### Magnetization of Iron and Steel by Breaking.

At a recent meeting of the Society of Physical and Natural Sciences of Karlsruhe, says the *Karlsruher Zeitung*, Herr Bissinger offered a communication on the magnetization of steel and iron bars when broken in a testing machine. The phenomenon is not brought about by the elongation that accompanies the breakage, but is produced at the very moment of breaking, the two halves being converted into magnets of equal strength. The breaking occurs with a loud noise and strong shock, and the resulting concussion might possibly be considered as the cause of the magnetization. It should be remarked just here that in the testing machine the bars are placed vertically, and that the south pole forms at their upper extremity.

It would be interesting to ascertain whether magnetization would occur equally and with the same intensity if the bars were horizontal or inclined. The maximum of magnetization should occur in cases in which the bar was parallel with the axis of the earth; but the machine owned by Herr Bissinger allows only of a vertical position.

The different tools and objects of steel that happen to be in the vicinity of the bar at the moment it breaks also become magnetized, but to a much less degree.

### Sense Culture.

The special culture of the senses is too much neglected by us in this modern busy life. Probably at no previous period of human history has the nervous system generally, and, more particularly, the sense organs, been so severely taxed as they now are, but never have they been less carefully cultivated. This is in part, if not wholly, the cause of the progressive degeneracy of the faculties of special sense, which is evidenced by the increasing frequency of the recourse to spectacles, ear trumpets, and the like apparatus, designed to aid the sense organs. The mere use of faculties will not develop strength—it is more likely to exhaust energy.

Special training is required, and this essential element of education is wholly neglected in our schools, with the result we daily witness—namely, early weakness or defect in the organs by which the consciousness is brought into relation with the outer world. It is not necessary to adduce proofs of the position we take up, or to argue it at length or in detail. The truth of the proposition laid down is self-evident. On the one hand we see the neglect of training, and on the other the increasing defect of sense power. The matter is well worthy of the attention of the professional educators of youth.

Muscular exercise wisely regulated and apportioned to the bodily strength is felt to be a part of education. Sense culture, by appropriate exercises in seeing, hearing, touching, smelling, would, if commenced sufficiently early in life, not merely prevent weakness of sight, deafness, loss of the sense of feeling, and impairment of the sense of smell long before old age, but by its reflected influence on the nutrition of the brain and upper portion of the spinal cord would do much to reduce the growing tendency to paralytic diseases, which are very decidedly on the increase.—*Lancet.*

### Sinking of a Large Building.

A curious instance of the difficulties which the peculiarities of tropical soils give rise to when dealing with the foundations of heavy buildings has recently occurred in Georgetown, the capital city of British Guiana. Designed by the government engineer until lately in charge of the Public Works Department of that colony, some erections intended for use as law courts had proceeded to a certain point, when the successor to the office above named discovered that the buildings were bodily sinking, and this—as far as we have been able to learn—was taking place without any settlements or cracks being visible in the walls of the building, and without any disturbance of the surface soil close to them. In fact, it was not easy to detect the immediate cause of the subsidence, but it was ultimately found that at a few yards distance the ground was bulging upward. The present head of the Public Works Department in his report in no way reflects upon the character of the design given by his predecessor to the footings, or on the dimensions of the foundations.

There is nothing, indeed, in these to find fault with, and the difficulty has arisen apparently from the twofold character of the soil in the immediate vicinity of the buildings; that on which the work is erected being of good, solid, unyielding sand, but being surrounded to all appearance by a bed of earth less capable of withstanding either vertical or lateral pressure. The consequence has been that this surrounding belt of earth has yielded upward to the force exerted upon it by the lateral thrust of the squeezed material immediately below the buildings.

### Iridium Plating.

Mr. W. L. Dudley has announced before the Ohio Mechanics' Institute that the problem of electroplating with iridium has been solved by employing a suitable solution of the metal and properly regulating the electric current. The solution is kept at uniform strength by using a plate of iridium as the anode. The metal is deposited in the reguline state, and takes a good polish. A buffing wheel that will grind off nickel plating in a few moments only serves to polish the iridium. Thin platinum foil, coated with iridium, retains its flexibility; and if the coating is not too thick, it will not readily scale off.

### THE HUDSON RIVER TUNNEL.

After a cessation of about five months, work has been resumed at the New York end of the tunnel. It will be remembered that upon the New Jersey side nothing had been encountered in driving the tunnel but silt, which presented a shell or coating sufficient to hold the air when the pressure was kept near the hydrostatic head; but on this side nothing has been found except sand, and the difficulties presented have been serious and hard to overcome.

