far described, while of but negative value so far as the main object of the search is concerned, are of interest and importance to hydrographic science, as establishing the fact of depths in the sea hardly to be expected in view of the numerous soundings of the Challenger and of the Tuscarora herself, over wide expanses of the Atlantic, Pacific, and Indian Oceans, and confirming the existence of a very deep trough under the Japan stream, similar to that cut by the Gulf Stream on our own coast.

Commander Belknap's third attempt has proved more successful; and in a telegram from Ounalaska, dated August 29, he announces the practicability of a shore line along the coast of the Kurile Islands. The greatest depth found was 4,037 fathoms, 80 miles from Aggalton; the next greatest depth, 3,754 fathoms, 120 miles east of Kurile's Straits. A ridge is reported between Kurile and the Aleutian Islands, the least depth of which is 1,777 fathoms, and at Tenega a fine harbor and beach exists.

Correspondence.

Hardening and Tempering Tools.

To the Editor of the Scientific American:

The query of your correspondent J. T. N., "is this true," (referring to the colors produced on the surface of steel in the process of tempering) is very certainly answered in the affirmative, Nobili to the contrary notwithstanding, when it is remembered that these colors appear as readily upon pure (wrought) iron, in which, of course, there is no carbon, as upon steel. In facts similar effects are produced upon many other metals, and always during an elevation of their temperature.

It is true, as he states, that the hardness of a piece of steel varies with the carbon contained, but not so with the temper, the latter being simply a degree of softening produced by elevation of its temperature, of which softening the olors are taken as a measure; and this measure holds good for any grade of steel.

It is well known, also, that a coating of oxide upon the surface of any metal greatly retards the further rusting, instead of accelerating it, as J. T. N. asserts. But for this fact, the value in the arts of most of the oxidizable metals would be greatly diminished, and iron would be one of the most perishable of substances, even at ordinary temperatures. This fact, then, accounts for the protection afforded to metallic surfaces by the presence of such a film, and does not require that the infinitesimal quantity of carbon resident in steel should have any credit for it. JOHN T. HAWKINS.

62 Cannon street, New York city.

To the Editor of the Scientific American:

Mr. Rose's papers on "Practical Mechanism" come right down to an intricate knowledge of practice and its theory. I find in them solutions of things that had often puzzled me, and explanations of things which I thought I understood, but now find I did not. In speaking of tempering taps, etc., Mr. Rose gives three methods, which include all our present shop practice, to which a Mr. Hawkins objects. What plan does he want to substitute?

We do not care why the color comes; but if there is a new way to temper, any better than the old one, I for one would like to know it. G. S.

New York city.

Swimming with the Clothes On.

To the Editor of the Scientific American:

After perusing your valuable article on learning to swim, I gave swimming with the clothes on a trial, and I must say I fully agree with you as to its value. I felt nervous at first, thinking that I would not be able to swim at all; but after making an attempt, I was astonished to find but little trouble in keeping upon the upper surface of the water. My clothes seemed to act as if they were filled with air, assisting to keep me up rather than to pull me under. I find that confidence and coolness are of great value. Many good swimmers are lost for want of these. W. A. HUTCHINSON.

Albany, N. Y.

A New Disinfectant.

To the Editor of the Scientific American:

The deodorizing and disinfecting properties of the protosulphate of iron have been long enough known, and immense quantities of it have been used for such purposes during the past three or four years. Still the odor of the city of Cologne can be distinctly discerned in every town and city; and there are few abodes of men where there is not still needed some chemical agent for making the air tolerable The stable, the pig pen, the privy, are all offensive, and probably will be until that scientific millenium comes, when cleanliness and healtbfulness will be cared for first. I have had my attention drawn, to a new source for disinfecting purposes, by an accident. Last winter I had brought to me, in a load of bituminous coal, a bushel or two of that slaty sort which is filled with iron pyrites. I had it thrown into a heap at the time, upon some sod. It remained there some months, slowly decomposing into flakes and white efflorescence. At last a heavy rain came and washed a quantity away into the grass; and wherever it went it killed the grass, turning it black to the point. This led me to think of the chemical changes which had taken place, from which I concluded that it might be useful as a deodorizer, and I had the rest thrown into a privy vault, with the result that the odor was so completely removed that no one would suspect the place from it. As this sulphide of iron is so abundant throughout the United States, and especially as it is got out in large quantities in the great coal fields (where it is not only worth nothing, but is an expense to cart away), it may become of some use in the way of a disinfectant and deodorizer. The iron sulphide becomes iron protosulphate when exposed to air and moisture, and then, uniting with more oxygen, becomes iron persulphate. This latter change is what makes the protosulphate valuable as a disinfectant; but as the sulphide has to be converted into the protosulphate by uniting with four atoms of oxygen, it will be seen that the sulphide will be the more valuable, weight for weight.

