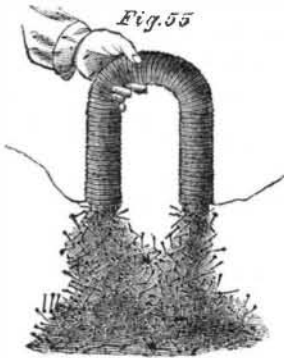
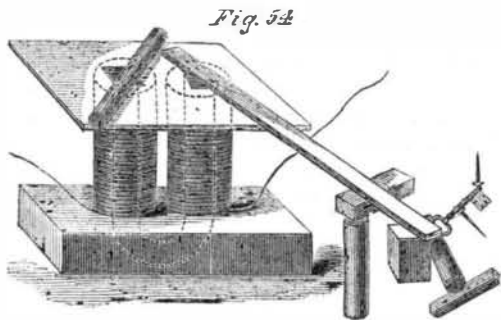


when the contact is broken, see how they fall. What can show you better than such an experiment as this the magnetic attraction with which we have endowed these portions of iron? Here, again, is a fine illustration of this strong power of magnetism. It is a magnet



of the same sort as the one you have just seen. I am about to make the current of electricity pass through the wires which are around this iron for the purpose of showing you what powerful effects we get. Here are the poles of the magnet; and let us place on one of them this long bar of iron. You see, as soon as contact is made, how it rises in position (Fig. 54); and if I take such a piece as this cylinder, and place it on, woe be to me if I get my finger between; I can roll it over, but if I try to pull it off, I might lift up the whole magnet, but I have no power to overcome the magnetic power which is here evident. I might give you an infinity of illustrations of this high magnetic power. There is that long bar of iron held out, and I have no doubt that, if I were to examine the other end, I should



find that it was a magnet. See what power it must have to support not only these nails, but all those lumps of iron hanging on to the end. What, then, can surpass these evidences of the change of chemical force into electricity, and electricity into magnetism? I might show you many other experiments whereby I could obtain electricity and chemical action, heat and light from a magnet, but what more need I show you to prove the universal correlation of the physical forces of matter, and their mutual conversion one into another?

And now let us give place as juveniles to the respect we owe to our elders, and for a time let me address myself to those of our seniors who have honored me with their presence during these lectures. I wish to claim this moment for the purpose of tendering our thanks to them, and my thanks to you all for the way in which you have borne the inconvenience that I at first subjected you to. I hope that the insight which you have here gained into some of the laws by which the universe is governed may be the occasion of some among you turning your attention to these subjects; for what study is there more fitted to the mind of man than that of the physical sciences? And what is there more capable of giving him an insight into the actions of those laws, a knowledge of which gives interest to the most trifling phenomena of nature, and makes the observing student find

"Tongues in trees, books in the running brooks,
Sermons in stones, and good in everything!"

PATENT OFFICE REPORTS FOR 1859.—We are indebted to John Heart, Esq., Superintendent of the Public Printing, for copies of the mechanical report of the Patent Office for 1859. It consists of two volumes, one devoted to the claims and one to the illustrations. In a recent number we referred to the excellent manner in which the illustrations were executed, and it only remains now to say that the whole report is very satisfactorily done. The arrangement is much better than heretofore.

A NEW TYPE METAL.

Every person who has ever cast bullets knows that lead shrinks in cooling, forming a depression or hollow in the neck which sometimes extends down into the ball. This property of contracting on changing from the liquid to the solid state is common to nearly all the metals with two remarkable exceptions—iron and antimony, which expand in solidifying. This property renders these metals peculiarly adapted to casting, as it causes them to fill the mold and thus produce a perfect copy of the pattern. For this reason, antimony is employed to form the alloy for casting type, the standard proportion in England being 3 lbs. of lead to 1 lb. of antimony. Antimony is much harder than lead; but as it is worth from 14 to 17 cents per pound, while lead ranges from 5 to 7 cents, rival manufacturers are apt to accuse each other of producing an inferior article by forming their alloy with too large a proportion of lead.

It is now quite common to coat the face of type with copper by the galvanic process, and an impressive proof of the extreme delicacy and evenness of this deposit is furnished by the fact that it is only in very nice work that even the fine lines of the type are found to be impaired by the copper coating. Copper faced type is far more durable than that which is not so faced, and is extensively used.

Type is formed by being cast in molds. The bottom of the mold, for the face of the type, is formed by punching a steel die into a bar of copper, called a matrix, and the mold for the body of the type is formed of movable iron or steel plates adjusted above the copper bar. The mold is held up horizontally against the face of the reservoir of melted metal, when, by turning a crank, an opening is made, and a little pump drives the proper quantity of metal into the mold. The smallest sized type in use is called diamond, 205 lines of which are contained in a foot, or 17 1-12th lines in an inch. There are 14 sizes of type in common use, the names of which, with the number of lines of each to the foot, are as follows:—

Double pica.....	41½	Bourgeois.....	102½
Paragon.....	44½	Brevier.....	112½
Great Primer.....	51½	Mignon.....	128
English.....	64	Nonpareil.....	148
Pica.....	71½	Agate.....	168
Small pica.....	83	Pearl.....	178
Long Primer.....	89	Diamond.....	205

This article is printed in brevier, and the patent claims on another page in agate.

