THE PRICKLY COMFREY.

Our illustrations represent a plant now much recommended, by the French scientific journals, to farmers, as yielding large quantities of excellent forage. It is known as the prickly comfrey, its botanical name being *symphytum asperrimum*. With regard to the rapidity of growth and amount of herbage yielded by it, the *Journal de l'Agriculture de la France*, of October 7 last, says: "Two sets put late into the ground in the month of May, in a fairly deep soil but of poor quality, gave on September 29, the one 7,150 lbs. forage, and the second 3,850 lbs. The height of each plant was 15 inches, diameter 32 inches. The appearance was that of the small engraving, Fig. 2, which was drawn from nature at the Botanical Gardens, Kew, in England. Two cows, to which we offered the leaves freshly cut, ate them at once, in spite of their roughness. The quantity of water is 88 per cent, and the proportion of nitrogen 0.4 per cent in the green state, or about the same as in green Indian corn. The total of nitrogenous substances is about one third, a remarkable richness, justifying the high opinion cultivators who have tried it have formed of the plant. The sets we experimented on were sent us by M. A. E. Ragou."

The *Journal d'Agriculture Progressive* says: "We persist in recommending this plant, chiefly for small and middle farming; those who farm on a large scale will probably adopt it all in good time. The price of the plant is high; but we must not forget that a thousand plants will yield from fifteen to twenty thousand the year following, and that the planting of these sets, the original price deducted, does not cost more than pricking out cabbages, and less than does planting potatoes."

The following letter, dated October 30, from Culloor, in Malabar, Madras Presidency of British India, was received by *Land and Water*, from the pages of which we select the engraving:

"Thus far I am glad to be able to report most favorably on the progress of the comfrey roots I brought out with me here for the Tambracherry Coffee Estates Company. I have had them planted on a low, marshy soil, in ridges three feet apart, taking care previously to have the soil broken up two feet deep, and at subsoil of the ridges making a good coating of cattle manure mixed with jungle soil. By this cultivation the roots will not only have considerable depth of soil to grow in; but in the event of having a dry season, the manure, being placed at a fair depth under the top soil, will tend to make it moist for a very considerable time. I was greatly surprised at the quick germinating qualities of these roots, which, in several instances, had not been planted more than forty-eight hours at about three to four inches below the surface, and had appeared in that time one inch above the surface. I also found, after a voyage of six weeks from England, on opening the case, that the roots had germinated a little. The comfrey has now been planted about ten days, and promises well. I only hope our cattle will take to it here, as, being so quick in growth, it will be invaluable, in my opinion, here on coffee estates as a standard food for cattle: grasses being often difficult to obtain

during some seasons of the year. I shall advocate its trial to my agricultural friends in England. I am surprised it is not more generally grown. To a dairy farmer it would be an acquisition. I confidently expect to get here a crop every two months, if not more frequently."

Sand and Water.

An important point in the selection of materials is to procure a pure silicious sand for mixing with cement or lime to form mortar. The sand used should be free from all nitrogenous, and some saline matters, such as alkaline chlorides; if not, these matters are liable to undergo a chemical change, after being mixed with the lime and cement, and so cause a rupture of the work even after it has set. For cementing purposes, for mixing with cement, a sharp sand is undoubtedly the best. It would be a saving of cementing material to select sands of various degrees of fineness so as to reduce the interstitial space as much as possible. Pure silicious sand forms, in combination with the limes, a silicate of lime which augments the strength, especially in those parts excluded from the air, as the interior of thick walls. Sand acts as

SYMPHYTUM ASPERRIMUM.

a dilutant for cement, so that its approximate strength, within certain limits, may be arrived at by knowing the proportions of sand used.

With regard to the selection of water, either fresh or sea water may be used for mixing with Portland cement. It has been shown by Mr. J. Grant, C. E., that the use of sea water augments the strength of Portland cement. This may be due to certain combinations taken place between some of the salts in sea water and the cement; on the other hand, the excess of certain salts will undoubtedly injure the cement. Sewage water, for example, should on no account be used in compounding mortar. The author has seen cases in which the best materials, both as regards cement and sand, have been used; but when mixed with sewage water the cement has never properly set, while the same cement, in the same work, compounded with pure water, has set rapidly and well. Care should also be taken in the mixing of cement that too great a proportion of water is not used. The smaller the quantity of water used in the compounding of cement, the better it will be found to be. The volume of water to be used, therefore, should only be sufficient to bring the mortar into a thick paste. Where more water is requisite, it is a sign that the bricks or other materials which are used in the construction of the works have not been sufficiently soaked, and that the mortar is robbed of its moisture, by reason of the inattention paid to this important point.—*Engineering News*.

