IMPROVED LEWIS.

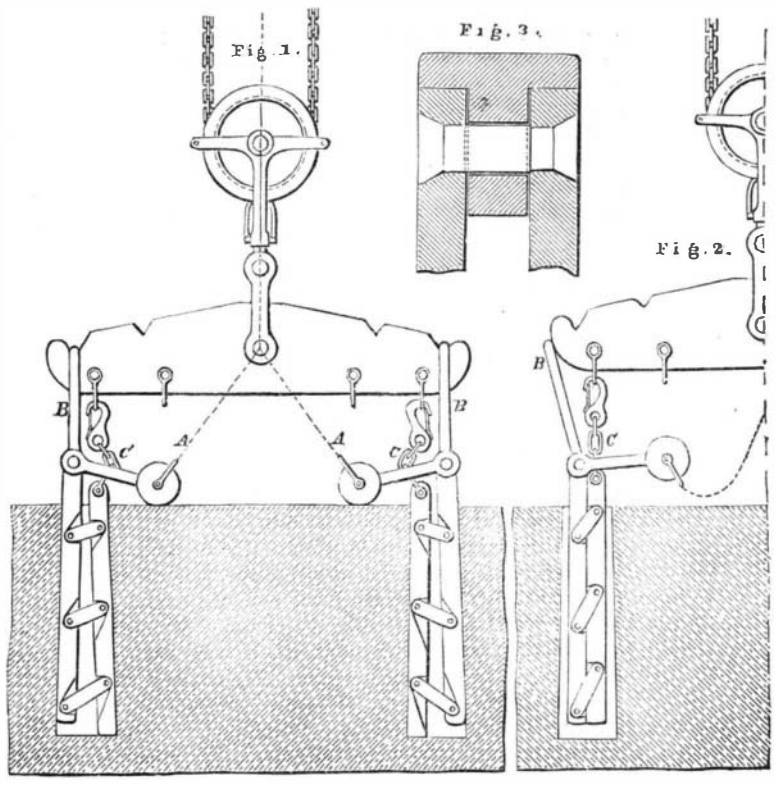
At the present time it is no uncommon thing to use, in the formation of breakwaters, piers, and other similar structures, blocks weighing from twenty to thirty tuns each, and it is found that, with suitable plant and machinery, masses of this weight can be moved readily and safely.

The ordinary lewises, by which large concrete and artificial blocks have hitherto been lifted and deposited, consist of a pair of round bars with a T end on each, and a ring at the top to receive the hook or shackle of the setting crane or traveler, suitable holes, with boxes and pieces of hard wood at the lower ends, being formed in the blocks for the reception of the bars. When a block has been lowered, say for subaqueous work, divers are required to turn these T bars around, and to draw them out of the holes preparatory to their being lifted up with the slack chain of the crane or traveler. For heavy blocks the weights of these bars must of necessity be great, and the process of turning and lifting them by divers consequently expensive. It is the object of the lewis which we herewith illustrate, and which has been invented by William Matthews, of England, to provide for disengaging from above water, so that, when no longer required, the lewises shall free themselves and be drawn out of the holes in the blocks by means of the setting machine, and lifted with the slack chain to the surface.

The holes, instead of being parallel as in the ordinary cases, are made dovetailed; they are formed in the blocks by means of core pieces. The apparatus consists of two lewises, each formed of two wrought iron square bars linked so as to open in a dovetail shape. At the top of one bar of each lewis there is a shackle which is passed over the hook of the beam, the other bar being attached to the underside of the beam by means of a short piece of chain and a spring hook. Fig. 1 shows the lewis in the act of lowering a block; when the block has been set and adjusted, the beam is lowered from three to six inches, and the bridle rope, A A, drawn up from the top upon which the shackles, B B, are thrown over so as to clear the ends of the beam; the apparatus is then lifted by means of the setting machine, and, as the chains, C C, are tightened, the lewises fold and come clear out of the holes in the block.

