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.

The escape of gas from the wound of entrance, after rectal insufflation of hydrogen-gas, afforded positive evidence of perforation existing somewhere in the gastro-intestinal canal, and on this evidence alone was laparotomy performed. The perforations were so situated as to put this diagnostic measure to the severest test. It was found reliable, and further experience will prove that it is as infallible in the human subject as Senn has found it in animals. It never once failed.

In conclusion, we come to the medico-legal aspect of this case. The man who did the shooting has been committed for trial. The symptoms present were only presumptive of the existence of perforation, until rectal insufflation was made. Had an exploratory laparotomy been performed with the above fatal result, and no intra-abdominal lesions sufficient to warrant such a grave operation been found, the position of the surgeon would have been very embarrassing. The defence might affirm that the surgeon ought to be held responsible for the patient's death, and not the defendant. Naturally, this would deter one from operating; but if the surgeon can demonstrate, by rectal insufflation of hydrogen-gas, the presence of diffuse tympanites due to escape of gas through a perforation into the peritoneal cavity, even without the escape of gas through the external wound, he may rest assured that perforation exists somewhere in the gastro-intestinal canal, and he can then safely proceed to the necessary operative treatment without incurring any medico-legal responsibility.

Dr. William J. Taylor, in the same journal, reports the successful use of this means of diagnosis in another case.

ANTISEPTIC AMMUNITION. — According to the *Medical Press* of May 9, a useful suggestion is being carried out by the Netherland Government, by which provision will be made for supplying each soldier, during the time of war, with a cartridge containing some antiseptic dressings. Each cartridge will be made of convenient size, namely, about three inches in length by two in width, and will be secured at one end with a safety-pin. The dressing contained in each will consist of a bandage about three yards long, and two pieces of gauze, all of which have been rendered antiseptic by a sublimate solution. Hence, in the event of wounds being received, a ready means would be at hand for the immediate application of antiseptic dressings. Soldiers, in the case of slight injuries, would probably at once avail themselves of the dressings, and the latter could not fail to be of much use to the surgeons. The idea is well worthy of the attention of the military authorities in this country, and might even with advantage be adopted, as it has been for years past in the German army. In the wars in which, during the past few years, England has been engaged in tropical climates, the early application of antiseptics to the wounds received by the men was admitted to be a matter of the utmost importance by the army medical officers attached to the forces.

A MEDICO-LEGAL CASE. — The following case of suicide, which recently occurred in Jamaica, presents features of considerable interest and no little importance. A colored man, after murdering his sweetheart, entered his house, and cut his throat with a razor. Some of the neighbors who had witnessed both deeds rushed into the house, but were unable to find him. After a search, his dead body was found under the house, which was a small one, built on supports, raising it about two feet from the ground. After cutting his throat, the man must have walked or run to the back entrance, a distance of sixteen feet, and then have crept through a hole in the partition, and have crawled on all-fours to the spot where his body was found, exactly beneath the room where he cut his throat, and therefore a further distance of sixteen feet. The throat was cut from ear to ear by a clean sweep, both carotids and jugulars being severed, as well as the trachea and œsophagus, the wound reaching back to the anterior portions of the bodies of the cervical vertebræ. A blood-stained razor, which was deeply notched, was found in the room, and marks of blood were traced from the room to the back entrance, by which the man must have gone out. Remarkable instances of the retention of voluntary power after wounds of the carotid artery, have been occasionally recorded; but *The British Medical Journal*, June 30, in commenting on the case, says that they know of no occasion on which the vessels on both sides of the neck were divided, where so much power was retained by the subject of the injuries as in the present instance. The case should serve as a perpetual warning to medical men not to be too dogmatic as to what is, and what is not, possible, even in the presence of the most rapidly fatal wound.

VACCINE VS. BOVINE VIRUS. — The fear of contracting disease has to a great extent done away with the use of vaccine virus taken from the arm of a vaccinated child, and caused physicians, oftentimes against their judgment, to confine themselves to bovine virus. That this latter virus is not always innocuous is well shown by a report of the Royal Bureau of Hygiene at Berlin. Virus which was obtained from a vaccine-farm at Eberfeld produced in those who were vaccinated with it eruptions of the skin, and in some instances pustules formed. Among children, several deaths occurred. In one of these cases post-mortem examination revealed an abscess. Considerable constitutional disturbance followed the occurrence of the eruptions. Contagion seemed to be promoted by schools and the occurrence of the harvest. By order of the government, the vaccine-farm was temporarily suspended, all instruments and appliances were destroyed, the buildings most thoroughly disinfected, and the heifers destroyed. Vaccine-lymph subsequently produced at this farm was excellent in its results. The physician in charge sent a specimen of lymph to Berlin for examination. The microscope showed isolated bacilli, and numerous micrococci which multiplied in chains and did not liquefy gelatine. No control experiments by inoculation were made.

THE MICROBE OF DYSENTERY. — Chantemesse and Widal report the discovery of a specific bacterium in dysentery (*Progrès Médical*, April 21, 1888). Working in Cornil's laboratory, they have studied five cases of tropical dysentery, and have found the same microbe in the lesions and stools of a fatal case and in the stools of four others. The bacteria were found in colonies in and between the tubular glands of the intestine, in the lymph-glands, and spleen. The organisms develop rapidly at the ordinary temperature, thriving on all the usual culture media. They are bacilli, with rounded ends, and somewhat thicker in the middle than toward the extremities. They grow luxuriantly in sterilized water from the Seine. Fed to guinea-pigs, pure cultures produce intestinal inflammation and necrosis, the stomach itself being affected. The lesions are more marked when the gastric contents are rendered alkaline. Intraperitoneal injections cause death in two or three days with peritonitis, pleuritis, and pericarditis. The liver is affected in these animals, necroses with colonies of bacilli being found in the portal areas. All the lesions in the experimental cases furnished pure cultures of the bacillus. From these facts, and the absence of the bacillus in the fæces of healthy men, Chantemesse and Widal feel justified in claiming specific properties for this bacillus. In commenting on this paper, the *Medical News* says, that, although the observations made are too few in number to bring absolute proof, they are of interest as being the first in which so much has been accomplished. Numerous other investigators have described micro-organisms in dysentery; but none, up to this time, have succeeded in cultivating them. Further developments will be awaited with interest.

ELECTRICAL SCIENCE.

The Danger of Alternating Currents.

THERE has been a warm discussion before the Board of Electrical Control in New York as to the relative danger of continuous and alternating electric currents. Communications, most of them of a partisan nature, have been addressed to the board, and statements of a directly contradictory character have been made. Mr. Harold P. Brown, who champions the continuous-current side, has put the matter to a practical test by experiments tried at Columbia College July 30 and Aug. 3. He has killed a number of dogs, using both types of current, and he draws the conclusion that the alternating current is much the more dangerous. On July 30 only one dog was experimented on. The continuous current was first tried, the electro-motive force being increased from 300 to 1,000 volts, and the result was not fatal; then an alternating