Correspondence.

Aerial Navigation.

To the Editor of the Scientific American:

The accompanying engraving shows a boat which, it is asserted, can be propelled and guided through the air by means of surplus buoyancy (in rising) and weight (in falling) without any machinery, except the two rudders and the weight exhibited.

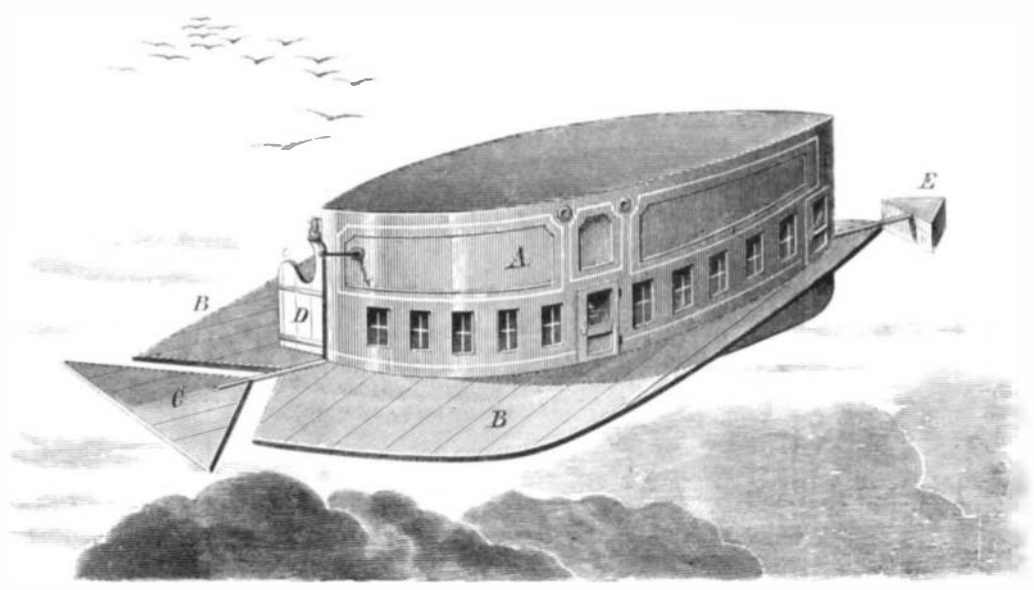
A is a boat of fixed form, inside of which is placed a gas bag. B B are stationary resisters or wings, projecting on each side, on a plane with the bottom of the boat. D is an ordinary rudder attached to the stern of the boat, to guide it in a horizontal direction; C is a horizontal rudder, connected by a rod with E, which is a weight; these, pushed fore or aft, will elevate or depress the bow of the boat.

The two rudders, the weight, as also the valve for the escape gas, and sand bags, if any, are all to be controlled by a man in the pilot house at the bow; and when ready for starting, the center of gravity is through the cabin.

Suppose we have a surplus buoyancy of 500 lbs.: this, I claim, will lift the boat with the same force as if it were so many pounds falling, and the air will press downwards, so the boat will take the course of least resistance—a diagonal—the resultant of the two forces. Besides, after ascending upward and forward some distance, a force will be developed which, on depressing the bow of the boat, will drive it some distance downward, or further on a horizontal. The same action as described in rising will take place in falling, after 1,000 lbs. of buoyant force is thrown off, leaving the weight 500 lbs.

D. L. RHONE.

Wilkesbarre, Pa.



A NOVEL AIR SHIP.

The Mississippi River.

