperatures, comparing it with such well-known allotropic modifications of carbon as the diamond, graphite, amorphous carbon. The main results of this investigation are the following:

Carbon gives off an appreciable vapor tension at a temperature not exceeding 1,500 deg. C.; this tension being so low as to require several hundreds of hours to produce some milligrammes of condensed carbon, even in the nearly absolute vacuum of electric lamps. On the other hand, the carbon thus vaporized at the lowest possible temperatures, is, under Prof. Berthelot's experimental conditions, amorphous carbon without any addition of graphite or diamond. The temperature at which a vapor tension of carbon may be noted proves thus about 2,000 deg. below the boiling point, which, according to Prof. Violle, is 3,600 deg.; this interval is very much larger than the interval of temperatures during which most of the remaining bodies exhibit an appreciable vapor tension. This tension, however, in the case of carbon, does not, in Berthelot's opinion, correspond with a simple vapor-