Composition and Nature of the Red Rain.

BY DR. T. L. PHIPSON.

The newspapers of various countries of Europe have recently called attention to a red rain which fell between the 11th and 13th of March, 1901, in Sicily, Naples, Leghorn, Venice, Coburg, Hamburg, Schleswig-Holstein, and at Malvern, in Worcestershire.

The deposit left by this rain in the form of an exceedingly fine dust is described as reddish or fawn-colored, and greasy to the touch. At Leghorn 4½ grammes were swept from the marble table in front of a café, and it was calculated from this that many thousands of tons of this fawn-colored dust must have fallen throughout Italy between the dates above-mentioned.

I am indebted to Capt. C. J. Gray, F.R.G.S., for a small quantity of a precisely similar product that fell with the rain at Melbourne, Australia, on the 12th of December, 1896, and I have submitted it to as full an examination as the very minute quantity would allow.

In my recently published work, "Researches on the Earth's Atmosphere," I have alluded to salt rain, and to colored rain produced by volcanic ash, or desert sand uplifted by the wind and suspended in the air; there have been also blood-red deposits found upon the ground, which consist of cells of the *Protococcus nivalis*, or *Palmella sanguinea*, and similar microscopic plants that have shown themselves after a fall of rain or snow. I have invariably found abundance of unicellular algæ in the first fall of snow in early winter, and the red rain deposit examined formerly by the French chemist Cahours (in 1852) was found to consist of organic cells, and burnt away entirely, leaving little or no residue.

The fawn-colored dust left by red rain is, on the contrary, of a mineral nature; it is always similar in color, fineness, and microscopic appearance. I have made a careful examination of this reddish deposit, and the result has been rather unexpected and interesting.

When dry it is of a fawn-color, rather paler than oxide of cerium, but becomes darker when wet. Under the microscope it is seen to consist of exceedingly minute grains, *mostly flat*, and of various colors; they are also of various shapes and sizes. The largest are about 2-100 of a millmeter; the greater number are about 5-1,000, and the smallest 5-100,000 of a millimeter in diameter. The irregularity of their forms gradually disappears as they get smaller, so that to the eye the smallest appear circular. Many are white, and more or less transparent, gray, greenish-gray, slate-colored; others are yellow, and brown, and translucent; a few are ruby-red, and others are dark and opaque.

When calcined at a red heat this dust darkens, and loses 14.3 per cent of water and organic matter (this is exactly the amount of water and organic matter found in the Orgueil meteorite). On cooling after calcination it becomes fawn-colored again, and the colors of the grains seen under the microscope have not been much altered by calcination.

When boiled in hydrochloric acid (finally adding a few drops of nitric acid), a notable portion is dissolved, and yields a solution containing *iron*, and other substances, *among which is nickel*.

After this boiling in acid the fawn-color becomes much darker, similar to the dark crust seen on meteorites where it is very thin. Having placed the existence of nickel in this substance beyond doubt, I am of opinion that it is partly, if not wholly, of cosmic origin, and not merely desert sand uplifted by the wind, nor volcanic dust; it would appear to be the mineral dust left in the higher regions of the air by the explosion of meteors, or shooting stars.

The only thing that makes me hesitate to assert this absolutely is the fact that oxide of nickel has once been said to have been found in the *rapili* of the Kölerberg, in Silesia, to the extent of 0.1 per cent (the analysis by Zulkowski is given in my work on "Meteors, Aërolites, and Falling Stars," p. 118). In the fawn-colored products of the red rain I estimate that there is considerably more nickel than that, more than ten times as much; and in the ash or cinders of Etna and Hecla no nickel has ever been found, nor in those of Vesuvius.

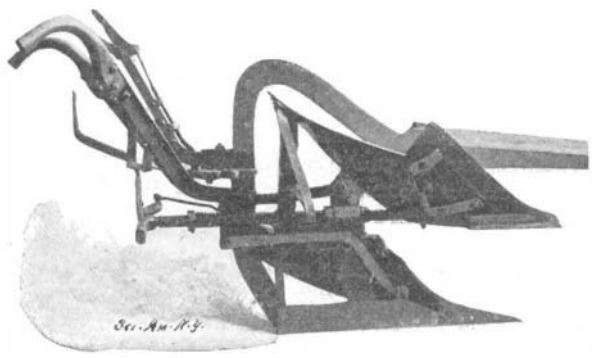
I may add to this that both March and December are known to be meteoric "periods."—Chemical News, London.