To the Editor of the Scientific American:

The letter of Mr. Sidney Cook, of Presque Isle, Mich., in your issue of June 27, proposing to deepen the channel at the mouth of the Mississippi by means of currents of water forcibly discharged on the bottom, calls to mind my letter to you under date of July 30, 1868, describing a dredging process invented by me, in which I said: "I propose a powerful pump on a vessel (steamboat, ship, or scow). The pump to be propelled by steam or other power, and conduct the water through pipes to near the bottom, there to be ejected downward, vertically, or at such angle as may be found advantageous. The force of the water, shot through a pipe, will rouse up all the mud or earth at the bottom of the river, and the natural current will carry it away." And again in my letter of August 6, 1868: "to be used on steamboats or other vessels to remove bars when aground." This plan of operating was secured by letters patent (No. 95,213) to me, in 1868, you being the agents and attorneys.

In 1869 I had a tin model made of a section of a vessel to operate at the mouth of the Mississippi, and have it yet, which, together with patent 95,213, will show Mr. Cook that he has been anticipated. My patent machine (on paper) is now under consideration by United States engineers, and ought to be put into a substantial form for use. That the mode of operating proposed by me is the most philosophical, the most in harmony with natural laws, and the most economical, I have never doubted; but I have not been in a fret to have it put to use. Everything must bide its time; and inasmuch as water, put in motion rapidly enough, will stir up mud more effectually than any other agency at the same cost, the time will surely come when my mode of removing bars—where there are currents—will be resorted to. Dredging is not, in my opinion, the proper remedy at the mouth of the Mississippi. I would build jetties, and make the river keep its own mouth open. But if people will try to keep a channel deep by dredging, let them do it in the best way.

Kirkwood, Me. R. S. ELLIOT.

The Shadow Sail.

To the Editor of the Scientific American:

In your issue of May 16 is an illustration of a shadow sail, spoken of as being patented. I have used one on my boat for the past two years; but instead of the clumsy arrangement described by *Land and Water*, I use one of the American fashion, namely, a lug sail nearly as large as the mainsail.

I need scarcely say that the shadow is useless except when going dead before the wind and when the jib can be of no service unless boomed out. I bend the fall end of the jib halyards to the yard, which saves the expense, or what is worse, the encumbrance, of a special halyard. The boom can be attached to the mast by a gooseneck; and in the case of boats with standing masts, a small stay from the hounds to the deck amidships could be fitted with a hook traveler to keep the sail in place aloft. A top sail could be as easily set over a lug as a gaffsail. The fore and aft guys or vangs are superfluous, as this sail needs them no more than the mainsail.

I am induced to make these remarks, thinking they may be useful to some person as fond of boating as I am.

Hermitage Bay, Newfoundland. I. LEWIS KNIGHT.

The Colorado Potato Bug.

To the Editor of the Scientific American:

The Colorado bug has appeared in Maryland, doing serious damage to the potato crop. I have tried every remedy suggested in print or by my own observation with the following results: Guinea fowl, recommended in a late issue of your paper, are ineffectual. The birds will eat a few, but soon become surfeited. Hellebore, sulphur, soot, ashes, whale oil soapsuds, carbolic acid, and many other methods give no positive relief.

I succeeded in saving my crop by shaking the larvæ from the vines and then dusting with Paris green. The simplest way to work is to cut a round log with the bark on, about 4 feet long, and 12 to 18 inches diameter. Sharpen one end and drive in a staple, to which harness a mule. Two boys with stout leafless bushes pass down the rows, striking the vines briskly and knocking the bugs into the space between the rows, where they are crushed by the log which follows. The vines should then be immediately dusted with Paris green 1 part and common flour 9 parts, thoroughly mixed and dressed on every point of the vine. A 3 lbs. fruit can, with the bottom punched full of holes, makes a handy and safe tool for this purpose. It is better to have two boys following the mule and applying the poison. In this way a large field can be rapidly worked. If the work is done while the dew is on the vines, the flour will cause the Paris green to adhere. For large fields the above mentioned force will be found more economical than a less number. In garden culture, of course it would not be required.

Baltimore, Md. MARSHALL P. SMITH.

Car Ventilation.