Fig. 2 shows the lewises when disengaged and in the act of being lifted. Fig. 3 shows the construction of the bars and links, from which it will be seen that the bars of the ends of the latter have a solid bearing against rounded recesses in the former, so as to avoid strain on the pins. If considered desirable, the disengaging levers might be omitted, in which case the shackles, B B, would be thrown back by the divers employed in setting the work, and the lewises would then disengage and free themselves as before. It will be seen from the illustration that provision has been made for dealing with blocks of different sizes.

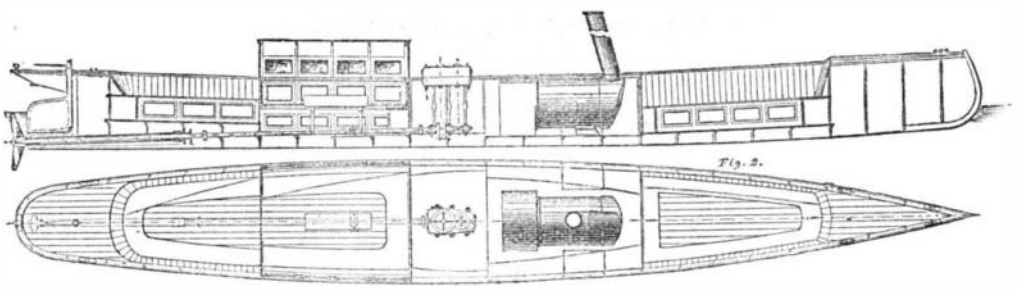
The apparatus has been in successful operation for some months on the new harbor of St. Heliers, Jersey, and is about to be introduced on many other important works. It is claimed for the invention that it effects a saving of an expensive description of labor, namely, divers' work.



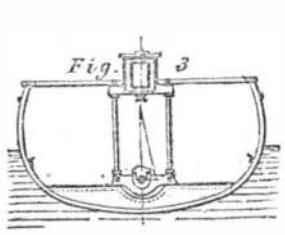
MATTHEWS' DISENGAGING LEWIS.

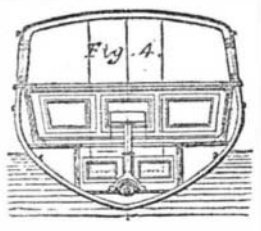
A NEW STEAM LAUNCH.

Mr. George Baird, an engineer residing at St. Petersburgh, Russia, has recently constructed a high speed boat, which has proved a remarkable success. Her outer shell is entirely constructed of Muntz metal, an alloy of great durability, much used in Europe for sheathing wooden vessels and for axle bearings, etc. At a recent trial, against one of Messrs. Thornycroft's fast boats, the Mab was victorious, accomplishing 19 miles per hour. The Mab is 48 feet long at the load line, and has 6 feet 6 inches beam and 3 feet 6 inches depth of hold, while her mean draft is 1 foot 9 inches. She is fitted with a beautifully made pair of compound engines, driving a screw 2 feet 9 inches in diameter and 3 feet 4 inches in pitch. During the trials the engines made an average speed of 593 revolutions per minute, working with steam at 100 lbs. per square inch in the boiler. The general arrangement of this very successful boat, says *Engineering*, will be better explained by reference to our engravings than by any verbal description.



THE STEAM LAUNCH MAB.





St. Gothard Tunnel Air Compressors.

In the case of the St. Gothard Tunnel, dry compressors are employed for furnishing the necessary supply of compressed air, these compressors being constructed on the system of M. Colladon, of Geneva. The sets of compressors employed at the two ends of the tunnel are alike in general construction, but differ somewhat in dimensions and in some points of detail, as well as in the arrangement of the driving machinery. The compressors at Airolo have been constructed in three groups, each consisting of three compressors.

The three compressors in each group have each a cylinder 18·11 inches in diameter and 17·72 inches stroke, and they are driven so as to have a mean piston speed of about 265 feet per minute. The pistons are coupled by connecting rods to a three-throw crankshaft, this shaft having its three cranks set at an angle of 120° with each other. The arrangement of bedplate, main bearings, crosshead guides, etc., is neat and substantial.