Last November, when it was decided to stop work, the tunnel had been completed through this sand to a distance of about seventy feet from the shaft, and a bulkhead of flanged iron plates had been built across the heading just in front of the masonry, as shown by the dotted line in Fig. 2.

To support this bulkhead, heavy timbers were placed vertically across its face, and others at right angles to these, while against the latter beams rested whose rear ends were embedded in the masonry. When the engines were stopped and the air pressure lowered, the incoming sand and water quickly pushed out the calking in the seams and flooded the chamber. In this condition the tunnel was left.

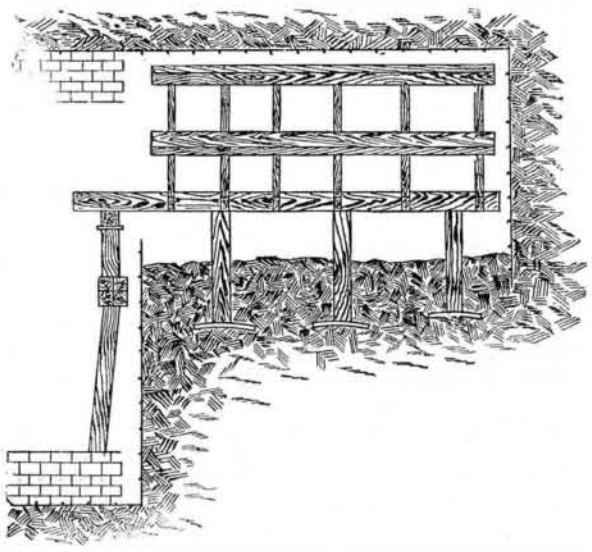

Fig. 1.—HUDSON RIVER TUNNEL.

On the 22d ult., when the engines were started again, the work was found unchanged, and no time was lost in beginning the building of another section. The method now pursued is very simple in appearance, yet requires great care and experience to insure success.

The upper plate of the bulkhead is removed and another inserted horizontally and bolted to the one already in position over the masonry, so that the crown line is continuous. One by one plates are put in ahead of and to the side of the first one, until the end of the section it has been decided to build has been reached, when the bulkhead is commenced and carried down with the sides. A regular system of bracing prevents settlement. The engravings are longitudinal sections, Fig. 1 showing the section when about one-half excavated, and Fig. 2 when all the material has been removed.

As the work is carried down, the upper part of the section forms a segment of a cylinder having a vertical end of iron plates, sides of plates, and the other end open to the working chamber, or finished tunnel. This acts as an inverted basin, beyond the edges of which the water cannot rise.

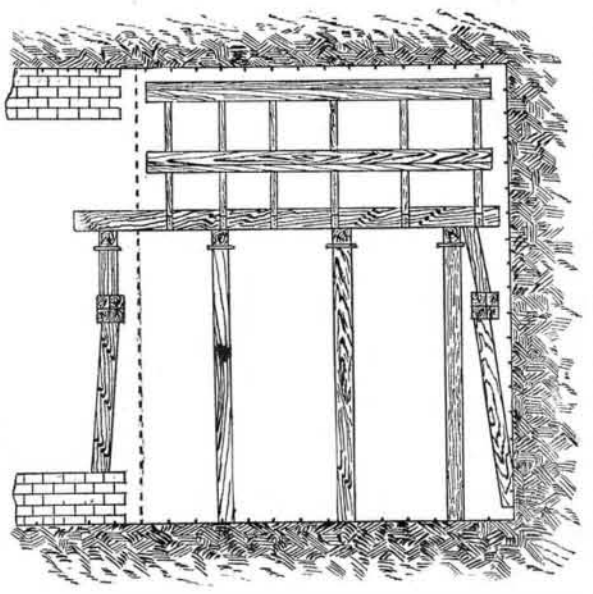

Fig. 2.—HUDSON RIVER TUNNEL.

To support the roof, beams are placed beneath the framing, and rest on plates embedded in the sand, as shown in Fig. 1. When the section has received its coating of iron the masonry of the tunnel is begun, and gradually carried up and around until completed. To prevent the escape of air, every seam is thoroughly calked, either with silt brought from the other side of the river, or with a mixture of Portland cement and sand.

Air is furnished by two compressors built by the Ingersoll Rock Drill Company, and one duplex compressor, built by the Clayton Steam Pump Works.