A Sinking Island.

The Island of Heligoland is reported to be gradually disappearing. It is now, says *Iron*, less than a mile in superficial extent; but in 1649 it was four miles in circumference, in 1,300 forty-five miles, and, in 800, a hundred and twenty miles. The encroachment of the sea is effected almost entirely from the northeast, owing to the set of the currents and the direction of the prevailing winds.

IN painting woodwork, a priming coat followed by a dark coat, such as chocolate or purple brown, and finished off with a coat of common varnish, is cheaper than, and as durable as, four coats of common color; it looks better, is more rapidly executed, and stands washing well.

A MIXTURE of 96 parts salt, 20 parts caustic soda, 1 part extract of oak bark, and 4 parts potash, is recommended as a preventive of incrustation in boilers.

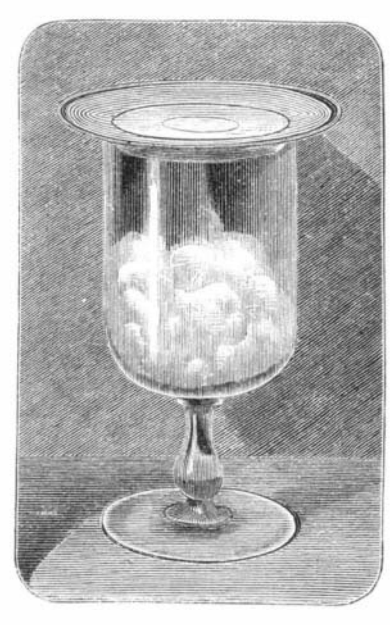
A Few Modest Hints.

Although the depression in the iron trade, says the *American Manufacturer*, is very great, and almost universal, the manufacturers of agricultural implements and hardware, as well as certain other lines of goods, are doing a good business. Especially is this the case in the West. The activity in the farming implement branch is doubtless due to the fact that the tillers of the soil have enjoyed a succession of years of prosperity, and that existing in the hardware branch of manufacture is attributable, no doubt, to the fact that this business is not overdone, as is the case with many other branches, and to the further fact that American hardware is crowding the foreign into narrower limits, not only in this country but in many foreign markets. There is in this a lesson that manufacturers would do well to heed. It shows that if the demand for some manufactures is less than the productive capacity of the works, for other productions it is not. Indeed, the import figures furnished by the Bureau of Statistics show that for many kinds of goods which could be produced with advantage in this country the production is either *nil* or totally inadequate to the demand. So long as this is the case capitalists ought not to complain that there is no use for their money.

What is needed is diversity. There should be a branching out into the manufacture of the finer grades of goods. When one looks over the long list of imports and notes how many might be profitably produced at home, he is struck with amazement. The production of iron rails, of many forms of merchant iron, of certain kinds of glass goods, etc., has outgrown the demand; but is this a good reason for allowing the works at which these are made to stand idle or go to decay? Why not use the buildings, the power, as much of the machinery and as many of the employees as possible in producing articles for which there is a paying demand? Let the owners of such works look over the list of our imports and see if there are not many things which they could produce without making any costly changes in their plan; and let capitalists ascertain in the same way if there is not room for the profitable employment of their money in erecting and operating new works for the production of goods not now made in this country. This would be more enterprising at least, and we hope more profitable, than waiting, Micawber-like, for something to turn up. Our English cousins set us a good example in this respect. When one branch of business becomes overgrown, they adapt their works for the production of something for which there is a better demand. Is the iron rail business overdone? then they make the necessary changes for the production of steel rails. Is the pig iron of the vicinity unsuited to this? then they put their experts to work to see if an iron rail cannot be made that will compete strongly with steel rails. Their boldness and energy in opening foreign markets are also worthy of emulation.

CHEMICAL MAGIC.

A subscriber to *La Nature* communicates to that journal a simple trick, which is as deceptive as many of those per-



formed by professional "magicians." It is proposed to place the fumes of a cigarette, smoked by the operator at some distance, in a closed goblet, as shown in our engraving. The goblet is to all appearance empty, and the phenomenon of the white smoke wreaths inexplicable. But the vapors are formed by the admixture of muriatic acid and aqua ammonia, two or three drops of the former being put in the goblet, and the covering saucer being wet underneath with the latter. The quantity of the liquids is so small as to pass unperceived; but as soon as the saucer is placed on the goblet, white vapors of muriate of ammonia are formed, which closely resemble tobacco smoke.