The leading feature in the Colladon system of air compressors consists in the arrangements made for the efficient cooling not only of the barrel of the cylinder, but also of the piston and piston rod. The cylinder is enveloped in a jacket through which water is made to circulate. The piston and piston rods are made hollow and water is caused to circulate through them.

In addition to the cooling action of the currents of water already mentioned, the air, during compression, is further cooled by the injection into the cylinder of a small quantity of "pulverized" water admitted through suitable injection nozzles in the cylinder covers. The compressors are driven by turbines.

New Life-Preserving Dress.

For some time past Captain Boyton has used this dress with wonderful success at Atlantic City, N. J., where he held the post of Captain of the Camden and Atlantic Life Guards, a corps of gallant men whose business it is to save life at dangerous sea-bathing places.

It is simply a dress composed of the best india rubber, made in five distinct airtight compartments, namely, one for each leg, one at the back, another in front, and the fifth for the head. Each of these is inflated by means of a tube long enough to reach to the wearer's mouth when the dress is on. The dress is made in two pieces, the lower part being like a loose pair of trowsers ending in a pair of waterproof socks. At the waist is a broad steel hoop or band, which has a groove cut in it into which the other part of the dress exactly fits, rendering the whole suit perfectly watertight. Strong suspenders fixed to this hoop pass over the shoulders and retain the lower portion of the dress in its proper place.

The upper part of the dress is made similar to a jacket with a head piece attached. In order to allow of the face being uncovered and yet to be quite watertight, an elastic padding of india rubber fits round the face, which presses (closely enough to keep out the water, but not unpleasantly) round the face and head, when the chamber at the back is inflated. When this part of the dress is put on, it is fitted round the waist hoop, and, being strained tightly, the whole dress is quite impervious to water or even damp, not by any means the least important of its advantages, as many, perhaps more people are drowned owing to the benumbing effects of cold as from the actual incapacity of swimming. So simple is the adjustment that the entire dress can be put on and thoroughly inflated in a few minutes by any one who has had a little previous practice. Being made in so many different air chambers, there is no danger should one or more parts get injured, as the chamber at the back of the head alone is sufficient to float the heaviest man. The total weight of the dress is about 15 lbs.

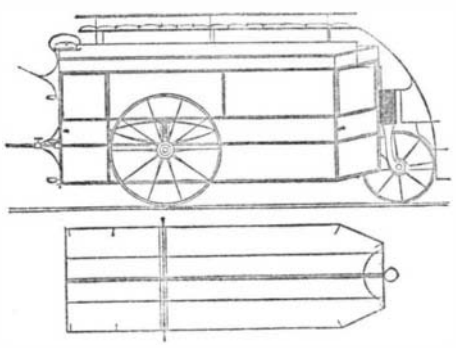
On the 10th of October, 1874, in accordance with his previous public announcements in our city papers, Captain Boyton left New York in the National steamship Queen, intending to go overboard when about 250 miles distant from America and return to the coast at the nearest point he could reach. However, when he came on deck in his curious dress and told Captain Bragg that he was going back to America, asking him at the same time to "slow" the ship so as to let him get into the ocean comfortably, he was very properly ordered to go below, and was told that if he attempted to leave the steamer he would be put in irons. Greatly disappointed, he was compelled to remove his dress and remain on board content. But on the night of the 20th of October, at half past nine o'clock, when about two and a half miles distant from Cape Clear, the southern extremity of Ireland, he left the steamer, having obtained the reluctant consent of Captain Bragg. His departure is thus described in the London *Examiner* by a passenger: "A loud cheer greeted him as he plunged into the waves, which were then heavy, as the breeze at the time amounted to half a gale. 'All right, captain,' he shouted, 'go on!' as the ship left him behind. The captain gave orders to go ahead, full speed, and in a moment the daring adventurer was lost to sight."

