foreign substances should not be carried into the gun on the sponge or the projectile, or by the wind in batteries on shore.

In using guns on shore a canvas muzzle bag or a soft wad, or tight stopper of wood, suggest themselves as a means of security during the interval between loading and firing the gun. The cover or stopper might be removed, or left to be blown away at each discharge.

The longer the interval above alluded to, and the higher the elevation at which the gun is kept, the more important will be the precaution here recommended.

Much care is taken to give the projectiles uniformity of size, and if the powder is of suitable quality, those now supplied will almost invariably take the grooves. Should difficulty in this respect, however, be experienced from any cause, it may be remedied by separating the brass ring from the iron at three or four points of circumference. This should be done with a cold chisel, very slightly, and not so as to interfere with the loading. It is only necessary to sever the contact of the two metals.

It should be observed that the projectile slides in the gun with very little friction, particularly when greased. The gun should therefore be elevated and eased out when firing to leeward, that the shot may not be started from its seat. An experiment to test this, showed that running a 100-pounder out with the force of its crew against the forward heurter, the gun being level, started the shot forward nearly two feet. If the gun were fired with the shot in this position it would probably burst.

The 100-pounder and 150-pounder guns being, respectively, of the calibers of the 32-pounder and 64-pounder, spherical shot, and fired with the same charges, these shot may be fired from them with excellent effect, particularly on ricochet. The round shot should be sewed up in canvas, strapped to a sabot, or snaked between two gromet wads.

Both percussion and time fuses are supplied for these guns. When the object to be fired at presents a sufficient resistance, such as masses of timber or earth, ships, or solidly built houses, the percussion fuses alone should be used from rifled cannon. They will, however, frequently fail to explode the shell at long ranges, owing to the shell nor striking on its apex; or, if fired into loose earth, which checks its momentum too slowly to allow the plunger to strike with sufficient force.

It has been observed that "time" fuses burn with greater rapidity in shell thrown from rifled cannon. Being in front they are subjected to greater pressure from the air. A similar effect is produced when the fuse is confined under a water-cap, as in the naval time fuse. Hitherto no reliable time fuse has been arranged for rifled cannon.

DRIFT.

This is a deviation caused by the direction of the rifling, and is always *to the right* when influenced by the wind, and is always to be allowed for.

The *drift* is in practice confounded with the *deviation* produced by the direction and force of the wind, which may either annul or double it, according to whether it blows from right or left across the line of fire. At long range it is also necessary to consider the motion of the vessel across the line of fire. Suppose the vessel was moving at the rate of six knots, and the gun elevated to 50°, the time of flight would be by the tables, 18s., and the deviation arising from this cause would be upwards of 60 yards. It is therefore of great importance that the captain of the gun shall be carefully instructed in making this adjustment of the eye-piece.

The Sugar Beet in Illinois.

The *Prairie Farmer*, published at Chicago, Ill., gives the following account of the introduction of the sugar-beet into Illinois, and of the arrangements which are being made for the manufacture of the sugar:—

"There was a very general interest manifested throughout the North, in the experiments in the growing of sugar-beets and their manufacture into sugar, inaugurated in this State, last season, by the Gennert Brothers, at Chatsworth. We did what was in our power, to give the enterprise that position before the public that its importance demanded, and we know that very many men of capital watched its progress with eager interest, ready to embark in the business should it be clearly demonstrated to their minds that it was a success. As it is well known, the crop was successfully grown. The yield was all that was desired—the quality of the beets superior, and the cost of growing entirely satisfactory. On account of the scarcity of mechanical labor, it was impossible to secure and get ready for operation all the machinery necessary for manufacturing the large crop into sugar, though enough was done to satisfy those who examined into it most closely, of the feasibility of profitably growing the beet for sugar, upon our prairies. But the great public that, very justly, demands the strong proof of complete success, demonstrated by actual figures, of so many acres grown, at so much cost, and producing so much sugar, was not fully convinced, and hence the beet-sugar question is still an open one.

"But interest in the matter has not subsided, and further progress is closely watched. Messrs. Gennert's premises are frequently visited by gentlemen from various parts of the East, and there is much inquiry from all quarters concerning the prospects the present year. In order to keep our readers as fully posted as possible upon this subject, we recently addressed Mr. T. Gennert, the manager at Chatsworth, concerning it, to which he replies, that his present crop planted upon land where beets were grown last year, is in first rate condition, even better than last season at this date, and the beets far sweeter than at a similar stage of growth in Germany. Whether this is owing to the difference in the season, or to a somewhat different and better cultivation, he is not prepared to say. Everything so far, fully meets the promise given last year, of the perfect adaptability of prairie soil to the sugar-beet crop.

"With regard to machinery, Mr. G. informs us that with the exception of a single piece, everything is upon the spot, and most of it already in its appropriate place. The remainng piece is being made at St. Louis, and is nearly completed. He assures us that everything will be in complete running order by the time the beets are ready to work up, and that he has experienced help engaged to attend to each process in the manufacture. He intends to commence manufacturing early this season—certainly by the last of September—and thinks he shall be able to work up his entire crop of twenty-five acres, in about four weeks.

