Correspondence.

Hearing the Whistle.

To the Editor of the Scientific American:

I lived at one time about one and a half miles west from Havana, N. Y., at an elevation of about 600 feet above the valley at the head of Seneca Lake. I have frequently heard the locomotive whistle distinctly at Corning and at Elmira, N. Y., a distance of about eighteen miles from where I lived. The condition of the atmosphere at such times was looked upon as indicating an approaching storm.

BURR NOBLE.

San Francisco, Cal., October 11, 1883.

To the Editor of the Scientific American:

I have often heard locomotive whistles from Nevada, which is not less than nine miles on an air line. I have heard the mill whistle a few times from the same place. I have also heard the locomotive whistle a few times in favorable weather from Fort Scott, Kansas, which is a trifle over seventeen miles. I have heard the foundry whistle from the same place. This is not an every day occurrence, for the weather must be favorable to hear from any of these points.

D. K. HUBBS.

Mount Vernon County, Mo.

The English Skylark in America.

To the Editor of the Scientific American:

Under the above heading appeared in No. 12—September 22d, 1883—of the SCIENTIFIC AMERICAN, an account of the successful acclimation of the skylark in Bergen County, New Jersey.

Permit me, sir, to correct several errors in the notice referred to, viz.:

The skylarks were first brought to America for acclimation purposes in 1873 by the undersigned, then Secretary of the "Cincinnati Acclimatization Society," and set free in the spring of 1874 at Burnett Woods Park, near Cincinnati. They have since returned, or at least some of them, and every spring chosen as a place for abode a spot near the point where they first greeted the free American air, namely, a summit in the vicinity of the park before named.

Contrary to their habits in Europe, these skylarks have selected a hilly ground as their favorite place of abode, whereas in the old country the skylark generally inhabits meadows or a level country. The writer of the notice in question states that the skylark is *not* a migratory bird. In this he is, however, not in accord with the facts, for the skylark is a migratory bird; only in rare instances small numbers remain over winter in northern climates. Why, further, the same writer should use the term *English* skylark, I do not comprehend. Many also call the common sparrow in America *English* sparrow, but neither of these birds are of English origin, nor are they found solely in England.

ARMIN TENNER.

Berlin, Germany, October 6, 1883.

Hearing the Whistle.

To the Editor of the Scientific American:

I have been a reader of your paper for five years, and cannot do without it. It is worth $10 a year to me. I have read quite a number of articles in my paper about hearing locomotive whistles a long distance; so thought I would tell what I have heard many times: This village is twelve miles south of east from Blood's depot, on the Rochester division of the Erie Railroad; three valleys and four ranges of hills intervene. It is nothing uncommon, on quiet days preceding a storm, to hear the throbbing, rumbling sound of trains passing that place, and I have often followed them by the sound till they reached Kanona, a station twelve miles west of south from here, the whistles being very distinct at the intervening stations. I have heard this many times from a place one mile east of here, and have frequently listened and distinctly heard the whistle of trains as they approached a station (Wayland) four miles farther west of Blood's depot. I do not hesitate in saying that I have heard locomotive whistles *sixteen* miles away, and have hundreds of times heard the roar of passing trains twelve miles away. This statement can be vouched for by reliable men living here in this village.

F. M. M.

Prattsburgh, N. Y., October, 1883.

Nickel Plating on Zinc.

BY PROF. H. MEIDINGER.

Successful electroplating in general depends on three conditions: on the quality and properties of the metallic solution (the bath), on the strength of the current, and its relation to the surface of the pole, which determines the thickness of metal deposited in a unit of time (rapidity of precipitation), and on the nature of the surface of the pole on which the metal is to be deposited. If the pole is of metal and is to be inseparably united with the deposit, as is the case with silver plating, the surface must be perfectly clean and free from oxide or grease. If the surface is dirty, the precipitate peels off. It will not adhere at all to nonmetallic substances, but merely incloses it.