He had taken with him, in his waterproof and airtight sack or traveling bag, food and water sufficient for three days, besides other articles, such as a compass, lantern, signal rockets, bowie knife, axe, American flag, and his indispensable paddle. His intention was to make for Baltimore, distant about seven miles, but owing to the roughness of the weather he was driven as far as Frefaska Bight, some miles east and south of Baltimore, after having been seven hours on the water and having traveled about thirty miles. His trials on that night—a night which will be long remembered on account of the numerous shipwrecks which took place during it, and the heavy gale blowing—must have been most severe, and no other form of life buoy could possibly have saved his life. So tremendous was the sea and violent the storm that, notwithstanding his confidence in his dress, Boyton's heart nearly failed him when the steamer disappeared from his sight and he was left a solitary waif on the ocean.

For hours through that wild dark night, so stormy that no mail steamers crossed the Irish Channel, Boyton lay on his back tossed about, unable to use his paddle, and quite at the mercy of the sea and wind, but, thanks to his dress, dry and warm. About one o'clock the wind changed, blowing on to the land, and about three he saw land "under his lee." With such a sea his danger was greater than before, and he narrowly escaped death. More by luck than anything else, however, he got ashore safely and made his way to the coast-guard station. Since then he has exhibited his apparatus in many places in England, proving how thoroughly adapted it is to its purpose.—*Hunt's Yachting Magazine.*

A THREE-WHEELED OMNIBUS.

The upper figure in our illustration shows the elevation, and the lower figure the plan, of a three-wheeled omnibus, which is claimed to secure economy in cost and draft, as well as comfort for riders, by reason of the four side entrances, and one step in from the road, and a staircase behind on to the roof seats. On some routes such vehicles might supplement the present rolling traffic of our public streets. Dispensing with an under carriage and one wheel must prove a material economy; the triadic bearing of the wheels on the ground would favor the draft. The bulk of the weight, being on the large wheels and partly suspended beneath the axle, would also tend to diminish draft as well as enable a wider and lighter body to be used than in an ordinary omnibus, the total weight of which ranges from 20 to 24 cwt. for 26 passengers; for the same number of passengers, a three-wheeled omnibus might be made to weigh from 14 to 16 cwt.



The obvious simplicity of construction makes any technical detailed statement unnecessary, beyond saying that the hind wheel turns round freely in an upright axle box, fitted with a coil spring round the spindle.—*Carriage Builders' Gazette.*

Useful Recipes for the Shop, the Household, and the Farm.

An old gun loaded with a heavy charge of powder and hung near the rafters, in a barn or in any dangerous locality about the house, makes an excellent fire alarm The explosion is caused by the heat.

The following alloy of copper will attach itself firmly to surfaces of metal, glass, or porcelain: 20 to 30 parts finely blended copper (made by reduction of oxide of copper with hydrogen or precipitation from solution of its sulphate with zinc) are made into a paste with oil of vitriol. To this add 70 parts mercury and triturate well; then wash out the acid with boiling water and allow the compound to cool. In ten or twelve hours, it becomes sufficiently hard to receive a brilliant polish and to scratch the surface of tin or gold. When heated it becomes plastic, but does not contract on cooling.

To preserve anatomical specimens, immerse in a saturated solution of 100 parts alum with 2 parts saltpeter. The article at first loses color, but regains it again in a few days, when it is removed from the liquid and kept in a saturated solution of alum and water only.

An excellent, well recommended pickle for curing hams, is made of 1½ lbs. of salt, ½ lb. of sugar, ½ oz. of saltpeter, and ½ oz of potash. Boil all together till the dirt from the sugar has risen to the top and is skimmed. Pour it over the meat and leave the latter in the solution for four or five weeks.

Save the soot that falls from the chimneys, when the latter are cleaned. Twelve quarts of soot to a hogshead of water makes a good liquid manure, to be applied to the roots of plants.

A folded newspaper placed over the chest inside the vest, on going out during the present raw spring weather, constitutes an excellent protector for the lungs.

There is no rule of health more important than "keep the feet dry and warm and the head cool."

Do not allow a grindstone to stand in water when not in use. Clean off all grease from tools before sharpening, as grease or oil destroys the grit. When you get a stone that suits your purpose, send a sample to the dealer to select by; a half ounce sample is enough, and can be sent by mail.

To clean a watch, even if it be of the lowest grade, the barrel or mainspring box should always be taken apart and cleaned, fresh oil being applied before the cover is replaced Naphtha is the best stuff to clean with.

