it is impossible to conceive a vessel, "sixteen feet beam and several miles in length," built sufficiently strong to maintain its form. To carry out and extend the proportion between the length and beam, it is necessary that the form should admit of a straight floor, and not tapered to both ends from its center. We must confess that we cannot see how the round form will prevent the rolling without a keel, and we are inclined to think that if the length be increased in proportion to the diameter beyond certain limits, the action of the waves will be to twist the vessel and rupture the plates. What that proportion is remains yet to be seen; but the fact stated by us, that "long and narrow ships have been found to roll too much already," still holds good; and, although we are not prepared to say that "the increased length being abeut 50 per cent, the tendency to roll will increase in equal ratio," yet we do hold the doctrine that there is a point of relation between the diameter and length of ships beyond which it is dangerous to go. But Messrs. Winans' steamer, although not 50 per cent, will, we think, roll, owing to its taper form and absence of keel.

To objection 5, Messrs. Winans' answer is very satisfactory, and there is no doubt that a perfectly fireproof vessel is a desideratum, and here is the true improvement of the whole, namely, constructing it all of iron; but why this peculiar form should be better adapted than a safer one, for an entirely iron constitution we do not see, unless, perhaps, it is that it could not well be constructed of wood.

To support our sixth objection, sweeping as it is, let us briefly say that we cannot see much chance of success for a vessel unsteady in its shape, whose lowest part is a point and not a line—too accommodating to the motion of the waves to be a comfortable dwelling, without sufficient deck room to give the passengers that free and spacious walk in the open air, so desirable at sea, being nearly all machinery, and of an internal shape which must waste a great quantity of room.

Being asked to give our opinion on some other points than those previously mentioned by us, and we will now state our views on the subjects proposed in the last paragraph but one of their communication.

The hull of Messrs. Winans' steamer is a duplex cone, 180 feet long, 16 feet in diameter at its center; the form converts its floor into a curved beam, with a tendency to oscillate upon its center, in its mobile element. The resisting strains in a longitudinal direction will be transmitted from the extremities and concentrated within a very small space at the center, thus causing great instability at that part. It appears evident to us, that had its middle been a prolonged cylinder of 60 feet, its carrying capacity would have been much greater, with the same submerged sectional area, and the strains would have been distributed over a far greater amount of space. This would have given it greater stability, avoided oscillation, and imparted greater steadiness either under steam or sail. In a vessel like the cigar ship, in which curves are substituted for straight lines in the bottom, a keel is indispensible, to improve its lateral resistanee, and yet no keel is provided for it whatever. A deep keel, fore and aft of the center, appears to be positively necessary to give it greater stability.

We do not like the conical entrance or bow of this vessel; we prefer the clipper wedge bow with hollow water lines. In a rough sea the teudency of this vessel will be to bury itself in the water; hollow water lines would have tended to lift it gently above the waves. Much stress has been laid upon placing the center of gravity of this vessel "low down;" this is undoubtedly right for a rough sea, but there is something due also to the correct position of the center of gravity, which seems to have been overlooked by its builders. In swift birds and fish this is placed at two-fifths the distance from the forward extremity,—three-fifths from the stern—in order to counteract and balance the extra resistance which the fore part of the body meets in passing through the air and water. The center of gravity in this vessel is placed at the middle, and although it is low, yet it cannot prevent lateral play, owing to its absence of keel and want of prolonged breadth at the center.

The position of the propeller is not good; it should have been situated where nature has placed it upon a swift fish, at its stern. Screw propellers, with fine lines aft, are faster than those with full lines, and swift fish have always long tapering extremeties in front of their propelling agent. In this cigar ship the order of nature is inverted, the propeller being placed where the lines are fullest—in the wrong place—it will therefore carry dead water just behind the wheel, and cause negative slip.

The propeller is a wheel extending around the whole circumference of the vessel, and is about eighteen feet in diameter. There was not the least necessity for such an amount of propelling area. A screw of eighteen feet diameter is sufficient for the *Himalaya*—a steamer of 3,500 tuns displacement—a ship of ten times the capacity—and one of the swiftest in the world. By experiment, it has been found that a very small proportion of propelling area is sufficient, and any excess tends to absorb the power. One great advantage of the common screw propeller over the paddle wheel is its very limited size; now, it appears strange to us, that this very advantage should have either been contemned or overlooked in the design of this small vessel; with its huge screw wheel, it must offer a great amount of unnecessary resistance.

