### WHAT IS FOUND IN THE AIR.

From the Scientific Review.

Quite as much might be written upon the composition of the air we breathe as upon that of the water we drink. But it happens that muddy water is more visible than dirty air, and generally attracts more attention, though in reality foul air is far more injurious to man than foul water, for the latter comes first of all in contact with the digestive organs, which have the power of repelling, to a certain extent, any noxious or poisonous ingredient, whilst impure air is, on the contrary, intimately mixed up with the blood at every inspiration, and introduced at once into the system by thousands of minute blood vessels.

The refined chemical processes that have been brought to bear upon the analysis of water, and have proved so useful in a sanitary point of view, have been no less successful with regard to the atmosphere. By washing or filtering large volumes of air, we find, besides the gases oxygen, nitrogen, and a considerable amount of organic matter, germs and spores of fungi, certain acids, ozone, nitric acid, ammonia, and several other substances may be detected in greater or less quantities, according to the localities, the season of the year, the direction of the wind, the proximity of the sea, etc. Arago and De Fonvielle have written upon the sulphur which lightning finds in air and deposits upon the objects which it strikes; Baron Liebig and Lassaigne have found nitrates and ammonia in the air, which are washed down by thunder storms. Professor Barral has noticed that phosphate of lime is likewise present to a certain extent in the atmosphere, and Dr. Phipson, in its curious little work on meteors, describes an experiment in which a sheet of glass covered with glycerin, and exposed to the wind after the great fall of shooting stars in November, 1866, collected certain black corpuscles, which, on being treated with hydrochloric acid, gave yellow chloride of iron, and were, probably, some of the substance of shooting stars.

The passing of the alkali act of 1863, which compels manufacturers to consume 95 per cent of the hydrochloric gas evolved from the sulphate of soda furnaces, has gone far to purify the air of large manufacturing towns, and to protect the vegetation that exists around them, and contributes pure oxygen to their atmosphere. The reports published by Dr. Angus Smith on the operation of this Act show that its beneficial effects continue. The last report, recently issued, contains the results of some interesting observations on the air of cities, and gives some notion of the ordinary state of the atmosphere of towns.

The refinements of modern science are enabling us to grasp a class of facts hitherto unknown except by the effects which they produce. The air seems now to be undergoing an investigation similar to that which was commenced some years ago in regard to the water supply. "Horrors" hitherto unknown burst upon mankind when the microscope revealed the animal organisms which reveled in the polluted water of the Thames. More recently science has been able to detect not merely the signs of actual and present contamination, but the tokens of a previous pollution. Hence, the analytical chemist is able to give us the history as well as the character of the water we drink, and can tell whether in its course down the stream it has at any time been in contact with decomposing animal matter. The question is not merely curious, but of great sanitary value, since there is reason to believe that sewage sometimes gives to water a species of poison which remains even when the sewage itself is destroyed. Something of the same kind is now being revealed in regard to the atmosphere. By examining rain we are enabled to discover what are the gases and substances which float in the air. When there is no rain it is possible to wash the air in bottles, and so make it yield the foreign matters with which it is impregnated.

Rain varies greatly in its character according to the source from whence it proceeds, and the locality where it falls. Falling on the coast, and coming from the sea, it contains chiefly common salt, which crystallizes readily. The proportion of sulphates to chlorides is larger in rain than in sea water. This is a general rule, holding good from Central Germany to the most northern Hebrides, and, as we advance inland the rain-water sulphates increase. These sulphates are derived from the sulphureted hydrogen, which otherwise would be intolerable, and which is given off by decomposing matter. The pure oxygen of the air combines with the stinking gas, oxidizes it, and makes it harmless, so far as the gas itself is concerned

Just as the nitrates in the water supply of London are a measure of the "previous sewage contamination" of that fluid, so the sulphates washed out of the air by rain are a measure of a similar contamination affecting the atmosphere. There is, indeed, a disturbing cause in reference to air. The sulphates are largely increased in the atmosphere of towns by the combustion of coal. From the same cause, coupled with the decomposition of certain substances, there is an increase of the ammoniacal salts in the rain as towns increase. Rain may also become acid from the presence of sulphur, combined with oxygen. Towns vary in their atmosphere and their rain. Civilization not only pollutes rivers, but pollutes likewise the ærial currents. The rain of Manchester turns the blue litmus paper red, and where most soot is found there is much acidity. Sulphuric acid exists as the result of a large consumption of coal. Rain coming after a period of drought is particularly rich in acid, while continuous rain reduces the quantity.

Even where there are no alkali or glass works there is a certain amount of chlorides in the air in excess of that which the sea contributes. This is rather a puzzling circumstance; but Dr. Angus Smith offers an explanation of it. He suggests that the extra chlorides come from the burning of coal, and have their origin in the common salt of the ancient seas.

But there is much more in the air than acids and salts, and a day will come when the Registrar General will publish monthly analyses of the London air, like the present returns with regard to the water supply.

Tuns of solid impurity may doubtless be found in a month's supply of air to the metropolis. Not long ago an enthusiastic projector proposed to "lay on" fresh air from Hayes Common, in Kent, to be conveyed into metropolitan houses by means of pipes. If ever this idea becomes an accomplished fact it may be proper to analyze the air as "drawn from the company's mains." At present we have to rely on ærial reservoirs in the nature of parks and open spaces, the value of which is undoubted.

