there has been a great cutting down of firewood, the timber there having been used up some time ago.

It is true that planting has also been going on, but not on a large scale—not enough to prevent those changes in soil and climate which certainly follow the destruction of standing forests. It would be well, therefore, for our farmers and the owners of estates to consider whether they ought not to take some greater pains to plant and preserve the growth of wood, which for fuel, for protection to the soil, and for ornament, will become of more and more value each year.

The countries in Europe, which most nearly resemble our own in respect to forests are Russia, in which there are 450,000,000 acres of woodland out of a total of 1,000,000,000 acres; and the Scandinavian peninsula, where it is said three fourths of the country is covered with wood. Canada and the extensive possessions of England to the north of Canada are counterparts in this hemisphere of Norway, Sweden, and northern Russia, and will be more and more drawn upon as our population increases and the woods recede. They are now of much value to Great Britain in this respect, for the English and Irish forests have almost entirely gone, and but few remain in Scotland.

England has thus far found in her coal mines a greater resource than anciently in her forests, but it is a great loss to her to have parted with those entirely. Let her children in America profit by her example and preserve their woodlands.
—*Springfield Republican.*

THE COPPER REGION OF LAKE SUPERIOR.

Attention was very early called to the remarkable deposits of native copper upon the shores of this great lake. The first mention of it appears to have been in the Missionary Reports of the Society of Jesus, for 1659–60. It is next spoken of by Claude Allouez, a Jesuit missionary, who visited this region in 1666. He speaks of having seen pieces of copper of ten or twenty pounds weight, which the savages reverenced as household gods, and of having passed the site of a great rock of copper, then buried in sand. In 1670 Father Dablon reports a marvellous story, which was told him by the Indians, concerning a copper island about fifty leagues from the Saut, which he interprets as a cause of poisoning from the metal, loose pieces of which the savages used in cooking their meat. Charlevoix, whose travels were published in 1744, corroborates these accounts, and mentions the fact that a brother of the order made chandeliers, crosses and censers of the copper which was there found.

About 1763, a practical Englishman, Alexander Henry, passed through this region. He narrowly escaped being massacred by the Indians, but in spite of his trouble he kept his eyes open to his own interest. In 1771, he commenced mining operations in the clay bluffs, near the forks of the Ontonagon river. The following year he transferred his workmen to the vein on the north shore, but being discouraged by the contraction of the lode from four feet to four inches, he became disgusted, and finally abandoned his workings.

In 1819, General Cass and Mr. H. R. Schoolcraft, passed through this region, and visited the famous mass of native copper on the Ontanagon. In 1823, Major Long and his party saw the scattered boulders of this formation. Nothing, however, came of all these observations, the general impression being that the wildness of the country and its distance from settlements rendered these enormous natural resources valueless, at least for many years.

The first impulse to mining in this district was given by Dr. Douglass Houghton, State geologist of Michigan, who, in 1841, in his annual report to the legislature, gave an account of the geology of the country, and the first scientific description of the copper deposits. Subsequently, he devised an admirable plan for developing the resources of this region, and had commenced carrying it into practice when his sudden death by drowning put a stop to these important observations.

In 1843 was ratified with the Chippewas a treaty, which put the United States in possession of the territory as far west as the Montreal river, and southerly to the boundary of Wisconsin. The same year numbers of persons entered land in this neighborhood, by the provisions of a joint resolution of Congress in reference to the "lead lands" of Illinois, passed as far back as 1818. At first the applicant was allowed to select a tract three miles square, but afterward he was limited to one mile square. He was required to make selection within a year, to mark the corners, to leave a person in charge to point out the bounds, and to transmit to the proper department a description and plat of the same. On the receipt of this plat, the applicant was entitled to a lease of three years, renewable for three additional years, on condition that he should work the mines with due diligence and skill, and pay the Federal Government six per cent. of all the ores raised.

