who have bought no less than 200 six-pounders, and the Japanese, who, on their trip through Europe two years ago, ordered at once 60 six-inch cannon, 30 of which were delivered in September last. Mr. Krupp's establishment has delivered 2,500 cannon of steel, mostly rifled breech loaders, 400 of which have a caliber of eight inches and more, the rest having from three to four and a half inches.

The workshops of Krupp cover at present over 500 acres of land, consume daily 15,000 cwt. of coal, work by steam from 120 boilers, are illuminated by 7,000 gas lights, and employ over 8,000 men and boys, whose wages amount to about 2,500,000 dollars, or an average of 312½ dollars each per annum. A fund has been established to which every workman has to contribute an average of one groschen (about three cents) of every dollar he earns, in return for which he receives support in case of sickness, and a good pension in his age. Mr. Krupp himself contributes to this fund half as much as his workmen: so that in fact, if a workman pays for instance \$1, the fund gets \$1.50. From this source every workman gets, after twenty-five years service, a good pension. In case of accident, he receives full wages during the whole time of inability to work, and if sick he is supplied with medicines, and finally, burial expenses are usually paid out of this fund. Besides this, Mr. Krupp's workmen enjoy a good many other advantages. To supply them constantly with good and cheap bread, he erected bakeries in a grand style, the flour for which he buys in large quantities from Russia. Similar arrangements have been made to supply them with good and cheap potatoes, and we hear that Mr. Krupp intends to do the same with meat. These father-like arrangements prove very beneficial for both employer and workman, and have been imitated in England in many of the large manufactories.

The iron ores for the enormous demand are partly from Krupp's own mines in the late dukedom of Nassau, and near Coblenz, and are partly bought. The former give the well-known Spiegel iron. It contains a large quantity of manganese, of which, however, it is cleaned by a simple process, and contains then over 98 per cent of pure iron, the other two per cent consisting mostly of silicious earth, cobalt, nickel, copper, and a very small quantity of phosphorus. That which is to be used for cannon must be softer than ordinary steel, so as to have a certain elasticity under the force of the discharge. This softness is attained by mixing a quantity of forge iron in the steel mass. Iron and steel are cut into bars of six inches length and put in plumbago crucibles containing from thirty to sixty pounds each. The manufacture of these Krupp crucibles was a secret for a long time. At present, however, those of Ruel in London, and the Patent Crucible Company, Battersea, are deemed to be almost as good. The foundry is an enormous building, containing so many furnaces that the necessary iron and steel masses for castings of the largest dimensions can be melted there in 1,200 crucibles at the same time. About ten crucibles are placed in every furnace, resting on movable bars. The heat in the furnaces is so great that the best Scotch fire-proof stones which surround them, and sometimes even the crucibles, melt, so that the latter can be used but once. The workmen are divided into companies, and obey commands with the greatest precision, so as to be able to found the contents of the different crucibles all at once into a reservoir and thence into the mold beneath. As soon as the casting is solid it is surrounded by hot ashes and kept in a red glow until the forging takes place. As this can only be done in cool weather, the largest pieces sometimes lie two or three months in their hot beds, the necessary temperature being maintained by constant supplies of glowing ashes.

The castings consist first of round or square forms, and are afterwards forged, hammered or turned. By the regular form of the casting, a symmetrical mass is obtained, free of bubbles; the steam hammer gives the mass the necessary compactness, strength and elasticity, and generally compresses it 2 or 3 per cent, and the power of resistance rises from 760 to 1,320 cwt. per square inch. The last mass for the cannon is pretty soft and has a power of resistance from 800 to 900 cwt.

The smaller cannon consist of one solid piece: those over eight inches caliber are compound, and fastened by rings. The largest steel cannon yet manufactured is of eleven inches caliber. It was firstcast as a cylinder of 750 hundred weight and seven feet diameter, and then forged, after which it was strengthened by rings of cast steel. Two monsters of this kind, weighing 540 cwt. each, and worth about 14,000 thalers, have been manufactured for the Russian government. They are breech-loaders, and are able to throw a ball of 540 pounds with a charge of 50 pounds of gunpowder. Their destination is the Russian fortress of Kronstadt. A still larger monster of 15-inch caliber, throwing balls of 900 lbs., for the same government, will be at the grand exhibition.