The north and south tunnels upon the other side of the river have been finished to a distance of 1,550 and 560 feet respectively from the shaft. Work on the tunnel has been resumed and is progressing favorably.

We are indebted to the courtesy of Mr. S. H. Finch, Chief Engineer, for explanations of his methods.

### Bleaching of Paraffine.

M. De Molon's patent process of bleaching of paraffine (as described in the *Corps Gras Industriels*) is said to be more rapid and less expensive than the older methods, while presenting the additional advantage of incurring none of the waste which has been alluded to. It consists, in the first place, in the filtration of the rough paraffine, which is subjected in a boiler to the action of lime, there being added about five per cent of its own weight of sulphide of sodium and water. The mixture is let cool in order to allow of the solidification of the layer of paraffine; it is then washed with boiling water and then pressed. The sulphide of sodium may be replaced by ten per cent of lime in powder. After boiling for an hour, the mixture is filtered, and is treated, as above, with amylic alcohol. The residues from these operations are preserved in order to be treated subsequently by an acid—for instance, hydrochloric acid or sulphuric acid. The action of these acids is to form with the base a salt, and consequently to liberate the carbureted oily substances. The paraffine and the amylic alcohol are then set free by the process of distillation.

The inventor of this system remarks that in place of sulphide of sodium and lime other sulphurous combinations could be used. It is further stated that, after the performance of the operations which have been described, the action in a suitable apparatus of sulphuret of carbon, of amylic alcohol, or other dissolvents can be substituted for the filtration by means of animal charcoal, which has hitherto been customary. Care should be taken that the liquid intended to be used in the filtering process should be made as cool as possible. After this treatment has been carried out, the paraffine has only to be filtered and pressed before being delivered to the trade.

### Book Cleaning.

Some of the books in the last installment of the Sunderland sale, London, have been ruined by clumsy attempts to clean them. A Terence, with the date 1469, would be the earliest known printed copy, if the date were genuine. But the paper was so grievously rotted by chemicals that the volume was sold for twenty-five shillings. In another copy, so extremely rare that Dibdin only knew it in an imperfect state, and Brunet did not know it at all, the paper had also been rotted in the cleaning, and the book sold for four pounds. It seems a pity that a beginner in the fine art of washing books chose such valuable specimens for his first experiments. In the "Annuaire du Bibliophile" for 1862, M Meray teaches the poor collector how to make a clean and valuable book out of a dirty and ignoble specimen. If a book be greasy, you separate the sheets and dip them in a solution of *potasse caustique*, following up this by a bath of eau de javel, with a fourth part of clear water. A bath of sulphite of soda follows, and it only remains to hang the sheets up to dry on strings stretched across the room. When paper is "cottony" and rotten, a bath in water in which gelatine has been dissolved with a little alum may be recommended. The *Graphic* facetiously adds, however, that it would be extremely interesting to make these experiments on the books of our friends.

### Don't be Afraid of Work.

Don't be afraid of killing yourself with overwork, son, is the facetious way the Burlington *Hawkeye* has of counseling young men to thrift. Men seldom work so hard as that on the sunny side of thirty. They die sometimes; but it is because they quit work at 6 P.M. and don't get home until 2 A.M. It's the intervals that kill, my son. The work gives you an appetite for your meals; it lends solidity to your slumber; it gives you a perfect and grateful appreciation of a holiday. There are young men who do not work, my son—young men who make a living by sucking the end of a cane, and who can tie a necktie in eleven different knots, and never lay a wrinkle in it; who can spend more money in a day than you can earn in a month, son; and who will go to the sheriff's to buy a postal card, and apply at the office of the street commissioners for a marriage license. So find out what you want to be and to do, son, and take off your coat and make success in the world. The busier you are, the less evil you will be apt to get into, the sweeter will be your sleep, the brighter and happier your holiday, and the better satisfied will the world be with you.

IT is not uncommon to meet in our streets peddlers of kerosene going from house to house vending their illuminating fluid from a can. In Paris the electric stored light is carried about the streets like kerosene here, and it is said to have become a favorite way of illuminating houses on social and official occasions. The accumulators are carried in a vehicle, which is stationed in front of the house, and electric wires are conducted into the building through the windows. Incandescent lamps are placed in the ordinary candelabras, and the fitting of the most complex lighting is an affair of but a very short time.