As a natural consequence of these liberal provisions, a great influx of speculators and their agents took place into this territory. The first mining operations were commenced in 1844. Masses of native copper, containing silver, were found, and numerous veins were discovered. About a thousand permits were granted by the department, and nine hundred and sixty-one sites selected. Sixty leases for tracts three miles square, and one hundred and seventeen for tracts one mile square, were granted, and mining companies were organized under them. Most of the tracts covered by these were taken at random, and without any explorations whatever; indeed, a large portion of them were on rocks which do not contain any metalliferous veins at all, or in which the veins, when they do occur, are not found to be productive. The excitement reached its hight in 1846. Quantities of stock were sold which represented no value whatever, and this reckless speculation injured the reputation of the mines.

In 1847 the country was almost deserted, only about half a dozen companies, out of all that had been formed, being engaged in mining.

In 1846, further grants of land were suspended as illegal, the resolution in regard to *lead* not covering *copper* lands, and the following year Congress passed an act authorizing the sale of the lands and a geological survey. For the latter purpose, Dr. Charles T. Jackson was appointed, but after having spent two seasons in these explorations, he resigned, whereupon the work was confided to Messrs. Foster & Whitney, who have given a very full and satisfactory account of the geology of the country and its prospects as a mining region. Meanwhile, the actual miners had made considerable progress in their excavations, and as they purchased lands after thorough examination, confidence was gradually restored. By the time the United States Survey had been completed, and its results published, in 1850, copper mining had become an established business.

The report of Foster & Whitney contains some very interesting details of the discovery of ancient excavations for mining purposes. Some of these are quite extensive, reaching the depth of fifty feet, and containing rude implements for boiling water, stone hammers, copper gads, and other mining tools. It would appear, from some of the indications, that fire was the agent used to disintegrate the rock. Some idea of the extent of their operations may be formed from the fact that one of the explorers found a mass of native copper weighing six tuns, which had been detached by these ancient miners and supported on billets of oak, preparatory to removal. The age of these works may be inferred from that of a pine-tree stump, growing out of one of the mounds of rubbish from the mine. This contained three hundred and ninety-five annual rings, so that the exploration must have been made before Columbus started from Europe on his memorable voyage of discovery.—*Piggot on Copper.*

EXPANSION AND CONTRACTION OF STEEL.

Expansion and contraction belonging to this subject is the enlargement, or increase, or decrease, in the bulk of the steel, as the case may be, in consequence of a change in the particles by the process of hardening. It is pretty generally known to those who are employed in the process of hardening steel, and to those in the habit of fitting up various kinds of work requiring great nicety, that the hardening of steel often increases its dimensions; so that such pieces of work, fitted with nicety in their soft state, will not fit when hardened, and the workman has therefore to resort to the process of grinding or lapping to make the work fit.

The amount of the expansion (or the amount of the contraction) of steel cannot be exactly stated, as it varies according to the size of the steel operated upon, and the depth to which the steel hardens; also in the different kinds according to the amount of carbon combined, and even in the same steel operated upon at different degrees of heat. Steel which is the most liable to injury by excess of heat is the most liable to these expansions, and steel which is less liable to injury by heat is most liable to contractions. As, for example, the more carbon the steel contains, the greater will be the expansion of the steel; and the nearer the steel approaches to the state of iron, the less will be this increase of bulk.

Although the steel expands in hardening, it is not universal for pieces of all sizes to increase in dimensions; for sometimes it is smaller in dimensions after hardening. This, at first sight, appears anomalous; but I will endeavor to give an explanation of it.