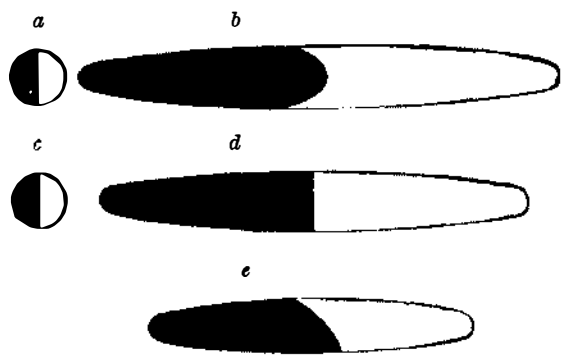
It is probable that the iron sulphide, found in masses so abundantly throughout the country, could be made available for this purpose by crushing it. A. E. DOLBEAR.

Measuring the Distance of the Sun.

To the Editor of the Scientific American:

When one edge of the illuminated surface of the moon appears as a straight line, the line joining the center of this line and the eye of the observer forms a right angle with the line joining the centers of the sun and moon. If we can determine the exact time when the edge of the illuminated surface appears as a straight line, we can measure or calculate the angular distance between the centers of the sun and moon; and taking the moon's accepted distance from the earth as a base line, we have only to find the hypothenuse of a right-angled triangle for the distance to the sun.

To find the exact time when the right angle is formed: The common telescope, with spider lines, is not suitable for the purpose, for the edge will appear rough and straighter than it does to the naked eye. I propose to use an instrument that will make the edge of the light appear, say, one thousand times as crooked as it does to the naked eye; so that when the edge becomes exactly straight, in being made one thousand times as crooked it will still be straight. This instrument contains the same number of lenses as an astronomical telescope, but the surface of the lenses must be cylindrical instead of globular, and rectangular instead of round. Such lenses will throw parallel rays of light to a line instead of a point. In adjusting the instrument, these focal lines must coincide. One spider line should be placed so as to coincide with the focal line of the eyepiece. This instrument will only magnify in one direction. It will make round objects very elliptical. To determine whether a line is straight or not, the instrument must be placed in such a position that the direction of the magnifying power will form a right angle with the line. The edge of the illuminated surface appears smooth when magnified in only one direction. By making observations at both the first and last quarters, and comparing the results, corrections can be made for the small irregularity of the general curvature of the moon's surface, at the very moment that the edge of the illuminated surface appears straight, as viewed through this instrument. The sun's and moon's right ascension and declination must be known, from which we can obtain the required angle. I hold that by this method the distance to the sun can be measured with greater accuracy than by the common method, because the base line is so much longer.



a To the naked eye when edge of light is not quite straight.
b As moon appears through the instrument at same time.
c To the naked eye when edge of light is exactly straight.
d With the instrument when the edge of light is exactly straight.
e With the instrument, when the focal line is not quite parallel with the straight edge of light.

California College, Cal. L. LILLARD.

Undetectable Adulterations.

The public has been so frequently cautioned against the poisonous compounds sold under the name of liquors, at even the more pretentious drinking saloons, that warnings are taken as a matter of course and set down as part and parcel of the well known though incontrovertible arguments of the teetotallers. While we should scarcely expect to awaken new interest by reverting again to the quantities of fusel oil, benzine, and kindred abominations entering into the composition of the liquids retailed, there is certainly sufficient of novelty and importance to arouse thought and attention in Professor J. F. Babcock's excellent article on testing wines and liquors, recently published in the *Laboratory*, particularly since the writer positively asserts that artificial liquors may be made, the difference between which and the genuine, chemical analysis cannot detect, and which are excelled only by the very finest brands.

Distilled liquors are at first colorless, because the coloring matter of the substances from which they are distilled, being non-volatile, remains behind in the still, while only water, alcohol, and the peculiar compound ethers to which the different liquors owe their flavors pass over. By keeping in an oak cask, an amber tint is obtained from the wood, and also a small portion of tannin, augmenting the astringent properties.

