Scientific American

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY

At No. 37 Park-row (Park Building), New York

O. D. MUNN, S. H. WALES, A. E. BEACH.

TERMS—Two Dollars per annum—One Dollar in advance, and the remainder in six months.

Single copies of the paper are on sale at the office of publication, and at all periodical stores in the United States and Canada.

Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.

☞ See Prospectus on last page. No traveling agents employed.

VOL. VI. NO. 10.....[NEW SERIES.].....*Eighteenth Year.*

NEW YORK, SATURDAY, MARCH 8, 1862.

WHAT CAN BE DONE FOR INVENTORS.—ADVICE GRATIS AND ADVICE FOR PAY.

For the information of our new subscribers, we would state that it is the custom, at the office of this paper, to examine models or drawings and descriptions of alleged new inventions, and to give written or verbal advice as to their patentability, without charge. Persons having made what they consider improvements in any branch of machinery, and contemplate securing the same by Letters Patent, are advised to send a sketch or model of it to this office. An examination will be made and an answer returned by early mail. Through our Branch Office, located directly opposite the Patent Office in Washington, we are enabled to make special examinations into the novelty and patentability of inventions. By having the records of the Patent Office to search, and the models and drawings deposited therein to examine, we are enabled to give an inventor most reliable advice as to the probabilities of his obtaining a patent, and also as to the extent of the claim that it is expedient to set up when the papers for an application are prepared. For this special examination at the Patent Office we make a charge of Five Dollars. It is necessary that a model or drawing and a description of the invention should accompany the remittance.

The publishers of this paper have been engaged in procuring patents for the past sixteen years, during which time they have acted as Attorneys for more than FIFTEEN THOUSAND patentees. Nearly all the patents taken by American citizens in FOREIGN countries are procured through the agency of this office.

Pamphlets of instructions as to the best mode of obtaining patents in this and all foreign countries are furnished free on application.

For further particulars as to what can be done for inventors at this office, see advertisement on another page, or address MUNN & Co.,

No. 37 Park-row, New York.

HEAT, WORKING AND SUPERHEATING STEAM.

Philosophers have been divided in opinion respecting the nature of heat. One class have supposed it to be a property of matter, like gravity, and that it consisted in the peculiar vibration of its particles, The other class believed it to be a distinct substance —a peculiar subtile fluid pervading bodies. The latter hypothesis was supposed to have been proved by experiments made about sixty years ago with colored glasses by Sir John Herschel and others, and it had been taught as an established scientific doctrine. Recently the former hypothesis modified, has prevailed under the name of "The Mechanical Theory of Heat." New and important discoveries have been made respecting the modes of measuring the effects of heat and a unit of energy for it has been adopted and is called "Joule's Equivalent." It was discovered by Mr. Joule of Manchester, England, while making experiments with friction in heating water, oil, &c., that 772 lbs. lifted one foot, produced that quantity of frictional heat which elevated 1 lb. of water one degree. A pound of water raised one degree in temperature is therefore a unit of heat, and is equal in mechanical energy to 772 lbs. lifted one foot.

Heat and mechanical energy are mutually convertible, and the most perfect example which we have of this upon an extended scale, is the steam engine. The work done by a steam engine is just in proportion to the heat developed and usefully applied. In a late paper upon the theory of heat, read by Prof. Macquorn Rankine, F. R. S., before the Glasgow Philosophical Society, he directs attention to the discovery of Joule and Thomson, that when gases (such as steam) expand without performing work, scarcely any cooling effect is produced. It is therefore possible that steam may be used expansively without doing its proper quantity of work, which is equivalent to so much heat wasted. Some useful facts in this relationship have lately been published in the *Engineer*, taken from the annual report of Mr. L. E. Fletcher, chief engineer of the Manchester Association for the Prevention of Steam Boiler Explosions. He directs the attention of those who use condensing engines to the fact that these motors generally do not execute work in proportion to the quantity of steam delivered from the boilers. The loss, as measured frequently, is about thirty-three per cent. This is due to the alternating connection of the cylinder, each stroke of the engine, with the boiler at a high temperature, and the condenser at a low one—about 100° Fah. In such engines there is an alternate action of condensation and reëvaporation in the internal surfaces of the cylinder, and it is thus a considerable percentage of steam passes from the boiler to the condenser through the engine without doing useful work. This action is so silent and subtile that it had escaped detection for many years. Such a loss is of most consequence in steamships which have to carry their own fuel. It amounts to about three hundred tuns of coal on one of the larger class of steamers in a voyage across the Atlantic ocean. "The remedy for this loss," says Mr. Fletcher, "is to adopt the steam jacket for the cylinder, or superheat the steam. There is nothing new, or untried, or dangerous in either of these." Some have held up superheated steam as a bugbear, and have asserted that it destroyed the interior surfaces of cylinders, cut the faces of valves, corroded the metal and prevented proper lubrication. Actual experience has proved these objections to be visionary. Mr. Fletcher says, on this head, "I find that when superheated steam has been fully tested, no difficulty is experienced in its use, and no alteration is required for old engines to which it may be applied beyond the introduction of a slightly better description of packing for the glands. The Peninsular and Oriental Steam Navigation Company have, in many of their engines, realized an economy of upwards of 30 per cent by the introduction of superheated steam;" and a new steamer, lately built, of 2,600 tuns burthen, with engines of 400-horse power, in which steam jackets, surface condensers, and superheated steam are applied, has realized, we are told, a saving of fifty per cent in fuel compared with a steamer of like tunnage and power without such appliances. These statements claim the attention of all steam engineers and steamship companies. It has been found most advantageous to superheat the steam to about 100° above that in the boiler, when no difficulty is experienced in lubricating valves, pistons and glands. Every new economical application of steam deserves to be generally known and carried into practice.