Steel, like all other substances composed of particles, varies in its dimensions with a change in temperature. It follows that when the steel is at a red heat, the natural positions of its particles are in a measure displaced, and it is expanded to a greater bulk; and when immersed in water and suddenly cooled, such a change of its particles takes place as to make it hard and brittle. It also contracts to a smaller bulk by the loss of heat; but this cannot so rapidly occur at the central part, because it is protected by the surface steel. Consequently, large pieces of steel do not harden all through; or, in other words, do not harden properly to their centers, but toward the center the parts are gradually less hard, and will sometimes admit of being readily filed; and as it is only the outerparts of the steel which harden properly, consequently it is only those parts of the steel which harden that increase in bulk. When the steel is immersed in the water, the water begins first of all to act upon the outer crust of the steel, and then cooling it gradually toward the center. The outer crust being the first to part with its heat, it is of course the first to contract and become smaller. The outer crust in contracting is held in a state of great tension, by having to compress the central steel (the central steel at the time being expanded by the heat). While the surface steel is in this state of tension, and the central steel in this state of compression, the particles of the surface steel (by the strain) are displaced to a greater distance from each other, and the particles of the central steel (by the compression) are compressed into a denser state. The particles of the central steel being compressed into a denser state, it causes the central steel, after it has become quite cool, to occupy less space than what it did previous to hardening. The particles of the surface steel become hard while in this state of tension, consequently the hardened part of the steel becomes fixed, and cannot return to its original bulk; consequently, the hardened part of the steel occupies more space than what it did previous to hardenirg.

If the displacement of the particles of the outer steel predominates over the compression of the particles of the central steel, the piece of steel under operation will then be larger in dimensions. If the compression of the particles of the central steel predominates over the displacement of the particles of the outer steel, the piece of steel under operation will then be smaller in dimensions. In other words, if the expansion of the outer steel amounts to more than the compression of the central steel, the piece of steel will increase in bulk; if the compression of the central steel amounts to more than the expansion of the outer steel, the piece of steel will then decrease in bulk. The expansion of the steel is greatest when it is heated to a high degree of heat before immersion. This effect is owing to the particles being displaced at a still greater distance from each other, and which may, in some measure, account for the brittleness of steel when overheated. This expansion is, in some measure, reduced by tempering; and this effect is caused by the hardness being reduced and allowing the particles to partly rearrange themselves to their natural positions.

It is believed by some that the hardness of steel is caused by the compression of the whole of the particles into a denser state; in confirmation of this they say that steel after hardening always looks closer and finer in the grain. Now, if this were the only cause of steel becoming hard, how does the steel get larger in dimensions? Pieces of steel of all sizes would, according to this, universally become smaller. The compression of the particles of the central steel into a denser state certainly does take place, as I have before remarked, but the particles of the outer parts of the steel are displaced at a greater distance from each other, or the steel could not become larger in dimensions. It is believed by some that if a piece of steel (in hardening) increases in bulk in one part, that it must decrease in bulk in proportion in another part. Now, if this were the case, how is it that the specific gravity of some pieces of steel is reduced by hardening, and how is it that workmen have often to grind or lap pieces of steel to make them fit the same places which they fitted previous to hardening. It may be said that the steel may be prevented from fitting the place it previously fitted by becoming crooked or oval in hardening; but if this were the only cause, how could it be made to fit its place again by grinding or lapping? It would be impossible (unless it were softened and upset) to make the lean or concave side of it fit its place again. I may also inquire, what is the cause of steel being whiter in color after hardening? As I have previously remarked that it is only those parts of the steel which harden properly that increase in bulk, it may perhaps be asked, how is it that a piece of bar steel becomes shorter in hardening? The answer is that the central steel is compressed by the surface steel endways as well as sideways, by the surface steel contracting shorter by the loss of heat. The central steel contracts after the outer crust is fixed, consequently an internal strain is caused; and, if the steel becomes shorter than what it was previous to hardening, it is because the force of this internal strain shortens the outer steel more than it expands in hardening.

It is quite reasonable to suppose, if the particles of the hardened parts of the steel are removed to a greater distance from each other, that the steel would look considerably more open and coarser in the grain; consequently, it may be inquired, if it is not the compression of the whole of the particles into a denser state, what is the cause of steel looking closer in its texture after hardening? The answer is, if we accept the theory that it is the crystallization of the carbon which causes the hardness in steel, that the carbon expands in the act of crystallization (in a similar manner that water expands by extreme cold in crystallizing into ice) and fills up every pore or crevice, and gives the steel the appearance of being closer and more solid.