Mr. Dancer has studied the character of the solid particles contained in the air of Manchester. Samples of the air were washed by Dr. Angus Smith, and the fluid was afterwards microscopically examined by Mr. Dancer. A single drop of the water was computed to contain no less than a quarter of a million of fungoid spores. The fact was verified by examining an extremely small particle, and multiplying the result. The bottle of water having been kept for thirty-six hours, the quantity of fungi, already so great, "visibly increased," and on the third day minute creatures were observed moving about in the fluid. Keeping, however, to our former figures, we find that 150 drops of water would contain more than 37,000,000 of the fungi, these 150 drops being the washings of 2,495 liters of the air of Manchester, which is about the quantity of air passing through the lungs of a man in ten hours!

The drops of water yielded a kind of dust, which in the space of three or four days produced considerable numbers of animalculæ, in which monads were most conspicuous. In this dust were particles of partially burned wood, fragments of vegetation, filaments of cotton and granules of starch.

Dr. Angus Smith has also experimented on smoke of various degrees of blackness and brownness, and shows that the difficulty of consuming smoke does not commonly arise from a deficiency of air in the furnace, but from the fact that a rapid draft often fails to allow time for proper combustion. It is now certain that the black smoke prohibited by act of Parliament, contains carbonic oxide, one of the most poisonous of gases. Carbonic oxide is only detected in smoke by the illegal density, and when we find this black smoke is really an expensive article to produce, we seem to be furnished wtth every reason why such a nuisance should be prohibited.

But though man and his works tend constantly to render the atmosphere dirty and unfit for life, nature on the other hand tends to counterbalance the evil. The constant production of ozone and nitric acid in the air of the country, the presence of iodine and ammonia and sweet scented essences occasionally met with in our atmosphere, the evolution of oxygen by trees and shrubs, areso many beneficial influences which contribute to purify the air.

### Value of Meteorological Observations.

An instrument which can accomplish the registration of sunshine and cloud would furnish information of the utmost value to agriculture, and some of the most important industrial pursuits of our country. We may illustrate what is here meant by taking one of the most valuable of our farm crops—the hay crop—as our example, though, as will be seen, the remarks apply to all other agricultural products. On a fertile soil the weight of grass that may be produced depends on two conditions—the supply of a sufficiency of rain, and the furnishing a sufficiency of sunlight in the eleven weeks between the middle of April and the last of June. The rain brings into the growing plants the inorganic materials they require from the soil, and of course, furnishes their requisite supply of water; the sunlight forms in them their various organic and nutritive material. Now last year (1868), during the period referred to, there was a copious supply of water, but, owing to prolonged cloudy weather, an insufficient supply of light—the grass was all the time growing, as it were, in the shade. When haymaking came, observing farmers remarked how much longer than they expected it took to cure the grass; that is, to get rid of its water; and how great a falling off there was in the resulting weight of hay. Nor was this all. The diminished quantity of nitrogenized material it contained caused it to be less nutritive; a greater weight of it was required to fatten cattle, or even to keep them in good condition. The effect was felt by those interested in raising animals for sale, and eventually in the quality and cost of butcher's meat.

The object of meteorological observations is to enable us to record the past and predict the future state of the weather, and that the imperfect manner in which this has hitherto been accomplished has been mainly due to the unreliable and unsatisfactory mode in which such observations have been made. When self-recording machinery, such as New York has in her Central Park, shall have been established in all our large cities, the problem of predicting the weather will undoubtedly be solved. One most important agency is, however, essential to this result—it is telegraphic communication between such various observatories. A little consideration will show how this, which is at present a vague conception floating in the popular mind, can be carried into effect. Already telegraphic companies, desirous of aiding the progress of science, send over their lines, without compensation, brief dispatches of the state of the weather and aspect of the sky. They report, for instance, that at St. Louis it is cloudy—at Charleston, the wind is at the north. They also give the hight of the thermometer. But this information is really of little use. What is wanted is a statement of *changes* in the weather, with the time of their beginning and end. Thus, if it were stated that a rain-storm began at Raleigh, North Carolina, at 2 A. M.; that a rain-storm began in Richmond, Virginia, at 11 A. M.; that the same occurrence happened at Washington at 5 P. M., and at Philadelphia at 10 P. M., the inference would be that this was in fact the same rain-storm advancing northeastwardly, and that it would reach New York at about three o'clock on the following morning. In like manner if the time of ending were given at each successive station, its time of ending at others not given might be foretold. If to this information were added the quantity of rain that had fallen in succession at each place, the condition of the storm, as to whether it was on the increase or decrease, could be indicated, and perhaps the point at which it would die out. Now what is here said by way of illustration in the case of rain, applies to wind-storms, tornadoes, periods of great heat, periods of great cold, and other atmospheric phenomena.—*J. W. Draper in Harper's Magazine for August.*

### Establishment of Soap Factories.

The fabrication of soaps requiring substances of different origin, the manufacturer must prefer that locality where the crude materials which furnish the basis of the fabrication are abundant and easy to be obtained. It is thus that a manufactory of soap with olive oil for its base, will be in better condition of success in a seaport, or in its neighborhood, than in an inland city, because the oil being imported, the manufacturers of soap of the other localities would obtain those oils from second hand, with much expense, and could not compete with the manufactories of the seaports.