The simplest, and perhaps best, paint to prevent buried wood from decaying is made of boiled linseed oil, into which charcoal is stirred until the whole is of proper consistence. Apply with an ordinary paint brush.

To silver the inside of hollow glass vessels, globes, convex mirrors, etc., the following amalgam, which becomes fluid at a low heat and adheres to glass, may be used: Lead and tin, of each 2 ozs.; bismuth 2 ozs.; mercury 4 ozs. Add the mercury to the rest in a melted state, and remove from the fire; mix with an iron rod.

The elevation of temperature produced by the friction of a journal is sometimes used as an experimental test of the quality of unguents. When the velocity of rubbing is about four or five feet per second, the elevation of temperature with good fatty and soapy unguents is 40° to 50° Fah., with good mineral unguents 30°.

A tablespoonful of niter (per gallon of milk) dissolved in as much water as it will take and put in the pail before milking will lessen the taste of turnips or other vegetables in the milk.

Carbolic acid, combined with glycerin or linseed oil in the proportion of 1 to 20, is a good application to wounds of horses.

The germination of seeds can be watched at every stage of its progress by laying the seeds between moist towels and placing the latter between plates. The towels can be lifted without damage to the tender sprouts.

To remove clinkers from stoves and ranges, mix a few oyster shells with the coal or put them upon the coals while the fire is burning freely. An occasional application of this kind will keep the grate free and the cook good-natured.

Two thicknesses of paper are better than a pair of blankets, and much lighter for those who dislike heavy bedclothes. A spread made of double layers of paper tacked together, between a covering of chintz or calico, is really a desirable household article. Soft paper is the best, but newspapers will answer.

Owing to irregularities of surface, it often happens that considerable difficulty is encountered in putting a good polish on articles of brass or copper. If, however, they be immersed in a bath composed of aquafortis 1 part, spirits of salt 6 parts, and water 2 parts, for a few minutes if small, or 20 or 30 if large, they will become covered with a kind of black mud, which, on removal by rinsing, displays a beautiful lustrous undersurface. Should the luster be deemed insufficient, the immersion may be repeated, care always being taken to rinse thoroughly. All articles cleaned in this manner should be dried in hot dry sawdust.

The Transit of Venus.

At the Stevens Institute, Hoboken, N. J., Professor C. A. Young, of Dartmouth University, recently gave an interesting lecture on the transit of Venus, as witnessed by him at Peking, China.

"In obtaining photographs, instead of a telescope opening upon the sun, we had," said the lecturer, "the object glass of the telescope fixed with a focal distance of forty feet. By means of mechanism we were enabled to throw the sun's rays through the lens. The manipulation of the instrument was very simple; it only required that a person standing near the post of the instrument should throw the light up the post upon a screen, and, as the image was formed, by turning a spring to one side, he caused a slit to open, making an exposure of about one quarter of a second.

We obtained one hundred pictures, of which a dozen or fifteen are good for nothing, a few are tolerable, and the rest are very good, so that we are very well satisfied. I imagine that the results will not be worked up as fully as they ought to be until eight years from now, when the next transit of Venus takes place. That is a very important transit, as it is to be visible all along the Atlantic coast."

High Speed Torpedo Launches.

A trial was lately made of a new steam launch, built by Messrs. Yarrow & Hedley, Isle of Dogs, Eng., for the Argentine Republic. The little vessel is 55 feet long, and 7 feet beam; the plating is throughout of Lowmoor iron, the frame being of steel. She is propelled by a beautifully finished pair of engines indicating 60 horse power, with which a very high rate of speed is obtained. The torpedo resembles in form an ordinary elongated projectile, and will hold about 100 lbs. of gun cotton, estimated to give an effect equal to three times that weight of gunpowder. It is carried at the end of a pole about 25 feet long, and the launch is provided with steel shields to protect the crew from rifle shot. The little craft is a most successful specimen of boat building.