THE GEOLOGY OF MICHIGAN.

When Michigan received her grant of public lands from the general government a princely portion was set aside for educational purposes. Instead of frittering their fund away in small portions to half-endowed, weak and semi-denominational establishments like the State of New York and other States, her rulers wisely determined to endow liberally one University for the entire State, wherein all the studies of modern high civilization should be taught, and to which all the students of the State should have free access. The various departments of learning have been filled up with competent professors as rapidly as the accumulated funds would permit.

To one of these departments—that of natural history—Prof. A. Winchell has been called, and, in addition to his college duties he has made a geological exploration of the State. The result of this work is now before us, "First biennial report of the progress of the geological survey of Michigan, embracing observations on the geology, zoology and botany of the lower peninsula, made to the Governor, Dec. 31, 1860. By authority, A. Winchell, State Geologist."

One accustomed to the rock examinations of the Eastern States, where exposures can be found in every ravine, roadside, or hilltop, can hardly appreciate the difficulties of making out a comprehensive survey of a State like Michigan, where all the rocks lie low, seldom to be seen at all, and mostly covered over with a mantle of debris, often 200 feet thick. One may travel from Detroit to Lake Michigan, across the entire State, and not see a rock *in situ*, only the ruins of the State geological structure, scattered over the plains and prairies.

To say that the work is well done under the circumstances is not sufficient praise. It is more than well done; it is a credit to the gentlemen employed, to the University with which they are connected, and to the State which ordered the survey.

We particularly notice the chapter on economical geology. The results of this portion of the work are worth more than the whole work cost, looking at it in a pecuniary view. Not only is the exact geological formation to which the brine springs belong ascertained, but it is demonstrated that the waters are strong, and in overflowing abundance.

The commercial importance of these salines may be best understood when we say that between Lake Michigan and Salt Lake, in Utah, no brine springs have been discovered. The whole northwestern country must then be tributary to this State for its supply of common salt. Brine springs have been discovered west of Michigan, but they lie in the British possessions.

The coal formation, too, has received the attention of the survey. The number of the seams of coal, their thickness, their depth beneath the surface, as well as the thickness of the entire surface, have been determined. At present the north of Michigan is covered with an immense growth of forest vegetation. But a few years will pass, and this vast amount of forest will give way before the ax of the woodman. Then will the hidden wealth of coal be sought for, to work her brine springs, to feed her locomotives, furnaces and forges, as well as to give heat to the inhabitants of the country.

To the agricultural portion of the State the value of the beds of gypsum cannot be overrated. These have received special attention in the report. Michigan is a land of sandy soil—one that feels the genial effects of sulphate of lime (plaster of the farmer), and abundantly repays the outlay of its use. Michigan is the only State of the Union which possesses a supply of gypsum, salt and coal.

We notice some points in the science of geology as settled by the investigations of Prof. Winchell.

First, That the salt and gypsum rocks belong to the carboniferous system of geologists, and in this respect differ from that of any of her sister States. In New York the salines and plaster beds belong to the silurian system. In Ohio, Pennsylvania, Western Virginia, Kentucky and Illinois the salines are included in the carboniferous system. In Southwestern Virginia the salines are with the devonian, while in Kansas and the Indian country, Utah and the Great Desert they belong to systems much more recent than the carboniferous, viz., the permian, triasic and cretaceous, if not also to the tertiary.

Second, We also notice another scientific truth developed; one which we have always maintained, that Michigan, and each geological territory, has its own history; that the great march of geological phenomena, which finally culminated in the North American continent, did not proceed with equal step over the whole wide area inclosed within the oceans. And the men who finally work out the undeveloped portion of the continent will do well to follow the example of this report, and give the independent history of each one's own portion.