The Analysis of the Diamond.

The great French chemist Lavoisier undertook the examination of the diamond, and it is worth while noticing how carefully he went to work, how he proceeded slowly from one step to another in logical sequence, until he arrived at the true solution of the question he had undertaken to investigate: that is, until he was able to tell us exactly what happens when the diamond evaporates in the free fire, and why it did not do so when surrounded by charcoal. In the first place, he evaporated the diamond by means of the burning glass, and he observed that no visible vapor or smoke was given off, but that the diamond disappeared. He thought that perhaps the solid diamond had in some way been dissolved by the water, and that by evaporating the water, which was in the lower part of the bell jar in which he burnt his diamond, he might obtain the constituents of the diamond in a solid form; but he found that no solid residue was left on evaporation, and thus no trace of the diamond could be found. His next experiment was that of placing a diamond in the focus of a less powerful lens than the one he had formerly used, so that the diamond was not heated to so high a temperature as before, again placing it, however, in a bell jar over water. He then found that the diamond, when not heated quite so strongly, lost only about one quarter of its weight; it did not disappear altogether, but the remarkable fact was noticed that it became covered with a black substance which Lavoisier describes as being exactly like lampblack or soot, so that it dirtied the fingers when touched, and made a black mark upon paper. Hence Lavoisier concluded that the diamond is susceptible of being brought under certain circumstances into the condition of charcoal, so that it really belongs to the class of combustible bodies. He was, however, yet far from having proved this point, and he went on experimenting. He next measured the volume of air in which he was going to burn the diamond, and found it to be eight cubic inches. Then he burned the diamond in this volume of air by means of a lens, and found that the air had diminished to a volume of six cubic inches: thus showing that the air had undergone some change by the combustion of the diamond, and that two out of the eight volumes of air had disappeared. The next experiment he made was to examine the condition of the air in which the diamond had been evaporated. What changes had gone on in the air in consequence of the evaporation of the diamond? After allowing the glass in which he had burned the diamond to stand for four days, he poured clear lime water into the jar in which the diamond had been evaporated, and he says this lime water was at once precipitated in the same manner as if it had been brought into contact with the gas evolved in effervescence and fermentation, or that given off in cases of metallic reduction. Here, then, he had got on the track of what he wanted. Hitherto the diamond had apparently disappeared, and nothing was found to account for its disappearance; but now he had found that there was something contained in the air in which the diamond was burned which was not contained in that air before.

The next step he took was to examine the white precipitate or powder which was formed, and he found that the substance thus precipitated from lime water, by the air in which the diamond had been evaporated, effervesced on treatment with acid, and evolved what was then known as *fixed air*, but which we now know as carbonic acid gas. Here, then, in his last experiment he completes his proof, showing that exactly the same effects are observed when charcoal is experimented upon instead of diamond. Lavoisier had now run his quarry to earth; he had determined exactly what it is that is formed when a diamond is burned. He has shown that a diamond when burned produces exactly the same substance that is produced when common charcoal is burned, and he, therefore, legitimately concludes that diamond is only another form of the element carbon. The reason that the diamond did not burn in the furnace when surrounded by a mass of charcoal was that the air, or rather the oxygen of the air, could not get to the diamond, because it was kept off by the charcoal, which burned instead of the diamond.—*Professor Roscoe.*

The Avoidance of Colds.

This is the season when coughs and colds are most frequent, and when by lack of proper care slight attacks often increase to serious ailments. The following sound suggestions by Dr. Dobell, in his excellent work on "Coughs, Consumption, and Diet in Disease"* are therefore of timely importance:

"But 72 per cent," says the writer, "of the cases of winter cough, which I have analyzed, might probably have been prevented by attention to commonplace things. Let us then give a few minutes to their consideration. 1. Sudden changes of temperature.

"This is the most difficult to avoid of any on the list. The occupations and amusements of all classes involve such changes, and we cannot stop these occupations and amusements, even were it desirable to do so. But very much could be done to prevent the body from feeling these changes. The first and most important is the complete envelopment of the body and limbs in wool next the skin, thus interposing a bad conductor of heat between the surface of the body and the outer air. It is surprising that even in the present day this simple and common sense protection is neglected by so large a number of persons, both of the educated and of the uneducated classes. It is not sufficient for the purpose in view that a little body vest should be worn, just big enough to cover the thorax and abdomen, leaving all the extremities unprotected. It should be insisted upon by medical men that the arms and legs require to be protected from the sudden transitions of temperature, as well as the trunk.

