SCIENCE

FRIDAY, SEPTEMBER 7, 1888.

ONE OF THE IMPORTANT functions of a State geological survey is to furnish accurate and impartial information on the general character of so-called 'mining districts.' Nearly all of our State geologists have had experience in such matters, from the early days when the 'black shale' was exploited for coal, to the later times, when certain iron-fields in Wisconsin needed discouragement. The most recent example comes from Arkansas, where much excitement has arisen in a mining district from which rich discoveries of valuable metals were reported. Professor Branner, recently appointed State geologist, was called upon to examine the region and its ores, and as he failed to find evidence of value in them, and clearly stated his unflattering results in a brief report, he is now made the object of violent abuse from the parties whose hopes are dashed by his work. The better people of the State, however, are with him, and, with their support in his honest course, we shall hope to see his survey continue and thrive. He was elected secretary of the geological section of the American Association at the Cleveland meeting, his nomination being in part due to a desire on the part of his colleagues to express their appreciation of his integrity and their approval of the course he has taken.

THE IMPORTANCE OF PRESERVING the forests becomes evident in South Africa. J. G. Gamble, in the Proceedings of the Institute of Civil Engineers, points out that the soil of Africa becomes dryer every year. Although the amount of precipitation is not decreasing, the springs become less strong, and rivers that used to flow permanently are dry during summer. Gamble considers the devastation of forests, and the grass and bush fires, the principal reasons for this state of affairs. Besides this, the trails made by animals are transformed into cañons of considerable depth by sudden rainfalls. In these cañons, which are in some cases more than thirty feet deep, the surface water runs off before it has time to percolate the soil. Tripp has made observations on the amount of evaporation, and found that on the highlands fully one-half of the falling rain runs off without penetrating into the soil. This experience emphasizes the fact that the ultimate aim of rational forest-culture, so far as its influence upon agriculture is concerned, is the increase of the power of the ground to hold moisture, and thus to prevent the rapid flowing-off of the precipitated rain.

THE PILOT CHART for September, under the title 'Transatlantic Routes,' refers to the collision between the two Danish steamships 'Geiser' and 'Thingvalla,' Aug. 14, about thirty miles south from Sable Island, the sinking of the former in a few minutes, and the drowning of 117 persons, and adds, "The Pilot Chart for December, 1887, discussed this subject of transatlantic navigation at some length, and a supplement was published calling attention to the importance of some general understanding as to the routes to be followed by eastward and westward bound vessels. The plan thus inaugurated has been adhered to each month since that time, one track being plotted as the southern limit for westward-bound vessels, and another as the northern limit for eastward-bound vessels." This discussion, in which it was stated to be "the object of this chart to recommend only what masters of vessels may reasonably be expected to follow, having due regard to the mutual benefits to be derived from such an agreement, as well as the mutual concessions to be made in order to make it effective," was reviewed editorially at some length in No. 256 of *Science*, so that it is unnecessary to repeat it here; but it is pertinent to remark, that on the Pilot Chart for each of the last ten months the transatlantic routes recommended for eastward and westward bound steamships for the succeeding month have been carefully plotted; and this fact adds startling emphasis to the closing sentence of the note on the September chart, which is as follows: "This recent disaster would not have occurred had the 'Geiser' been farther to the southward, as recommended for eastward-bound vessels; and the collision thus emphasizes the importance of this matter, not only to owners, agents, masters, and marine underwriters, but to the public generally." This fixes the responsibility for the loss of the 'Geiser,' and the appalling sacrifice of life and property that resulted, beyond the possibility of question; for, as every reader of *Science* knows, the Pilot Chart is published on the first day of each month, and enough copies are furnished at each Atlantic port of the United States to furnish a copy, free of cost, to every vessel that departs during the month. The captain who does not pay heed to its recommendations assumes a fearful personal responsibility, which should not be overlooked in fixing the severity of the punishment he is to receive if disaster results from this neglect. The work of the United States Hydrographic Office is universally recognized as the best of its kind done in the world, and mariners cannot afford to disregard its recommendations.