"Mr. Gennert also planted out last spring a large quantity of his beets grown in 1863 for producing seed. They did well and give every promise of a large yield. His idea is to experiment with this so as to compare the beets produced with those from imported seed, a quantity of which he expects to arrive as early as October or November. In order to test the value of home-grown seed, he will furnish to parties, binding themselves to faithfully report to him the result, a half pound package of each—his home-grown seed and the imported—at the mere cost of growing and of importation.

"For ourselves we can but repeat our former expressed conviction of the paramount importance of this enterprise considered with reference to its future bearing upon the agricultural and commercial greatness of the West, if successful, and our own unshaken faith in its final and speedy success."

BONES.

On the 31st of March a lecture was delivered on bones before the Society of Arts, in England, by Dr. F. Grace Calvert, F.R.S., F.C.S., from which we take some valuable extracts:—

BONES OF YOUNG AND OLD.

The composition of "green bones," or bones in their natural state, may be considered under two general heads, viz: the animal matters, consisting of a substance called osseine and a few blood-vessels, and the mineral matters, chiefly represented by phosphates of lime and a few other mineral salts. The composition of bones has been examined by many eminent chemists, but the most complete researches are those published in 1855 by Mr. Fremy, who examined bones, not only from various classes of vertebrated animals, but also from different parts of the same animal.

The first conclusion drawn by Mr. Fremy from these researches, is that he found a larger proportion of mineral matter than is generally admitted by chemists. Secondly, that there is no material difference in the composition of various bones taken from different parts of the man, or of any one animal, but that age has a very marked influence on composition. Thus, in the bones of infants, there is more animal and less mineral matter than in the adult, whilst in old age there is more mineral and less animal matter than in the middle-aged man. The mineral substance which chiefly increases in old age is carbonate of lime. Lastly, he could find no marked difference between the bones of man, the ox, calf, elephant, and whale; while in the bones of carniverous animals and of birds there is a slight increase in the amount of mineral matter. Allow me now to call your attention to a most interesting query. I hold in one hand the mineral matter only of a bone, which you can see retains perfectly its original form, and in the other hand I have the animal matter only of a similar bone, which also retains the form in which it previously existed, but is flexible instead of rigid. The question, therefore, arises, whether the strength and hardness of bones proceed from these two kinds of matter being combined together, or are their respective molecules merely juxtaposed? The answer is, the latter; for, as you see by this specimen, the mineral matter has been entirely removed without deforming the animal texture. Further, in the fœtus it is found that the bones contain nearly the same proportions of animal and mineral matters as those of the adult. Also, it has been observed by Mr. Flourence and other eminent physiologists, that the wear and tear of bones during life is repaired by the formation of a new bone on the exterior surface of the bone, while the old substance is removed through the interior duct, and that the composition of the new layer is the same as that of the original bone.

WHERE THE PHOSPHORUS IN BONES COMES FROM.

The animal matters are chiefly represented by phosphate and carbonate of lime. Berzelius was the first to establish the fact that phosphate of lime was the only substance possessing the properties necessary for the formation of bone, owing to the extremely simple chemical reactions which cause the soluble phosphates to become insoluble. Let us trace shortly the sources from whence we derive the large proportion of phosphate of lime which exists in our frames. Several of our most eminent chemists have proved the existence of phosphorus in sedimentary and igneous rocks, and the important part played by phosphorus in nature cannot be better conveyed to your minds than by this extract from Dr. Hofman's learned and valuable 'Report on the Chemical Products in the Exhibition of 1862':—"Large masses of phosphorus are, in the course of geological revolutions, extending over vast periods of time, restored from the organic realms of nature to the mineral kingdom by the slow process of fossilization; whereby vegetable tissues are gradually transformed into peat, lignite, and coal; and animal tissues are petrified into coprolites, which, in course of time, yield crystalline apatite. After lying locked up and motionless in these forms for indefinite periods, phosphorus, by further geological movements, becomes again exposed to the action of its natural solvents, water and carbonic acid, and is thus restored to active service in the organisms of plants and lower animals, through which it passes, to complete the mighty cycle of its movements into the blood and tissues of the human frame. While circulating thus, age after age, through the three kingdoms of nature, phosphorus is never for a moment free. It is throughout retained in combination with oxygen, and with the earthy or alkaline metals, for which its attraction is intense."

THE WAY TO MAKE SUPERPHOSPHATE OF LIME.

Bones are generally used for manuring in one of these three forms:—1st, As ground green bones; 2d, As ground boiled bones (that is, bones nearly deprived of their osseine by boiling under pressure); 3d, Superphosphate of lime.