The most remarkable feature is the system of igniting the torpedo, designed by Captain McEvoy, of Messrs. Vavasseur and Company, London Ordnance Works. Hitherto these torpedoes have usually been ignited by a concussion fuze on striking the ship's side. It is evident that, used in this way, the crew have little chance of escape, as the boat must be driven at speed against the ship, and her own momentum will carry her on, breaking the hole, and involving her in the results of the explosion; while if she does not go right, head on, the concussion fuse may not explode at all. Captain McEvoy gets over this objection by carrying three wires down the pole and into the torpedo, within which is placed a very simple detonating fuze. A brass cap is fitted to the torpedo, and a suitable battery is placed in the launch. A very slight blow will drive home the brass cap and "make contact," when the charge explodes. Besides this, the third wire is so arranged that contact can be made in the boat and the charge exploded at any time. Thus a launch might steal alongside a ship, and, by just touching her, explode the torpedo at the instant that her engines are turned full speed astern to back the launch off; and if she does not come square on and so make contact, the torpedo can be exploded by the auxiliary gear without trouble. We may add that Messrs. Yarrow and Hedley propose to build torpedo launches 100 feet long with a speed of twenty-five miles an hour. No ironclad afloat could run away from such craft, and two or three of them would constitute a most dangerous force.

The Electric Telegraph.

Mr. Latimer Clark, in a recent address before the Society of Telegraph Engineers, states that, on the 1st of February, 1758, a Scotchman, Charles Marshall, of Paisley, published in the "Scots Magazine" a full and clear description of a practicable electric telegraph, and suggested the coating of his wires with an insulating material. Mr. Clark thinks that Marshall may therefore be considered, in a sense, the inventor of the telegraph.

"In 1816 our late lamented member Sir Francis Ronalds produced his electric telegraph, and at great expense and trouble erected a considerable length in his garden at Hammersmith. He employed frictional electricity and only one wire, and exhibited his signals by the divergence of pith balls, combined with rotating dials working synchronously, a system afterwards brought to great perfection in the printing telegraph of Professor Hughes. Sir Francis Ronalds will always take a high position in the history of the telegraph, not so much on account of the excellence or originality of his invention, as on account of the confidence and ardor with which he pursued his experiments and endeavored to bring them to the notice of his countrymen. With wonderful prevision he fully perceived its value and foretold its destiny. His "Description of an Electrical Telegraph," which was published in 1823, the first book ever published on the subject of electric telegraphy, might almost serve for a description of a telegraphic system at the present day. He proposed the establishment of telegraph offices throughout the kingdom, and pointed out the benefits which the government would derive from their existence. He described methods of insulating the wires, either on poles or underground, with all the details of tubes, joints, and testing boxes, testing stations, line men, and inspectors, as at the present day. But the most interesting and singular point, to my mind, is the clearness with which he foresaw and explained the phenomenon of retardation of the electric current by induction in underground wires, a phenomenon which has so greatly engaged the attention of electricians in the present day.

The influence of this is so great that on our Atlantic cables we do not transmit messages at a greater rate than fifteen or twenty words per minute, whereas, if the effects of induction could be removed, we might transmit three or four hundred words per minute.

There can be no doubt that if Ronalds had worked in the days of railways and joint stock enterprise, his energy and skill would have triumphed over every difficulty, and he would have stood forth as the practical introducer of the telegraph. But he was thirty years before his age, and the world was not ready for him.

Having completed his arrangements, he modestly invited Lord Melville on July 11, 1816, to witness his experiments, in order that he might demonstrate the nature and merits of his invention.

The reply he eventually received was eminently characteristic of the neglect and even contempt with which Science and scientific men were, and to some extent still are, regarded by statesmen.

'Mr. Barrow presents his compliments to Mr. Ronalds, and acquaints him, with reference to his note of the 3d instant, that telegraphs of any kind are now wholly unnecessary, and that no other th the one now in use will be adopted.—Colonial Office, August 5, 1816.'"

Phosphor Bronze.

The latest and most succinct information on this new and valuable compound we find in a letter of Mr. Stanislas Delalot, chemist, of Sheffield, England, to the *Moniteur Industriel Belge*. M. Delalot embodies a great many useful facts in very terse phrases, which we translate literally.