The steam hammers are of great importance in Krupp's establishment. The largest of this kind has a fall of ten feet and cost about 700,000 dollars, two thirds of which were paid for the tilter or bed of the hammer, which has not sunk in the least, although the hammer has been thundering day and night. We should say that nothing could resist the power of these blows, but the large masses of red glowing steel it has often to forge bear these blows with so much resistance that they become effective only by long repeating. Mr. Krupp has therefore decided to use a three times greater power upon his steel, and to forge a hammer of 2,400 cwt. with a fall of thirteen feet. The cost thereof will be about 1,300,000 dollars.

Steel cannon were until lately the principal manufactures of Krupp, but lately he has also manufactured a good many balls and bombs for the Russian government, to which he has delivered several thousands of oblong eight and nine inch shot and shell, all the finest cast steel, the smaller sort of which contain eight pounds of powder and are able to crush

iron plates five and a half inches thick. But every one of these pills costs over 100 dollars, all being hammered and forged. Similar though smaller bombs are destined for the Italians, and partly already delivered.

THE MECHANICAL EQUIVALENT OF HEAT.

Prepared for the Scientific American.

Our present mechanical equivalent of heat is established by proofs of such seeming strength and conclusiveness that it is no light matter to call its truth in question; however, I propose to show that these proofs are not really so conclusive as they appear and that our equivalent, which says a unit of heat will give 772 foot lbs. of force, has no direct proof for its support but the all direct proof which can at the present time be brought to bear on the subject would go to establish quite a different measure for the power of heat. I will first quote from "Heat considered as a mode of motion," by Professor Tyndall, to show how the equivalent has been established and will then present the reasons for making the above statement.

"Using the accurate numbers, the quantity of heat applied when the volume is constant, is to the quantity applied when the pressure is constant, in the proportion of 1 to 1.421.

"This extremely important fact constitutes the basis from which the mechanical equivalent of heat was first calculated. And here we have reached a point which is worthy of, and which will demand, your entire attention. I will endeavor to make this calculation before you.

"Let C, (in Fig. 1,) be a cylindrical vessel with a base one square foot in area. Let P, P', mark the upper surface of a cubic foot of air at a temperature of 32° Fah. The height A P will then be one foot. Let the air be heated till this volume is doubled; to effect this it must, as before explained be raised 490° Fah. in temperature; and, when expanded, its upper surface will stand at P' P', one foot above its initial position. But in rising from P P' to P' P' it has forced back the atmosphere, which exerts a pressure of 15 lbs. on every square inch of its upper surface, in other words, it has lifted a weight of $144 \times 15 = 2,160$ lbs. to a height of one foot.

The "capacity" for heat of the air thus expanding is 0.24 water being unity. The weight of our cubic foot of air is 1.29 ounces, hence the quantity of heat required to raise 1.29 ounces of air 490° Fah., would raise a little less than one-fourth of that weight of water 490° The exact quantity of water equivalent to our 1.29 oz. of air is $1.29 \times 0.24 = 0.31$ oz.

"But 0.31 oz. of water, heated to 490° is equal to 152 oz., or 9½ lbs. heated 1° Thus the heat imparted to our cubic foot of air, in order to double its volume and enable it to lift a weight of 2,160 lbs., one foot high, would be competent to raise 9½ lbs. of water 1° in temperature.

"The air has here been heated under a constant pressure, and we have learned, that the quantity of heat necessary to raise the temperature of a gas under constant pressure a certain number of degrees, is to that required to raise the gas to the same temperature when its volume is kept constant, in the proportion of 1.42 : 1 hence we have the statement—

$$\frac{1.42}{1} = \frac{9.5}{6.7}$$

which shows that the quantity of heat necessary to augment the temperature of our cubic foot of air, at constant volume, 490°, would heat 6.7 lbs. of water 1°.

