OUR EXCHANGES.

We take this opportunity, at the close of the year, to acknowledge our indebtedness to several of the scientific papers published in the United States for many of their excellent articles and illustrations which we have made use of during the past year in the columns of this Magazine, but particularly to the *Scientific American, Polytechnic Review, Manufacturer and Builder, Architect and Building News, Plumber and Sanitary Engineer,* and *Mining and Scientific Press.* We trust during the coming year to offer, in return, also much interesting matter. If at any time we should neglect to acknowledge the source from which we obtain information, we trust our contemporaries will kindly call our attention to the omission.—Ed. C. M. M.

AN ECONOMICAL LOCOMOTIVE.

A new anthracite coal burning locomotive has lately been tried on the Old Colony (Mass.) Railway with very promising results. It is said that it is constructed with a largely increased fire surface in order to remove the difficulties arising from the consumption of coal in the ordinary locomotive. Rating the consumption of fuel in the ordinary locomotive at forty to fifty pounds per hour per square foot of grate surface, in this engine when doing its hardest work the consumption is said to be only sixteen pounds per hour. The fire box is behind and on a line with, instead of under, the boiler, and while in the common locomotive the dimensions are 60 and 66 by 32 inches, the new design is 8 feet 6 inches by 7 feet 6½ inches wide. The heating surface of the fire box is 103 square feet; of the combustion chamber, 26 feet. The grate rest is between water bars, which prevent them from burning out, and the area is 64 feet. The diameter of the six driving wheels is 54 inches, and above them are placed the boiler and fire box. The cab is over the rear end of the boiler, while on top of the fire box are seats, protected from the sun by an awning. The weight of the engine is 86,150. At the front end of the boiler is a revolving register, which, when open, has an area of six hundred square inches. On account of the free steaming qualities of the engine, it becomes necessary to open this register in order that the steam may pass directly to the stack without passing through the fire. The fuel used by this engine can be delivered in Boston at $2.25 per ton, or $1.50 less than the cost of fuel which is now used. As the fuel remains perfectly quiet in the fire box, the consumption is slow, and although the engine has no spark arrester, not a spark escapes from the stack; neither is there any annoyance from smoke and gas, which are consumed.

THE TREATMENT OF HYDROPHOBIA.

Mr. Stanford, a member of the English Parliament, has offered a prize of £100 for an essay on hydrophobia, its nature, prevention, and treatment, and the British Minister at Washington has brought the matter to the attention of the Department of State, that the necessary publicity may be given to the offer in the United States. The prize is to be awarded by the Royal College of Physicians of London. The questions which are thought by the college to require special investigation are: The origin and history of outbreaks of rabies, particularly in the British dominions; the best mode of prevention of rabies; the characteristics of rabies during life, and the anatomical and chemical changes which are associated with the disease in its successive stages, particularly in its commencement: the origin of hydrophobia in man, and the chemical and anatomical morbid changes observed in the subjects of the disease, with special reference to those having their seat in the organs of the nervous system and in the salivary glands; the symptoms of the disease, particularly in its earlier stages, and the diagnosis of the disease in doubtful cases, from conditions more or less resembling it, together with the alleged prolonged latency of the disease, and the efficacy of the various alleged remedies and modes of preventing it; and what plan of treatment, whether prophylactic or curative, it would be most desirable to recommend for future trial.

The conditions under which the prize is to be competed for are that the essay must be in English or have an English translation accompanying it, and be delivered to the college on or before January 1, 1880. The essay must be accompanied by a sealed envelope containing the name and address of the author and bearing a motto on the outside, the same motto to be inscribed on the essay, which may be the joint production of two or more authors. If not published by the author within a year, it is to become the property of the college.

CHARCOAL IN DENTIFRICES.

A correspondent, who is a practical dentist of large experience, sends the *Journal of Chemistry* the following note: I notice a paragraph from the *Chemist and Druggist*, referring to the use of different substances for dentrifice, which states that the "microscope pointed out that every particle of charcoal had proved to be a small crystal, which, acting by attrition, was hurtful to the enamel." If attrition or friction were the only objections to the use of it as a dentifrice, I imagine the consequence would not be very harmful; but it is absolutely dangerous on other grounds. Of course its antiseptic properties are not questioned, but the most serious danger arises from its pernicious effects upon the gums and soft tissues. I might add that in extreme cases the alveoli or sockets of the teeth are not exempt from its effects. It may be laid down as an invariable rule that no substance should be used as a dentifrice that contains acids or any ingredients insoluble in the secretions of the month. Now with regard to charcoal, the microscope reveals the fact that, no matter how finely pulverized, it is composed of minute augular crystals. These are absolutely insoluble in the month, and when used they work up under the free margins of the gums, and the more loose and diseased these are the greater the danger. The little carbon crystals get imbedded in the soft tissues, acting as a constant source of irritation which is followed by inflammation. A chronic state is reached; the gums become swelled; pus exudes from their margins; and absorption of gums and alveolar processes, with ultimate loss of the teeth, is the sequel. Of course extreme results are produced only by habitual use of the article. I think all observing dental practitioners of any considerable experience will bear me out in the above statements.

DOES RUNNING WATER PURIFY ITSELF?

This subject is discussed in the November *Popular Science Monthly* by J. A. Judson. He takes a decided negative, as will be seen by the following paragraph: It is not impossible to point out authorities on sanitary matters so wedded to pet theories that they unhesitatingly deny that the conversion of a pure running stream, or even a large river, into a conduit for the sewage-filth of a great city, will have any deleterious effect on the potable quality of the water taken a few miles below the filth-entering point. It has been demonstrated that this is not only false in theory, but also in fact. It was Dr. Letheby, of the English "Royal Commission on the Water-Supply of London," it is believed, who was the first to announce what has since been proved a fallacy, viz., that "if sewage be mixed with twenty times its volume of river-water, the organic matter which it contains will be oxidized and completely disappear while the river is flowing a dozen miles or so;" and further, that "it is safe to drink sewage-contaminated water after filtration." The "Royal Rivers Pollution Commission" of 1868, unwilling that this expression of opinion should remain untested, submitted it to careful and ingenious experimental investigation. The result is thus announced: "It is thus evident that so far from sewage mixed with twenty times its volume of water being oxidized during a flow of ten or twelve miles, scarcely two-thirds of it would be so destroyed in a flow of one hundred and sixty-eight, at the rate of one mile per hour, or after the lapse of a week." And, after mentioning details in support of this, the commissioners conclude with the remark that "it will be safe to infer, however, from the above results, that there is no river in the United Kingdom long enough to effect the destruction of sewage by oxidation." Dr. Frankland, an eminent English authority, before the Royal Commission on Water-Supply, gives some strong testimony in support of the statement that it is impossible to remove the sewage-contamination from water by any known process, natural or artificial, so as to render it harmless, except by boiling for a long time, or by distillation; and, as these two processes are impracticable on a large scale, then, he says, in his opinion, "Water that has once been contaminated by sewage ought not afterward to be used for domestic purposes; and, inasmuch as it is generally believed that the noxious matter of sewage exists there in the form of minute germs, which are probably smaller than blood-globules, I do not believe that even filtration through a stratum of chalk could be relied upon to free the water perfectly from such germs."