For the fabrication of the other kinds of soaps, such as those of tallow, greases, animal oils, oleic acid, etc., experience proves that this fabrication succeeds, in general, better in the inland cities, and particularly in the northern than in southern localities. It is then important in the establishment of a soap manufactory, to make products similar to those employed in the locality. For example: a manufacturer of oleic soap will realize fine profits in New York, Philadelphia, Cincinnati, etc., and may experience a loss in New Orleans, and other cities of the south.

As for the other conditions which have to be observed in establishing a manufactory of soap, it must, if possible, be established in a locality where the supplies are convenient, and can be obtained with little expense. It is thus that we see in France, that the principal manufactories of oleic acid soaps surround the manufactories of stearic acid, which furnish them with the oleic acid; they thus save the expenses of transportation. In industry, a useful economy is one of the most essential elements of success.

In regard to the working material, it is about the same in all manufactories; however, there exist some modifications, but these modifications are only in the apparatus used to prepare the lyes. Thus, in all the manufactories where crude soda is employed to prepare the lye, to wash the soda and extract its alkali, they use vats built of masonry, or large cylindrical tanks made of sheet-iron; whilst, if salts of soda or potash are employed, their solution is effected by means of boiling water in cast-iron or sheet-iron kettles. Necessarily, these different methods of operating cause modifications in the apparatus for preparing the lyes.

There exist also some differences in the construction of the frames according to the kind of soap which is manufactured. Thus, at Marseilles, the frames in which the soap is run are always made of stone, while in other localities they are generally of wood. As for the kettles, those of Marseilles are of stone, elsewhere they are of cast iron, sheet iron, or wood. Their shape is generally the same in all manufactories; it is a truncated cone.

The manner of heating is improving every day. Heating by steam is now employed in all large factories.—*Dussauce's Treatise on the Manufacture of Soaps.*

### Watering Streets with Saline Solutions.

Our readers will recollect an article on the above subject published on page 217, Vol. XIX, of the SCIENTIFIC AMERICAN, wherein it was stated that a solution of mixed chlorides of calcium and sodium had been satisfactorily used for this purpose. We now learn that this system is in full and success full operation in Liverpool, with the cordial co-operation of the local authorities. In Liverpool it is found that 75 per cent of the work of water distribution is saved, but probably the most interesting fact elicited, is that in streets watered on this system, sweeping may be practically dispensed with. This is a result worth noting, and we hope something of the kind may be tried in this city. We have no doubt of the efficiency and cheapness of the method, the expense of the salts employed being covered by the saving in cost of sprinkling.

### A Small Engine.

W. I. Trafton of Manchester, N. H., who has already made one miniature steam engine of great delicacy and beauty, is about to construct another. He is to make every part of the engine, with the boiler, from a single silver half-dollar. When done it will be placed under a glass case three-quarters of an inch in diameter and an inch and an eighth in hight. The boiler will hold about 8 drops of water, but one-half that quantity will run it several minutes. It will have all the parts of an engine, and the boiler will have two minute gages. Some of the smaller parts can only be made by the aid of a powerful magnifying glass.

Senator Sprague is said to be the largest employer in the United States. He gives work to about eight thousand persons, and has recently raised their wages fifteen per cent.

### Improved Siding Hook and Combined Tool.

Our engravings exhibit the form and details of W. A. Sharp's combined joiners' tool and siding hook. The form of the tool is distinctly shown in Figs. 1 and 2.

It is made of mahogany, or other suitable wood, and covered on all sides with polished brass plates. It is twelve inches long, two and one half inches wide, and three fourths of an inch thick.

The plates on the front and back sides are graduated to form common foot rules, which are divided into eighths and sixteenths. An adjustable slide, A, Fig. 1, may be set to all widths between three and six inches from the spur, B, and by loosening the set screw which holds it, and reversing its position, it can also be set to all widths between five and eight inches from the spur, C, so that spacing may be done from one or the other spurs for all widths between three and eight inches.

The spurs, B and C, are attached to the screws that fasten the end plates, and a quarter turn of these screws throws them up, in which position they engage, by notches not shown in the engraving, with the brass surface plate and are firmly held in position ; a reverse motion turns them below the surface plate out of the way. These spurs may be taken out to be sharpened by loosening the screws referred to, which releases them, and as their lower ends are slotted they may then be slid off the screws. A screw driver is attached to the end of the calliper bar, D, sliding in on the right hand side of the compass, E. On the right hand side of the tool is a spirit level, F, and on the side near the compass is a plumb level, G. The convenience of this level will be apparent to every joiner. In the same side plate is cut a second longitudinal slot in which plays a bolt, with milled thumb nut, H, carrying at the opposite end a diamond-shaped knife blade, I, Fig. 2, used to mark across the siding in weather-boarding. When not in use the knife is drawn inside of the surface plate by a spring which holds it until again required. The knife is V-shaped, which insures a smooth cutting stroke when moved in either direction. By removing the thumb nut, H, when in the position shown in the engraving, the knife may be taken from the knife block (which plays in a groove between the side surface plates), through a hole in the surface plate, Fig. 2, corresponding to a hole in the knife block, in which the shank of the knife blade is inserted.