"Deducting 6.7 lbs. from 9.5 lbs., we find that the excess of heat imparted to the air in the case where it is permitted to expand, is competent to raise 2.8 lbs. of water 1° in temperature.

"As explained already, this excess is employed to lift the weight of 2,160 lbs. one foot high. Dividing 2,160 by 2.8, we find that a quantity of heat sufficient to raise one pound of water 1° Fah. in temperature, is competent to raise a weight of 771.4 lbs. a foot high.

"This method of calculating the mechanical equivalent of heat was followed by Dr. Mayer, a physician in Heilbron, Germany, in the spring of 1842.

"In August 21, 1843, Mr. Joule communicated a paper to the British Association, then meeting at Cork and in the third part of this paper he describes a series of experiments on magneto-electricity, executed with a view to determine the "mechanical value of heat." The results of this elaborate investigation gave the following weights raised one foot high, as equivalent to the warming of 1 lb. of water 1° Fah.

1. 896 lbs.	5. 1026 lbs.
2. 1001 lbs.	6. 587 lbs.
3. 1040 lbs.	7. 742 lbs.
4. 910 lbs.	8. 860 lbs.

"In 1844 Mr. Joule deduced from experiments on the condensation of air the following equivalents to 1 lb. of water heated 1° Fah.

823 foot lbs.
795 foot lbs.
820 foot lbs.
814 foot lbs.
760 foot lbs.

"As the experience of the experimenter increased, we find that the coincidence of his results become closer. In 1845, Mr. Joule deduced from experiments with water, agitated by a paddle wheel, an equivalent of

890 foot lbs.

"Running up his results in 1845, and taking the mean, he found the equivalent to be

817 foot lbs.

"In 1847, he found the mean of two experiments to give as an equivalent

781.8 foot lbs.

"Finally, in 1849 applying all the precautions suggested by seven years experience, he obtained the following numbers for the mechanical equivalent of heat:—

772.692, from friction of water, mean of 40 experiments
774.083, from friction of mercury, mean of 50 experiments
774.987, from friction of cast-iron, mean of 20 experiments

For reasons assigned in his paper, Mr. Joule fixes the exact equivalent of heat at 772 foot lbs.

"According to the method pursued by Mayer, in 1842, the mechanical equivalent of heat is

771.4 foot lbs.

"Such a coincidence relieves the mind of every shade of uncertainty, regarding the correctness of our present mechanical equivalent of heat."

This subject will be completed in another article.

CURIOSITIES OF COMBUSTION.

BY PROFESSOR CHARLES A. SEELY.

"Combustion is the disengagement of heat and light which accompanies chemical combination." This is a very good definition, the best one I remember to have seen. I intend this as a high compliment for I have observed that school-book definitions often need more explanation than the thing defined. It is a very interesting and profitable mental exercise, to discover the heterogeneous things that a definition owing to its inaccuracy of language, is obliged to cover. Any book on the physical sciences will furnish good material. It is a very ancient amusement. Plato once defined man to be a "two-legged animal without feathers," a definition of man about as precise as ever was made. But Diogenes plucked a goose, and throwing it into the Academy, exclaimed, "Plato, behold your man." So I might bring phosphorus and rotten wood which shine in the dark and to a delicate thermometer exhibit heat, as cases of combustion. But Dr. Ure, the author of the definition, might very aptly retort, as did the preacher whose sermon was criticised, "better it if you can." And I should be forced to reply, "I cannot unless you allow me to use a great many more words."

The combustion with which we are most familiar is that where oxygen is one of the elements concerned. A very interesting peculiarity of this ordinary combustion is the fact that its beginning requires a high temperature. We consider coal, wood, oil, sulphur, and gunpowder very combustible, but there is no combustion, although oxygen be present, until they be set on fire or ignited, that is, until some portion be heated up to a high temperature. Oxygen is very different from other supporters of combustion in this respect, for with them combustion begins at ordinary temperatures. If suddenly chlorine were put in the air in place of oxygen, or if the oxygen should assume its active form known as ozone, every thing combustible upon the earth would take fire and be consumed with fervent heat in a few hours. This property of oxygen, to which I allude, is another of the striking evidences of the adorable Wisdom everywhere to be found in the order of nature.