It is a fact worthy of attention that under otherwise similar conditions many metals do not take certain deposits well. In some cases the deposit is streaked, powdered, or of bad color, and in others it peels off afterward when polished. Iron in its different forms (steel, wrought iron, or cast iron), zinc, lead, and tin cannot be readily silvered or gilded in the cyanide bath, although it works first rate on copper and its alloys, and is generally used for that purpose. But of the copper alloys German silver causes more difficulty than brass. Copper, brass, and iron are easily plated in the nickel bath; zinc, on the contrary, is not. In some of these cases the metal to be plated acts directly on the solution itself, as, for example, zinc acts on silver and nickel solutions, and this circumstance may affect the properties of the whole deposit; this does not happen with iron.

If a metal cannot be nicely plated in a bath, it is customary to cover it first with some other metal of better quality in this respect. Thus iron, zinc, and tin are easy to silver and gold plate after they have been copper plated, and zinc can also be nickel plated under these conditions.

To unite the deposit as firmly as possible with the object, it has been found in many cases advantageous to slightly amalgamate the surface of the metal to be plated, especially in giving a thick coating of silver to instruments. The method is extremely simple, for it is only necessary to dip the articles for a short time into a mercurial solution and then rinse them with water.

The quantity of mercury used is insignificant, in fact a heavy amalgamation must be avoided, as it would make the metal brittle. A mercurial solution serviceable for this purpose is made with the commercial mercuric nitrate or chloride (corrosive sublimate). The solution must be very dilute, about one, five, or at most ten parts of the dry salt in a thousand parts of water; to this solution some sulphuric or chlorhydric acid is to be added until the liquid is perfectly clear. The stronger solution gives up more mercury in a given time than a weaker one, and this must be taken into account in amalgamating. With practice it is easy to tell from the change of color when enough mercury has been deposited. Iron does not alloy, or only very badly, with mercury, and hence it cannot be subjected to the process just described.

Within the last decade nickel plating has reached an extraordinary development. At first it was limited to iron, then it was gradually extended to brass and German silver, and now is increasing in favor for coating zinc. As this metal takes the nickel from ordinary baths very badly, it has been proposed to copperplate it in the cyanide bath. But this is a nuisance. The use of the poisonous cyanide bath should be avoided as far as possible, and limited to cases where it cannot be dispensed with; in nickel plating, cyanides are not absolutely necessary, even if an intermediate layer of copper is desirable in thick nickel plating. The cyanide of copper (and likewise brass) bath has a disagreeable property of only working when certain conditions are exactly observed; it also decomposes easily. As the nickel wears off by use the red shines through, which is worse than if the white zinc itself were laid bare. Experience also showed that coppered zinc, when it came into the nickel bath, at once turned black and could not be plated.

There is not yet any literature on amalgamating zinc for the purpose of nickeling it. On many sides objections are heard against the deficiencies of the customary process of nickel plating, and it seemed to me worth while to make some experiments in this direction. The experiments were satisfactory. I amalgamated a sheet of zinc and then had it nickel plated by Schwerd in Carlsruhe. The nickel adhered well, united perfectly, and took a fine polish. I think it is not improbable that the nickeled sheet-zinc of commerce is prepared in a similar manner. This supposition receives support from one of the properties of this zinc to which my attention was called by Beuttenmüller, who has used a good deal of it in his factory.

It is rather brittle in comparison with pure sheet-zinc. I cannot explain this brittleness in any other way than due to amalgamation. The alloys of mercury with solid metals, called amalgams, exhibit this property, that the mercury dissolves off small quantities of the metals to form a thicker liquid; with a larger excess of the solid metals the alloys are solid, but fragile and brittle. This character remains, but grows gradually less. When a sheet of metal is amalgamated, it depends on the quantity of mercury combined with it and the depth to which it penetrates, whether it will cause a perceptible change in the strength of the metal.

Copper must remain in contact with mercury for a long time until it has penetrated a considerable depth; with zinc this takes place very rapidly. A sheet of zinc one millimeter in thickness, thoroughly cleansed in acid, only needs to have metallic mercury poured over it so that it forms a bright mirror to make it so brittle that it will not stand bending. Zinc carries this peculiarity into its alloys with copper, so that brass and German silver are much more sensitive to mercury than copper. If zinc is immersed in a mercurial solution, it will depend upon the time it stays in whether the mercury will be merely deposited upon the surface or will penetrate more deeply into the zinc. A concentrated mercurial solution will make a sheet of zinc one millimeter thick brittle in a few minutes.