A new alloy for casting type is just being introduced by James Conner & Sons, of this city, which is likely to prove vastly superior to the ordinary type metal. We are having a font cast from the new metal for this paper, and on the 1st of January we shall appear before our readers in an entirely new dress.

CAR AND LOCOMOTIVE COMBINED.

MESSERS. EDITORS:—Mr. Geo. W. Cass, President of the Pittsburgh, Fort Wayne and Chicago Railroad, has just made an experimental trip to Chicago with the new locomotive iron car, which was built by Russell & Co., of Massillon, Ohio, under the patent of Moore & Young. The experimental trip was a perfect success. The extreme length of the car is 77 feet; weight, 16 tons; weight, when provided with fuel and water, 19 tons and 20 lbs. The capacity of carrying is seats for 98 passengers. The car ran at the rate of 45 miles per hour up grades of 50 feet to the mile. You will no doubt be glad to record the success of a car and locomotive combined. The improvement is valuable to all short lines of railroad, and roads using portions of their lines only for accommodation trains. J. H. D.

Pittsburgh, Pa., November 15, 1860.

CARROTS FOR HORSES.—The *American Stock Journal* says:—"The carrot is the most esteemed of all roots for its feeding qualities. When analyzed, it gives but little more solid matter than other roots, 85 per cent being water; but its influence in the stomach upon the other articles of food is most favorable, conducing to the most perfect digestion and assimilation. The result, long known to practical men, is explained by chemists as resulting from the presence of a substance called *pectine*, which operates to coagulate or gelatinize vegetable solutions, and this favors digestion in all cattle. Horses are especially benefitted by the use of carrots. They should be fed to them frequently with their other food."

HYDRO-ELECTRIC APPARATUS

In answer to a correspondent, we will describe a steam electrical machine. It is made with a small steam boiler insulated on glass legs, and having on its top a small tube, crossed with another pipe filled with little holes tipped with pieces of hard wood. Opposite to these orifices, but entirely separate from the boiler, is placed a box containing a great number of metal points connected with a conductor. Attached to the metal of the boiler opposite the steam jets is a horizontal iron rod, mounted with a brass ball, which collects the excited electricity from the boiler as the points carry off the opposite electricity. The sparks obtained from the brass ball of the boiler are dense and rapid, and almost produce a continuous sheet of light. This machine was the result of an accidental discovery in 1840, by an engineer in Newcastle, who, while putting forth his hand to stop a small leak in a safety valve, received a severe electrical shock. Mr. Wm. Armstrong (now Sir William, inventor of the Armstrong gun) heard of the circumstance, was led to investigate it, and this led to the invention of his "hydro-electric machine." The electricity is the same as that produced by the glass frictional machine.

IMPORTANT EXPERIMENTS WITH STEAM.—The Secretary of the Navy has ordered a Board of Naval Engineers, consisting of Chief Engineers Isherwood, Zellen, Long and Stimers, to meet on board the United States steamer *Michigan*, in the harbor of Erie, Pa., on the 19th inst., for the purpose of making a careful set of experiments as to the practical advantages of using steam expansively, and any person engaged in the manufacture or management of steam engines, who may present themselves on board for the purpose of witnessing the experiments, will be afforded every reasonable facility for so doing.

[This paragraph appeared in the *Herald* of the 14th inst., and as it did not afford sufficient notice to those who feel a deep interest in this subject, we addressed a letter to the Secretary of the Navy, urging him to postpone the time for beginning the experiments, at least ten days. At the time of going to press we had not received Mr. Toucey's reply.]

IMPORTANT TO MEAT PACKERS.—The Commissioner of Patents to-day issued a patent to Hon. D. E. Somes, of Maine, for packing and curing meats in warm climates, destined to produce remarkable results, not only in this country, but in Central and South America, where the curing of meats has heretofore been impossible. The *modus operandi* of this invention is simple and cheap, consisting of sinking shafts into the earth sufficiently deep to obtain the minimum of mean temperature, and aided in the hottest climates by artificial refrigerators. These shafts constitute subterranean packing houses, where meat remains until sufficiently cured for market.

[We find the above announcement in the telegraphic news of the *Herald*. We wonder if it would be any infringement of this patent to dig a deep cellar in some southern climate and then put meat into it; or would it infringe the patent to store up meat in a coal mine, or suspend it in a well? We wonder if this patent was issued under the "watch and care" of the Revisionary Board?

MANGANESE IN PENNSYLVANIA.—It is said that a rich deposit of manganese has recently been discovered in Maxatawny township, Berks county, Pa. The land belongs to a German farmer named John Kohler, and has been leased by parties who have contracted with a New York firm to deliver to them all the manganese which the place will yield. It is of superior quality, and the deposit is very extensive, at some points commencing four feet below the surface, and, as far as ascertained, seventy-five feet in depth. With the exception of an inferior article found in Vermont, the manganese used in the United States is mainly imported from Bohemia, Saxony, France, England, and other countries. Manganese is a mineral used in the bleaching of muslin, linen, &c.; by potters for glazing their ware, and by glass manufacturers to obliterate discolorations produced by sesquioxide of iron; and for many other purposes.

AN IRON PALACE.—The Pasha of Egypt is establishing a magnificent palace, built of French cast iron, for a museum of antiquities, to be filled with relics of antiquity, found in Egypt, in the execution of which 2,500 men are now employed, under the direction of Mariette, the French archæologist.