The temperature of ignition varies greatly for the different combustibles. Phosphorus, sulphur, and sodium take fire below a red heat, while the ignition point with others is so high that we rarely have an opportunity to see them burn. The combustible nature of iron, lead, copper, silver, and gold, was not even suspected until a recent period. We know now that they burn even more readily and fiercely than any common fire, when once they are kindled; if I wanted to make the most gorgeous pyrotechnic display I would make a bonfire in which I would burn up a few tons of iron. The ignition temperatures have been determined for only a few substances. Here is useful work to be commended to the rising generation of chemists. The facts ought to be determined and put into the form of a table.

The philosophy of spontaneous combustion is now well determined and can be made plain to everyone. Heat is always a product of oxidation, or in other words, heat always accompanies the union of oxygen with another substance. The amount of heat produced is, moreover, exactly proportioned to the amount of oxidation. If a day or a year be employed in burning (oxidizing) a pound of coal the amount of heat in the two cases is precisely the same. The rapidity of burning has nothing to do with quantity of heat; it is a question of intensity, quite another thing. The pound of coal burning in a minute gives an intense heat and consequently light, but let that heat be distributed over the space of a year, and it would require an instrument far more delicate than our senses to detect that which would appear in a second or a day. In slow burning or oxidation the heat is simply diluted in time or space. Let a child's supply of candy be divided and administered constantly, and in the homeopathic doses he would never suspect that candy had any taste.

The rust which is produced from a pound of iron indicates or represents an amount of heat sufficient to raise nearly 3,000 pounds of water 1° Fah; that is such a quantity of heat was produced by the rusting or oxidation. As the specific heat of iron is one-ninth (nearly) that of water, this quantity of heat is sufficient to raise the temperature of one pound of iron to the temperature of 27,000°, or nine pounds to 3,000° which last is without doubt above the ignition point of iron. Suppose the heat of rusting be retained in the rust. Would not we have a spontaneous combustion which would be fearful even to think of!

In ordinary oxidation the heat leaks away by radiation and conduction as fast as it is generated. Let us see how we may retain it. As oxidation takes place only at the surface it is plain that its rapidity will be increased just as we increase

the surface. Thus, a pound of iron extended so as to have double the surface will be rusted in half the time, with one-hundredth the surface in one-hundredth the time. Suppose the pound of iron to be originally in the form of a ball and that we divide it successively into balls smaller and smaller. The surfaces of balls are to each other as the squares of their diameters, while their weights are as the cubes of their diameters, and the ratio of the surfaces to the weights is constantly increasing as the division goes on. It is evident that by so dividing and increasing the surface a point might be reached where the heat would be generated by oxidation more rapidly than it could leak away, and that thus the ignition temperature would be reached, when combustion would ensue.

This is no speculation. I can prove the facts by actual experiments, dividing the iron and exhibiting it taking fire, with far less labor than I have put on this article. Prussian blue is a compound of iron, nitrogen, and carbon. If it be heated to a bright red heat in a tube or crucible from which the air is excluded, till fumes cease to be evolved, the iron is left finely divided. When the apparatus is cool the iron may be taken out and on exposure to the air it will immediately take fire. Ordinary lead is not easily set on fire. But get it in fine powder! Fill a small vial with tartrate of lead, fit in a clay stopper, set the vial in a sand crucible, imbedding the vial in sand, and subject the whole to a low red heat for half an hour. The vial now contains lead powder, the particles of which are prevented melting together by other fine particles of carbon. This lead powder takes fire as soon as it is brought into the atmosphere. Dissolve phosphorus in bisulphide of carbon, and dip a piece of cloth or paper in the solution and expose it to the air. Instantly as the solvent has evaporated, the phosphorus (now left finely divided) takes fire. I might describe hundreds of similar experimental illustrations, but I hasten to the cases of spontaneous combustion which occur in the ordinary routine of life.