"The main source of protection, then, against sudden changes of temperature to the surface of the body, is to be found in a complete covering of wool next the skin. But, besides this, a much greater attention than is common should be paid to putting on and taking off complete and efficient overclothing, on going from hot to cold and from cold to hot temperatures. This is particularly neglected by the working classes, and by girls and boys at schools.

"What I have said with regard to sudden changes of temperature will apply equally to two other causes of fresh colds, namely, draughts of cold air, and cold winds. Both are to be deprived of their sting by proper clothing of the skin and mucous orifices.

"Getting wet, and wet feet, occupy a very serious place in our list; and there is no doubt that damp and cold applied to the general surface is the most efficient means of producing chill and vital depression, with congestion of the internal organs. It is necessary that cold be combined with moisture to produce this effect. Even if all the clothes on the body are wet, no harm will come so long as they are kept warm; and this suggests the very great value, to all persons liable to exposure to wet, of light waterproof overalls. They may either be put on to keep the under clothing dry; or if the under clothing has become wet, either by weather or by perspiration, they may be put on to prevent too rapid evaporation and consequent reduction of temperature, especially when the person is about to remain still after getting warm with exercise. In this variable climate, therefore, schoolgirls, governesses, shop and factory girls, and all women whose occupations call upon them to brave the weather, ought to carry with them complete waterproof mantles, made as light as possible, but extending from the neck to the ankles, which can be put on or not as required; and boys and men, similarly exposed, should carry waterproof overalls.

"But if wet and cold to the surface of the body is a fruitful source of catarrh, wet feet—which means wet and cold feet—is a still more prolific source. There is no external influence which so surely produces congestion of the naso-pulmonary mucous membrane as wet and cold to the soles of the feet. There is nothing so universally neglected, and yet there is nothing more easy to avoid. Warm socks, horsehair soles, goloshes, provide efficient protection against wet and cold feet. It does not seem to be half enough understood that, although a shoe or boot may not be wet through, if the sole is damp it will by evaporation most effectually conduct away the heat from the sole of the foot, and therefore ought never to be worn after exercise is over.

"We have still one item left on our list—namely, fogs and damp air. I have particularly remarked, that although the smoke and other irritating matters constituting fog are unquestionably very injurious, it is the moisture and cold of the fog which are the qualities most potent for mischief to the naso-pulmonary mucous tract. There is but one means of depriving a fog or mist of its injurious properties, and that is a respirator; and the same may be said of the changes of temperature, of which I spoke just now; a respirator is the only means of protecting the respiratory passages from the effects of transitions of temperature. It would be difficult to over-estimate the value of efficient respirators, as a means of protection against naso-pulmonary catarrhs, if persons disposed to these affections would only carry respirators about with them in their pockets, ready to put on if required at a moment's notice.

"Although it is quite proper to cover the neck lightly, I am decidedly of opinion that warm wrappers round the neck are objectionable; they produce congestion of the nasal and faucial mucous membrane, and thus dispose to the very complaints they are supposed to prevent. On what possible grounds people justify the sudden transition from a hot sitting room to a wretchedly cold bed room, which may not have had a fire in it for weeks or months, it is impossible to say; but it is quite certain that the absurd neglect of proper warming in bed rooms is a fruitful source of all forms of catarrh. We cannot too much impress this upon our patients. It may often be almost as necessary for a delicate person to put on a respirator on going up to bed as when going out of doors, unless proper precautions are taken to assimilate the temperature of the sleeping room with that of the sitting room.

"Such, then, are the principal means by which I would attempt to defeat the fickleness of climate. They all assume that the patient suffering from winter cough is to lead an active and an out-of-door life—not to be confined to his bed room, or his sitting room, or even to his house."

*Published by D. G. Brinton, 115 South Seventh street, Philadelphia.

American Beef in England.

A correspondent of one of the English journals writes as follows in regard to the American beef recently received in London and other cities:

"A novel feature at this year's market was the introduction of American cattle, and the American breeders are to be congratulated on the result of their initial effort. Their consignments were none the worse for their long journey, and we doubt not the experiment will be followed up in future years to a far larger extent, and with even greater success. * * * There is a sudden rage for American beef. A little while ago, when the weather was bad, American beef was selling at two cents a pound at Smithfield, and from ten cents to fourteen cents a pound at Birmingham. To-day I hear it has risen to the same price as English beef, and a well known West End butcher, whose customers are almost exclusively aristocratic, has purchased no beef but American. This looks as if Brother Jonathan were going to beat Brother John out of the field. If it has the effect of lowering the price of English beef I shall not grumble; but if fashion is going to run it up to the price of a luxury, I don't know that we shall be much better off after all."