Such is a slight sketch of the expansion and contraction of steel; and, although a great deal more might be said, I have not thought it necessary to entangle the reader with a lot of theories, although it may be necessary for his amusement, and for the exercise of sound judgment, to occasionally glance at them in treating fully the purely mechanical operations.

The expansion of steel is prevented in some measure by annealing the steel about three times previous to its being finished, turned, or planed; for instance, after the first skin is cut from the steel it should be annealed again, after which another cut must be taken from it and again annealed, and so the third time. This may appear to some like frittering away time, but in many instances the time will be more than saved in lapping or grinding to their proper sizes after the articles are hardened, especially when it becomes necessary to lap or grind them by hand labor, for hardened steel works with great difficulty; therefore in some instances it becomes a matter of importance in hardening to keep the article as near as possible to its original size. I have myself had articles to harden which could not be lapped or ground to their finished dimensions in the turning lathe owing to their peculiar shapes, so that the workman has been compelled to adopt the slow process of lapping with a copper file and emery dust, mixed with oil. I have known those articles which were only once annealed, to take several hours to lap them to the finished dimensions after they were hardened; and I have known articles of the same kind, and of precisely the same dimensions (in their soft state), made from the same bar of steel and heated to the same temperature (as near as the eye could judge), and hardened in water of the same temperature, which have been annealed three times, scarcely requiring to be touched with the copper file after they were hardened. As there may be some persons who may perhaps require an article to be after hardening as near its original size as possible, and who may not perhaps be provided with such things as buffs, laps, or stones, I presume therefore that this hint will not be out of place in making those acquainted with it. Another hint deserves a place. I have found that articles made of steel which have been well forged will always keep truer and keep their original sizes better in hardening, and be less liable to break in hardening, than articles which are made of the steel in the state it leaves the manufacturer; for instance, if a very long screw tap, or reamer, etc., be required for any special purpose, it will be well to take a piece of steel sufficiently large to admit of being forged to the required dimensions. If for a long screw tap, three quarters of an inch in diameter, seven eights round-bar steel swaged down at a cherry-red heat to three-quarters and a sixteenth will suffice (the one-sixteenth is allowed for turning); but if the edges of seven-eighths square steel be hammered down so as to form eight squares and then swaged down to three-quarters and a sixteenth, it will prove even better for the purpose than the seven-eighths round-bar steel, it must be obvious that if similar methods be adopted with larger articles, they will be less liable to break in hardening.—*Ede on Steel.*

Correspondence.

The Editor are not responsible for the opinions expressed by their correspondents.

The Chicago Artesian Well.

MESSRS. EDITORS:—In two or three numbers of your paper I have read notices of this truly great and wonderful work, which, though originated and prosecuted upon theories outside of old fashioned mundane science, has proved more successful than any thing of the kind ever attempted in this country. The history of the work, as detailed by its principal agent, Geo. A. Shufeldt, Jr., is briefly this: A gentleman named Abraham James, claiming to act by spiritual impressions, pointed out the locality where the well is now flowing, and insisted that at a certain depth artesian water could be had by boring. Upon the strength of his representations the work was commenced, and water in large quantities, and, for deep well water, of very pure quality, was struck within a few feet of the depth he had designated, and flows out at considerable hight above the surface, at the rate of 1,200,000 gallons per day. As Chicago, before this proof was given, was not known by most people to be situated over the bottom of a geological "basin," the whole matter is considered by its projectors a signal proof of spiritual intelligence and communication. But the work being finished,—no matter by what authority,—its details show clearly, that instead of its being wonderful that an artesian well is obtained there, it is one of the most beautiful *proofs* of the truth of the common theory of such wells; and to demonstrate this is the object of this paper.