### On Sea-going Torpedo Boats.

At a recent meeting of the Institution of Naval Architects, a paper was read by Mons. J. A. Normand, in which was advocated the extended use of sea-going torpedo boats, of from fifty to eighty tons displacement, having a maximum speed of eighteen to twenty knots, capable of steaming at least 1,000 nautical miles at ten or twelve knots, costing from £8,000 to £11,000, and manned by a crew of from ten to fifteen men. The importance of vessels of this class in future warfare was then referred to, and the consequences that would follow on their adoption. These were: (1.) No ironclad, no squadron or fleet, no cruisers (unless cruisers should attain the speed of torpedo boats), could navigate in a sea of moderate dimensions, such as the Channel or Black Sea, belonging simultaneously to powers at war, unless they should be escorted by sea-going torpedo boats equal in strength to those of the enemy. (2.) Military ports situated in those seas, or nearer than 200 or 300 miles to the enemy's shores, would be rendered useless as stations for ironclads or cruisers. For instance, supposing a war between England and France, this would be the case for Cherbourg, Plymouth, Portsmouth, and Sheerness. Cherbourg and Plymouth could then be assimilated to two military ports, whose entrances should be under the fire of each other, shot being here replaced by torpedo boats. (3.) Powers not having military ports sufficiently far from the enemy's shores would be actually deprived of the use of their navies, with the exception of those vessels stationed in foreign neutral waters, unless they could force the blockade of sea-going torpedo boats with a fleet of the same kind equal in strength. The above propositions are founded on the hypothesis that one squadron of sixty to eighty sea-going torpedo boats, equal in men and cost to one ironclad, are stronger than this ironclad by daylight, and *a fortiori* at night, even when reduced to half its number, the other half having left to coal and reprovision itself. Could sea-going torpedo boats be coaled at sea by means which are yet to be found, or could they, by such means as the use of liquid fuel, have their time of steaming doubled, their importance in warfare would be immensely increased. No second-class torpedo boats could replace boats of this kind, because they cannot stand a gale, nor can they then be lowered or shipped, so that the enemy can escape the attack of small torpedo boats by taking advantage of bad weather. The question now is, are torpedo boats of such small displacement as from fifty to eighty tons really sea-going? If they are not, can they be made so? Time and experience will show, but we already know that with their steel deck and hatchway coverings they can stand very bad weather. In an appendix was given the results of the official trials made last summer at Cherbourg of the sea-going torpedo boat No. 60, the first of a series built or building by the author for the French Government: Length of hull at load line, 108 ft. 2 in.; breadth, extreme, 10 ft. 10 in.; diameter high-pressure cylinder, 12·60 in.; diameter low-pressure cylinder, 20·48 in.; stroke, 14·96 in.; heating surface, fire-side, 816 square feet; grate surface, 19·3 square feet. Full speed three hours' trial. The boat was complete, with launching tubes, compressing engines, air reservoir, six 19 ft. Whitehead torpedoes, 2½ tons coal, two Berthon collapsible boats, no masts. Displacement, 43 tons; mean speed, 20·62 knots; consumption of coal during the three hours, 1·58 tons; consumption of coal per hour, 0·53 ton; indicated horse-power, about 500; revolutions per minute, 328·5; boiler pressure, 132 lb.; air, 3⅜ in.

In the discussion which followed, several speakers remarked on the extremely low rate of consumption of fuel, and desired that further information should be supplied in regard to the engines and boilers, but more especially the latter. Mr. Samuda thought that Mons. Normand was entirely wrong in his view that a naval contest at sea could ever be carried on with cruisers and torpedo boats of from fifty to eighty tons. Such boats might be useful as scouts, but for the actual work at least 1,200 or 1,400 tons displacement would be required, and he questioned whether a protection of armor would not be necessary, in which case 2,500 tons displacement would be nearer the mark. Admiral De Horsey confirmed Mr. Samuda's opinions, and thought that boats capable of steaming only six hours would be of no value at sea. What was wanted was a certain size of torpedo boat for harbor work, a larger size for the Channel, and larger again for the Mediterranean; but for the ocean he submitted that no torpedo boat was of any use whatever. Mr. White, however, pointed out that the boats mentioned in the paper, though only of 50 to 80 tons displacement, were practically unsinkable, while they were self-supporting under sail at sea, so that the fuel would not be used till the enemy was actually in sight, and operations about to commence. Reference was made to the recent bombardment of Alexandria, and to the fact that if the Egyptians had been provided with torpedo boats of the class mentioned in the paper, the bombardment would in all probability not have taken place, as our fleet would have found it very difficult to stay off Alexandria at all.