Green or raw bones have been used on grass land for a long period, but their action is exceedingly slow and progressive, owing to the resistance of the organic matter to decomposition, and the consequently slow solubility of the phosphate of lime in carbonic acid dissolved in water. What substantiates this view is that boiled bones are far more active than the above. It is found that from 30 to 35 cwt. per acre of these will increase the crops on pasture land from 10 to 20 per cent in the second year of their application. But the great advantage which agriculture has derived from the application of bones as a manure, has arisen from their transformation into superphosphate of lime, especially applicable to root and cereal crops. To Baron Liebig is due the honor of having first called the attention of farmers (in 1840) to the importance of transforming the insoluble phosphate of lime of bones into the soluble superphosphate, rendering it susceptible of immediate absorption by the roots of plants, and of becoming at once available for their growth. These suggestions of Liebig were rapidly carried out on a practical scale by Messrs. Muspratt, of Lancashire, and J. B. Lawes, of Middlesex; in consequence of the valuable results obtained by them, the manufacture of artificial manures has gradually grown into an important branch of manufacture in this country. The manufacture of superphosphate of lime is so simple that any farmer possessing a knowledge of the mere rudiments of chemistry can make it for himself, by which he will not only effect great economy, but also secure genuineness of product. All he requires is a wooden vessel lined with lead, into which can be placed 1,000 lbs. of ground boiled bones, 1,000 lbs. of water, and 500 lbs. of sulphuric acid, sp. gr. 1·845 (or concentrated vitriol), mixing the whole, and stirring well, for about twelve hours. After two or three days a dry mass remains, which only requires to be taken out and placed on the land by means of the drill, or to be mixed with water and sprinkled on the land. When very large quantities of this manure are required, the plan devised by Mr. Lawes appears to me to be the best. It consists in introducing into the upper end of a slightly inclined revolving cylinder a quantity of finely-ground boiled bones, together with a known proportion of sulphuric acid of sp. gr. 1·68. As the materials slowly descend by the revolution of the cylinder they become thoroughly mixed, and leave it in the form of a thick pasty mass, which is conducted into a large cistern capable of containing 100 tuns, or a day's work. This is allowed to remain for twelve hours, when it is removed, and is ready for use. Most manufacturers find it necessary to add to the phosphate of lime of bones other sources of phosphates, such as coprolites, or the fossil dung of antediluvian animals which have been found in large quantities in Suffolk, Cambridgeshire, and elsewhere, and contains from 36 to 62 per cent of phosphate of lime, and from 7 to 38 per cent of organic matter. Others employ a mineral substance called apatite, containing about 32 per cent of phosphate of lime, and found also in large quantities in Spain, Norway, France, etc. Others, again, employ guanos rich in phosphate of lime, such as those of Kooria Mooria Islands and Sombrero phosphates. The following is the average composition of the superphosphate of lime of commerce:—

Soluble Phosphate..........	22	to	25	per cent.
Insoluble "	8	"	10	"
Water..........................	10	"	12	"
Sulphate of Lime............	35	"	45	"
Organic Matter	12	"	15	"

Nitrogen 0·75 to 1·5 per cent.

The valuable and extensive researches of Messrs. Lawes and Gilbert, and Messrs. Boussingault and Ville, have not only demonstrated the importance of phosphates to the growth of cereal and root crops, but also that phosphates determine in a great measure during vegetation the absorption of nitrogen from the nitrates or from ammonia.

[To be continued.]

The Old Mines of Mexico.

From the records of the past we may often discern or speculate with some certainty on the course of the future; and now that recent events have turned the attention of Europe to Mexico, we believe that we shall be doing good service when we recall a few facts as to the old mines of that interesting quarter of the world. One fact cannot be denied, that if metallurgy has made immense strides in consequence of the metalliferous discoveries which have characterized the nineteenth century, Mexico has not waited for the development of science in order to give to the world a large share of the wealth with which she has been endowed by Providence. On the contrary, with extremely restricted means, this country has drawn from its mines unheard of results. The mineral wealth of California has enjoyed this advantage; incontestible as it was prodigious, it has fallen into the hands of a people the best adapted to bring it out in strong relief. It is not enough for a merchant to have fine merchandize, as upon his power of making it please the eyes a good deal of his reputation depends; and it is probable that in the hands of another nation, California would have been far from promising only that which she has already yielded; at the same time, it may, perhaps, be said that, notwithstanding the marvelous results attained, no Californian mine has at present acquired the justly merited celebrity of some of the old veins of Mexico. Many facts might be cited in support of this assertion, but we will content ourselves with the following, merely remarking that the totals advanced may be considered as authentic, being based upon the amount of dues levied by the Spanish Crown previously to 1822, those dues representing one-fifth of the total production.