The quantity of mercury necessary for nickel plating will have an imperceptible influence on its strength if the zinc is thick; but if it is thin it may show a perceptible difference, which makes it difficult to work the zinc. Special care must be taken to prevent too much mercury being deposited on the zinc by leaving it in the solution too long. The exact quantity can only be determined by experiments that are simple and easily carried out

When one metal is deposited on another by the galvanic current, we cannot speak of them as alloys if they are inseparable, for they are only held together by adhesion. Hence there can be no change in the characters of the two metals; neither a harder nor a more brittle product results from electroplating. If the latter is observed even in a slight degree, it is easy to conclude that there is mercury in it.

Pure zinc has a different action on nickel solutions from amalgamated zinc. The former soon turns yellow and brown, and the deposit can be rubbed off with a piece of paper. If a feeble current is employed this chemical action preponderates, and hence we obtain a poor deposit. If the current is very strong, the zinc will be more rapidly coated with nickel by electrical action than it would by the chemical action of zinc on the solution, and a good deposit can be obtained. It is only by observing these precautions that it is possible to nickel plate zinc directly, and yet this is frequently inconvenient. If amalgamated zinc is dipped into a nickel solution, after a long time feeble action will begin. The mercury, although there is so little of it, protects the zinc against the action of the liquid, like zinc in its alloys with copper, brass, etc., is protected against the attacks of different liquids, copper sulphate, sulphuric acid, etc. Yet in all these cases the protection is incomplete; after a while a slight action is observed. In nickel plating zinc, slight amalgamation will suffice to secure a good deposit with a feeble current.

It has been observed that some kinds of German silver take nickel badly; previous amalgamation may, perhaps, be an advantage here, too.—*Badische Gewerbe Zeitung.*

Coloring Amber.

For coloring amber it is necessary to find a liquid in which the amber can be heated, and this liquid must fulfill, says Prof. Ed. Hanausek, the following conditions. Its boiling point must lie above 150° C. (302° Fahr.), and it is better if it boils above 200° (392° Fahr.). The amber must not be attacked by the hot liquid nor must its physical characters be changed. The liquid must be able to dissolve dyes and not decompose them, or at least not rapidly. It should also be mentioned that the dyestuffs employed must not decompose at 150° or 200° C. Many of the fatty or essential oils, and also solid fats and hydrocarbons which melt below 150°, may fulfill these conditions. The attempt to impart different shades of color to amber were made with linseed oil. The following pigments dissolve in it without being entirely decomposed at 200° C., viz., dragon's blood, alizarine, purpurine, and indigo. Of the aniline colors, fuchsin, aniline violet, methyl green, and alkali blue, all refuse to dissolve in pure linseed oil. In carrying out the experiment a weighed quantity was stirred into linseed oil, and the piece of amber to be colored suspended therein, and slowly heated to 190° or 200° C. The liquid was then kept for some minutes at the temperature of 180° or 200°, after which the source of heat was removed and the hot liquid allowed to cool gradually. After taking the amber out of the oil and cleansing it, it was found to be dyed.

Different colors can be obtained with the above mentioned dyes, and various shades can be produced according to the relative proportions of dye and oil.

A light or dark reddish brown can be made with dragon's blood, bright yellow with alizarine, an orange yellow with purpurine, light or dark green, dark blue, and black from indigo. The proportions of indigo that must be taken to obtain the shades mentioned are given as follows: For light green, one-fourth of a part of indigo to a hundred parts of oil; for dark green, half a part to a hundred; for dark blue, one part of indigo to a hundred; and finally for black, four or five parts of indigo to a hundred of oil; on heating the oil, the indigo dissolves in it and imparts to it a very beautiful reddish purple.

