Correspondence.

Dr. Yeakel's Mode of Making Cannon.

MESSRS. EDITORS:—The United States was pleased to grant me Letters Patent for a new and improved mode of making cannon and other ordnance, bearing date February 1, 1862; but as the papers therewith were placed in the confidential department of the Patent Office, it was not reported in your published list of patents of that date; therefore you could not have had information thereof until your agency was sought to patent the mode in England on the 31st day of March. As this mode of constructing ordnance is destined, in my belief, to recommend itself as superior to all other ways of making cannon now in use, I hope you will grant me the use of your valuable paper for the purpose of presenting a few reflections on the subject of ordnance.

CANNON NOT SO GOOD NOW AS THEY WERE FIFTY YEARS AGO.

It is generally conceded, I believe, that since the coal measures of the earth have been opened and coal so generally used in the smelting of iron ores, the cannon and other ordnance so made are neither so good or strong as formerly, when wood only was employed; this is because all coal contains to a greater or less degree, a sulphur pyrite, generally in the form of the bisulphite of iron, which, as an atomic part of the metal is greatly destructive of its tenuity and strength. Besides, all cannon and other ordnance of whatever or by whatever principle they are cast, are only in a crystallized form.

A GUN SHOULD BE HOMOGENEOUS IN MATERIAL.

Thus, by Capt. Dahlgren's principle, the outer shell of the casting from the trunnions to the end of the breech is made very hard, by a cooling process which vitrifies the metal, so called, of the exterior of the gun, for a couple of inches in depth. By this alteration of the crystallizing process it is intended to diminish the expansion of internal metal opposed to the expansive forces of the burning powder. But I am told that the process of cooling defeats its object by vitiating and weakening the internal crystallization, causing the metal to slough away rapidly at the vent hole.

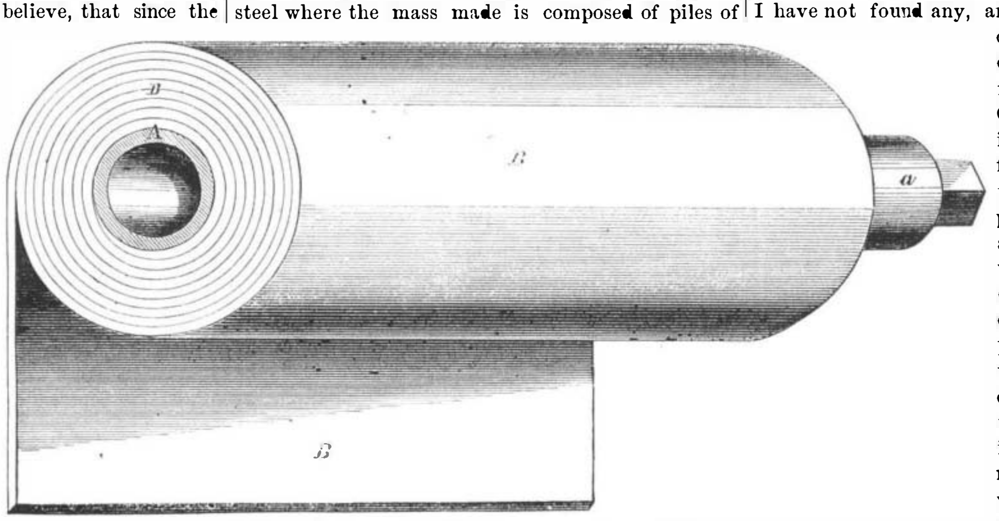
WHAT THE FRENCH AND ENGLISH GOVERNMENTS HAVE DONE.

The French and particularly the English governments have expended a great deal of money in efforts to improve their cannon since the commencement of the Crimean war; and they have attained a considerable improvement, especially of their heavy ordnance; nearly all these latter inventions and improvements have had for their object the substitution of wrought iron and steel for cast iron. Thus one inventor uses a central tube wrapped with wire and soldered, then incasing the mass within an outer metallic covering or jacket. Another builds a series of rings around a central caliber core, then another series are shrunk on the top of the first, and all are welded together. Still another, Mr. Greener, carefully forges and planes a sufficient number of parallel bars, and arranges them around a central mandrel hooped together and then welded. The Armstrong gun, as now made, consists of a given number of bars of iron wound spirally on a central core and then welded by means of a chuck ram to each other and to the breech. The reinforce band on the outside of the Parrott gun is so made while the tube is of cast iron. But it will readily be seen that if a single defective welding should exist, by any one of these several modes, and in practice it has been found almost impossible to prevent their occurrence, the whole forging is lost; I have been informed that only one in three are reliable.

Mr. Horsfall, of England, first made what he denominated wrought-iron guns, by welding together successive piles of heavy bar iron, until he had built up and forged the approximate form and size of gun. This iron mass was then bored and turned in the usual manner. It is in this way that the heavy shafting is made in the United States and elsewhere.

OBJECTIONS TO THE HAMMERED WROUGHT-IRON AND SEMI-STEEL GUNS.