The mines of El Lacal and La Biscaina, in the province of Mexico, worked by one Cedro Tereros (created subsequently Count de Regla, in consideration of the magnificent presents which he made to the Spanish Crown), produced in 1762, £868,320. From this period to 1774 the production left a nett profit of £1,200,000, after having paid £240,000 for expenses of working and the establishment of two haciendas at San Antonio and Regla. From 1794 to 1801 the nett profit was still £1,200,000. The Veta Madre at Guanajuato, comprising some direct ramifications. produced from 1766 to 1825, judged by the fifth paid to the Crown, and the accounts kept, £45,-187,157. The Valenciana Mine to the north of the town of Guanajuato, was first worked by some poor people, but at a depth of 80 yards they met with a vein which produced from 1788 to 1810 an annual average of £276,639, which left to the workers a clear nett profit of £105,540. If it be desired to form an idea of the fabulous sums expended in working these mines, the case of the Valenciana Mine may be cited by way of illustration. Thus the different pits sunk in the working of this mine cost the following sums:—El Tiro Viejo de San Antonio, £79,200; Burgos and San Ramon, £16,400; the hexagonal pit of Nuestra Senora de Guadaloupe, £140,000; and, finally, El Tiro General commenced in 1801, and stopped at the period of the revolution—or rather the revolt from the yoke of the parent state—when it had attained a depth of 635 varas, or 1,693 ft., £200,000. The Santa Anita Mine, situated on the Veta Madre de Guanajuato, on which a pit known as the San Miguel was sunk at an expense of £140,000, gave a first profit of £2,200,000. The vein of Catorce, in the province of San Luis Potosi, was in full working from 1781 to 1783, and Father Flores, of the Company of Jesus, received for his share during those two years the sum of £700,000. The Catorce mineral, it may be added, sold on the opening of the mine at 4s. 2d. per lb. The Pavellon Mine in the Zacatecas, paid to the Crown, as the fifth of its total production during ten years, £2,400,000, which would carry its annual production £1,200,000. Don José Mariano Fagoago, who directed at a later period the works of this mine, and carried out some very extensive operations, derived from them in eight months, according to the registers of the Royal Treasury, the immense sum of £2,300,000. But such was the imperfection of the means of reduction, &c., which then existed, that Don José was not less than nine years in reducing the mineral which he had extracted in eight months. The Abra Mine, in the neighborhood of Guarisamez, in the Zacatecas, under the direction of Senor Zambrano, yielded in 25 years, to the king of Spain for his fifth, £2,200,000. Let us further mention the mine of Nuestra Senora de Guadaloupe, in the district of Cosala (State of Sinaloa), worked in 1825 under the direction of Don Francisco Iriarte, who refused to let it to an English company for £200,000, and who did much better with it; at any rate, according to his own account. The mine of Agua Caliente, in the district of San Ignacio, prospered from 1810 to 1815, when it was worked by three families—the Picos, the Nicts, and the Urrias. The yield was so rich that there was scarcely a member of these families who had not the most ordinary utensils of his household of silver, while the broker charged with the sale of the silver produced realized £4,800 for his commission during two years.

If the Mexican mines yielded in old times such striking results, although worked with very imperfect processes, what may be hoped for from them when steam and other modern improvements are applied to their development? Nevertheless, there are persons who carry their skepticism so far as to call in question the wealth of the mines of Mexico. It must be folly or ignorance to do so, and with good government we doubt not that Mexico will again deliver very great quantities of the precious metals to the world. There is nothing which so checks the national progress as individual insecurity. We do not say that the rule which Spain exerted over her South American colonies was exactly what it should have been, on the contrary, we fear that it was arbitrary, selfish and unjust; at the same time it must have been better than the violent agitations and discords with which this important quarter of the world has, up to the accession of the new Emperor, been assailed, to the annihilation of credit and the prostration of industry.—*London Mining Journal.*

Uses of Ice.

In health no one ought to drink ice-water, for it has occasioned fatal inflammations of the stomach and bowels, and sometimes sudden death. The temptation to drink it is very great in summer; to use it at all with any safety the person should take but a single swallow at a time, take the glass from the lips for half a minute, and then another swallow, and so on. It will be found that in this way it becomes disagreeable after a few mouthfuls. On the other hand, ice itself may be taken as freely as possible, not only without injury, but with the most striking advantage in dangerous forms of disease. If broken in sizes of a pea or bean, and swallowed as freely as practicable, without much chewing or crushing between the teeth, it will often be efficient in checking various kinds of diarrhœa, and has cured violent cases of Asiatic cholera.

A kind of cushion of powdered ice kept to the entire scalp, has allayed violent inflammations of the brain, and arrested fearful convulsions induced by too much blood there. In croup, water, as cold as ice can make it, applied freely to the throat, neck, and chest, with a sponge or cloth, very often affords an almost miraculous relief, and if this be followed by drinking copiously of the same ice-cold element, the wetted parts wiped dry, and the child be wrapped up well in the bed-clothes, it falls into a delightful and life-giving slumber. All inflammations, internal or external, are promptly subdued by the application of ice or ice-water, because it is converted into steam and rapidly conveys away the extra heat, and also diminishes the quantity of blood in the vessels of the part.

A piece of ice laid on the wrist will often arrest violent bleeding of the nose. To drink any ice-cold liquid at meals retards digestion, chills the body, and has been known to induce the most dangerous internal congestions. Refrigerators, constructed to have the ice above, are as philosophical as they are healthful, for the ice does not come in contact with the water or other contents, yet keeps them all nearly ice cold. If ice is put in milk or on butter, and these are not used at the time, they lose their freshness and become sour and stale, for the essential nature of both is changed, when once frozen and then thawed.—*Hall's Journal of Health.*

Improved Cement.

Common lime mortar becomes hard from long exposure to the atmosphere, by absorbing carbonic acid slowly, and thus returning to its original condition—limestone being a carbonate of lime. A patent has been taken out by C. W. Westmacott, of London, for a new cement to be used as mortar for building and plastering and also casting in molds. The nature of the improvement consists of a mixture of carbonate of lime with common burned lime. The cement is composed of one bushel of burned lime to two bushels of ground dry chalk or ground limestone or marble. The lime, as it comes from the kiln, is first slacked with water, then mixed with the ground chalk or limestone in water; sand is then added in the same way that common mortar is made, and the mass allowed to stand for two or three days before the cement is used. This cement may also be made by mixing the burned lime, dry, with the chalk (which is dried in an oven) in powder, and kept for use, to be mixed with water. It may also be worked into a paste and molded like clay. It soon becomes quite hard and fixed.