By placing the tool on the siding at the right-hand corner boards, or casings, with the guards, J K, against the casing, the knife may be drawn down by the thumb nut, H, to mark the board or siding, and by reversing the tool the same may be done at the other corners.

By placing the half circle plate, L, Fig. 2, on the lower edge of the siding or any studding, the siding may be marked squarely across to form a head joint. The half circle, L, is graduated, so that it may be set to a right angle with the knife slot, or to any other angle required for cutting miters, as when siding up under eaves on gables. A set screw holds it when so adjusted. The guard, K, is also adjustable laterally to correspond with the set of the half circle-plate, L.

M is a tape line of any desirable length, graduated on one side to feet and inches, and on the other side to links, and wound in by a crank, N, or a spring between the plates.

O is a plane for making joints when the sawing has been defective, or a rabbet plane for bench, or getting out moldings. The bit can be readily taken out and sharpened.

A try and bevel square blade, P, which may be graduated to inches, shuts into the edge of the tool, as shown in Fig. 2, with set-screw pivot, and can be opened by the thumb nail like a knife blade. By loosening the set screw it can be slid back in the slot to form a try square, in which position it is held by the set screw. This is a convenient feature in cutting the siding around moldings.

We need not specify more particularly the uses to which the different parts of this ingenious tool may be put as they will be perfectly obvious to every mechanic.

The inventor claims that it will save its cost in a very short time, in the saving of time consequent upon the use of a large number of tools liable to be misplaced on the scaffold.

The workman, attaching it to his suspender, need only take upon the staging his hammer and nails ; all the other operations required may be accurately and rapidly performed by the use of this combination tool. When not in use all the parts exterior to the plate may be removed leaving only a flat surface to the tool when it is packed in the chest.

The inventor feels confident that a workman once employing this tool would be content to use no other.

Application for a patent is pending through the Scientific American Agency, by W. A. Sharp, of Tama City, Tama Co., Iowa, who may be addressed for the entire right, or for the right to manufacture on royalty.

### Stewart and Tait's Experiments on the Heating of Bodies by Rotation in Vacuo.

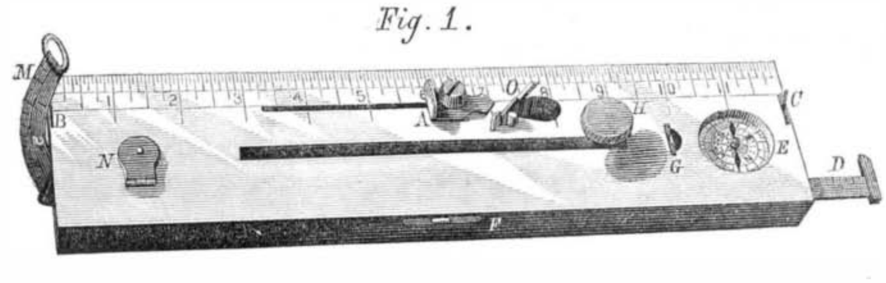
Since the theory of a universal all-permeating elastic ether, far more subtile than any known gas, even when expanded to the utmost by mechanical means, has been found to account for the phenomena of light and heat more perfectly than any other, the actual demonstration of its existence has been a desideratum. The experiment described in the present article, although to our minds not at all satisfactory, were undertaken to prove the real existence of ether.

The experiments are those of Balfour Stewart, F.R.S., Superintendent of Kew Observatory, London, and P. G. Tait, M.A., of Edinburgh, a description of which we extract from "Professor Pepper's Cyclopædic Science."

These gentlemen, having obtained certain results in air, were encouraged to construct an apparatus wherewith to procure rotation *in vacuo*.

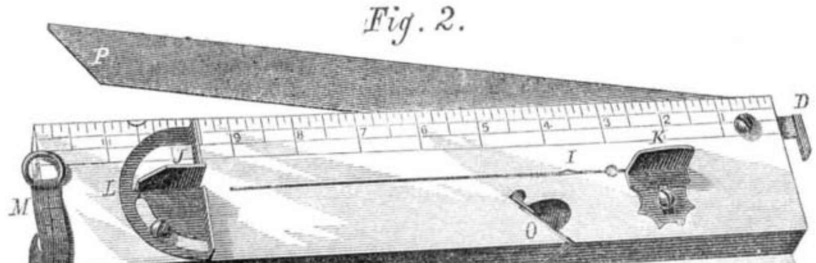
In this apparatus a slowly-revolving shaft is carried up through a barometer tube, having at its top the receiver which is to be exhausted. When the exhaustion has taken place, the shaft connected with the multiplying gear revolves in mercury. The train of toothed wheels causes the disk of aluminum to revolve 125 times for each revolution of the shaft. The thermo-electric pile, the most delicate thermometer or test of heat, is connected by two wires carried through two hole in the bed-plate of the receiver with a Thompson's

*Fig. 1.*



**SHARP'S COMBINATION SIDING HOOK.**

*Fig. 2.*



reflecting galvanometer needle. The outside of the thermo-electric pile and its attached cone was wrapped round with wadding and cloth, so as to be entirely unaffected by currents of air.