By Mr. Horsfall's plan two insuperable difficulties are encountered, which have not as yet, nor are they likely to be overcome. First, by imperfect welding of the component fragments of iron used, and, second, defective consolidation and lamination of the whole forging; besides the repeated heats to which the substance of the mass is subjected, renders the interior structure granulous, spongy and unconsolidated. In nearly all of these heavy forgings it is only the outside of the mass which is laminated and consolidated from impact of the hammer, the impress of impact or pressure of roller, diminishing toward the center in a direct ratio with the diameter of the mass. These objections apply equally to the forging of semi-steel where the mass made is composed of piles of



YEAKEL'S MODE OF MAKING CANNON.

charcoal iron, called ingots, welded together. Mr. Krupp, of Essen, in Prussia, is the inventor of this mild or semi-steel, and although the explosion of his trial gun, at Woolwich, England, on the sixteenth fire, was not by any means a fair test of his principle, still it may well be doubted whether thick masses of iron or steel can be perfectly consolidated by the impact of hammering or the pressure of rollers. When we were surprised by the present rebellion from the pursuits of a long and prosperous peace, our government had to create field batteries on an immense scale to meet the exigencies of the occasion, and the Secretary of War did certainly the best thing possible in contracting for brass field guns of the old pattern, the Parrott cast-iron gun with wrought-iron reinforce, the Wiard semi-steel, and a wrought-iron gun made by Reeves & Co., of small caliber, in about equal proportions, that we might have in the shortest possible time an abundance of field artillery. The first named is brass, the second and fourth kinds of gun are not homogeneous, and the third-named gun is consolidated imperfectly; it remains to be seen whether the United States, in its ordnance and field artillery, is any better off than England was at the close of the Crimean war.

NEW MODE OF CONSTRUCTING CANNON AND OTHER ORDNANCE.

We come now to consider as briefly as possible the mode by which I propose to construct wrought-iron and steel ordnance of any size, from the 6-℔. field piece to that of 150-℔. caliber. I would first premise, by suggesting the belief that the strongest form which metals can be made to assume, reference being had to great size and surface, is the plate or sheet form, for the obvious reason that to give them this form the metal must be attenuated, and to attenuate is to consolidate, to laminate and to render the plate-fibrous. By my mode it is proposed to take, inspected carefully, rolled plates of charcoal iron, of a determinate thickness and of a length, if in one plate, or in one, two or more plates of an aggregate length, equal, when wrapped to produce the intended diameter of the cylinder, and of a width somewhat exceeding the desired length of gun, and to wrap and to weld the same around a central mandrel, solid or hollow, of a little less diameter than the intended bore of the gun; then to bore and finish in the usual manner.

The plan is illustrated in the annexed engraving; A *a* being the mandrel and B B, the sheet wrapped around it. A cylinder thus made it would be impossible to burst, for it is not possible to conceive any other form into which metal could be shaped, which would oppose so great strength and resistance to the expansive forces of gunpowder. At the first glance it would seem to be impossible to construct large cylinders by this mode. But such impression is mainly due to the fact that the eye is not familiar with the kind of machinery required to execute the work. Within the past thirty days I have visited some forty furnaces and forges in Massachusetts, New York and Pennsylvania in the hope of finding a furnace and rolling forge, a trifling or at least not very expensive alteration in which, by the addition of a mandrel, rest and a roller adjusting itself to the ever-increasing mandrel mass, would enable me to construct a mass which would finish up say 500-℔s. weight. But I have not found any, and I must wait until I can command the means to construct the furnace and forging or wrapping mill. One necessary prerequisite is an annealing or heating furnace having great bottom surface to heat the plate, with a wide door, and of width and depth very much greater than generally met with, and so constructed as to heat the plate uniformly; this is required for one of my processes. Next we require a winding or wrapping mill in near relation to the mouth of the furnace, that will wrap up tightly the red-hot plate on its central mandrel. Now a plate of iron thus heated hot and wound up on its mandrel under tension, which tension may best be made by a roller adjusting itself in pressure to the increasing mandrel mass, is ready to go back into the furnace for its welding heat, and the welding and consolidation may be made by impact of hammer or the pressure of rollers. This is one mode of constructing the mass which you see is not impracticable, and a gun constructed in this manner would be the best ever yet made. But there are one or two metallurgical conditions connected with the above process from which it would be well to relieve the forging. Another way of producing the mass is to bend around a central mandrel, a first layer of plate metal, and to weld this first mandrel fold to itself, or itself and mandrel, then continue by means of a wrapping mill to bend several inches of plate at a time, and then to weld it, and so on until the entire mass is wrapped up and welded.

It will be perceived that by this second mode the laminated and fibrous character of the plate is mainly retained, while a doubt maybe permitted whether by the first process the mass retains its plate consolidation as perfectly as by the last-described mode. This second mode will require the mandrel to have a rest in the furnace as well as the mill, as the mass requires to be changed frequently by means of a crane or rail slide-way from the furnace to the winding mill and back again. This last mode, it will be seen, unites a number of advantages over the first-described method —first, the forging obtained will certainly preserve to a greater degree its laminated and fibrous character, for only so much of the mass is exposed to the intense heat as is about to be welded. Second, all impurities of the metal, called slag, will constantly be forced out before the welding pressure of the roller or hammer. Third, the mass will not be exposed to the danger inherent to very large forgings, exposed to intense heat in mass to take on a new form of crystallization; and, lastly, a forging of almost any required diameter can be made by this mode by the use of several plates of one thickness or of different thicknesses.