Improved Steam Bell-ringer.

The object of this invention is to ring the bells on locomotives without requiring the services of the fireman for that purpose. The invention is, as may be seen in Figs. 1, 2 and 3, a case or cylinder, A, containing a wheel, B, which has pistons or floats upon the extremities of the arms. This wheel is connected to its shaft in such a way that by the rotation of the wheel motion is imparted to the crank on the bell to which the rod, C, connects. Steam is admitted to the wheel by the handle, D, which runs into the cab of the engine, where it is controlled by the engineer. In regard to its action and advantages the inventor says:—"I admit the steam at the under side of the machine, the shell being slightly convolute, so that the steam may strike and pass three of the floats in succession, until it reaches the fourth, the shell at that point becoming concentric. The floats work steam-tight from that point one-eighth—or more—of the diameter to where the shell enlarges for the expansion of the steam and the exhaust. To accomplish this the floats are attached to the periphery of the wheel, the rim of which works steam-tight between two flanges, E (see Fig. 3), attached to each side of the shell on the inside; completing about three-fourths of the diameter of the circle. The object to be obtained by leaving out the other portion of said ring is to give the steam room to expand into the center of the wheel, so as not to follow the floats in their revolution. When these pass the opening of the two rims they then work steam-tight in the shell a portion of the diameter of the circle to the point where the jet of steam was originally admitted. The advantage of this bell-ringer over the old way of ringing bells with a cord, are, that it will give a uniform stroke, and the strokes will come as fast as the engineer wishes, according to the amount of steam let on; it will ring all day if steam is kept up, whether the engine is running or standing still, and the fireman can be doing whatever is necessary about the engine, as it will not require his services. In coming into a town or city or through either, where there are many cross-streets, either the engineer or fireman can be on the look-out or watching the train. In coming into or going out of depots it is necessary to use much caution; this machine is equal to an extra man for that purpose, for with the old way it takes the engineer or fireman about half of the time to ring the bell." Several of these bell-ringers are now in use on Western roads, where they are said to give perfect satisfaction. This bell-ringer was patented through the Scientific American Patent Agency on April 19, 1864, by W. H. Beach, of Chicago, Ill.; for further information address the inventor at the Post-office drawer 5,785, Chicago, Ill.

Fig. 1

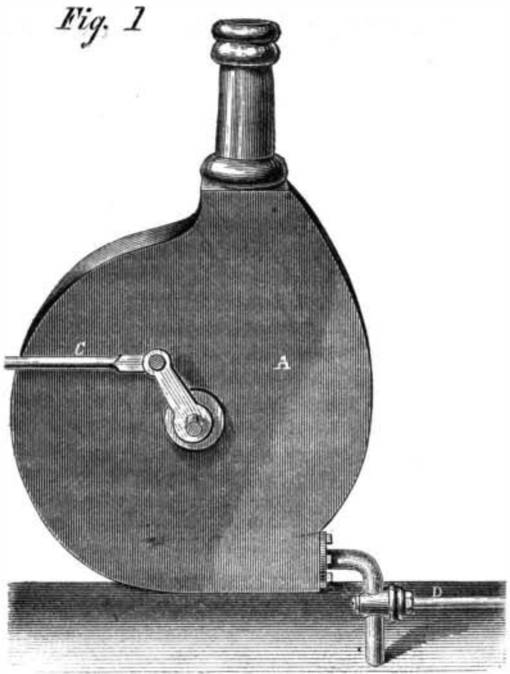
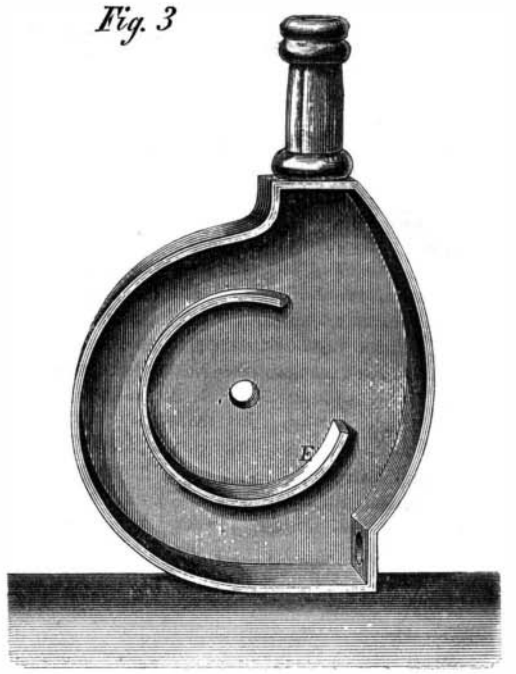


Fig. 2

Fig. 3



BEACH'S STEAM BELL-RINGER.

A CURE for whooping cough is announced in France, of rather a singular character. It is inhaling for a few moments the vapor given off by the lime which has been used in the purification of coal gas.