One of the hardest of problems to solve appears to be that in relation to the satisfactory heating and ventilating of railway cars. The public demand for such appliances increases year by year, but has not yet been met. Never was there a better opportunity for the invention of effective devices in this line. A good and simple improvement would have a wide introduction and be likely to prove very remunerative to its author. Nearly all the railway companies are calling for improved means for heating and ventilation. The Master Car Builders' Association have frequently discussed the subject, and have appointed committees to search for information, but they cannot reach a satisfactory result. Different members have different views as to how ventilation should be accomplished. Here is an example of how minds differ on the subject, taken from the report of the proceedings of the Association at their recent session:

Mr. L. Garey, New York Central and Hudson River, said that the subject of the report was one of the greatest importance, especially that part of it which pertained to the ventilation of passenger cars. No public conveyances were so poorly ventilated as passenger cars; and if any improvement upon present devices for remedying the evil could be made, the means for doing it should be ascertained. He was glad to notice that the subject of ventilation was receiving a due share of attention in our common schools, and that the nature and elements of the atmosphere, its effects on physical health, and the importance of a right understanding of its laws, were getting to be better understood. He hoped there would be a full discussion of the subject in its application to railway cars.

Mr. J. D. McIlwain, Lake Shore and Tuscarawas Valley, thought the best method of car ventilation was to admit the air at the bottom of the car and let it out at the top. He did not find that the system of letting the air in and out at the top of the car exclusively worked well, for the reason that it did not create sufficient movement of the volume of air in the lower part of the car, where it was most needed.

Mr. W. W. Wilcox, Chicago, Burlington, and Quincy, said his road had formerly used the Ruttan system, but did not find it to be altogether satisfactory. His road was now using the system of taking in the air at the frieze and exhausting in the upper deck. The supply openings in the frieze, or upper part of the car sides, were protected by perforated plates, which to a very great extent excluded the dust. He had tried the plan of taking in air at the bottom, but it did not prove to be a success.

Mr. Ambrose Ward, Pennsylvania Railroad, had abandoned the frieze plan on account of the dust. He had found that the best point for admitting the air was under the hood at the end of the car, with an automatic arrangement on the roof for exhausting it.

Mr. W. R. Davenport, Erie Car Works, said that it was one of the most perplexing and difficult problems ever presented for solution. One important fact, which is very apt to be overlooked, is that a kind of ventilation which will do for summer will not do for winter, and *vice versa*. To get pure air, it must he taken in high up and not low down. Ventilation from windows in winter was not to be thought of. The air must be warmed in some way before it enters the car. This we have got to do. The top of the car must be closed in winter, and there must be a free outflow from the floor.

Mr. M. P. Ford, Pittsburgh, Cincinnati and St. Louis, said that none of them were satisfied with the methods they were using. He thought that, for summer, Foote's plan was as near perfect as any he had seen tried, which consisted in ridding the inflowing air of dust and other impurities by causing it to pass through a spray of water. This water was carried in a reservoir underneath the car, holding about two barrels, and the impurities contained in the air were shown by the color of the water, which was nearly black as ink after being used for any considerable time. He believed that in winter the air must be exhausted at the bottom. The great obstacle to the working of any effective plan was the movement of the car. This set nearly all theories at defiance.

Mr. John Kirby, Lake Shore and Michigan Southern, said that his road, as long ago as 1854, put the Foote ventilation into 24 new cars. The box reservoir under the car held between two and three barrels of water, and was 16 or 18 feet long. It was found objectionable, however, for several reasons.

The apparatus occupied too much room in the center of the coach, the spray injured the seats, and in wet weather the car was too moist for comfort. These ventilators were all taken out at the end of the season, and Westlake's plan was next tried. This consists of a hood on the roof facing each way. It worked very well in the open country; but in the woods, where the smoke and cinders follow in the wake of the cars, it was less satisfactory. The Ruttan system was next tried, and was found to work well for short trips.