A third way in which this form of wrought cylinder may be made, is to wrap and weld a plate of iron simultaneously around a central hot mandrel in an almost inappreciable space of time; if, as the most experienced forgers in the country assure me, and my own experience approves it, the welding flux lasts three seconds on a quarter-inch plate of iron, five seconds on a half-inch plate, and from eight to ten seconds on a seven-eighth-inch plate. Why not? provided the welding cylinders are heated to a maximum consistent with their retention of strength equal to the welding, and the wrapping and welding machinery is in such close relation to the furnace fires as to insure the welding heat to be as perfect on the last inch of plate as on the first.

By this mode it will be seen that the most carefully consolidated plates of iron or steel are rolled or wound and welded together in one continuous length or lengths, thereby producing a quality of uniform welding and consolidation of metal, and a form of barrel composed of concentric welded folds capable of opposing a resistance to the explosive force of powder, which cannot be obtained in any other way.

Lafayette, Ind. D. T. YEAKEL, M. D.

[In accordance with Dr. Yeakel's special request we permit him to state his case in his own way. Our readers will understand that we are not responsible for the opinions of our correspondents.—EDS.]

"Philosophy of Projectiles."

MESSRS. EDITORS:—From your remarks in the SCIENTIFIC AMERICAN of May 3d, under the above caption, I infer that my communication to which you there allude is not sufficiently explicit. You appear to have understood me to argue that shells, from their shape, are the most efficient projectiles against iron-plated vessels. And as bearing against this opinion, you state the fact that cast-iron shells will crush against iron plates. As an instance, you say, "The large shells fired by the *Merrimac* against the *Monitor*, we understand, were all broken in pieces." You also refer to experiments related by Sir Howard Douglas, where solid cast-iron shot were broken to fragments against plates only five-eighths of an inch in thickness.

I was unfortunate in not making myself well understood. I do not hold that a hollow shot is the most effective projectile when guns of small caliber are used, and where a solid shot can be thrown with equal velocity; nor do I claim that cast iron is sufficiently tenacious to give the best results; but I do hold that when it becomes necessary to use guns of 20-inch caliber the shot must be made hollow, or of a material lighter than iron, because of the impossibility of imparting great velocity to such a mass of metal in the shape of a solid shot, and of the almost certain disaster that will follow the attempt. If cast iron is not strong enough for such shot something stronger must be used. I do not, however, think there is any present necessity for the use of such large guns, but fully believe a well-constructed hollow shot, of 250 lbs. weight, may be fired from a 15-inch gun so as to penetrate through the side of any vessel now afloat.

Now a word in relation to the cases you have cited. The shells thrown by the *Merrimac* could not have been over 7½ inches in diameter, as she appears to have had no guns of larger caliber. For that size there appears to be no necessity for using hollow shot; but had they been solid the result must have been the same, as is clearly proved by your example of experiments, as given by Sir Howard Douglas.

In this last example there is one important fact which is not clearly shown in the brief manner in which you relate it. The shot, though "converted into a cloud of langrage too numeous to be counted," in every instance, went through the target, which was a section of the *Simoom*, the plates being supported by strong iron ribs, which, whenever they were struck, were broken in pieces and carried away. And when the experiment was repeated, after filling all solid between the iron ribs with 5½-inch oak timber, and adding 4½-inch oak planking, Sir Howard says: "All parts of the shot passed right through the iron and timbers, and then split and sped abroad with considerable velocity." In fact Douglas condemns iron ships of war for this very reason, and questions their use as transports in case of war, because of the terrible effect of the broken shot after they pass into the vessel. I might follow his statements further, and show, from him, that hollow balls proved as destructive as solid shot, but I will not occupy your space with statements that have been already made public.

And now allow me to correct an error that appears in my communication as published. I am made to say, "It is claimed that a much longer range may be attained with the *large* shot." It should read, "with the *long* shot." I readily admit the claim of long range for large shot. E. S. WICKLIN.

Washington, D. C., May 3, 1862.

[Capt. Benton, of the Ordnance Department, U. S. A., in his work on "Ordnance and Gunnery," agrees with our correspondent in his opinions respecting the effects of large projectiles. He says, "It remains to be determined whether vessels can be conveniently covered with sufficient thickness of iron to resist the crushing effect of enormous projectiles of the 15-inch columbiad; or, in other words, is it practicable to increase the resistance of such iron coverings as to keep pace with the increase in the destructive power of projectiles?" Capt. Redman claims, with a show of reason, that if the 15-inch gun is not sufficient for this purpose much larger ones can be made that will suffice.

Respecting the resistance of wrought plates to shells, Capt. Benton says, "Thin plates of wrought iron may serve as a protection against shells of any size. The plates may be penetrated, but the shells are broken by the impact, and, therefore, rendered harmless, if the woodwork behind the plates is sufficient to arrest the fragments." He also says, "Cast and wrought-iron projectiles, fired with high velocities against thick wrought-iron plates, are generally broken by impact, while those of puddled steel and homogeneous iron are not much affected by it."