Pearl Fishery in Ceylon.

The fishery usually takes place in the month of March, when the sea is calm and the current least perceptible.

The process is as follows:—The whole of the boats assembled are numbered and divided into two squadrons, the red and the blue, each consisting generally of sixty or seventy boats. The squadrons fish alternately. Each boat has its company, five diving-stones, and two divers to each stone. All the men are numbered as well as the boat, and in the Kottoo there are divisions with corresponding numbers, so that each boat knows the precise spot where its oysters are to be deposited.

The squadron starts usually between eleven and twelve P. M., so as to reach the fishing-ground by sunrise. The banks are about twelve miles from the shore. As soon as the boats have arrived, the signal is given, and the diving-stones go over the sides of the boats with a low rumbling noise. One diver goes down with each. The other holds the signal-rope, watches the motions of his comrade, draws up first the stone, then the net in which the oysters are lodged as torn from the bank, and then the diver himself. Each pair of divers keep their oysters separate from the rest in large nets or baskets, so that luck and labor determine the remuneration of the pair.

When one man is tired, the other takes his place; but they do not dive alternately, as too much time would be lost by changing. The man who has been down, after remaining a minute or so upon the surface, during which he either floats without apparent exertion or holds on by a rope, descends again, and repeats the process, until he requires rest, when he takes his turn on board. This continues without interruption for six hours. Indeed, the stimulus of self-interest brought to bear upon all is so great, that as the time approaches for striking work, the efforts of the men increase, and there is never so much activity as when the heat is most intense, the sky without a cloud, the sun glaring frightfully, and the sea like molten lead. At last the second gun is fired, every stone goes down simultaneously for one more haul, and then every hand is employed in making sail, and every boat has her head to the shore.

The Adigar (a native head-man stationed at Manaar, who is allowed a boat with five stones as his share of the fishery) acts as commodore.

As the boats reach the beach they let go their anchors opposite the Government "Kottoo," the first arrival getting the best place.

Each boat swings upon her anchor, with her stern to the shore, and in an instant the divers are in the water and each pair carries the results of their day's work to the Kottoo. Then they divide the oysters into four heaps. In two hours the whole of the seventy-five boats are unloaded, unless delayed by contrary winds. The divers' share removed, and the three-fourths belonging to Government left in the Kottoo, divided into heaps of 1,000 each, the doors are locked, guards stationed, and everything is in readiness for the Cutcherry sale.

This system appears peculiarly well suited to the country and to the objects in view, by bringing to bear upon the daily results of the fishery the largest amount of private interest and the smallest amount of Government control. No man could be forced into doing what the divers do voluntarily. No fixed payment would induce them to dive as often in the day, or to unload their boats with equal dispatch.

The revenue derived from the pearl fishery is of a very uncertain and precarious nature. The Dutch had no fishery for twenty-seven years—from 1768 to 1796, and they were equally unsuccessful from 1732 till 1746. From 1833 to 1854 there was no fishery at all. But the scientific inquiries recently made led to the conclusion that the pearl-oyster may possibly be brought within the domain of pisciculture.

The pearl fishery of 1859 was, as regards results, the most successful that has taken place since the fisheries were resumed in 1855. It realized £48,215. This great increase in the selling power of the oysters was owing to the profit, which could not have been less than 300 per cent, made by the speculators in 1858. The fame of this brought all India into the field as competitors. Money was as plentiful as buyers; and the same oysters which averaged £1 19s. a thousand in 1858, in 1859 produced an average of £4 10s., the highest rate paid being no less than £8 8s. There is no reason to doubt that even at these high prices large profits were made.

Captain Pritchard describes the fishery of 1860 in the following terms:—

"The most prominent feature connected with this fishery has been the unprecedentedly high prices given or the oysters; those of the North Modregan having sold at rates varying from 155 to 115½ rupes per 1,000 (for £8,726 18s.), and the oysters of the south-east Modregan at 180 to 92 rupes (or £27,954 14s). Circumstances generally favored this result. But the principal causes were, that the oysters themselves had yielded a most valuable out-turn, and that there exists now a very great demand for pearls in the various markets of India and China. The following statement shows the result of this pearl fishery from 1855 to 1863:—

Years	No. of Oysters fished for Government.	Average Price per 1,000. £	s.	d.	Total Produce. £	s.
1855......	5,012,108	2	4	0	10,922	0
1856......	Nil.		—		—	
1857.....	24,380,308	0	16	8½	20,550	15
1858.....	12,353,049	1	19	0	24,120	
1859......	6,391,549	4	10	0	48,215	19
1860......	2,733,954	13	4	0	36,681	12

There was no fishery in 1861 and 1862. The annual expenditure incurred by the Government for the fishery is about £4,000.—*The Technologist.*

IT is confidently stated that the out-turn of coffee in 1864—65 will be the largest ever shipped from Ceylon.

Economy of Lenoir's Gas Engines.

Mr. John Pinchbeck writes as follows to the London *Engineer:*—

"Notwithstanding the unfavorable opinion expressed by your correspondent, Mr. Birckel, on the merits of the Lenoir gas engine, I am not without the hope (if you will allow me space in your columns) of removing, or, at least, of modifying, that opinion, and of proving that, after all, the gas engine may possess some merits, and that it is not so 'monstrous a production' as he at first imagined.