Ninety-nine hundredths of these cases originate from the oxidation of linseed oil. This oil in a paint pot has little surface exposed compared with its whole mass, and the heat generated is diluted over the whole body of the oil, radiates into the air, etc. When the paint is spread on wood, the oil oxidizes rapidly and heat is correspondingly produced but being in contact with the conducting wood it is carried away. But if the wood were a non-conductor and no heat were radiated the oil would speedily take fire. When the oil is mixed with sawdust or spread on cotton wool, paper, or clothing, and the mass is kept away from strong currents of air, spontaneous combustion ensues. A painter rolls up his greasy overalls in a bundle, throws them in a corner or on a shelf and the house is set on fire: dozens of cases like this have occurred in this city. Linseed oil is so remarkable in this way that I think it might sometimes be made available for kindling a fire where matches and other conveniences are not at hand.

The spontaneous combustion of nitro-glycerin, gun cotton and pyrotechnic compounds may be brought within the category of oxidation. But in all these cases the oxygen is not supplied from the air. It is part of the substance itself, and is gradually eliminated to the part which is combustible. A complete explanation of these cases would extend this article beyond reasonable limits.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

The Menhaden Oil Mania.

MESSRS. EDITORS:—The time was once when those engaged in the manufacture of Menhaden oil were looked upon with disgust by those who considered themselves the "Upper Ten" of society. But now how great the change! Whether the exalted have become abased, or the abased exalted, dependent saith not, but certain it is that it has taken the form of a mania second only to the petroleum excitement. This business, which about fifteen years ago was in its infancy, has now become one of the "institutions" of our land and is not confined to our vicinity but is spreading north and south with astonishing rapidity, and the finny tribes are disturbed in their most secret haunts. While fifteen years ago there was but one factory in this vicinity, today there are perhaps twenty or more, and nearly all of them prospering, as we should think by the extensive preparations being made for the coming season. A novel plan has originated here, to follow the fish with the change of season. Two large steamers have been fitted with necessary apparatus for extracting the oil, and have cruised the past season from Maine to Virginia in search of the "miniature whale." This plan is attended with extra expense and difficulty and we think has hardly been profitable so far, but with proper care and more experience may yet be made remunerative. It certainly has the merit of originality and perseverance, and merits success. About three years since, a company from this place started a factory in the state of Maine. Since that time other companies hearing "fairy tales" of the success of the pioneer works, have located in that vicinity, and now they are nearly as numerous as here. We certainly wish them all success, but fear that the large number engaging in the business will eventually ruin it for all. But in this we may be mistaken. The oil as now made is used largely for outside painting and is considered by many superior to linseed. Forming a smooth glossy coat on the surface of the wood, and being sold at a much lower price than linseed, it is getting into general use. It is also used by rope-makers and curriers of leather, as it is much cheaper than other oils and answers their purpose as well. The refuse of the fish is considered an excellent fertilizer, and is

used in large quantities on the Island, and also in Connecticut and Massachusetts. It is also an important component in the manufacture of phosphates, containing a large amount of ammonia, which is necessary to certain crops. But perhaps we have written enough on this subject, our object in writing this article being to enlighten your readers concerning a business of which comparatively little is known.

A. Greenport, L. I., Jan. 29, 1867.

Elongated Shot and Shell.

MESSRS. EDITORS:—Capt. Norton, I observe by your paper of the 2nd inst., has furnished you with evidence relating to his claims of priority. The article states that one Richard Airey, Quarter-master General, had seen Capt. Norton's elongated expanding shot and shell, identical in principle with the present Minie bullet, at Woolwich, England, in 1823. The statement does not furnish us with the information required. If Captain Norton claims to be the first to propose the use of elongated projectiles, I refer him to Joe Hunter's French patent dated 1790, wherein he fully describes his compound shot and sabot for rifle guns. A drawing of Hunter's sabot in my possession represents it as formed on a conical based shot like "Sawyers." Dr. Reed's patent is dated 1756 and consists of the application of expanding sabots to elongated projectiles, but he casts the projectile on the sabot. In practice it is found to be very destructive to guns and projectiles, and it is now abandoned.

Major, now Major General, Dyer, in the spring of 1859, proposed to the Ordnance Department the application of expanding soft metal sabots to the base of projectiles, being the converse of Dr. Reed's patent.