It is supposed by Agassiz and others that the first rocks which appeared above the primeval ocean upon this continent—and perhaps on the earth—are those which constitute the Laurentian Range, bordering Lake Superior and running outwardly to the Atlantic. What we know is—for the rocks testify to it—that on the outward slope of this range, along the Mississippi river and its eastern branches, as we go downward geographically, or hydrostatically, we go *upward* geologically; that is, the different stratas of deposited rock—many of which outcrop along the river's bank—all lie like the tiles upon the roof of a house, overlapping and running under each other; but—to follow out the figure, the eave of the house is the highest; and, of course, the water falling upon it would run under instead of over the stratas.

The first deposit upon the Laurentian (which is an igneous rock thrown up by internal convulsions), is what has been called by some the St. Peter's Sandstone. This commences on the St. Croix river, one of the principal eastern branches of the Mississippi, at about one hundred miles south of the lake, and fifty or more from the ridge which forms the water-shed between the lake and all the eastern branches of the upper part of that river. For thirty miles along the St. Croix this stone forms its banks, into which it has cut its way in ages past to a depth of one hundred feet or more, leaving nearly perpendicular precipices upon each side.

This stone is impervious to water, and is probably the foundation stone of all that part of northern Wisconsin which abounds in tumarack, cedar, and cranberry marshes. It is covered with a thick deposit of drift, forming low hills of loose, pebbly soil, between which are the swamps and lakes, and some alluvial deposits. Following down the Mississippi river, this sandstone, which is called by the Iowa State Geologists the Potsdam Sandstone, is last seen near the north line of that State, and there dips under the lower Magnesian limestone, which in about forty miles dips under another thin bed of sandstone, over which soon commences the thick and extended deposits of the Galena, or lead-bearing limestone, the latter the principal rock of the river bluffs for over one hundred miles. A little north of the latitude of Chicago commences a bed of Hudson river shale, which is overtopped by a thick deposit of Niagara limestone, which disappears under ground at a point on the river exactly west of Chicago. From this point the geological deposits going south and east rise with great rapidity up to the coal measures of central Illinois, through various stratas of limestone, mostly of a fine building quality.

Now what I wish to show is, that the drill of the Chicago well penetrated through all these stratas, which were not wanting, until it reached and went through the St. Peter's sandstone, and struck the water which fell upon the earth along the Southern Laurentian slope, and has run beneath that bed of rock, ready to spout from any hole which reaches it. This, if true, would account for the great purity of the water as compared with other artesian fountains, as it has encountered on its way no soluble mineral substances, and was originally strained through the sand drift of upper Wisconsin.

The diary, kept apparently with great care during the boring of the second well, shows plainly that after going down about three hundred feet, through various limestones and marble, the drill struck the Niagara limestone, which forms the surface rock on the Mississippi, directly west of Chicago. It is described as a grey limestone, one hundred feet thick, with layers of flint. This description tallies exactly with the character of the stone exposed in the bluffs at this place. Underneath this was found a bed of shale, the same in character as that which lies below the limestone here, but which is still partially above the bed of the river. This proved to be about one hundred and fifty feet thick (here it has been bored into a great distance, but not through). From the bottom of this shale downward, the character of the rock is not so well defined in the diary. The Galena and lower beds of limestone seem to be wanting, and the drill appears to have reached the still lower sandstones, under which the water is stored.

The conclusions which I draw from the above are, 1st, That artesian water can be obtained at any point in this region by going deep enough to penetrate the St. Peter's or Potsdam sandstone; and 2d, That along the Mississippi river, as low down as the latitude of Chicago, it can be had at a depth several hundred feet less than at that place. C. B.

Lyons, Iowa.

The Cave of the Puy de Dome.