Mr. F. D. Adams, Boston and Albany, favored the plan of admitting the air into the end of the car by means of wicket windows over the door, the entrance of dust and cinders being prevented by a projecting hood on the outside. The drop sash in the door was objectionable, as it disfigured the door, was liable to rattle, and was more or less difficult to raise. Admitting air through the frieze was also objectionable, as it exposed passengers to a direct draft. The wicket sash over the end windows could be regulated by the conductors or passengers, and the projecting hood outside obviated the necessity for using wire screens.

Mr. F. D. Adams, Boston and Albany, said: "Mr. Garey has alluded to some experiments that were made on our road; these experiments were tried very thoroughly. The committee have taken a great deal of pains to ascertain all the facts that they could; and yet neither they nor any of the rest of us are fully satisfied yet. Some things, however, have been demonstrated beyond contradiction, and among these things are these exhaust ventilators talked about so much today. To speak in plain words, the whole thing is a humbug. I have got up on the seats and smoked, and in many cases I have found no air that would take the smoke out at any of these ventilators. If there happened to be an eddy, the smoke would go out with the air, and perhaps the next mile the air would come in. It does not create a steady draft out of the car. Practical demonstration shows clearly it does not do so.

I will allude to one other test that we are trying now. The air is conveyed into the car by a blower driven from one of the axles of the truck, at a speed of twenty miles an hour; about a thousand turns a minute, drawing the air into the car through a side window. This side window is covered with gauze wire, which is supposed of course to keep the cinders all out. The air is designed in the winter to pass over a hot stove, and in summer over an ice box. It is then taken immediately up to the top of the car and carried completely around in a tube perhaps six inches in diameter. That tube is at various points, as often as is deemed necessary, perforated with fine holes, allowing the air to pass out into the car, distributing it equally and evenly as far as possible. We found that, at a high rate of speed, this worked very finely. I might say, in addition, that they exhausted the air through the floor by registers. Unfortunately our road is very heavily graded, and we found that, when we came to go up a long grade of 75 to 80 feet to the mile with a heavy express train, we did not make very rapid speed, and consequently got no air. That trouble occurred on hot days, and we felt like knocking the windows out with our elbows. There is no difficulty in devising a plan to ventilate a house, yet the various circumstances under which railroad trains are placed make the difficulties to be overcome almost insurmountable."

Mr. S. Griffith, Indianapolis, Cincinnati, and Lafayette: "I think the time for exhausting the foul air is much less

than any person would suppose,and I will state that we have a practical test of it by every train that passes over our road. There is a fertilizer factory established a few miles below the city on the road, which causes the air to be very offensive. The moment the train strikes this stench, the car appears to be entirely filled wtih it, but I don't think it requires half a minute after the car passes through this stench before it is entirely clear of it, to all appearance. We have nothing except the ordinary exhaust ventilators and perforated plates; and this is the case in winter, when the doors and windows are closed. I think that people generally are mistaken with regard to the time required to change the air.

Mr. J. M. Leech, Pittsburgh and Connellsville, said: "I think that what we require is something that will force the air from the floor up, and not something overhead. The ventilation that we have had heretofore has been either on the end of the car, forcing the draft into our faces, or else over our heads,forcing the air down. I think that what we require is something below. We don't propose to fasten down the windows. We propose to fetch the air in, and every person can regulate it to suit himself. We also propose in the winter season, by forcing the air over the fire box in the engine, to make it warm. In case the train is not in motion, there is a small stationary engine which will work a fan and supply air, either warm or cold, to fill the cars, giving all the air needed. I think something of that kind is what is required by the public."

PRACTICAL EDUCATION.

Professor John Sweet, of Cornell University, is a practical man, if there ever was one. It will be seen from the following address to the students that he considers the practice of the manipulations of the art which the student intends to follow to be of as much value in an educational sense as the study of text books, and thinks the time spent in the shop ought to count, hour for hour, equally with class room periods:

Mr. President and Gentlemen:—Every man's value, aside from his value to himself, that is, his value to his employer, if he be an employee, his value to his family, if he has one, and certainly his value to the world, depends upon what he can do rather than upon what he knows. Unless he can do, what he knows is nowhere. The more we know, the better we ought to be able to do. Education fills its mission only when it aids us in accomplishing our life work better or more readily.