Mr. Thomas Taylor, of Washington Arsenal, claims to be the first to render the Dyer system practical. The advantages of Mr Taylor's improvement are of much importance. Shot and shell may now be fired over the heads of troops without danger, as the sabot never strips. Brig.-Gen. John Gibbons says—page 120, Artillerist's Manual, 1863—"the importance of applying the rifle principle to guns of large calibre is too evident to need explanation, and many and various have been the attempts made to succeed in it, but up to the present without any degree of certainty, although much progress has been made. The importance of the question is much enhanced by the fact that the moment a successful plan is discovered, the great problem of concussion and percussion shells is solved. That a way will sooner or later be discovered, there can be but little doubt. Large projectiles, being made of iron, cannot of course be forced into the grooves of the gun like the leaden ball of small arms."

"Attempts have been made to cast on the outside of the cylindrical part of the shot some softer metal such as lead or composition to take the groove and give the necessary rotation, but it has invariably been found that although these metals take the groove at first they are immediately torn to pieces and off the iron part of the shot by the force of the powder. The increase of the force in powder cannot be calculated upon like any other motive power, and because a leaden projection of .01 of an inch will hold in its position a common rifle ball of 2 oz. in weight when acted on by 60 grains of powder, it does not follow that the same effect will be produced when these elements are increased a hundred times—much less when they are increased one thousand times, in a great many inventions of the day."

Mr Taylor's improvement consists in the application of a soft, tough and yielding alloy, and in so constructing the sabot that a portion of the gases is employed to compress the body of the sabot upon the base of the projectile, while another portion is employed to expand the sabot into the grooves of the gun, causing the shot to rotate and ensuring great accuracy of flight.

ONE OF THE SMITH FAMILY.

Washington, D. C.

Artesian Wells.

MESSRS. EDITORS:—In your issue of January 26th, in an article on "Artesian Wells," D. C. says, "Beneath the blue limestone there exists a heavy formation of sandstone, very compact in its structure, and not likely to have any reliable water-bearing strata. It is known in the New York Survey as the Potsdam sandstone. This formation rests on the primary rocks, and artesian wells cannot be expected in rocks of that age and depth."

I am happy to inform D. C. that his theory is not altogether correct, as a glance at the geological survey of our State will show you that we are in Ogdensburg on the limestone formation and not a little above the Potsdam sandstone, yet we have two artesian wells, one at Arnold & Co.'s Brewery that has been flowing for six or eight years and is nearly one hundred feet deep. The other is at the Ogdensburg gas works. This latter well is about one hundred and one feet deep, and discharges a stream of about one inch in diameter, with a capacity of fifteen to seventeen galls. per minute, of the purest soft water imaginable. Some of our leading citizens will probably sink another this spring to the depth of three hundred or four hundred feet, perhaps more, on an eminence in our village, to supply their houses.

S. S. BLODGETT.

Ogdensburg, New York, February 9, 1866.

Bridging the East River.

DEAR SCIENTIFIC:—You are growing more portly and more handsome as you grow older. You are a pearl of great price—a perfect mine of wealth. I hailed you when a "little shaver" many years ago. With increasing admiration I hail you now. Long may you wave for the benefit of the great engineering and industrial interests of our glorious land. Our country abounds in periodicals, but we have only one SCIENTIFIC AMERICAN.

Among the very many engineering enterprises discussed

in your columns I have been much interested in the Broadway problem, which, it appears to me, is drawing to a practical solution in the grand project illustrated and described in a recent number of the current volume.

I see also that the bridging of the East River is looming up and various suggestions being elicited. In this line we have a most splendid achievement in the bridge thrown across our beautiful river between this city and the city of Covington, on the Kentucky side. It is a magnificent structure and commands the admiration of all that can appreciate the wonders of science.

In regard to bridging the East River it occurs to me that if we keep up with the spirit of the age and make proper use of the achievements of science, the proposition is not as chimerical as many might suppose. We are starting into a new era when steel will displace the great feature of this age and crowd iron out of ten thousand places in which for years we have held it to be supreme. I have not time nor data at hand to do so, but I trust some engineer will think sufficient of the suggestion to make a calculation of the difference in favor of steel over iron; estimating to drive iron completely out of place where strength and lightness of material may be required.