MESSRS. EDITORS:—In your issue of Nov. 9th, I notice a communication from "M. A. D.," requiring a solution of a natural phenomenon existing in the south of France. As you intimate, the facts are scarcely correct, as represented by "M. A. D." They are these: In the locality mentioned a spring issues from underneath a deposit of lava, which is remarkably cold, sometimes even covered with ice, in the hottest part of the summer; and in the winter has a temperature exceeding that of the air surrounding. Now there is nothing very extraordinary about this spring, excepting its excessive coldness (exhibited by the production of ice) in excessively hot weather, and this wonderful quality so much dwelt on and exaggerated possibly, by the guides who conduct tourists to the mountain (Puy de Dome), admits of a very simple explanation to the educated man, though a great mystery to the uneducated natives, and to some of those who ought to know better. This explanation consists in the fact that the rock through which the waters of this spring percolate, is of a very porous texture; in the hot weather a very rapid and abundant evaporation takes place, which reduces the temperature and causes the water to escape at or near the point of freezing. At my visit there, there was no ice in the spring, though I was assured that the occurrence sometimes took place. Under the circumstances, it is possible, and I believed the assertion for that reason, and not because one is told so. In the winter, in cold weather, as a matter of course, the water would be warmer, and in certain states of the atmosphere would give off vapor, as other springs do under the same circumstances. This vapor is magnified into steam, and the double contrariety of cold in summer and heat in winter makes a pretty wonder for the uninstructed villager or traveler. Possibly the wonderful evidences of intense volcanic action to be seen here, predisposes one to be rather too credulous as to mysterious phenomena. HENRY STEWART.

Norristown, Pa.

Treatment of Kerosene Lamps.

MESSRS. EDITORS:—In your issue of Nov. 2, page 275, your correspondent "Experimenter" has given advice, which I cannot but think detrimental to the safety of the Kerosene burning public. He states that "if the wick fits the tube, it is impossible to drive the flame down into the lamp by blowinto the chimney," and further, recommends that method of extinguishing the lamp. Now your correspondent must be more fortunate in the possession of a good and perfect burner than nine-tenths of the people, for nine-tenths of all the burners used are made with *vent holes* along the side of the tubes, or in close proximity thereto, much larger in area, and much nearer the explosive mixture in the lamp than by way of the tube, with never so loose a wick as usually used.

The theory of lamp explosions, as I understand it, is this: First, Kerosene of itself is not explosive, nor is the gas which rises from it, but it is the admixture of that gas with a large body of air that makes it dangerous. Kerosene, or coal oil, is a dense body, which gasifies slowly, requiring, during the process of combustion in lamps as used, air to take the place of the oil consumed; this air, passing down by the heated tube through the *vent* holes, as before stated, becomes warm, and by its heat eliminating a certain amount of gas, small in proportion to its own incoming body. The prolonged burning of the lamp, say for four or five hours, reduces the quantity of oil, enlarges the space for the explosive gaseous mixture, and imparts also a great heat to the contents of the lamp, which then gives forth vapor more freely, so as finally to produce the proportion of one part gas to nine of air, which I take it is the maximum point. This heat also increases the volume inside the lamp, causing this dangerous mixture to exude by these same vents, close beneath the flame, then catching from some deflection of the flame or its proximity thereto, explodes the lamp while standing on the table, and more often still when carried in the hand, or in going down stairs. Thus it will be seen that to blow the flame *down* is to invite destruction, unless the burner is properly constructed, as comparatively few are. The proper method is to draw the wick into the tube by means of the ratchet, which, while avoiding danger, will prevent any odor arising from the oil in the wick. PENROSE CHAPMAN.

Brunswick, Me.

Artesian Wells—Why the Water Flows—Is it Centrifugal Force?

MESSRS. EDITORS:—A correspondent has published in a recent number of your journal, a theory of the nature of spouting water, in which he attributes the discharge of the water to the centrifugal motion of the earth—the tendency of matter to fly from the center. I have heard this opinion advanced before, and the existence of perennial springs, on the Adelsburg mountains in Switzerland, and in other places, adduced as evidence in support of the theory, but I do not believe it to be founded on fact.