During these experiments the disk of aluminum was rotated rapidly for half a minute, and a heating effect was, in consequence of the rotation, recorded by the thermo-electric pile.

To obviate the objection that the electric currents which take place in a revolving metallic disk might alter the zero of the galvanometer, the position of the line of light was read before the motion began, and immediately after it ceased, the difference being taken to denote the heating effect produced by rotation.

The thermometric value of the indications given by the galvanometer was found in this way : "The disk was removed from its attachment and laid upon a mercury bath of known temperature. It was then attached to its spindle again, being in this position exposed to the pile, and having a temperature higher than that of the pile by a known amount. The deflection produced by this exposure being divided by the number of degrees by which the disk was hotter than the pile, gives at once the value in terms of the galvanometric scale of the heating of the disk equal to 1° on Fahrenheit's scale.

The disk of aluminum being blackened with a coating of lampblack, applied by negative photographic varnish, and rock salt inserted in the cone, the following results were obtained.

| No. of set. | No. of observations in each set. | Time at full speed. | Heat indications ° Fahrenheit. |
|---|---|---|---|
| I. | 3 | 30 | ·85 |
| II. | 4 | 30 | ·87 |
| III. | 4 | 30 | ·81 |
| IV. | 3 | 30 | 0·75 |

To ascertain whether the radiant heat recorded was derived from the rock salt, or from heated air, or from the surface of the disk, the next series of experiments were tried.

EPXERIMENTS WITH BLACKED ALUMINUM DISK WITHOUT ROCK SALT.

| No. of set. | No. of observations in each set. | Time at full speed | Heat indications ° Fahrenheit. |
|---|---|---|---|
| V. | 3 | 30 | 0·92 |
| VI. | 3 | 30 | 0·93 |

With certain modifications of the above experiments it was satisfactorily proved that the effect was not due to heating of the rock salt, or to radiation from heated air ; it must therefore be due to the disk of aluminum, which seemed to have rubbed against some matter which remained in the receiver after the air was removed. The question being "Was this ether?" the experimenters further state that :

1. It may be due to the air which cannot be entirely got rid of.

2. It is possible that visible motion becomes dissipated by an etherial medium in the same manner and possibly to nearly the same extent as molecular motion, or that motion which constitutes heat.

3. Or, the effect may be due partly to air and partly to ether.

Not to leave the matter wholly undecided, it was suggested by Professors Maxwell and Graham that there is another effect of air, namely, fluid friction, the coefficient for which they believe to be independent of the tension.

It would appear, however, that the fluid friction of hydrogen is much less than that of atmospheric air, so that were the heating effect due to fluid friction it ought to be less in a hydrogen vacuum. An experiment proved that the heating effect due to rotation in a hydrogen vacuum was 22·5, while in an air vacuum it was 23·5, and the authors are inclined to consider these numbers as sensibly the same, and that the experiment indicates that the effect is not due to fluid friction ; at the same time they do not suppose that their experiments have yet conclusively decided the origin of this heating effect, but they hope to elicit the opinions of those interested in the subject, which may serve to direct their future research.

These experiments are considered by Professor Pepper as more satisfactory than any previously tried, and, taken in conjunction with facts, such as the temporary phosphorescence of certain bodies by what is termed insolation or irradiation, or the action of light in reducing certain salts to their metallic state, or the elaborate and beautiful effects obtainable from thin films of solid, fluid, and gaseous bodies, or the action of crystallized bodies on polarized light, they do altogether impress the reasoning faculties with a conviction that a vibrating motion accompanies the production of all light, which can only be propagated by the communication of these vibrations or tremblings to a medium, itself as subtile, rare, and exquisite as the delicate mechanism that sets it in motion.

### Waterproofing Walls.

One of the most recent of the many uses to which Mr. Frederick Ransome's process of manufacturing artificial stone has been applied is in protecting the outer walls of buildings, so as to enable them to resist the action of the weather by making them waterproof. Through well-built and substantial walls, moisture will make its way, and the ordinary type of dwelling house is very pervious to wind-driven rain. We recently noticed what Mr. Ransome is doing in preserving stone, and his system of waterproofing is only an application of the same process.

The external surfaces of the walls to be protected are first washed with a silicate of soda or solution of flint, which is applied again and again, until the bricks are saturated, and the silicate ceases to be absorbed. The strength of the solution is regulated by the character of the bricks upon which it is to be applied, a heavier mixture being used upon porous walls, and a lighter one of those of denser texture. After the silicate has become thoroughly absorbed, and none is visible upon the surface, a solution of chloride of calcium is applied, which, immediately combining with the silicate of soda, forms a perfectly insoluble compound, which completely fills up all the interstices in the brick or stone, without in any way altering its original appearance. By this operation the wall is rendered perfectly watertight, and, as the pores of the bricks are thoroughly filled for a considerable depth from the surface with the insoluble compound, which is entirely unaffected by atmospheric influences, no subsequent process is necessary.

Already Mr. Ransome has successfully applied this process to a large number of buildings, several of which were previously almost uninhabitable from the constant dampness, and a lengthened experience has proved that it is not only thoroughly effective; but, from the comparative insignificance of its original cost, and the fact that renewals are never required, the system recommends itself for general adoption in preference to all other methods of waterproofing.