Capt. Benton states that iron-clad ships could be seriously damaged by land batteries. He says, "Though iron-plated vessels have been made which are capable of resisting isolated shots from heavy cannon, none have yet been made fulfilling all the conditions of flotation, stability and manageability, which are capable of resisting a simultaneous and concentrated cannonade of 68-pounder shot, or of rifle projectiles. Such vessels may afford shelter for their crews, for a time, and may pass sea-coast batteries with comparative impunity, but it would not be prudent for them to take up a position near a place guarded by powerful cannon, for the purpose of cannonading it, more especially if the command of the land batteries gives a plunging fire on the vessels."

Capt. Benton's conclusions, he states, were chiefly drawn from experiments made in England, as related in Sir Howard Douglas's "Naval Gunnery."

Naval gunnery, naval architecture and fortification are in a transition state at present. *Monitors* and *Merrimacs*; Dahlgren, Redman, Parrott and Armstrong guns make men stand wondering respecting what new and more destructive agents may turn up next.—EDS.

Setting Sweet Potato Plants.

MESSRS. EDITORS:—On page 260, present volume, SCIENTIFIC AMERICAN, is an extract from the *Ohio Valley Farmer*, by M. M. Murray, in which he gives very good directions for the selection of grounds, &c., for the cultivation of sweet potatoes. As I am from a potato region, and have had much experience in planting and raising them, I will add another simple plan for setting out the plants, which may be done at any time your plants—called "slips" down in Dixie—are ready. It is better to prepare your ground immediately before the planting, as the freshly-prepared ground is much looser, and is, therefore, more suitable to receive the plants. Having got the ground together with your plants all ready, no matter how dry the weather, commence about the middle of the afternoon, having tubs or barrels of water conveniently situated, and use about a teacup full of water to each plant. The ground being loose, the four fingers of the right hand are passed down about their length into the earth and the dirt pulled up so as to make a hole large enough for a cup of water. With your left hand carefully set your plant down as it should stand. Now let some person pour on the cup of water, which will cause the fibrous roots to swim and straighten out and stand in their natural position. Now quickly let the dirt in your right hand be conducted around your plant in as loose a manner as possible, leaving the top of the plant properly out of the ground. No packing is desirable in this case. By using this method we never have to wait for a suitable season, but get the plants ready as soon as possible. Thus set they commence growing right along, and live and do better than if planted in any other way, unless it is a very favorable season. Much time is saved, and we have a much larger and more abundant crop. If the water is slightly manured it will still be better. A. W. TODD.

Louisville, Ky., April 24, 1862.

Concave Bolt or Projectile.

MESSRS. EDITORS:—Having noticed in your valuable paper a great variety of newly-invented projectiles, I would ask your opinion of one I have experimented with. I use a rifle of medium size. I have cut a clean hole through ½-inch iron plate at 25 yards distance. The shot is made of steel, concave at both ends, being turned from the inner end to within $\frac{3}{16}$ths inch of outer, leaving a shoulder $\frac{1}{16}$th inch; from the shoulder to the inner end is again made to the former size with lead. Could the same be used with effect in larger guns? What is your opinion as to it being a patentable article? May I find an answer to the above in your paper. J. B. W.

Maine, May, 1862.

[The projectile you describe is not new. A gentleman exhibited a similar one in this office sometime ago, and the iron target which was shown with it, indicated about the same result you have obtained. It was well riddled. The shot were fired from a Springfield army rifle. We see no reason why a large projectile might not be used equally as well, and the result be correspondingly great. We do not think you can obtain a patent unless you have your case put into interference with another pending application, and can prove priority of invention.—EDS.

An Improvement in Shell Fuses---Opening for a New Invention.

MESSRS. EDITORS:—Being a regular reader of your valuable paper, I have seen calls for new inventions promptly responded to by improvements in the cases suggested.

As an officer in charge of a division of the mortar service, I have found by experience that an improvement in making fuses would greatly improve our practice. As it is, our fuses seem to be filled by hand, and some being very soft, they do not burn the length of time they are expected to before the explosion of the shell. Some again are very hard, and they burn too long before the explosion takes place. The consequence of this irregularity in filling fuses is that we cannot depend upon our practice.

Now, if some of your readers would make a piece of mechanism by which fuses could be filled under a uniform pressure, they could be tested and marked properly, and then we could burst a shell with that precision necessary to secure perfect success.

By permission of Capt. H. E. Maynadier, commander of the mortar service, I have the privilege of making this suggestion. THOMAS. B. GREGORY.

On board U. S. steamer *Judge Torrence*, near Fort Pillow, May 3, 1862.

New Churning Power Wanted.

MESSRS. EDITORS:—To your list of "inventions wanted," I would suggest the addition of another, namely, some simple power for churning milk, to take the place of dog, sheep and horse powers. The want of such a power has long been felt by butter makers, as little reliance can be placed upon a dog, a goat, or a sheep for churning in a dairy. Such a machine should be cheap, simple in its construction, easily taken care of and economical to use. C. S.

Wallkill, Orange Co., N. Y., May 1, 1862.

AN Alabama paper reports that four caves are now worked for niter in that State. In one place fourteen hands in four months and a half produced 2,755 lbs. In another place 9,000 lbs. were made at a cost of 75 cents per lb., and another 4,350 lbs. at 73 cents.