The forestry division of the Department of Agriculture is engaged in drafting a working-plan looking to the conservation of timber on a tract of 300,000 acres in the neighborhood of Millinocket, Me., belonging to a private paper corporation, says The New York Tribune. It is a part of the general policy to be inaugurated by the department for the conservation of timber land throughout the United States to secure a perpetual crop of timber in the areas under consideration. The private concern will pay all the expense of the work, except the salaries of the government experts, who are directed by Prof. Pinchot.

AN IMPROVED PLOW.

Plows provided with two shares and moldboards located at opposite sides of the beam and with mechanism for bringing either share and its moldboard into operative connection with a common landside have proven highly efficient. But the construction has not always been of the simplest. To secure this simplicity of construction is the primary object of an invention for which John N. Hanna, of Moline, Ill., has taken out a patent.

The arched beam of the plow has guided movement horizontally in a slotted plate provided with teeth which are to be engaged by a spring-controlled thumb-latch on the handles of the plow. By this arrangement, the beam can be swung from side to side on



AN IMPROVED DOUBLE-SHARE PLOW.

the plate and locked in place by the thumb-latch. Friction-rollers both facilitate and guide the movement of the beam.

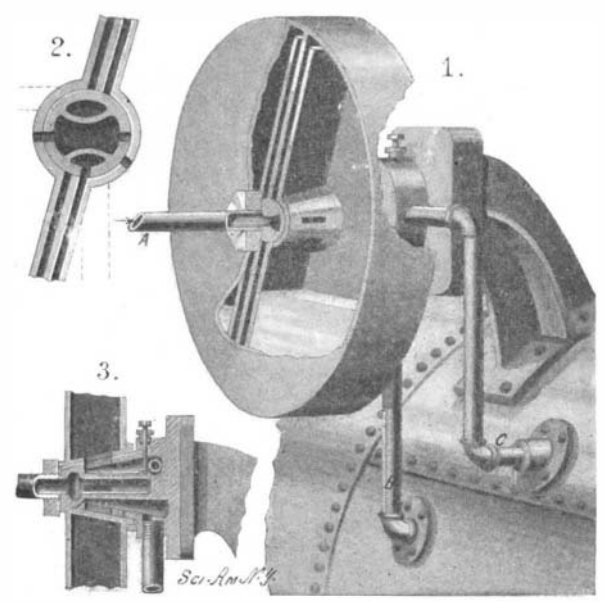
The plate referred to is supported on a standard, which in common with a second standard at the front is secured at its lower end to the landside. In these standards above the landside a tubular shaft is mounted to revolve, to the rear end of which a lever is pivoted connected with a guide beneath the handles. A slotted projection is formed on the upper surface of the landside near its forward end. Through this slotted projection an arm passes, which, together with a slotted bar sliding on the standards, constitutes a locking device to lock the moldboards to the landside, the slotted bar being operated from the lever previously mentioned by means of a link. A spring on the shaft acts to force the slotted bar forward. The combined moldboards and plowshares are located one at each side of the shaft. The moldboards are connected by straps and are provided with eyes adapted to enter the space between the members of the slotted projection on the landside and receive the arm carried by the slotted bar of the locking device.

The beam can be directed at its forward end to the right or to the left without interfering with the position of the supports for the beam and the position of the moldboards and shares. By moving the lever to the right or to the left either one or the other of the combined moldboards and shares can be brought to the ground. When one moldboard and share are in working position, the other moldboard and share will be held out of the ground. The arch of the beam permits the use of a large moldboard.

The characteristic features of the invention are the ease and rapidity of operation and the convenient reach of the lever.

AN AUTOMATIC BOILER-FEEDER.

The boiler-feeder shown in the illustration automatically maintains the water in the boiler at a certain



THE RICE AUTOMATIC BOILER-FEED.

level by employing the steam-pressure as a means of forcing water into the boiler. The invention has been patented by Jasper N. Rice, of Bethany, Mo.