### The Beet-Root Sugar Crop.

A recent issue of the *Journal des Fabricants de Sucre*, says that the late heat has proved favorable to the beet harvest in Europe. Reports of the crops continue to vary according to the locality. In some districts it is generally in fine condition in others not so good ; and in some places there are great complaints of the white worms, which are attacking the beet with all their destructive powers. The smaller beets, which are expected to form the greater portion of the harvest, require frequent watering, and they must have very favorable weather if they are to turn out well. The fine promises of spring have disappeared, and a good average harvest is all that can be anticipated ; but it will not nearly approach the 300,000,000 kilogrammes of sugar which were looked to at the commencement of the season. The temperature which has materially improved in Germany, has produced a great change in the growth of the beet, and has quite dissipated all the fears which were entertained as to the approaching harvest. According to the later estimates taken in all sugar-producing countries in Europe, the production on the quantity of beet sown will be ten per cent more than last year.

CAMPHOR WATER.—This useful domestic medicine is thus prepared : Take a quarter of an ounce of camphor and in close it with a glass marble in a muslin bag ; put this into a wide-mouthed bottle, such a one as is used for preserved fruit. Now fill up the bottle with water that has boiled a few minutes and has been allowed to become cold. The glass marble is used to keep the camphor from floating, which it otherwise would do. After about three days the water will become saturated with the camphor, and may be poured off as required. A wineglassful is a dose. It is very useful as an antispasmodic in hysteric and nervous affections.—*S. Piesse.*

### Improvement in Buggy Tops.

The simple improvement we herewith illustrate is well designed to remove an inconvenience to which we have heretofore called the attention of our readers, namely, the bumping of the rear bow in carriage tops upon the prop-blocks, and the consequent wear and sometimes breaking of that bow, and the wrinkling of the top cover when the top is thrown back. The improvement consists in placing a flat steel spring on the upright part of the rear bow, in the manner shown in the engraving, and a rigid brace of metal, to keep the rear bow and the one next it constantly separated, so that the leather of the top need not be crushed and crumpled between them. In the dotted outline the position of the parts when the top is thrown back is well shown ; A being the spring resting upon the prop-block, B, and C being the metallic brace which keeps the bows separated.

The engraving so well exhibits the nature of this improvement that further description will not be needful. This improvement is one that will commend itself to carriage builders and users. It may be applied without at all detracting from the beauty and grace of the top as ordinarily constructed, and will add greatly to its convenience and durability.

Patented through the Scientific American Patent Agency, August 24, 1869, by J. S. Wayne, whom address at Quincy, Ill.

### To Color-Stain Dried Grass.

There are few prettier ornaments, and none more economical and lasting, than bouquets of dried grasses, mingled with the various gnaphalia, or unchangeable flowers. They have but one fault ; and that is, the want of other colors besides yellow and drab or brown. To vary their shade, artificially, these flowers are sometimes dyed green. This, however, is in bad taste, and unnatural. The best effect is produced by blending rose and red tints, together with a very little pale blue, with the grasses and flowers, as they dry naturally. The best means of dyeing dried leaves, flower, and grasses, is simply to dip them into the spirituous liquid solution of the various compounds of aniline. Some of these have a beautiful rose shade ; others red, blue, orange, and purple. The depth of color can be regulated by diluting, if necessary, the original dyes with methyl or spirit down to the shade desired. When taken out of the dye they should be exposed to the air to dry off the spirit, They then require arranging, or setting into form, as, when wet, the petals and fine filaments have a tendency to cling together, which should not be. A pink saucer, as sold by most druggists at sixpence each, will supply enough rose dye for two ordinary bouquets. The druggists also supply the simple dyes of aniline of various colors, at the same cost. The pink saucer yields the best rose dye. By washing it off with water and lemon juice, the aniline dyes yield the best violet, mauve, and purple colors. —*S. Piesse.*

### Coating Castings with Gold and Silver.

GILDING.—Gilding cast iron by means of gold amalgam is very difficult, as the amalgam does not stick to the iron. It is therefore necessary to brush the well-cleaned surface of the iron with a concentrated solution of copper vitriol, and to apply the amalgam to the precipitated copper. As under certain circumstances the coating of copper is injurious, Böttger coats the articles direct with mercury by means of the electro-positive zinc in the following manner : The article to be gilded is well cleaned and boiled in a porcelain vessel together with 12 parts of mercury, 1 part of zinc, 2 parts of iron vitriol, $1\frac{1}{2}$ parts of muriatic acid of 1·2 specific gravity, and 12 parts of water ; in a short time a layer of mercury will deposit upon the iron, and upon this the gold amalgam may be uniformly distributed.

The gilding may also be effected upon polished iron in the following manner : If a nearly neutral solution of chloride of gold be mixed with sulphuric ether and agitated, the ether will take up the gold and float above the denser liquid. When this auriferous ether is applied by a camel hair pencil to brightly polished iron or steel, the ether evaporates and the gold adheres. It is fixed by polishing with a burnisher. This gilding is not very rich or durable ; in fact the affinity between gold and iron is feeble compared to that between gold and copper or silver.