True phosphor bronze is not an alloy. It is a combination, without intermediaries, of copper with phosphorus. It is simply a phosphide of copper in definite proportions. The metal unites with the metalloid by either a cold or hot process. For certain applications of phosphor bronze the cold suffices. M. Delalot prefers it to combinations produced by heat. Phosphor bronze by the hot process excludes all introduction of simple bodies other than the metal and the metalloid. Copper exempt from arsenic, antimony, iron of zinc, is required; it must be commercially pure. The manufacturer can take his choice from three kinds of phosphorus, ordinary, amorphous, and all the earthy bisulphates. Amorphous phosphorus is the most expensive, but the best. The secret of good phosphor bronze lies in the furnace and in practice. The following are the best combinations in definite proportions. The minimum and maximum percentages of phosphorus in phosphor bronze are 2 and 4. Between these there is an infinity of degrees. Five sorts of phosphor bronze, however, answer all requirements of industrial application:

0. Ordinary phosphor bronze. 2 per cent of phosphorus.
1. Good " " 2½ " "

These two numbers are superior to ordinary bronze and steel in all cases.

2. Superior phosphor bronze, 3 per cent of phosphorus.
3. Extra " " 3½ " "
4. Maximum " " 4 " "

These three, according to M. Delalot, are superior to any other metal or alloy. Above No. 4, phosphor bronze is useless; below 0, it is inferior to common bronze and steel. The price of phosphor bronze unworked, for all numbers, should not exceed that of copper plus ten per cent. Nos. 3 and 4 are to a certain degree unoxidizable.

An Ingenious Device.

A capillary correspondence was recently attempted between a notorious Parisian thief in durance vile and his comrades outside. The prisoner was sent a letter from his *fiancée*, containing merely a lock of hair wrapped in the leaf of a book. The jailor did not consider the souvenir important enough to be delivered, but a few days came a similar enclosure, and yet another. This aroused suspicion, and the governor took the matter in hand. He examined the leaf of the book; it was that of a common novel, twenty-six lines on a page. Then he studied the hair, and noticed the small quantity of the gift. Counting the hairs he found them of unequal length, and twenty-six in number, the same as the lines of the page. Struck with the coincidence, he laid the hairs along the line of the page which they respectively reached, beginning at the top with the smallest hair. After some trouble he found that the end of each hair pointed to a different letter, and that these letters combined formed a slang sentence, which informed the prisoner that his friends were on the watch, and the next time he left the prison, to be examined, an attempt would be made to rescue him. The governor laid his plans accordingly; the attempt was made, but the rescuers fell into their own trap.

Fumigating Greenhouses.

Some years ago, while in charge of the Botanical Gardens here, I experienced considerable difficulty with the old fashioned iron pot in producing smoke of sufficient volume to destroy the common aphis or green fly. The houses being roomy and very high, the smoking of them was a slow and tedious process, and something more effectual was needed; so I ordered another pot to be made, similar to a cylinder stove, of sheet iron, about two and a half feet high and ten inches in diameter, with a small sliding door at the base for a draft. To use it, put a handful of shavings at the bottom, then fill it nearly full of tobacco (we use stems), rather loose at first, and set fire to the shavings through the door. Should the tobacco burn too rapidly, the door may be partially closed, and the tobacco pressed down with a stick of wood. A few minutes will suffice to fill up the largest greenhouse with a dense smoke, when the furnace may be taken out to smoke other houses if needed. That little apparatus is now generally used by gardeners around Boston; all agree in calling it superior to any other in use, being so very prompt, simple, and effectual.—*Denys Zirngiebel, Cambridge, Mass.*

Food by Railway.

The degree to which large cities are dependent upon rail roads for the supply of food is exhibited by some startling statistics; and Mr. Smiles observes that London may be said to be fed by the railways from day to day, having never more than a few days' food in stock. He adds that in these days of strikes the stoppage of supplies is quite within the limits of possibility; and that, were it possible to land an enemy of overpowering force on the Essex coast, it would be sufficient for them to occupy or cut the railways leading from the north to starve London into submission in less than a fortnight