MISS HARRIET HOSMER's celebrated statue, *Zenobia*, has been sent to the Great Exhibition in London.

The Ventilaton of Mines.

The following are extracts from a paper on the important subject of ventilating mines, by Mark Fryar, of Glasgow, lately read before the South Wales Institute of Engineers :—

The greatest of all blessings that man can enjoy in this world is that of perfect health ; and whoever may devise means by which the health of a community shall be in any way improved must be looked upon as a benefactor of his race, and an instrument in the hands of the Almighty for the benefit and comfort of his creatures. The animal system of man is a most wonderful and strangely complex piece of mechanism, the order and healthy action of which depend upon the observance of certain laws, which laws are exceedingly simple, and suggested, in most cases, by instinct, the operation of natural desire, or absolute requirement. The violation of any one of these natural laws is sure to be productive of evil. No man has an absolute right to deal with his health according to his own will and pleasure. Our social bonds unite us so closely together that we cannot injure ourselves without injuring others ; and the civil law of the kingdom very justly interferes with all projects and processes in the arts and industrial pursuits which necessarily endanger life, or are productive of ill health and premature death. The extent, however, to which such interference should be carried is a very grave question, affecting, as it does, not only political freedom and the just liberty of individuals, but also the full scope of productive and manufacturing skill and enterprise. Not only is it the duty of every man to be careful of his own health and life, but he must be equally solicitous respecting the health and safety of his fellow man. There are some thousands of workmen employed in mining and other occupations in the world who are daily exposed to dangers, to unhealthy fumes and vapors, deleterious gases, and atmospheres which, from various causes, are charged with insidious diseases, making life but a lingering death, and yet the workmen themselves are comparatively unaware of their own condition in this respect. There are special branches of industry and art in the pursuit of which the individuals occupied therein are exposed to what promotes disease and very materially shortens life, and from which the rest of mankind are exempt ; but many of the evils are irremediable, and there must always be a class of men who are willing to sacrifice part of the years allotted to man that they may pursue a trade or calling of their liking, or society must dispense with some of its present conveniences and luxuries. It is, nevertheless, true that by care and skill the sanitary arrangements, even in places where deleterious operations cannot be avoided, may be considerably improved : and everything that can be done, by way of mitigating such an evil, surely ought to be done. . . . . The composition of the atmosphere, when in its normal condition of purity, and therefore best adapted for the requirements of life, has been ascertained to be, per 1,000 parts, 788 nitrogen, 197 oxygen, 16 moisture, and 1 carbonic acid gas. A consideration of the process of respiration will enable us more clearly to understand the ill effects of breathing in a vitiated atmosphere. The number of respirations, or alternate breathings, is about twenty per minute under ordinary muscular activity, and the average quantity of air inhaled about 200 cubic inches per minute. It has been discovered that the taller a man is the greater is the vital capacity of his lungs for air. . . . In coal-mines there is, generally speaking, a much larger amount of deleterious gas produced than in metalliferous mines. Every crevice, opening, or pore met with in rocks during the process of mining is likely to be full of gases of some kind. In coal-mines these gases are chiefly carbonic acid, carbureted hydrogen, and nitrogen, the presence of the latter proving that the coal, while in its natural position of a bed or seam, is undergoing decomposition. Carbonic acid gas is also produced by the breathing of animals, the burning of lamps, and the decaying of timber ; and Dr. Snow has shown that carbonic acid " acts more deleteriously upon the system in proportion as the normal quantity of oxigen has been reduced." The writer then traces the effects of breathing the impure atmosphere of mines, and concludes this part of his subject by saying, " A pretty extensive acquaintance with the most prevailing diseases among miners convinces me of the truth of the following, viz., that there are very few young men above the age of 25 who are quite free from pectoral disease in some shape or other, and above the age of 35 there are not 10 per cent who do not suffer more or less from asthmatic disease. Above the age of 40 almost all miners are the subjects of chronic bronchitis and asthma ; and at this age they generally bear the unmistakable marks of premature old age, and for the most part are unfit for engaging in any severe manual occupation." As a remedy in connection with good ventilation, restriction should be placed upon the hours of labor in the pit, and the adoption of more stringent measures as to the age at which boys are allowed to work underground. The laws of ventilation are very simple, and of easy application. We have seen that a man actually requires about 300 cubic inches of air per minute to maintain vital energy ; but seeing that the due supply of air to the working places in mines depends upon so many contingencies, and that so many causes are in operation by which the air is made impure, it is considered that from 50 to 100 cubic feet of air per minute is the least amount that should be supplied to each man in the underground places of a mine. Badly ventilated mines are most intolerably stupid means of making interest out of invested capital. Mr. Woodhouse, the eminent mining engineer of Overseal, Leicestershire, who has had large experience in the ventilation of coal mines, says "A large saving is invariably realized in practice from the adoption of improved modes of ventilation, because the constant introduction of fresh currents of atmospheric air into the pits tends in a remarkable degree to protect the woodwork of the mine, and to keep the roadways dry and in good order. In pits with a rapid circulation the men respire more freely, the roadways are kept dry and repaired at less expense, and the timber lasts longer by years ; and, therefore, it is a matter of strict economy to ensure a good ventilation." The best ventilated mine is the best paying mine, or, at any rate, its profits are much greater by a good ventilation than it would be by a bad one. It saves the timber and the cost of maintaining the ways; it enables the men to perform a much greater amount of work in a given time ; preserves the health of the miner, and thereby adds to his comfort and to the number of his days in the world.