This vessel is 16 feet in diameter at the greatest breadth of beam; and if we allow one-half of this to be submerged, it will have an immersed midship section of nearly 100 square feet; we give the even figures, which are not far from the mark. It has two boilers to drive the machinery, each with 1,500 square feet of heating surface—37 to each foot of grate. As there is no power in the engines apart from the boilers, the two boilers will be 300 horse power—allowing ten square feet for each. The form of this vessel being given, with this power, we are asked, "What will be its speed?" We would like to obtain a formula to enable us to calculate this exactly; but when eminent nautical architects and engineers have been disputing upon this very point for many years and are still divided in opinion, we will only pretend to give something like a plain approximate estimate.

In comparing the value of the performance of one steamer with another, Atherton, an English nautical author and naval architect, uses the following formula:—$V^3 D^{2\cdot3} \div I H P = C$. Armstrong, another shipbuilder and author, uses the formula:—$V^2 D \div I H P = C$. These are very different; both cannot be correct; and as they are applied to vessels of tried forms, are inapplicable to the cigar ship. Armstrong, however, gives us other data, in a table based upon the unit that 25-horse power and 100 pounds of coal produce a speed of five miles per hour for every 100 square feet of immersed mid-ship section. The cigar steamer has this amount of immersed mid-ship section exactly; therefore by the formula $V^2 D \div I H P = C$, her speed should be nearly 17·30 knots per hour in smooth water. This result is nearly in accordance with that of direct resistance, allowing nothing for friction; therefore we think no steamer can come up to this standard of dynamic value; yet it has been applied to common steamers of good model. The direct resistance would be as follows:—The power exerted by the engines of 300-horse power during one hour is equal to the moving of 594,000,000 pounds of water through a space of one foot. In one mile of water of 100 square feet area—represented by the mid-ship section—there are 33,000,000 pounds which becomes the divisor of the horse-power of the engines, and gives 18 miles per hour for this vessel, with her engines. Will the cigar steamer come up to this standard, with its immense power for such small carrying capacity—nearly twice the amount of common steamers? Its speed in smooth water will be much greater than in the sea, and will probably reach 15 or 16 miles per hour; but in a rough sea it will be so much burdened with the head pressure and oscillation, that it will not average more than nine or ten knots per hour. These are our opinions; they are not given to make a *point*, or in the way of carping at the enterprise of Messrs. Winans', as we wish them success, and would be glad to find ourselves in error, and that they had achieved a great improvement.

Iron Girders—Neutral Axis.

Messrs. Editors—In your journal of the 27th ult., M., of Baltimore, says in support of the theory of a neutral axis in a beam that when it "attempts any deflection from the strain of the load, the top flange *will* suffer from compression and the lower one from tension, gradually diminishing in intensity as they approach each other, the point where the two are expended must necessarily be free from strains, and therefore *is* correctly called a neutral axis." If M. will carefully examine my article No. 4, and the diagram accompanying it, I think he will there find good reason for supposing that instead of the intensity of the strains diminishing as they approach each other, the tensive strains remain constant, while the compressive strains *increase* gradually as they approach the tensive tie, as there stated. Or, remove the tie, and substitute abutments, then see if the intensity of the pressure will not increase towards the ends as it approaches the abutments, or ties. If so, then, of course there can be no *neutral axis* where the forces are *expended*, as M. supposes.

M. admits that "the parallel rib and flange girder" is not perfect, but thinks the facility afforded in manufacture a sufficient apology for the excess of material. This argument of "facility" to justify a waste of one-third of the material in rectangular girders is not good, when as before stated, they cost two-sevenths per pound more than the compound girders. Benjamin Severson.

Baltimore, Dec. 2, 1858.

Soluble Glass.

Messrs. Editors—I entertain a very unfavorable opinion regarding the uses of soluble glass, and hold a negative opinion to the conclusions and statements contained in the article signed "F," on this subject, in the Scientific American of the 6th ult., page 70. I purchased some of this substance, for which I paid $1 50 per gallon, and it does not answer for the purposes set forth in the communication in question. I have tried it as a varnish, and consider it worthless, because the surface to which it is applied cannot be washed. It is not suitable for a cement, or for coating surfaces exposed to the weather, either to render them fire-proof, or for any other protective purpose, because it is soluble, and rains wash it off. It is stated in the article referred to that it is a good substitute for soap, thus admitting its solubility in water, and its unfitness for coating boards, stone or brick on the outside of buildings. It never can take the place of oil as a vehicle for paint, because the real virtue of oil is its insolubility—the very opposite of the silicate of soda. E. W. D.

Norwich, Conn., December, 1858.

[After a coating of the silicate of soda has been applied to the surface of an article, and has become dry, it should be washed with very dilute muriatic acid. This operation will remove the alkali from the silica, which will be left adhering as an insoluble coating. The muriatic acid and the soda will combine together, and form common salt, which will be removed from the surface by the first shower. Without some such treatment, the silicate of soda, it appears to us, cannot withstand the action of rain.—Eds.