By frequently heating these mixtures to 200° C., both the indigo and the linseed oil suffer some change. The oil gets thicker and turns brown, and when heated it no longer assumes such a fine purple color. A mixture that has undergone this change from heating, colors amber brownish; hence when it is desired to obtain pure shades of green and blue, it is necessary to frequently change the dye baths or renew them. In dyeing black this is not so necessary, yet it has also been observed that in this case, too, the operation succeeds better by using fresh dye baths, or at least adding a little unused indigo to the bath after each heating. In dyeing black it is not necessary to suspend the amber in the liquid, for it is colored more quickly when it lies on the bottom in immediate contact with any undissolved indigo.

If finely pulverized asphalt is put in linseed oil, and the oil heated until it almost boils, a portion of the asphalt will dissolve, forming a brownish liquid and have a distinct green fluorescence. Amber that has been heated in this liquid for a long time to 200° C. acquires a brownish color and has a slight greenish fluorescence. This fluorescence is, however, much more distinct and striking if the amber is subsequently heated in a mixture of one part of indigo in a thousand of oil.

Asphalt is not the only substance that can be employed to impart this fluorescence to amber, as all hydrocarbons which are fluorescent themselves can impart this quality to amber.

Coloring amber is of practical interest in as far as it is a fact that this crude material can have the color changed in every way.

If it is found possible to give to any amber the color and shade of the finest quality, great results may be expected. Moreover, the method of dyeing low priced amber is so simple, that it can very easily be changed to black amber, for example, which is capable of being used for certain purposes.

Rendering amber fluorescent may be of considerable importance.—*Neueste Erfindungen und Erfahrungen.*

The New English Patent Law.