However well a minister may be versed in theology, Scripture, morals, religion, rhetoric, and elocution, unless he has the power to hold an audience, to increase his congregation, to build up his church, to loosen the purse strings of his flock, he is not a success; he is of limited value. The first is to know, the last is to do. Many men possess the former without the latter, and doing is something accomplished without any very great stock of education. A physician, however thoroughly versed in his profession, if all his patients die, is a failure; while a quack who cures is so far a success; and in this matter of doctoring, which is especially one of the learned professions, so much depends upon practice, so much on good judgment, so much on the character of the patient and the influence of the physician in the sick room, that the knowledge which they acquire from books is on the short end of the lever; and the more successful the physician, the nearer the fulcrum gets to the book end. With the surgeon it is as with the physician. One might have the ability to make a manikin with his eyes shut; but if he lacks even the nerve, which is acquired only by practice, to cut off a finger, he would be, as a surgeon, a failure. A lawyer, were he an unabridged edition of Blackstone, bound in calf, if he had not the ability to convince the judge and jury, would be a failure.

Now, if this is true with professions professedly intellectual, is it not equally true of the profession of mechanical engineering? The question is not: Do you know how a carding machine works, but can you make a machine to trim teasel? Less likely are you to be familiar with threshing machines, cotton gins, locomotives, wood-working machinery, portable engines, clocks, gun-making machines, scythe making, gimlets, fish hook machinery, pin machinery, machines for setting carding machine teeth, rolling mills, hooks and eyes, blast furnace machinery, carpet tacks, machinist tools, nail machines, agricultural implements, and sugar machinery. The question is more likely to be: Have you done either, than have you seen it done, or do you know how it is done? More likely to be, can you do, than have you done? Are you to step from your graduating classes into positions of master mechanics, managing directors, superintendents, professors, or foremen? Is your sheepskin degree to be that which will enable you to get a high salary, a commanding position, a passport to every workshop you may walk up to? I hope none of you are so childish as to suppose it. Your education and the opportunities, if we can make them what I hope we can, will enable you to take leading positions; if you make the best use of your advantages and are judicious in selecting companions, you can lead. According to the natural order of things, not more than five out of every twenty will ever be mechanical engineers, and not more than two or three out of that five will ever acquire distinction. Five, ten, fifteen years, yes, even a lifetime, is to be devoted to work, work to which our two hours a day, in comparison, is but child's play, and not only work but study. Study with a new significance Sudy to achieve, not to acquire; study to do, not to know. Study to accomplish, and none of this long day, late night, temporary "cramming" to pass. If you have entered on the study of mechanical engineering with a view of becoming mechanical engineers, which it is fair to presume the most of you have, and as the success of a mechanical engineer most assuredly depends upon what he can do, the question of all others which most nearly concerns you is: How can you best fit yourselves for doing? One might spend his entire freshman's year in drawing 60° angles, free hand and by drafting instruments; he might spend the remaining three years of his college life in seeing a journeyman grind diamond-pointed lathe tools; and without practice, to which his four years drafting and observation would add nothing except to shorten the time required to learn, he could no more grind a tool for cutting screw threads than he could copy the statue of the Venus di Medici. No one knows how a piece of steel will "wiggle" on a grindstone until he tries it.

Handling a file even excellently well is an art acquired by years of practice only, and those of you who take to the glory of making a dead true surface with shadows of reluctance find even in that there is something gained by practice; or rather that, simple as it appears in itself, it is an art no more to be learned without practice than the art of writing. And further, when the time comes when you can say: "I can do it no better than I could yesterday; I can do it as well as any man:" then, if you will count up the time it has taken you to scrape a flat surface, you will find that it falls not much short of the time which it took you to learn to write. I expect you to ask why are we to learn to grind and file and scrape at all? Cannot we be mechanical engineers without going through the drudgery of a common workman? Let us see. Did you learn to read and write and cipher before you came to the university? Yes. And what headway would you have made had you not? Do you expect to run a lathe and keep a cheap hand to grind the tools for you? Do you expect to be a judge of a workman and his work without having been a workman yourself?