Pure brandy contains: Alcohol, water, traces of acetic acid, acetic ether, œnanthic ether, coloring matter, and tannin. It never contains over fifty per cent of alcohol by weight, and to this percentage it owes its intoxicating properties. The last five ingredients impart flavor. By testing the alcoholic strength of the liquor, we may find either the addition of water, or of spirit, or that it is of the proper strength. By evaporating to dryness, the solid residue may be examined, and adulterations of glycerin, capsicum, etc., noticed; all brandies contain coloring matter and tannin, which are of course present in the residuum. But the determination that the alcoholic strength is exactly right, and that the residue contains no foreign ingredients, is no proof whatever that the liquor is not a gross imitation. Chemical analysis is powerless before the two common frauds of reduction and imitation. It cannot tell that perhaps twenty-five per cent of spirit and water, of the proper alcoholic strength, dosed with tannin and coloring matter, has been added, for the only effect is to impair the flavor. Experienced palates may detect the fraud by taste; but this is but a precarious reliance. So-called British brandy is prepared by giving to proof spirits, made from molasses and possessing 49 per cent of alcohol by weight, an imitation of brandy flavor. Oil of cognac, distilled from the lees of wine with water, and dissolved in alcohol, is often used in the spurious manufacture.

Professor Babcock gives the following formula for an artificial brandy, which, he states, contains nothing but what may be found in genuine Cognac. No chemical analysis can prove it to be an imitation; and for all practical purposes, he sees no reason why it should not have all the medical virtues of the original:

Cologne spirit is diluted with water till it stands at proof. Of this 12 gallons are taken and mixed with 5 gallons of water; ¼ lb. of crude cream tartar, previously dissolved in 1 gallon of boiling water, is added, together with 6 fluid ozs. of acetic ether, 2 quarts of wine vinegar, 5 lbs. of prunes (bruised), and a small quantity of oil of Cognac, sufficient to flavor the mixture. After standing for a fortnight with occasional agitation, the mixture is placed in a still and 15 gallons distilled. The distillate is put into a clean brandy cask, and a small quantity, say 1 lb., of oak shavings is added to produce the desired astringency. After standing for a week, it may be drawn of and colored with a solution of caramel.

What has been said of brandy applies equally well to whisky, gin, and rum, which may all be successfully imitated.

Pneumatic Telegraphy.

An interesting exhibition of telegraph machines, worked exclusively by air, was lately given in London by Mr. Guattaris, the inventor. A number of different instruments were on view. The impulse is produced at one end of a tube by the operator, and performs the mechanical work at the other end, either by ringing a bell or turning a needle round a dial. The rapidity and precision can be made equal to the electric telegraph, the conducting tube being able to be laid under or over cover in the same manner as the ordinary telegraph. Attached to each machine is a bell and dial, and the message is transmitted by the moving of a small lever which drives the air through a pipe to the other operator. As the lever is moved up and down, the dial, which stands where the message is destined for, registers whatever the words may be. Each dial is supplied with a needle: and as each spurt of air presses against the works of the machine, the needle is moved exactly the number of times that the lever is pressed. Each instrument can receive or send a message about 400 yards. The instruments exhibited were designed for intercommunication between large coffee houses, offices, hotels, and vessels.

Nickel Mines in Australia.

The Sydney *Morning Herald* notes recent analytical tests of a rich vein of nickel, found at Noumea, New Caledonia The substances present are oxide of nickel, magnesium, silica, iron, aluminum, and calcium. The nickel ore is a silicate of nickel and magnesium, with certain impurities, and the brown serpentine accompanying it is an impure silicate of magnesium, containing a small proportion of oxide of nickel.

The development of Australian mines of nickel will have no small effect upon the quantity and consequent value of that metal now in existence. It will be remembered that, not long since, the German manufacturers of German silver petitioned their government not to use nickel for coinage, on account of its scarcity and the greater need which existed for its application to other purposes.

RAILWAY STATISTICS.—A Parliamentary return just published states that in 1873 there were in all 15,814 miles of railway in the United Kingdom. The total authorized capital amounted to $3,383,432,930, of which $2,941,601,540 was paid up. The number of passengers, exclusive of season ticket holders, was 455,320,188. The total receipts from all sources amounted to $288.710,000, of which fifty-five per cent was from goods traffic, and forty-one per cent from passenger traffic. Fifty-three per cent of the gross receipts was consumed in working expenditure, leaving $134,945,760 for net receipts. This was 4·59 per cent on the total paid up capital.

G. R. B. says: "To restore the burnt steel point of a pick, drill, or any similar tool, do not touch it with a hammer; but while it is still emitting sparks, plunge it into cold water and let it remain until cold. Then reheat to the proper degree, and work it: you will find it as good as before it was burnt."