Notes & Queries

*** Persons who write to us, expecting replies through this column, and those who may desire to make contributions to it of brief interesting facts, must always observe the strict rule, viz., to furnish their names, otherwise we cannot place confidence in their communications.

J. L. M., of Ind.—By coating glass with the albumen of eggs, or liquid gum arabic, it will remain transparent, and you can write upon it with common indelible ink made with nitrate of silver.

A. M., of Pa.—The varnish for maps and pictures is made by dissolving Canada balsam in rectified turpentine. Use equal parts of balsam and turpentine, place them in a bottle in a warm situation, and shake it frequently for about a week, when the varnish is fit for use.

C. H., of Ohio.—We cannot "adopt measures to protect you against infringers" other than to secure a patent for your invention. We hope you will succeed in getting the means to prosecute your case without delay.

P. M. E., of N. C.—You had better address a letter of inquiry to F. Kuhlmann, Lille, France.

G. B. B., of Iowa.—India rubber boots and shoes are made with india rubber softened by heat, and mixed with some substance containing sulphur, after which they are submitted to a heat of 300° in an oven. Naphtha dissolves india rubber. The vulcanizing process is secured by the patent of Chas. Goodyear.

N. B., of C. W.—You want a hard quick-drying varnish, therefore gum lac dissolved in alcohol will be the most suitable. Copal varnish is made by dissolving fused copal in boiling linseed oil. It does not dry quick enough for your purpose.

C. F. & G. S., of Conn.—Strong cold soap suds, we believe, will answer as a hardening liquid for your steel tools. It is a medium liquid between oil and water.

Pencil Letters are not welcome. We hope all our correspondents will bear this in mind. We have now a letter from a correspondent written with a leadpencil, which we shall be obliged to throw away, inasmuch as in some places the scribbling is unintelligible.

L. W., of Conn.—Your advice concerning the Atlantic Cable, which was dictated by the *spirit* of Franklin, is fallacious, and the information very old. It would be almost impossible to lay a cable the thickness you describe. With all respect to Benjamin Franklin's ghost, we think he should know better than to rap out information on a subject with which he is perfectly unacquainted, as the peculiar kind of electricity by whose means we telegraph, was not discovered until many years after his death. If you should have any more talks with this spirit, and he gets garrulous on telegraphs, just turn the conversation on to lightning conductors, on which subject he will be more at home.

B. S., of Md.—You are in error in regard to the name of the author of the article referred to in your communication.

A. A. D., of Texas.—If a person cannot describe a true circle, it must be his own fault, not that of the compass.

S, T. McD., of N. Y.—The directors of the "American Union" appear to be well-meaning men, so far as we know.

J. H. S., of Texas.—The pressure of the steam upon the piston is always a little less than the pressure in the boiler. The exact amount can only be known by a gage placed on the cylinder. We have never known of a steam engine constructed without a piston of some form, but engines have been made with stationary pistons and movable cylinders. They are wrong in principle, and inefficient in action.

M, of N. J.—On the 17th of February, 1847, an act of Congress was approved for the relief of Thos. Blanchard, whereby his patent for a machine for turning irregular forms, was extended for a term of fourteen years, from the 20th January, 1848, at which time the patent would have expired, but for the Relief Act. The patent will therefore not expire till Jan. 20, 1862. We do not, therefore, think Mr. Blanchard will attempt to get it extended again, neither do we believe that Congress would grant another extension. Nothing will be done about it at present. We are having many inquiries about the lathe from parties who wish to use it and would like to know upon what terms the assignees are operating under this patent. It has been hinted to us that they monopolize this business entirely, and refuse to sell machines.

D. M. Campbell, of Lower Peach Tree, Wilcox county, Ala., wishes to purchase the best hub, spoke and felloe machinery.

R. K., of Pa.—The reason why you could not obtain good crystals of nitrate of silver from coin is because of the presence of copper and other metals, and to obtain them you must proceed as follows:—Dissolve the coin in nitric acid, and add to the solution common salt until all the silver is precipitated as chloride, then filter and wash the chloride well with distilled water. The chloride of silver must next be mixed with about one-fifth its bulk of powdered charcoal, and about twice its bulk of dry carbonate of soda; a little borax may be added, and the whole being put in a crucible and covered with charcoal, by putting it in a furnace or bright red fire for about 15 minutes, you will obtain a button of pure metallic silver. This button must now be dissolved in nitric acid, not very strong, and the solution slowly evaporated in a dark place, clear, well-defined crystals of nitrate of silver will be the result.

H. G., ——.Lead pipe is just as good as tin for the purpose of a siphon. There may be a small leak in yours, which can be remedied by giving it a thick coat of copal varnish or paint. It may be caused by friction, setting free a portion of the air contained in all water, which may have gradually accumulated at the "bend."