Signs of Health.

Perhaps there is no living writer on medical subjects who enjoys a higher reputation for keen observation than Professor T. Laycock, of Edinburgh. The following are some of his opinions delivered in a recent lecture respecting the outward signs of sound health, and indications of long life :—

1. The skin should be healthy ; this is indicated by a freedom from dry scurfiness, both of the skin and scalp ; a certain suppleness, the result of due secretion of sebaceous fluid ; a firmness of texture equally removed from transparent thinness and coarse thickness ; a freedom from chronic congestions, patches of varicose vessels, or any skin diseases, whether parasitic or diathetic. 2. The skin products, whether appendages—as hair, nails and teeth—or secretions, as the pigmentary, sebaceous or perspiratory, should be normal and healthy. The expressions of the eye should be free from peevishness or irritability, for these often mark a tendency to shortness of life ; there should be no *arcus senilis*, or infiltration of the lower eyelid, or marked vascularity of the upper lid. The complexion may be of any temperament, but should be good of the kind ; there should be no signs of unhealthy blood, as a peculiar pallor, or icteric tint, or duskiness of hue. Perhaps the best single criterion of a sound, enduring constitution is to be found in the character of the hair and teeth. Persons tending to longevity have usually sound, well enameled, well set teeth, continuing free from decay until old age, and their hair is thick, not soon gray, nor falling early. In such persons the general powers are vigorous, and it is only some visceral disease or acute fever which shortens life. If to the signs of good health you can add good conduct, and the fact of longevity being hereditary in the family, the individual has a good chance of long life.

The appearance of the patient may be fallacious as to the formation and deposit of fat, whether in the cavities or the adipose tissue. This occurring beyond the healthy mean is not a mark of strength, but of degeneracy. It constitutes the popular sign of advancing age in the " decreasing leg and increasing belly " of Shakspeare ; and an early or excessive fat deposit is not unfrequently indicative of premature old age. Scrofulous children and youth are apt to be very fat before tuberculosis comes on ; very fat men or women rarely reach sixty, and all the fat infantile monsters die early. Polysarcia, as this fatty condition is termed, is to be distinguished from atheroma, which is fatty degeneration, limited to the arterial tissues, and also from fatty deposit in the muscles. It is a general mode of degeneration of nutrition arising from constitutional tendencies, often hereditary, and apt to show itself at epochs of evolution or decline, especially of the sexual glands. Another commonly-received sign of a good constitution is a clear, florid complexion, and it may be received as such, with reservations. But it not unfrequently is the sign of a dangerous tendency to serious diseases of the heart and blood vessels, and to rheumatic affections in persons otherwise of a vigorous habit, and should never be accepted as a good sign without cautious inquiry, more especially into the morbid tendencies as to the nervous system.

Pastils for the Breath and Ulcered Gums.

The following are given by the American *Druggist's Circular* as being more convenient to use for the teeth and gums than liquids :

First, Take of hypochlorite of lime 7 drachms ; sugar flavored with vanilla, 3 drachms ; gum arabic, 5 drachms. The pastils are made so as to weigh from 10 to 11 grains. Two or three of these pastils are sufficient to remove from the breath the disagreeable odor produced by tobacco smoke. The pastils thus prepared have a gray color and become quite hard ; if pastils of whiter color are required the following substances are employed :—

Second, Take of dry hypochlorite of lime 20 grains ; pulverized sugar, 1 ounce ; gum tragacanth, 16 grains. The hypochlorite of lime is triturated in a glass mortar, and a small quantity of water is poured upon it ; it is then left to repose, decanted and a second quantity of water added ; the two liquids are filtered and the gum and sugar added so as to form a paste. This is divided into pastils weighing from 12 to 16 grains. If it is desired to aromatize the paste, one or two drops of an essential oil may be added ; the oil should be added to the sugar and gum before the paste is formed.

To remove the yellow color from teeth take of dry hypochlorite of lime ½ drachm ; red coral, 2 drachms. Triturate well and mix thoroughly. This powder is employed in the following manner : A new brush is slightly moistened, then dipped in the powder and applied to the teeth.

The following preparation has been employed by Dr. Angelot, of Briançon, in the treatment of ulceration of the gums, a very frequent complaint with soldiers :—Take of hypochlorite of lime from 10 to 25 grains ; mucilage of gum arabic, 1½ to 4 drachms ; sirup of orange peel, 1½ to 2 drachms. Mix thoroughly. This mixture is employed as a lotion to the ulcerated gums.

The *Ohio Valley Farmer* states that a bill is now before the Ohio Senate for making an appropriation of $1,000 to employ a competent person for giving instruction to persons in the manufacture of beet sugar. The *Farmer* suggests that the bill be amended so that the premium of $1,000 be awarded for the best specimen of 5,000 lbs. of merchantable sugar, and 25 lbs. of white sugar, made either from the sorghum or the beet root.