### Food Preservatives.

The action of very diluted nitromuriatic acid (aqua regia) on meat and other animal substances has been recently studied by Signor Pavesi, and he finds the substance an excellent preserving agent; meat in pieces of about 1 kg. kept in the liquid in wooden vessels remains unaltered and savory for years. The meat treated may also be dried at 15° to 20° without undergoing change, apart from a diminution of volume and the appearance of a brown color. Put for a few hours in water, the meat recovers its original softness and natural color. The proportions of the acids in the preserving liquid are not given. The method is also adapted to preservation of animal substances for scientific purposes.

A new set of experiments by Dr. J. Bersch on the preservatiou of must by means of salicylic acid are alluded to in a recent number of *Biedermann's Agricultural Journal*. The author of these observations has found that *fifteen* parts of salicylic acid in 200,000 parts of must is a sufficient quantity to entirely prevent the formation of mould or mildew. M. A. Dalpiaz not very long since made known the results of his experiments, which were begun as early as 1875, with the view of discovering some substance of not too expensive a nature which should enable us to preserve fruits and vegetables. He at last found what he desired in salicylic acid, and published a note on the subject in the eighth volume of the *Chemisches Centralblatt*, third series, p. 670, in which he treats specially of the preservation of fruits.

A solution is prepared with 2½ to 3 grammes of salicylic acid, and 100 to 500 grammes of sugar in one liter (about a quart) of water. The fruit to be preserved is simply placed in this fluid, and the vessel covered over tightly with a sheet of ordinary writing paper. No other precautions are necessary.

M. A. Dreher writes that he has taken 0·25 gramme (about 4 grains Engl.) of salicylic acid daily for the space of two months in beer, without experiencing the slightest inconvenience, and possibly with some benefit to his health, and as this is the largest quantity which should be used for the purpose of preserving beer from secondary fermentation and acidity, etc., he is glad to confirm Professor Kolbe's experiments in this direction.

M. R. Jacobi has lectured at Cologne, at the Union of Arts and Trades, on the advantages of salicylic acid in beer, and recommends that the quantity used should not exceed one part of salicylic acid in 5,000 parts by weight of beer for ordinary purposes. This is, he says, the largest quantity requisite for preserving beer under the most trying circumstances, and even for export in barrels. A person must drink 10 pints of beer daily in order to consume 15 grains of salicylic acid, and as most people drink far less than this, the introduction of salicylic acid, rigorously weighed, cannot prove in any way prejudicial to public health.

### MICE-GIRDLED TREES.

At a recent meeting of the Elmira Farmers' Club, several members gave their views in answer to the inquiry of an orchardist who had a number of trees girdled by rabbits. In answer to the inquiry, and in allusion to the remedy of making a connection of the bark above and below the denuded part by inserting shoots, a member said it was next to impossible to have this mode succeed. Others spoke of the difficulty in making the trees live. As frequent inquiries are made on the subject, we repeat in substance the mode described in the *Country Gentleman* many years ago, which we have always found easy and certain, even for trees several inches in diameter. The process is exhibited in the accompanying cuts. Fig. 1 represents the trunk of a tree which has been girdled; Fig. 2, the twigs or shoots inserted to make the connection; and Fig. 3, a section showing the position of the inserted shoots. The twigs may be

Fig. 1. Fig. 2. Fig. 3.

from a fourth to half an inch in diameter; the latter size will be best if the tree is large enough to hold them. They are sharpened to a wedge at each end, and the openings made with a narrow chisel to receive them. If the girdled part is low down, it will be necessary to dig away some of the earth, to make room for the chisel to enter the upper part. The twigs are first bent like a bow for entering, and then brought nearly straight when in place. It will be necessary to bind them to keep them firmly in their places. Then cover with grafting wax the two points of insertion. We have always done this work in spring before the buds opened, but if well performed, it would doubtless succeed later.

Some years ago a gentleman who had a large pear orchard of some thousands of trees a few years old called on us early in spring and said he had met with a great loss—the mice had girdled 1,200 trees in the course of two or three days under a March snow, where he had permitted weeds and grass to grow. They were, as he said, "hopelessly ruined," and the loss was at least $3,000. We assured him that he need not lose them, and explained to him the above described mode. "But I have no skilled grafter," said he. We told him that any man who was handy with tools could do the work—a common carpenter, for instance. He accordingly went to work and employed three men. They could each finish sixty or eighty trees in a day, with four shoots to each tree. Nearly all survived and grew, as well as the trees which remained uninjured, except some sixty out of the twelve hundred, and these were set by a careless bungler. Where the work was well done, they all lived. In a few instances only two shoots were inserted, but the want was supplied in a year or two by inserting the upper ends of suckers which sprang up below.