Gilding of cast iron by the galvanic way is also difficult, and is successful only if the article is perfectly clean. It is advisable previously to coat the article with copper or silver.

Polished iron may also be gilded with heat by gold leaf.

SILVERING CAST IRON.—Iron to be silvered is first provided with a coating of copper, upon which the silver is applied either by means of amalgam or silver leaf.

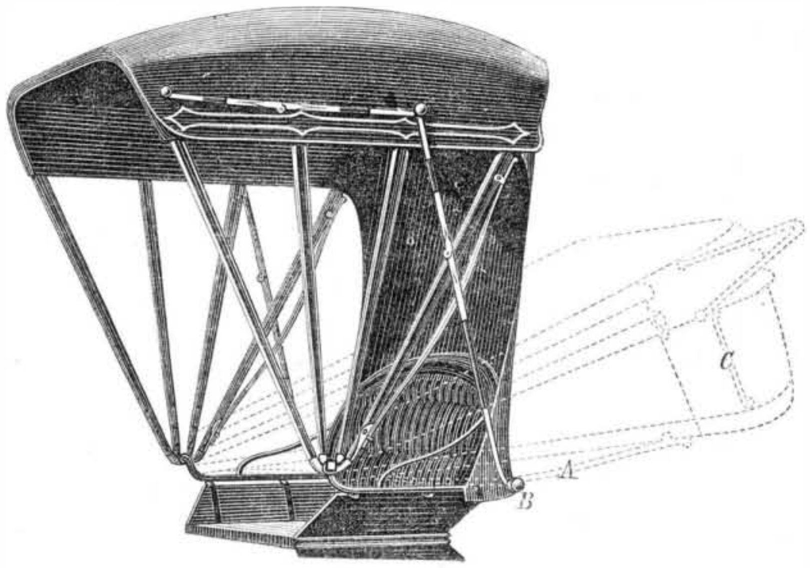
Cast iron can be well silvered by the galvanic way without a previous coppering.—*Practical Treatise on Metallurgy.*

### Preparation of Sizes for Gilding.

GOLD OIL-COLOR, OR SIZE.—The English method of preparing the color in size, which serves as the ground on which the gold is laid, is, to grind together some red oxide of lead with the thickest drying oil that can be procured—the older the better. To make it work freely, it is mixed, before being used, with a little oil of turpentine, till it is brought to a proper consistence.

GOLD WATER SIZE.—One pound of Armenian bole, two ounces of red lead, and a sufficient portion of black lead, are ground separately in water, and then mixed, and re-ground with nearly a spoonful of olive oil. The gold size is tempered by mixing it in parchment size which is clear and clean, and has been passed through a fine sieve to clear it of all foreign matters. The *parchment* size is made by boiling down pieces of white leather, or clippings of parchment, till they are reduced to a stiff jelly.

PREPARATORY SIZE.—Boil a handful of the leaves of wormwood and two or three heads of garlic in a quart of water, until the liquid is reduced to one half ; then strain it through a cloth, and add half a handful of common salt, and nearly half a pint of vinegar. The design of this composition (usually employed in gilding looking-glass and picture frames) is to obviate the greasiness of the wood, and prepare it the better to receive the coats which are to be laid on, and to preserve it from the ravages of worms. When used, it is mixed with a sufficient portion of good glue, boiling hot. In applying it to the gilding of plaster or marble, the salt must be left out of its composition ; as, in damp situations, this would produce a white saline efflorescence on the surface of the gold.



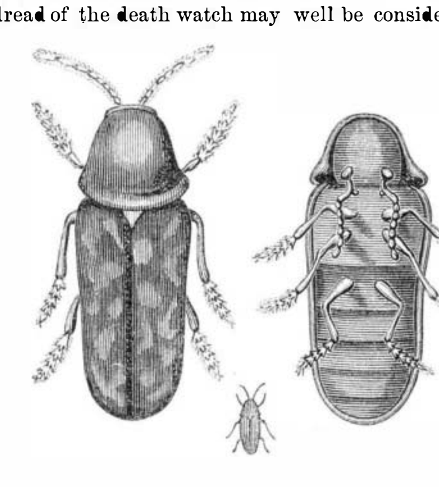

STILLENGER'S PATENT BUGGY TOP.

WHITE COATING.—A quart of strong parchment size and half a pint of water are to be made quite hot, and to this are to be added (in small portions from time to time) two good handfuls of common whiting passed through a fine sieve ; this mixture is to be left to infuse for half an hour, when it is to be stirred carefully so that the amalgamation may be perfect.