I bored the Chicago Artesian; they are 711 feet in depth; they commenced filling with water at a distance of ten feet from the surface, and continued full of water all the way down. Why did not the centrifugal force throw this water out? and why was no water discharged until the drill had penetrated a particular subterranean stream? Before this point was reached there was plenty of water in the wells, and we could pump out an abundant supply: and this is true of hundreds of other artesian wells scattered throughout the country, they do not discharge the water above the surface, but plenty of it can be obtained by pumping. Why does not the centrifugal force throw the water out of these wells? And why do they not all become flowing wells, as would be the case if the theory were true? Or, in case of dry wells, why does this force not throw out the stones and chippings of the drill as well as the water? For these reasons I am inclined to adhere to the opinion that water, in flowing wells, comes from a higher source, and that the crust of the earth is everywhere penetrated by these underground streams to an extent of which at present we have no conception. For the benefit of another of your correspondents I here state that the temperature of the water in our wells is 57° Fah., and is uniform winter and summer. It was incidentally mentioned in your paper that the flow was intermittent: this is not the case; but it is without change in quantity or force all the year round. The form of the overflow resembles the white plume of a soldier, and is extremely beautiful. GEO. A. SHUFELDT, JR.

The Philosophy of the Soap Bubble.

MESSRS. EDITORS:—On page 291, No. 19, current volume of your famous journal I find a communication from Mr. Alfred O. Pope, detailing his experiment by which he imagines he has proved Sir David Brewster's theory regarding the color of soap bubbles. I do not find fault with the experiment, but with the deductions drawn from it. He does not tell us how his experiments prove that secretions were formed and until he demonstrates that they were formed he has not proved Brewster's theory. All admit that the thicker the film of the bubble the brighter the colors will be. Oleate of soda and glycerin in solution make a thicker film than a solution of common soap. Consequently, when the liquid begins to flow down the sides of the bubble and collect in drops at the bottom the top gets thinner and the colors then become paler and there being a constant change in the thickness of the film all over the bubble there is as constant a change of color until a deep blue or black makes its appearance at the top of the bubble which becomes so thin that the cohesive force is overcome by the weight of the sides and bottom, and the bubble bursts. CHEMIST.

Cincinnati, Nov. 5, 1867

Recipe for Making Boots Water Tight.

MESSRS. EDITORS:—As the cold, muddy weather of fall is approaching, it may be of interest to many of your readers to know how to preserve their boots and make them at the same time pliable and water proof. It can be done in this way: In a pint of best winter-strained lard oil, dissolve a piece of paraffine the size of a hickory nut, aiding the solution with a gentle heat, say 130° or 140° F. The readiest way to get pure paraffine is to take a piece of paraffine candle. Rub this solution on your boots about once a month; they can be blacked in the meantime. If the oil should make the leather too stiff, decrease the proportion of paraffine, and *vice versa.*

I have used this for eight years past, and boots have lasted me two winters, the uppers always remaining soft, and never cracking. I have tried beeswax, rosin, tar, etc., but never found any other preparation half so good. C.

Dayton, Ohio.

ARTIFICIAL RUBIES, not mere copies in glass, but made veritably out of the same substance—alumina—of which the natural gems are composed, have been produced by M. Ebelsman of the Sevres Porcelain Works, near Paris. The process consists in employing a solvent, which shall dissolve the mineral or its constituent, and may thus, either upon its renewal or by a diminution of its solvent powers, permit the mineral to aggregate in a crystalline state. Certain proportions of alumina, magnesia, oxide of chromium, or oxide of iron, and fused boracic acid, are placed in a crucible made of refractory alumina enclosed in a second one, the whole being exposed to a high heat. The materials are first dissolved in the boracic acid, then as the heat continues, the latter evaporates, the alumina and coloring matter combine, crystallize, and present the exact appearance of the spinel ruby. In this way crystals of the same form, hardness, color, composition, specific gravity and effect on light, as the cymophane, and other precious stones are prepared.

WINE CONTAINING ZINC.—Dr. Wittstein has recently found that most European wines contain zinc in the form of salts, its presence being due to the fact that the isinglass used in purifying the wine is adulterated with about $2\frac{1}{2}$ per cent of oxide of zinc.