Another suggestion. I would propose a bridge exclusively for foot passengers as a preliminary experiment toward the final solution of the grand project.

J. A. C.

Cincinnati, Ohio, Feb. 11, 1867.

Compasses on Board Iron Ships.

MESSRS. EDITORS:—Your correspondent H., who wrote on this subject, page 122, appears not to understand the difficulty in question; he seems to think that the compasses are spoiled in the course of time by the effect of the iron in the ship, and says that fresh needles would always indicate the magnetic meridian. This is not so, but the iron of the ship itself is influenced by the magnetism of the earth is magnetized to a certain weak degree, strong enough however, to reach every compass on board, old or new. The magnetic meridian on board an iron ship, and even on board a wooden vessel by the influence of the iron used in its construction, is not the true magnetic meridian of the earth, and every compass will of course stand in the magnetic meridian as it is on board the vessel. Many years ago (some 40 or 50, if I am not mistaken) an attempt was made by Barlow, in England, to neutralize this magnetism of the ship's iron, by a contrivance called Barlow's correction plate: it consisted of an iron plate or steel magnet, placed in such a position, after repeated trials, in relation to ship and compass, that it counteracted the influence of the ship's iron; this however was only partially successful, as the magnetism of the iron is not the same in all portions of the ship, but shifts, by the induction of the earth's magnetism, when turning the ship around. The last correction is by Ritchie in Boston, lately patented, and appearing successful; he places his needle, floating on a liquid, above the vessel, finding a place where the influence of the different iron parts of the vessel neutralize each other. It has sometimes happened that a wooden ship was struck by lightning, and all the iron on board became so strongly magnetized, that the compass needle pointed always to the same part of the ship, in place of standing in the earth's magnetic meridian. The only disturbance the compass needle itself is subjected to, is either to lose its magnetism altogether, or to have its poles reversed, the north pole pointing south, and vice versa; but any compass needle of elongated form will always stand in the magnetic meridian, as it is at the place where the compass is situated, which meridian will often not correspond with the earth's magnetic meridian, in the same way as the earth's magnetic meridian in very few places corresponds with the astronomical meridian.

P. H. VANDERWEYDE M. D.

Philadelphia, Feb. 15, 1867.

An Inventor at the North Pole.

MESSRS. EDITORS:—It may not be uninteresting to you, and your many thousand readers, to hear a few facts in regard to one of our countrymen, showing what perseverance and energy can accomplish.

In the winter of 1849-50, the writer of this was a resident of Cincinnati, Ohio. I chanced to make the acquaintance of a young man who was engaged in the business of casting brands for stamp tools, by a peculiar process of his own, using type for patterns. Forward of better occupation, I engaged to take orders for him; his wife was making wooden dolls. Time passed, he engaged in the steel press engraving, and built up a good business. Onward, was his motto. Next I find him printing and publishing the "Penny Press" of Cincinnati, using the first (I think) hot-air engine used in the West. In all this time he had been reading all the works on Arctic exploration that were to be had, and he then conceived the gigantic scheme of another trip to the Polar seas, and through the aid of Mr. Grinnell, of your city, he was enabled to carry it out, and to-day is ice-bound amid the regions of an Arctic winter. And that man is Charles F. Hall. The man who seventeen years ago was molding his little types in Miles Greenwood's foundry is now known throughout the world. Comment is unnecessary.

O. V. FLORA.

Madison, Ind.

The French Fire Alarm.

MESSRS. EDITORS:—The French fire alarm mentioned in the issue of Feb. 9th as having been invented by Robert Houdin, is not new, as the undersigned while engaged in the manufacture of Telegraphic Instruments in Boston in the year 1858-1859, made a number of these instruments for the Hon. William Whiting, (late Solicitor to the War Department,) for use at his residence in Roxbury, and operated in connection with an Electro-Magnetic Burglar Alarm precisely in the manner