AGASSIZ says :—Of all air-breathing animals, none exhibits a more surprising power of adapting itself to great and rapid changes of external influences than the Condor. It may be seen feeding on the sea shore under a burning tropical sun, and then, rising from its repast, it floats up among the highest summits of the Andes and is lost to sight beyond them, miles above the line of perpetual snow, where the temperature must be lower than that of the arctics.

The *Atlantic Monthly* for May is received. It sustains its character as the leading literary magazine of the country. It is published by Tickner & Fields Boston, at $3 per annum.

Improved Light Telegraph.

The Morse alphabet, in which the several letters are formed by dots and marks of various lengths, may be used in many other ways than that for which it was originally designed—telegraphing by electro magnetism. For instance, two operators, sitting together in church, are able to carry on a silent conversation by pressing their fingers on each other's hands—forming the letters by continuing the pressures the proper lengths of time.

An apparatus has been invented by L. O. Colvin and G. H. Gardner, of Philadelphia, for telegraphing at night by means of a lantern and screen so arranged that the light may be readily displayed and obscured, and thus the letters of the Morse alphabet may be formed by successive flashes of light of the proper lengths. This apparatus is illustrated by the accompanying engravings, of which Figs. 1 and 2 are vertical sections, while Fig. 3 represents the mode of operating a lantern from the masthead of a vessel.

A is a close lantern provided with a lamp, B, and having a glass, *a*, in one side opposite the flame. A conical reflector, C, is placed outside of the glass plate to bend all the rays that issue into parallel lines so as to form a cylindrical beam of light. Inside of the glass plate, *a*, is arranged a shutter, D, in such manner that when this shutter is down no light can issue through the glass, but by raising the shutter the light is exposed.

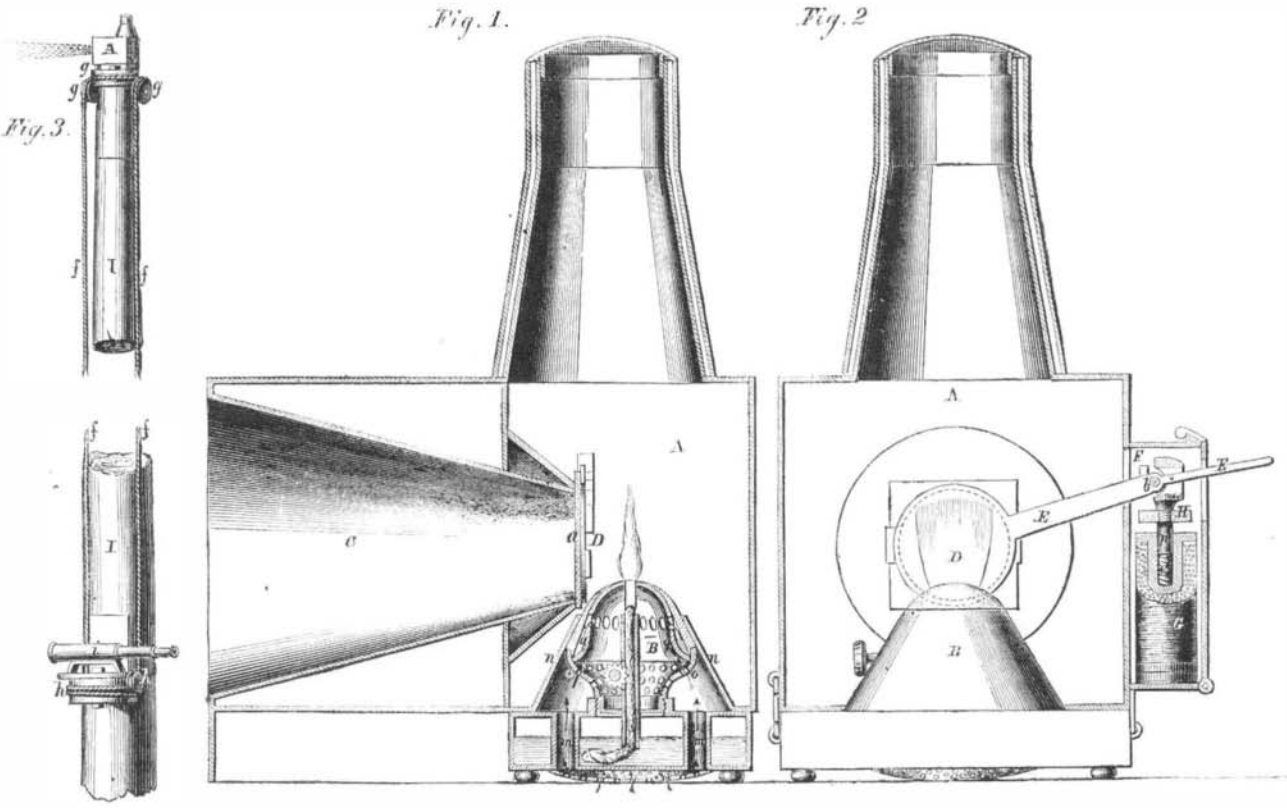
To enable the shutter to be raised and lowered with great ease and rapidity it is operated by electro magnetism. A lever, E, is connected with the shutter, and passing through a slot in the side of the lantern, has its fulcrum at *b*, and carries upon its shorter arm the armature, H, of the electro magnet, G. When the circuit of this magnet is closed, the armature is drawn down and the shutter is raised, exposing the light. In order that the shutter may drop very quickly when the circuit is opened, a spring, *e*, is inserted into the core of the magnet, and a pin, *p*, attached to the armature, compresses this spring when the circuit is closed, but on opening the circuit the reäction of the spring throws up the pin and armature, starting the shutter down, when its descent is completed by its own gravity ; the weight of the shutter slightly overbalancing the armature. Thus the successive flashes for transmitting signals are made by opening and closing a magnetic circuit as in the electric telegraph.