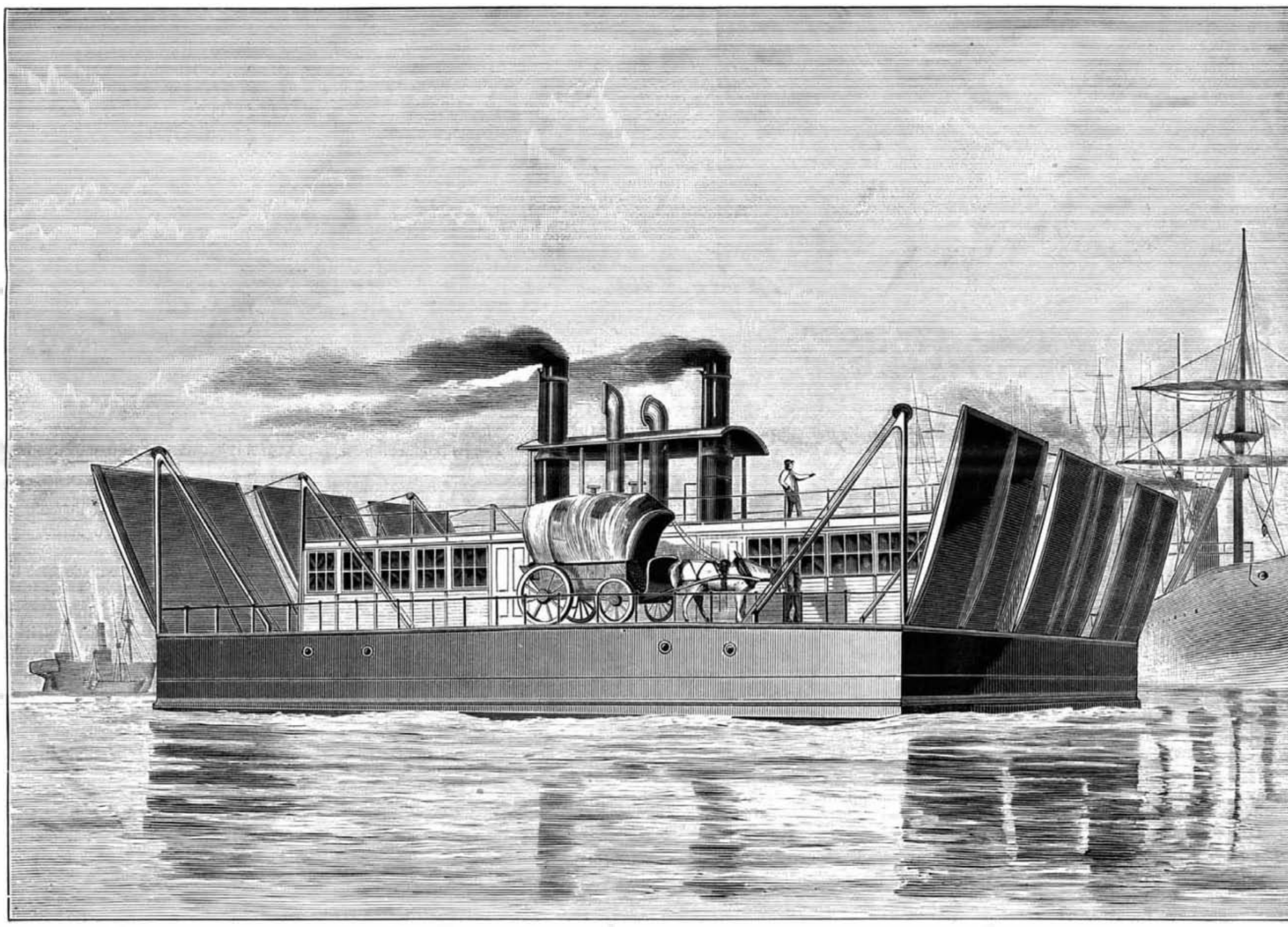
Writing upon the subject of the Patent Act, Mr. James J. Aston, Q.C.—perhaps the best legal authority on the matter—expresses the opinion that inventors have much cause to be grateful to the Government for passing the new act. Mr. Aston draws particular attention to one feature of the new law which has hitherto escaped notice, and which, in his opinion, constitutes an important benefit for inventors. Under the existing law a patent is granted upon the "express condition" that the nature of the invention, and in what manner the same is to be performed, shall have been described and ascertained by the inventor in his complete specification. This regulation throws the burden of proof upon the inventor, who has frequently been surprised to find that a description which he may have drawn up to the best of his ability has been held to be insufficient by the courts. Where this is the case the patent is voided. Under the new act, however, this condition is altogether omitted from the patent as draughted, and the complete specification will be filed before the granting of the patent, and will be approved by a competent officer before it is accepted and published. The new patent will further recite "that the inventor hath, by and in his complete specification, particularly described the nature of his invention." Hence it would seem to follow, as Mr. Aston says, that the official acceptance of the specification carries the guarantee of its sufficiency; wherefore, in future, patents granted in the prescribed form cannot be rendered void on this account. Mr. Aston writes in this case as an inventor; and, as such, he feels thankful for and greatly relieved by this change. Thus it would appear that the modified kind of inspection hereafter to be performed by the officials will be a greater protection to the inventor than was expected. We are not aware that Mr. Aston ever asked for an official guarantee of novelty, as did some fervid admirers of inventive genius; but protection against loss by inadvertence or ignorance of the necessities of accurate description is not too much to ask of the Patent Office. It must not be forgotten, however, that this conclusion is only the opinion of one lawyer (although an experienced one), and awaits confirmation by the court which first decides a disputed case of the nature indicated.—*Journal of Gas Lighting.*

Nearsightedness.

The points which should be insisted upon for the prevention of myopia, or for its arrest when it has commenced, are the following: 1. Work should always be done in a good light, and so far as may be possible by daylight; hence late hours, reading in bed, by twilight, and by firelight, should be discountenanced. 2. The type of the books in common use should be good. If two editions are printed, one with large and the other with small type, the former should be chosen. A few chapters may be detached and bound separately, so as to make a light book, easily held in the hand. 3. In order that the head may be kept up and the child prevented from poring over his books, a raised desk and a form well adapted to his height should be provided. 4. The hours of work should be moderate; none should be done before breakfast. School hours should not be longer than from nine till twelve and from two till four, with perhaps an hour in the evening for preparation. 5. Active out door games—lawn tennis, fives, football, and cricket—should be encouraged. 6. The diet should be abundant and varied. 7. The bowels should be kept in order, and constipation avoided. 8. Appropriate glasses should be provided for viewing distant objects, and especially for following instruction on the blackboard, which many children wholly lose; but if the selection of glasses is not placed in the hands of an ophthalmic surgeon, it will be well to remember that in moderate myopia no glasses are required for near work, and that the feeblest glasses which give good vision for distance should be used.—*Henry Power, M.D.*

AN AUSTRALIAN STEAM FERRY BOAT.