"If your correspondent will turn to the catalogues of the most eminent makers of portable steam engines he will see that the quantity of fuel required for working these engines is much greater than the 6 lbs. he has taken for his data. Take, for instance, an 8 horse-power engine; the quantity of coal is set down at 7 cwt. for 10 hours, exclusive of what is required to raise steam—about ½ cwt. The time necessary to get up steam is about 45 minutes, so that the engine requires 7½ cwt. for 9¼ actual working hours, or at the rate of 90 lbs. per hour. Compared with such an one a 1-horse power engine would labor under every disadvantage as regards economy of fuel, and I do not hesitate to say that the fuel required will not be less than 1 cwt. per day of 10 hours at the very lowest computation, instead of 60 lbs., as given by your correspondent. So small an engine would require constant attention on the part of the attendant; the slightest neglect, or an absence of ten minutes, would be enough seriously to lower the pressure of steam. No inconvenience of this kind is felt with the gas engine, as no attendant is required. The gas-tap is opened, the engine started, and continues to work till the gas is turned off. A little oiling once a day is all that is required; any comparison neglecting this point is unfair, because the major part of the expense of working a steam engine is ignored.

"In Paris, where upwards of 200 of the gas engines are at present at work, the average cost of the chemicals (sulphuric and nitric acids) if purchased at wholesale prices, is found to be 2½d. or 3d. per horse-power per day, which is not so serious an outlay as Mr. Birckel imagines. Taking his data, viz: 50 cubic feet of gas, at 4s. 3d. per 1,000, the cost of 1 horse-power per day of 10 working hours will be as follows:—

	s.	d.
500 cubic feet of gas	2	1½
Sulphuric and nitric acids, say	0	3
Total cost of 1-horse power for 10 hours.	2	4½

The cost of working the 1 horse portable steam engine will be—

	s.	d.
1 cwt. of coal at 1s	1	0
1 day's wages to attendant, at 18s. per week (wages in large towns)	3	0
Cost of working a portable steam engine for 10 hours	4	0

"From the above it will be seen that, although the gas used may be four times the expense of coal, yet the cost of the same power by the gas engine is little more than half that of a steam engine.

"If the expense of working a gas engine be compared with horse-power, the advantage will be equally in its favor:—

	s.	d.
Take keep of 2 horses, each working 5 hours per day, at 10s. per week	3	4
Boy to drive, at 12s	2	0
Cost of horse labor per day of 10 hours.	5	4

"I think, there ore, it may be fairly admitted that the gas engine does possess the advantage of economy in working; and that where power of one or two horses is required, it may be employed to advantage and that it is not so monstrous a thing after all.

"Reading Ironworks, July 11, 1864."

Petroleum transported through Pipes.

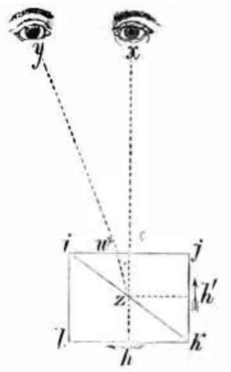
The *American Railroad Journal* says:—"For the more convenient transportation of the oil from the wells to the railroad, the Oil Creek Railroad Company and the Atlantic and Great Western Railroad Companies are laying between the termini of their roads iron pipes, through which the petroleum will be forced from the tanks at the wells to the railroad termini by powerful steam pumps. It is estimated that by this means, if necessary, 10,000 barrels a day can be delivered to the roads at a cost greatly less than by the present means, thus reducing the cost of the petroleum to the consumer, and preventing the fluctuations in the amount transported from the effect of the seasons on the wagon roads."

PHOTOGRAPHIC ITEMS.

A correspondent asks the address of the introducer of the wonderful "Crystal Miniature," of which we have before published some accounts. We believe Mr. Jos. W. Swan, of Newcastle, England, enjoys the credit of bringing this beautiful application of photography before the public in practical form.

For the information of photographers generally we subjoin a description of the crystal picture with a diagram, which will enable any person of skill to produce them. We copy from our valued contemporary, the *British Journal of Photography.*

"A piece of solid clear glass is ground into the form of a prism, having one of its angles a right angle, and the two other angles of about 43° and 47° respectively. This is cut in halves transversely, and the larger sides of the two pieces are placed in contact, so that viewing them endwise they appear as in *i, j, k, l.* It is evident that if an eye be placed at *x* an object at *h* will be visible, because the surfaces *i j* and *l k* are parallel, as also the two surfaces at *i k;* but, if the surfaces at *i k* were inclined at an angle of 45° to *i j*, an object at *h'* would also be seen by an eye at *x* by reflection from the surface *i k*, its incidence thereon exceeding the critical angle; and it must not be forgotten that, although the two surfaces at *i k* are popularly supposed to be *in contact*, this is not actually true, there being a film of air, however thin, between them. The surface, *i k* is, however, inclined to the perpendicular, *h z*, about 42°, so that, instead of the reflection being from *z* to *x*, it is really from *z* to *w*, where it is slightly refracted outwards in the direction of the dotted line to *y;* consequently if an eye be located at *y* it will see an object at *h'*. It is, therefore, only necessary to adjust in proper positions a pair of stereographs at *h* and *h'* in order that each one shall be seen by its appropriate eye, and stereosity of effect will be produced. It is observable that, as the object at *h'* is viewed by reflection, it must be inverted before applying it to the surface of the prism, and as Mr. Swan applies the films by tranference to the prism, and as transparent positives are needed they can readily be printed of a convenient size in the camera. It is probable that the paper prepared for the practice of photodiaphanie, lately introduced by Messrs. Harvey, Reynolds and Fowler, of Leeds, may be found useful for this purpose.