MR. EVERETT HAYDEN, who is in charge of the meteorological division of the Hydrographic Office, and who has recently distinguished himself by his exhaustive study of the great storm of last March, the results of which are about to be published at length, illustrated by a series of six superb charts, as well as by his contributions to the monthly Pilot Chart, which, under his direction, has become a most wonderful compendium of information that is of vital interest to mariners, has been authorized by Commodore Harmony, acting secretary of the navy, to go to Havana, Cuba, for the purpose of studying the laws of hurricanes. Mr. Hayden will visit the observatory of the Real Collegio de Belen, in Havana, the director of which has carried the study of hurricanes further than any other student of the subject in the world; and he will carry from Washington a great mass of material which he has already collected, and which he hopes to work up in the light of additional information which he expects to obtain in Havana, and from the actual observation of hurricanes during the remainder of the hurricane season. Mr. Hayden expects to be absent about six weeks. Very soon after his return he will make a special report. He also hopes to be able to qualify himself, as no one in the United States is now qualified, to discuss hurricanes in such a manner as to be able to give to the navy and commercial marine of this country, and of all other countries whose ships navigate the North Atlantic Ocean, much most valuable, practical information, and to contribute important data to the science of meteorology.

PHOSPHORUS PENTOXIDE AS A DISINFECTANT.

SINCE the publication in *Science* of the report of a series of experiments conducted by the Marine Hospital Service at the quarantine station below New Orleans to determine the efficacy of the different disinfectants used, and especially since that article has been copied in so many of the medical journals of the country, great interest has been manifested among quarantine officers, city health-officers, sanitarians, and chemists, in the discovery of some additional disinfectant. Phosphorus pentoxide was suggested, and

its use widely advocated, on account of its supposed deadly effect upon disease-germs and the convenience of its use. The amount of phosphorus required to produce a given volume of fumes is so much smaller than that of sulphur, and it can be so much more easily placed in the most favorable positions for its fumes to reach the article to be disinfected, that there was a general inclination to substitute it for sulphur.

In order to ascertain definitely what the value of phosphoric acid is as a disinfectant, Surgeon-General Hamilton, about three weeks ago, as was noticed in *Science* at the time, instructed Dr. Kinyoun, surgeon in charge at New York, to make a series of experiments with phosphorus pentoxide for the purpose of determining its utility and applicability for general disinfection. Dr. Kinyoun has made his report, and it will be printed in Dr. Hamilton's abstract to-morrow. He has courteously consented that it shall be published in the present number of *Science*. It is as follows: —

"I have the honor to state that I have, in accordance with your instructions as per letter of Aug. 15, made a series of experiments with the fumes of phosphorus pentoxide, in view of determining its utility and applicability for general disinfection. As a fact well known in chemistry, when phosphorus is ignited in a full supply of air, phosphorus pentoxide is formed, being a white amorphous powder, volatilized by heat, and absorbing moisture with the utmost avidity. It unites with water, forming hydrogen phosphate or phosphoric acid.

"When phosphorus is ignited in a closed vessel, the amorphous powder of phosphorus pentoxide is precipitated on the bottom and sides. It is never in suspension longer than forty minutes after the combustion has been completed.

"For the purpose of experimenting, a cask holding five hundred litres was made use of for testing the germicidal powers of the oxide. At first the phosphorus was placed in the bottom of the cask; but it was found necessary to place it near the top, and protect the cask by asbestos, on account of the great heat involved. This procedure gave as a maximum heat at the bottom, where the cultivations were placed, 32° C.

"The first observation was made to determine the penetrating-power of phosphorus pentoxide, which was done in the following manner: Fifteen test-tubes (1″ × 5″) were used, in which were placed several pieces of litmus that had been rendered alkaline by a solution of carbonate of soda. All the strips of paper were saturated before being placed in the tubes. Several of the tubes were left open, and were put in several positions, — some vertically, mouths upward; some horizontally, and then suspended mouths downward. Another series was covered with one, two, three, and four layers of dry filter-paper. Another series was covered with muslin, one, two, three, and four layers. A fourth was covered with flannel, one, two, three, and four layers. A fifth was covered with cotton, one, two, three, and four layers.

"All the above were placed in various positions in the vessel, and twenty grams of phosphorus ignited, and the cask sealed. It was opened twenty-four hours thereafter. There was no change observable in the color of the litmus-paper in those tubes that had been closed with the substances as noted above. In the tubes that were open, all had been acted upon by the acid, most in those which had been placed mouths upward, and least in those suspended mouths downward.