COLORING YELLOW.—Half a pint of parchment size is taken, which must be clean, white, and clear, and of one half the strength of that used for the white coating ; this is warmed, and there is mixed with it two ounces of yellow ocher, very finely ground in water ; it is then left at rest, and the clear portion decanted, which gives a fine yellow color, that serves, in water gilding, to cover those deep recesses into which the gold cannot be made to enter ; it serves also as a mordant for the gold size.—*The Painter, Gilder, and Varnisher's Companion.*

### DEATH WATCH---NATURAL SIZE AND MAGNIFIED.

Among the popular superstitions which the almost general illumination of modern times has not been able to obliterate, the dread of the death watch may well be considerud as one



of the most predominant ; yet it must be allowed to be a very singular circumstance that an animal so common should not be more universally known, and the peculiar noise which it occasionally makes be more universally understood. The insect, an engraving of which we present herewith, in question, is a small beetle belonging to the timber-boring genus, *Anobium,* and the popular superstition alluded to is, that when its beating is heard, it is a sign that some one in the house will die before the end of the year. It is chiefly in the advanced state of spring that this little creature commences its sound, which is no other than the call or signal by which the male and female are led to each other, and which may be considered as analogous to the call of birds ; though not owing to the voice of the insect, but to its beating on, or striking, any hard substance with the shield or forepart of the head. The prevailing number of distinct strokes which it beats is from seven to nine or eleven ; and this very circumstance may perhaps still add to the ominous character which it bears among the vulgar. These sounds or beats are given in pretty quick succession, and are repeated at uncertain intervals ; and in old houses, where the insects are numerous, may be heard at almost any hour of the day, especially if the weather be warm. The sound exactly resembles that which may be made by tapping moderately hard with the finger nail on a table. The insect is of a color so exactly resembling that of decayed wood, viz., an obscure grayish brown, that it may for a considerable time elude the search of the inquirer. It is about a quarter of an inch in length, and is moderately thick in proportion, and the wing shells are marked with numerous irregular variegations of a lighter cast than the ground color. It is singular that this insect may so far be familiarized as to be made to beat occasionally, by taking it out of its confinement, and beating on a table or board, when it will readily answer the noise, and will continue to beat as often as required.

### Utilization of Pine Leaves.

Near Breslau, in Silesia, are two establishments, one a factory where the pine leaves are converted into what is called "forest wool" or wadding ; the other, an establishment for invalids, where the waters used in the manufacture of this pine wool are employed as curative agents. The manufacture has extended, for there are now factories at Runda, in the Thuringer-wald, at Jonkoping, in Sweden, Wagenerger, in Holland, in parts of France, and other places. Two cases of these products were shown at the last Paris and Havre Exhibitions, which contained various illustratirns in the shape of wool for stuffing mattresses and other articles of furniture instead of horse-hair, vegetable wadding, and hygienic flannel for medical application, essential oil for rheumatism and skin diseases, cloth made from the fiber, articles of dress, such as inner vests, drawers, hose, shirts, coverlets, chest preservers, etc., and other useful applications. In the preparation of the textile material an ethereal oil is produced, which is employed as a curative agent, for burning, and as a useful solvent. The liquid remaining from the decoction of the leaves is used for medical baths. The membranous substance and refuse are compressed into blocks and used as fuel ; from the resinous matter they contain, they produce sufficient gas for illuminating the factory in which the manufacture is carried on.

### Invention of the Spirit Level.

He who first filled a glass bottle with a liquid, leaving a small quantity of air therein to form a bubble, then corked the bottle and laid it flat on one side, with the bubble floating against the upper part was the unconscious inventor of the spirit level, which is a very simple instrument in appearance, but of the utmost value, when properly made, to the astronomer, the engineer, and the builder ; for when the bottle is placed horizontally, the bubble always mounts to, and rests at its most elevated point ; and the tangent to that point, when the middle or apex point of the bubble coincides therewith, is a horizontal line ; that is a line at right angles, or perpendicular to the direction of gravity or the plumb line passing through that point.

This was first perceived and applied, so far as is known, in France in 1666, by Melchisédec Thévenot, who was a great amateur of science and a writer of books of voyages and travels. In this respect he enriched the literature of France as much as Hakluyt enriched that of England half a century earlier. It was at Thévenot's house that the learned men who founded the Academy of Sciences of Paris used to assemble ; and it was at one of their meetings that he propounded the spirit level.

A description of the instrument, accompanied with figures, was first published in the *Journal des Savants,* Paris, November 15, 1666, under this title :—*Machine nouvelle pour la conduite des eaux, pour les bâtiments, pour la navigation, et pour la plupart des autres arts.*" The instrument is there called an air level ; and is described as a glass tube, hermetically sealed at both ends, containing spirits of wine, which do not freeze, and a small quantity of air forming a bubble. It is stated that the instrument is capable of giving, with much exactness, the direction of the horizon, the perpendicular to the horizon, and vertical angles; and that it is easier to make, more convenient to use, and indicates a level line more readily and accurately than any other instrument.

### The Colorado Expedition.

The expedition under the command of Col. Powell, the Colorado explorer, has returned to Chicago, having successfully traveled through the entire Grand Cañon, from Green River to the point where the Colorado debouches into the open plain in the territory of Arizona.

From the point where Colonel Powell's last letter was written the expedition descended the river about four hundred miles, between walls almost vertical, ranging from five hundred to one thousand five hundred feet high, the exterior of the cañon being from two thousand five hundred to four thousand feet above the bed of the river. More than two hundred waterfalls and cascades, emptying themselves over the walls of the cañon into the main river, were seen in this distance, with almost every variety of natural scenery. The geological formation of the cañon consists principally of limestone and sandstone ; granite is only found at three places and in a limited amount. No discoveries of precious metals were made, and there were no indications of gold or silver found in the bed of the river.

One section of the cañon was found to consist of a very fine