In the orchard alluded to at the Elmira Farmers' Club, the trees had been set out the previous year, were still quite small, and the rabbits had girdled them a foot or more up while running on crusted snow. The mode recommended by some of the members, of cutting down below the girdled portion, and rubbing off all but the largest shoot springing up from the grafted portion below, may be the easiest and best, and in some instances it would furnish a new and handsome tree almost as soon as if no injury had been done, but there need be no difficulty in making the described connection if small shoots are inserted, with a narrow chisel to make the incision, and with the whole well bound together and waxed.

The best treatment is prevention by keeping the orchard clear of weeds and grass, and, if necessary, embanking in autumn with smooth, solid mounds of earth.

### Progress of the Telephone.

At the annual meeting of the Bell Telephone Company, held at Boston recently, the reports made showed the rapidity of the development of the business the past year. The total earnings for the year amounted to $1,576,031.57, against $1,001,924.91 the previous year. The expenses were $603,987.29, against $439,862.76 the year preceding; net earnings for the year, $972,044.28; balance of income from previous year, $126,034.58; total, $1,098,078.86. The total of the previous year was $606,555.01. Dividends paid, $595,000; carried to surplus account, $334,997.32; balance of income account, $168,081.54; total, $1,098,078.86. The increase of interchanges of telegraphic union doubled last year. The sales of instruments for export decreased and are likely still further to decrease, as foreign countries are making good instrumeuts of their own. The royalties from manufacturers now go to the manufacturing branch.

Local companies in New York, Chicago, San Francisco, and Boston are all paying dividends. All of the Dominion of Canada, exclusive of Newfonndland, is supplied by the American Bell Company, and dividends are to be expected from Canada. The legal expenses of the company have been heavy during the year. The report of the treasurer congratulates the company on the fact that the courts have decided that the Dolbear condenser telephone receiver, so called, infringes on the Bell patent, and an injunction has been issued; also upon the opinion of Justice Gray that the Bell patent has all the breadth that has been claimed for it, and covers microphones and instruments that employ electrical undulations. The People's Telephone Company, using a carbon transmitter, has set up lines in New Jersey, and the report says that an action on the case called forth the most careful examination that has ever been given to the principles of the various instruments, and gives additional proof that the microphone and other things claimed under the Bell patent are authorized. The case has since been decided in favor of the Bell Company. The underground wires in Boston have been found to transmit distinctly only for short distances, and it will be necessary to devise further improvements before they can be made available to any extent. It was voted that the capital stock of the company be increased from $7,300,000 to $9,800,000, and that new shares be allowed on the basis of one new share to each holder of the old ones.

### Remarkable Meteor in Italy.

Advices from Rome state that on the 16th of February some peasants working in a field near Brescia were startled by hearing a loud report like thunder. Looking up they saw the clouds torn open, and a large body followed by a train of bluish smoke hurtling through the air over their heads with the noise of an express train. The aerolite buried itself in an adjoining field, the fall causing a shock like that of an earthquake. It was felt ten kilometers away, while the report was heard at Verona and Piacenza, many miles distant. When they had recovered from their fright, the peasants hurried to the spot, and found a clean hole about three feet deep, running in an oblique direction from north-northeast; and on digging down they came to a solid block, in the form of a truncated cone, weighing from 400 to 500 pounds. The surface, which was still hot, and emitted a sulphurous smell, was covered with a greenish-black crust, full of small holes, such as would be made by finger-tips in a soft paste, which may have given rise to the report that one of the fragments bore the impress of a hand. The proprietor of the clover field in which the aerolite fell flew into a rage at his crops being trampled down by people coming to see it, and broke it up, when it was carried away piecemeal. So he gained nothing but damage to his fields, while those who picked up the pieces found a ready sale for them, one man getting as much as 7,000 francs for a lump that weighed twenty-five pounds. On a subsequent search by Professor Bombicci, of Bologna, several pieces of scoriæ, apparently detached from the aerolite in its flight, were found in the neighborhood.

### A Disinfective Laundry Blue.

Mix together 16 parts of Prussian blue, 2 parts of carbolic acid, 1 part of borax, and 1 part of gum arabic into a stiff dough. Roll it out into balls as large as hazel nuts, and coat them with gelatine or gum, to prevent the carbolic acid from escaping.