[For the Scientific American.]

CHEMICAL PROGRESS IN 1876.

ORGANIC CHEMISTRY.

The immense field which organic chemistry opens for investigation is being assiduously tilled by a small army of chemists. It is, indeed, a tempting one, for the possibilities are great; in fact, nothing in it seems impossible of accomplishment. The number of possible compounds is infinite, and centuries will not exhaust the field of experiment. Synthetical chemistry is, perhaps, the most fascinating. The strides that it has taken since Wohler first prepared urea, and broke down that imaginary barrier, the idea that life was essential to the production of organic bodies, almost surpasses belief. At the Centennial Exhibition were exhibited many substances only recently obtained by synthesis and yet articles of commerce. About two years ago we heard with some distrust that the flavoring matter of the vanilla bean had been made from the sap of the pine tree; now it is a commercial article, cheaper if not better than the natural. Recently, other methods of preparing it have been devised, totally unlike that first discovered, and from different material. We refer to its preparation by Reimer from wood tar creosote, and from eugenol or eugenic acid (found in oil of cloves) by Erlenmeyer. Tiemann, the original discoverer of artificial vanillin, has made important contributions to our knowledge of the subject, having devised methods for the estimation of vanillin, determined the other constituents of vanilla beans, and made ethyl-vanillin, vanillic alcohol, coniferyl alcohol, and other compounds.

Another interesting case of synthesis is that of bitter almond oil, made from toluol by first subjecting it to the action of chlorine, when benzyl-chloride is produced, and then acting upon that with dilute nitric acid or nitrate of lead. Lippmann and Hawliczek, of Vienna, have recently subjected this artificial oil of bitter almonds to a series of careful tests, both chemical and physical, and proved its perfect identity in every particular, even in vapor density, with the genuine oil.

Phenol or carbolic acid continues to be the subject of numerous experiments; and Reimer and Tiemann have found that it may be converted into salicylic acid by heating its alkaline solution with tetrachloride of carbon. Para-oxybenzoic acid is produced at the same time. Kupferberg has succeeded in converting the last named acid into salicylic acid.

New methods of preparing alcohols and vegetable acids have been devised, and are curious from a theoretical point of view. Many attempts have been made to prepare the costly alkaloids, but as yet unsuccessfully, although in some cases these efforts have led to other discoveries of great importance.

The synthesis of indigo blue has been equally unsuccessful; the only method of its artificial production produces but a trace of it when the utmost care is expended upon it. The number of new dyestuffs is legion, and is daily increasing, so that none but a dye chemist may hope to keep up with the latest improvements in this direction. Coal tar products are the chief source of these dyes; but new dyes are occasionally produced from other materials, such as the sulphuretted organic dyes of Croissant and Bretonnière; and even ultramarine has come in for a fair share of attention. Eosine, one of the latest and most beautiful of the coal tar colors, has been the source of repeated experiments. R. Wagner has devised a method of detecting it on dyed fabrics by means of collodion; Waterhouse has investigated its photographic action, by mixing it with collodion, as Vogel had done with some other dyes. He found such collodion very sensitive to yellow and green; but on exposing it in the camera, the time of exposure was increased threefold. Bindschedler and Busch state that Egli's method of making eosine by forming benzene-disulphonic acid, and then hydroxylating the compound, works well in practice. In all literature published on this subject, unfortunately, the most interesting details are carefully concealed, probably as trade secrets. The first step in the operation, says Durand, is to conduct benzol vapors into hot and concentrated sulphuric acid. The benzene-disulphonic acid formed is next converted into a lime salt, then into a soda salt, which is converted into resorcin by fusion with caustic soda. The resorcin is purified, and then fused with phthalic acid, which produces the fluorescene. To convert this into dibrom-fluorescene is the most difficult part of the operation; and it is on this point that we are left in the dark.

Aurantia is the name given to a new artificial dyestuff, which readily imparts to silk and wool a beautiful shade of orange. According to R. Gnehm, this dye is the ammonia salt of an acid discovered and named by him hexa-nitrophenylamin. It possesses the remarkable and unfortunate property of irritating the skin of persons using it, causing an