"The test-tubes that were covered with paper, etc., were placed under a large bell jar, and a small quantity of sulphurous oxide thrown in, and in less than one minute all the litmus was turned red. In another experiment on letters, newspapers, etc., having been perforated in the manner that is practised at the fumigating station at Waycross, Ga., each package having several pieces of litmus placed in the centre, exposure for twenty-four hours was made, and but little effect was observed. The litmus that had been perforated showed a slight discoloration around the point of puncture. Sulphurous oxide accomplished it in a few minutes.

"The micro-organisms that were exposed were recent cultivations of anthrax, yellow-fever (Finlay), typhoid-fever, Asiatic cholera, and cholera nostras, the nutriment medium being agar-agar. All the cultivations were made in shallow dishes about an inch and a half deep and three inches in diameter. These were classed in several series, the same as was done with the test-tubes, covered as follows: series 1, of anthrax, typhoid, cholera Asiatica, cholera nostras, and yellow-fever, covers of dishes removed; series 2, covered with filter-paper, dry; series 3, covered with muslin, dry; series 4, covered with flannel, dry; series 5, covered with a thin layer of absorbent cotton.

"These were exposed for twenty-four hours, then examined. In the dishes that were left open was found a certain, quite a considerable, quantity of phosphorous acid, and all the germs were found to be killed. In those that were covered with paper, etc., no change was noted, and innoculations from them showed all to be alive. Each cultivation was also tested for the presence of the acid in the medium, but in no instance was it to be found.

"These experiments were made several times, always with the same results. An attempt was also made to force the fumes of the acid through absorbent cotton, using for the purpose a large glass cylinder loosely packed with cotton. One hundred and twenty-five grams pressure was made, but none of the fumes came through it. This was readily accomplished with sulphurous oxide.

"Our conclusions are that the phosphorus pentoxide is a surface disinfectant *only*, having little if any penetrating-power, and is wholly unfit for fumigation and disinfection where penetration is desirable; that its limited scope of usefulness is altogether met in the use of bichloride of mercury. No observations on the spores of micro-organisms were made, as it gave negative results in fresh cultivations of the different germs tested."

HEALTH MATTERS.

Wounds of the Abdomen.

WE mentioned in a recent number of *Science* a suggestion made by Professor Senn of the use of injections of hydrogen-gas into the intestines to detect the presence of perforations in cases of gunshot or stab wounds of the abdomen. Professor Senn demonstrated the practicability of this method upon dogs, but, we believe, had no opportunity of applying it to the human species. Since then the method has been used in several cases with success. Dr. Mackie of Milwaukee, in the *Medical News*, reports its use in a pistol-shot wound of the abdomen. His method is thus described: "The patient was etherized, and rectal insufflation effected in the following manner. A four-gallon rubber bag, filled with hydrogen-gas, was connected by rubber tubing with the long glass tube of an extemporized chemical wash-bottle half filled with water. To the short glass tube, passing through the cork only, was attached, by rubber tubing, the rectal nozzle of an enema syringe. This bottle was introduced so that the rapidity of inflation could be judged of by the bubbling of the gas through the water. When the rectal nozzle had been introduced, slow, steady, and continuous pressure was made on the rubber bag. Under very slight pressure, the gas commenced to bubble through the water. As inflation progressed, the abdomen, previously flat on percussion from the umbilicus to pubes, became resonant, and the area of liver-dulness diminished from below upward. The inflation was continued until the abdomen became uniformly distended and tympanitic throughout. Still no gas escaped through the wound of entrance, although kept at the highest level. On firmly compressing the abdomen, there occurred an intermittent escape of gas mixed with blood through the wound of entrance. To demonstrate the presence of hydrogen by ignition of the escaping gas, matches were employed. These proved very unsatisfactory, for a burning match never once happened to be directly over the wound of entrance when the gas was escaping. The taper, as used by Senn in his experiments, had, in the hurry of preparation, been overlooked. The escape of gas from the wound of entrance positively proved that the gastro-intestinal canal had been injured, so that further attempts at ignition were superfluous."

In concluding the report of this case, Dr. Mackie says that it was impossible to diagnosticate, from the symptoms, perforation of the gastro-intestinal canal. The position of the wound of entrance, and the character of the vomit, were presumptive of injury to the stomach. The general direction of the bullet, and the position of the wound of exit, pointed to injury of the descending colon or kidney: still both were intact. The symptoms of intra-abdominal hemorrhage were not so marked as to justify a laparotomy.