Either the calcium or electric light may be employed or the flame of a lamp. The lamp represented in the engravings is recommended by the inventors. The air is admitted through a perforated screen, *l*, under the bottom, and passes through tubes, *m m*, into a cone, *n*, surrounding the upper portion of the lamp. From this cone it is supplied to the lamp through perforated screens, *o* and *q*.

Fig. 3 represents the manner of mounting the apparatus upon the top of a mast either on sea or land, so as to be operated by a person at the foot. A telescope, *i*, at convenient distance above the ground or deck, is connected with the lantern, A, by means of cords, *f f*, and pulleys, *g g*, in such manner that when the telescope is turned the lantern will be turned also, and thus the beam of light may always be kept parallel with the axis of the telescope. Hence the operator has merely to point his telescope to the station to which he wishes to transmit a message, when the light will be visible from the same station.

For secret dispatches the alphabet may of course be altered so as to be intelligible to those only who have the key.

The patent for this invention was granted, through the Scientific American Patent Agency, March 11, 1862, and further information in relation to it may be obtained by addressing Colvin & Gardner, 118 N. Broad street, Philadelphia, Pa.



COLVIN AND GARDNER'S LIGHT TELEGRAPH.

Important to those who use Steam Boilers in New York.

An act conferring additional powers on the Metropolitan Police, relating to the inspection of steam boilers, was passed last month, and by its provisions all persons owning or using any stationary steam boiler in the Metropolitan Police District, except those connected with ranges in private dwellings, are required to report to the Board of Police, in writing, before the 30th inst., the location of such boiler or boilers so used by them, and the business or purpose for which such boilers are used, and thereafter, in case of any removal of a steam boiler, or the erection of a new one, a like report shall be made forthwith ; and all persons are requested to have a nipple and cock, $1\frac{1}{4}$ inches in diameter, put in some convenient part of their steam boiler, so that the Inspector will have no delay in making inspection for testing.

The "Merrimac" Patented Forty-Eight Years Ago.

In the course of our investigations at the Patent Office we have come across a patent granted to Thomas Gregg, on the 19th of March, 1814—forty-eight years ago—for an invention of a "Ball-proof vessel, to be propelled by steam," which, on examination, proves to be an almost exact model of the *Merrimac*. The sides were to be plated with iron, inclined at an angle of 18° and the drawings show a sharp, iron prow, evidently to be used as a ram. This prototype of the latest triumph in naval architecture, it will be observed, was patented only seven years after the introduction of steam navigation. We shall publish the specification of this invention, with engraving in the next number of the Scientific American.

The Sole-Cutting Business.

The *Bay State*, Lynn, Mass., says :—Within the past ten or fifteen years there have been great changes in the shoe manufacturing business in this city, and we presume that changes of a similar character have taken place in other towns where the manufacture of ladies' and misses' boots and shoes has been carried on. Within that period the sewing machine and the sole-cutting machine, and different kinds of machinery for heeling have been introduced. And the introduction of machinery has led to the systemizing of the business in such a way as greatly to facilitate production.

The commencement of the sole-cutting business may properly be dated to the time, or about the time, when the sole-cutting machine began to come into use—say about twelve years ago. Manufacturers had found in the course of their business, that to get the sole leather which they wanted, they had to purchase, in buying whole hides, much that they could not use to advantage, and in this way were obliged to charge a higher rate for shoes or suffer loss. And in particular was this the case with small manufacturers. Hence, the idea of a separate branch of business, for purchasing and cutting up the leather into soles, assorting it into different qualities, and quantities as they might want.

We believe Mr. Perry Newhall, who is now in the business, was the first one to carry, to any extent, this idea into effect. He has now been engaged in the business some ten or twelve years, and the amount of his sales has reached, we believe, some years to about $100,000.

The advantages of such an establishment are so apparent that they need not be particularly pointed out. One, however, to manufacturers of small capital, is worthy of special notice. It is this, that it requires less capital to do business by purchasing just what you want and no more than on the old plan, when manufacturers were obliged to buy what they did not want to secure what they did.

L. Perkins, of London, has an engine of 60-horse power, working with a pressure of 500 lbs. on the square inch of piston. The consumption of fuel is only from 1 to $1\frac{1}{4}$ lbs. of coal per horse power per hour.

Common plumbago, according to recent researches of Dr. Calvert, is composed of 91 per cent of a subcarbide of iron, $8\frac{1}{2}$ per cent of a nitride of silicium, with traces of phosphorus and sulphur.