The increase of traffic between the north and south banks of the Yarra, at Melbourne, has now assumed such dimensions that the ordinary convenience afforded by the Falls bridge and the several ferry boats is entirely inadequate. From time to time the Harbor Trust has been urged to establish a steam ferry, and it now appears probable that the much needed reform will be accomplished. At the foot of Spencer Street men are now engaged cutting out a miniature dock, from which the ferry will start, and on the other side of the river a similar excavation is in progress. The ferry, which will be square, both stem and stern, will be driven by powerful machinery, and will be of such beam that several loaded carts and wagons, irrespective of passengers, can be conveyed at once. The arrangements for entering and debarking will be such that horses will have no more difficulty than in crossing a bridge, and a wonderful convenience will thus be afforded to the public.—*Illustrated Adelaide News.*



STEAM FERRY AT SPENCER STREET, MELBOURNE, AUSTRALIA.

New Metallurgical Discovery.

At a recent meeting of the British Association, Professor Chandler Roberts described some most suggestive experiments on the mobility of gold and silver in molten lead. Graham first ascertained the rate of diffusion of salts in solution; Dr. Guthrie has recently studied the diffusion in alloys; and Professor Roberts is now testing metals at temperatures above their melting points. If a lump of a gold-lead alloy with 30 per cent of gold, covered with lead, is heated in a crucible, the gold appears at the surface the very moment when perfect fusion has been attained; the diffusion also takes place rapidly if the gold alloy is put in a small crucible, and this one placed within another crucible containing lead. By melting in a cylinder, 200 millimeters high, a solid cylinder of lead with a small piece of the gold alloy fused to its bottom, or, better still, by placing the gold at the top of one limb of a U-shaped crucible, withdrawing test portions from the top end of the other limb, Mr. Chandler Roberts arrived at the diffusion rate, 300 millimeters in five minutes for silver, this rate being probably a little higher than that of gold.

Sir William Thomson characterized this as a great discovery. The rate of diffusion of gold in lead, he said, appeared to be immensely greater than the rate of diffusion of liquids. The fact was, it was a subject of which we understood very little indeed, but which would probably prove of great value in metallurgy, where one example of it, the rapid mixture of spiegeleisen with iron, was well known. If the experiments were repeated with salt and water substituted for the gold and lead, it would take years, twenty years at least, to produce the result now attained in forty minutes, and which took place not much less rapidly than the diffusion of oxygen through hydrogen, or the transmission of heat through iron.

Bone Black Superphosphate

Prof. F. Farsky's conclusions are that superphosphate goes back in the soil the more rapidly the more calcium carbonate is present. The more water circulates in the soil, the less is the reversion. Superphosphate of a coarse texture is less liable to reversion than that of a fine grain. As most seeds complete their germination in the soil in seven to fourteen days, it appears that in lime soils plants obtain the phosphoric acid of their nourishment chiefly, if not entirely, from the calcium phosphate soluble in ammonium citrate. In an experimental field fine grained superphosphate gave a less advantageous result than coarser qualities. Kladno phosphate gave in three cases a better result than superphosphate, except with potatoes. Precipitated phosphate did not act as well as the other phosphates.—*Biedermann's Centrablatt.*

The Dimensions of Atoms.

In a recent lecture at the Royal Institution, by Sir William Thomson, on the size of atoms, the speaker, through a series of learned considerations which cannot be given here, reached the following conclusions: It is very probable that in an ordinary liquid, or a transparent or semi-opaque solid body, the mean distance between the centers of two contiguous molecules is less than one five-millionth of a centimeter and more than one-billionth of a centimeter. To obtain an idea of the grain and of the corresponding relative sizes, let us imagine a globe of glass or of water of the size of a croquet ball (16 centimeters in diameter), and let us increase it in imagination until it becomes as large as the earth, each molecule being increased in the same proportion. Then the structure of this mass thus increased would be more granular than that of a pile of musket balls, but certainly less so than that of a pile of croquet balls.—*La Nature.*