One cannot take a leading position unless in his own shop, without becoming an employee. Employers do not place their affairs in the hands of men without some evidence of competency, and inexperience in the minor affairs shows itself when one is least conscious of it.

You came to the university to get a higher class of instruction than you could at the common schools. I had hoped and still hope to make the Sibley College machine shop a place where you can get a kind of experience which you cannot get at the ordinary establishments, but you must learn to chip and file and grind before you are fitted for it. Some of you may reasonably inquire, then, why are not those who have learned the trade before coming here compelled to take shop practice and do by their work as they do by their studies? That is exactly what I had hoped to do, not by rules and proclamations, but by force of example. Those who are doing so, I believe, will have less reason to regret it at the end of their college life than those who are not.

The glory of winning the Woodford prize is only equal to the glory won by another the year before, and may be eclipsed by him who comes after; while the glory of making the first measuring machine of America is the glory of a longer time; a glory not to be divided. There may be a good many Woodford prize winners; there can be but one first measuring machine. I regret that, in carrying out my plan to let each and every one do what he wanted to do, so far as possible, there should be even so few who, it would seem, have wanted to take the advantage of it. I regret that I have failed in getting more interest taken in the care of the tools; but I regret, far more than all, that I have failed in getting a greater interest taken in our work, by the larger part of you who are most to benefit by it. While I would not question the value of theoretical knowledge, as you may some time in your life find a use for every item of knowledge you can possibly acquire, that certainly will be of the most use to you which you can use the most frequently, and you most assuredly have got to gain a prominent position before your theoretical knowledge will be of special value. Suppose you were to leave here without any practical experience whatever, your only chance then for a situation would be side by side with the boy of no education. It is now a work of hands, not heads; and the boy, while you have been storing the mind for four years, has been skilling his hand for two; and although you may be two years his senior, he will at this handicraft outstrip you two to one. You will be paid for what you do, and not what you know; and if on Saturday night you go home with your little four dollars and a half in your pocket and not conclude that your college life has been half thrown away, I for one will be mistaken.

It is claimed that we give theoretical and practical instruction in the mechanic arts. The words are equal—how about the fact? It requires no greater knowledge of mathematics than to be able to count your finger ends, to find the ten hours a week spent in the shop is not half your working time; besides, the ten hours is not taken from your working time at all, but just so much out of your hours of recreation. To assume shop practice is recreation, is boy's play indeed. To put the practice on an equal footing with the study: While some of you choose to come here for an education, with the privilege of getting a smattering of the trade, others, if they so choose, should be allowed to come here and learn the trade, with the opportunity of gaining so much of theory as they have time and capacity for.

I, myself, should have liked to have had the shop practice put upon its true basis,that is that what you learn in the shop is and by right ought to be considered just as much education as that which you learn in the lecture room. But we have become so accustomed to dividing the theoretical from the practical—so used to call the one education and the other work—that as yet, it is past our power to change it. But whether we call it work or study, trade or education, I wish to convince you of its importance. I wish to show up the insignificant position it holds compared to what it deserves. Let us see. The spirit of the law, giving Government and State aid to the university, if it means anything, means to encourage practical education. Mr. Cornell with his endowment, if he "would found an institution where any man can receive instruction in any study," did not intend to exclude practice; and knowing the interest he takes in our progress, it is well enough known that he meant to include it, while Mr. Sibley's gift was unquestionably intended to establish the work shop. Now these gifts and endowments, and land grants, were given for what? To pay the superintendent of the machine shop and business managers? No, not at all. They were given wholly and solely for your instruction and the instruction of others like you. The executive committee are but guardians; the faculty, from president to instructor, are but instruments or agents for its execution.