The boiler-feeder comprises a shell having three superposed compartments, the central one of which communicates with a water-supply pipe, the uppermost of which is connected with a steam-pipe leading from the boiler, and the lowermost of which conducts the water from the shell to the boiler.

On this shell a drum is mounted to rock, which drum is divided into two compartments by a diametrical partition adjacent to which are false partitions forming passages from the outer part of the drum to the shell. The hub of the drum has ports communicating with the passage and with ports in the steam and water compartments of the shell.

When the ports of the central shell-compartment and of the drum-hub are in register, the water from the supply pipe flows into the drum. Steam enters the drum by way of the upper shell-compartment and passes through the upper drum-passage (formed by the true and false partitions) when one of the ports of the upper shell-compartment registers with the corresponding drum-passage. The pressure of the steam forces the water in the drum up through the lower drum-passage into the lowermost shell-compartment and thence into the boiler.

The various ports of the drum-hub and shell are arranged to move into and out of registry, such movement being brought about by the regular rocking of the drum, which in turn is due to the preponderance of water in one of its two compartments. The central compartment of the shell, as we have already remarked, communicates with the water-supply. As the water is sprayed into the compartments of the drum, the steam in the corresponding drum-compartment is condensed, thereby producing a partial vacuum and insuring the passage of the water into the drum. The operation once started continues automatically until the rising water in the boiler closes the steam-pipe and thus temporarily arrests the action of the feeder.

Automobile News.

Consul-General Guenther, of Frankfort, February 23, 1901, reports the appearance at Nuremberg of the first automobile sleigh. The vehicle glides along with great speed and a perfectly easy motion. It was constructed by the Nuremberg Motor Vehicle Factory Union.

The Automobile Club of France has organized its second competitive test of accumulators, which will commence the 1st of June and last one year. It will be held at the laboratory of the club in the suburbs of Paris. These tests will be carried out upon somewhat the same lines as last year's tests, which were held in the club building. In one of the rooms on the ground floor was mounted a four-wheeled wagon truck with rubber tired wheels, and below the floor was a motor-driven device by which a wheel carrying a series of projections was rotated rapidly underneath the tire, giving the whole truck a series of jolts resembling the shaking which an automobile would receive upon the road. The truck had a platform upon which the batteries were mounted, each in its appropriate box. The batteries were charged and discharged at intervals, and a series of measurements taken. The rules of the contest, which have lately been published, may be briefly stated as follows: The tests will have reference to the industrial efficiency of the battery, or the relation between the output and the energy of charge; the frequency, importance and nature of the operations of keeping in order and of repairs; the energy furnished compared with the weight of the battery; the cost per kilowatt-hour of output, taking into account interest and repairs. The number of batteries is not limited; each competitor must present two batteries of the same type of plate, also a complete descriptive notice with the necessary drawings and samples, stating the price of the battery and parts. An extra cell, without liquid, is to be kept under seal. Each battery, composed of an appropriate number of cells and contained in a suitable box, must furnish 120 ampere hours' discharge and its potential must not fall below 8.5 volts upon a régime of 20 amperes. The batteries will be ranged in two classes; first, those of great specific capacity and slow discharge, maximum weight 132 pounds; second, those of small capacity and rapid discharge, up to 208 pounds. The tests will be carried out in periods of 6 days; during each day they will undergo a 5 hours' shaking upon the machine, while discharging at a variable rate which is previously laid out. The load is varied by a revolving commutator turning once every half hour and throwing on a greater or less number of lamps. Each turn corresponds to a quantity equal to 12 ampere-hours. The load varies from 20 to 100 amperes, but the latter current is applied for only half a minute. The sixth day the batteries will have a constant discharge of 24 amperes for 5 hours. The charging will be carried out at 12.5 volts. The energy, voltage, and current will be accurately measured by a series of instruments, and the efficiency of each battery, its capacity, potential, etc., will be recorded. The club will award diplomas or medals to the successful competitors. For each group of two batteries the entry fee is $100 to the 1st of May, and $200 to the 25th, the limiting date. A complete list of the rules will be furnished upon application to the club.