"Mr. Swan mounts the prism elegantly in a kind of jewel case with opal glass at the bottom, so that when looked at, by being in the hand and the bottom turned towards the light, each eye can see only the image intended for it, the limits of the prism acting as diaphragms which obscure the image not intended for each eye respectively, and a portrait appears as a perfect miniature bust of surpassing delicacy and brilliancy inclosed in a mass of crystal. The crystal miniature is one of those productions that charms alike the unlearned by its beauty and the man of science by its cleverness of adaptation."

Re-union of Dissevered Nerves.

Professor Laugier, one of the surgeons of the Hotel Dieu, has recently made a most important communication to the Academy of Sciences. In an operation performed on the arm, and in which the median nerve had been severed, that skillful surgeon united by a suture the two ends of the nerve. Almost immediately after signs of sensibility were observed, and in a few days more the nerve had entirely recovered all its properties of sensation and motion. I need not insist on the importance of this case, which throws such a new light on physiological pathology of the nervous system. No longer than two weeks ago, in a discussion which took place at the Society of Surgery, it was affirmed by several members that the regeneration of the nervous tubes, which alone could cause the recovery of sensibility and motility, was the work of weeks and months, and could not immediately take place. Such also was the opinion of M. Brown-Sequard and of MM. Vulpian and Philippeaux. These two gentlemen published last year a memoir which received academical honors, and in which they gave the relation of different experiments they had made, the result of which is entirely opposed to that recently obtained by M. Laugier. The memoir of that eminent professor, read at the Academy of Sciences, has been the scientific event of the week.—*Paris Correspondent of the London Lancet.*

A Colorless Varnish.

There are few things in photography that give the professional and amatenr followers of the art more trouble than varnish; and as lac—a resinous substance, the product of an insect found on several different trees in the East Indies—is one of the principal ingredients used, it has been a great desideratum among artists, to render shellac colorless, as, with the exception of its dark brown hue, it possesses all the properties essential to a good spirit varnish in a higher degree than any other known resin. A premium of a gold medal, or thirty guineas, was offered some years ago by the Society of Arts for "a varnish made from shell or seed lac, equally hard and fit for use in the arts." There were two candidates, Field and Luning. When on due examination and trial both processes were found to answer the purpose, the Society awarded the sum of twenty guineas to each of the candidates. We give the process known as—

LUNING'S COLORLESS VARNISH.—Dissolve two ounces and a-half of shellac in a pint of rectified spirits of wine, boil for a few minutes with five ounces of well-burnt and recently-heated animal charcoal. A small portion of the solution should then be filtered, and if not colorless, more charcoal must be added. When all color is removed, press the liquor through a piece of silk, and afterwards filter through fine blotting-paper. This kind of varnish should be used in a room at least 60° Fah., perfectly free from dust. It dries in a few minutes, and is not liable afterwards to chill or bloom. It is particularly applicable to drawings and prints that have been sized, and may be advantageously used upon oil paintings which are thoroughly hard and dry, as it brings out the colors with the purest effect. This quality prevents it from obscuring gilding, and renders it a valuable varnish for all kinds of leather, as it does not yield to the warmth of the hand and resists damp, which subjects leather to mildew. Its useful applications are very numerous, indeed to all the purposes of the best hard-spirit varnish.

A common lac varnish may be made by digesting four ounces of clear-grained lac in a pint of spirits of wine in a wide-mouthed bottle, keeping it in a warm place for two or three days, and occasionally shaking it. When dissolved, strain through flannel into another bottle for use.—*British Journal.*

ARTIFICIAL LARYNX.—Dr. W. N. Cote in the Paris *Medical Gazette* says:—"M. Edmond Fournier, at a late sitting of the Academy of Sciences, produced an artificial larynx composed of india-rubber pipe and several keys and pedals, by means of which the action of the natural muscles is imitated and sounds similar to those of the human voice are produced. This apparatus is constructed according to the inventor's theory of the production of sound, founded on a long and patient investigation of the construction and action of the larynx."

A PEAT company is to be formed in Rochester, N. Y., to supply that city with fuel. It seems that the peat can be cut, dried, and conveyed to the city at a much less cost than coal. Long Island and New Jersey, it is said, are likely to produce large quantities, and the method of drying the peat and preparing for market has been patented.

FAST TIME.—The steamer *Daniel Drew*, Capt. Tillman commanding, on her down trip for New York, made the extraordinary fast time from West Point to New York—fifty-three miles—inside of two hours.—*Newburgh Telegraph.*