It is but right that the students of one class should stand upon an equality with the students of any other. At present the candidates for the degree of B.M.E. are not so situated. I would have the work and study equally divided, or optional, and credited hour and hour alike. I know this will necessitate the abandonment of some of your studies. What one of you has not at least one study that you would like to abandon? Besides you cannot learn all there is to be learned, nor all that is both advantageous and desirable in four years, and what is to hinder your learning after leaving the university, as well from books as from your practice? You will find many things to learn which are of the greatest value, in fact things indispensable in a leading position, which you are getting neither in your studies nor the shop. You must learn to lead, command, or direct men. That sometimes takes years of experience; to get that experience is easy if you begin right. The key note is this: "Always let your ability be superior to your position," for while you are superior to your associates you can lead them. Attempting a position you are not capable to fill is fatal. You are all supposed to be competent to write a good business letter; if you are not, let me tell you you will want that qualification one hundred times for every time you find use for your French and German. You are also supposed to understand bookkeeping; if you do not, you will find it is something you will want three hundred and sixty-four times to every time you find use for your calculus.

In conclusion, allow me to say that this is the opinion of but one man, in opposition to the opinion of twenty. It is based on firm conviction, after as due deliberation as I have been able to devote to the matter; and while no principles relating to business will hold good in all cases, I trust you will not find more exceptions to the rule than enough to prove it true.

Dangers of Nitro-Glycerin.

Nitro-glycerin is a thick colorless oil, and appears to be as harmless, to look at, as lard oil or petroleum. People are so accustomed to the handling of oils of all kinds that it is almost impossible to make them realize the danger that lurks even in the smallest quantity of nitro-glycerin. It explodes when gently struck, and is ten times more powerful as an explosive, weight for weight, than gunpowder. The other evening, in Jersey City, a gentleman and lady were taking a moonlight stroll on the hights, in the vicinity of one of the shafts of the new Delaware and Lackawanna railway tunnel. The man saw on the ground the glimmer of a small tin tube, picked it up, and slapped it from one hand to the other, when a terrific explosion ensued. His eyes were destroyed, his flesh lacerated, his limbs broken, while his lady companion was dreadfully injured. It was a discarded nitro-glycerin tube, such as are used in blasting, and is supposed to have been thrown away by workmen at the tunnel shaft.

In Parker City, Pa., recently, a young man was carting six cans of nitro-glycerin over a rough road in a wagon, when, from some cause which will never be explained, it exploded. The man, horse, and cart were literally blown to pieces. The man's head and part of his breast were found three hundred feet distant, having been blown over the tops of the highest trees. Fragments of his limbs were scattered in different directions, and his right hand was found half a mile from the spot. Even the horse's shoes were torn from his feet.

Copyrights.

The new law in respect to copyrights, by which the official fees for copyrights on labels are increased, goes into effect in August. Until that date, however, copyrights can be had at the old rates, and all who desire to avail themselves thereof should have their applications filed at once. Further information can be obtained at this office.

G. L. M. says: To make a nest egg, take an ordinary hen's egg, break a small hole in the small end, about $\frac{3}{8}$ of an inch in diameter, extract the contents, and, after it is thoroughly clear inside, fill it with powdered slacked lime, tamping it in order to make it contain as much as possible. After it is full, seal it up with plaster of Paris, and you have a nest egg which cannot be distinguished by the hen from the other eggs, and one which will not crack (like other eggs) by being frozen.

AN automatic feed arrangement, for supplying boiler and other furnaces with fuel in a pulverized or granulated state, is the invention of Mr. J. Martin Stanley, of Sheffield, Eng. The powdered or granulated fuel, suitably prepared, is injected into the fire space by means of a jet of steam, the quantities being regulated by suitable valves, and the supply of steam and fuel being automatic.

PROFESSOR C. A. YOUNG, of Dartmouth College, is on his way to China to observe the transit of Venus.