Correspondence.

A Lunar Rainbow.

To the Editor of the Scientific American:

A lunar rainbow is a phenomenon of such rare occurrence that the event seems worthy of notice.

On the evening of July 5, between nine and ten o'clock, a complete and beautiful lunar rainbow was visible to the inhabitants of Petersburg, Ill.

The evening was beautiful. The full moon lighted up a huge cumulus mass of cloud in the northwest, from the nimbus portion of which was falling a summer evening shower. As the rain was falling close up to the edge of the cloud, and as the atmosphere was exceptionally clear, with the moon about three hours high, it will be seen that the circumstances were peculiarly adapted to the formation of a rainbow. The southern extremity of the bow was first visible as a faint streak of light, but sufficiently striking to attract the attention of even a careless observer. Slowly it gained length and brilliance, until the arc was complete, standing out, with the colors easily distinguished, against the dark background of cloud and rain.

Immediately outside the bow the background was very dark, probably on account of the dense structure of the cloud above, while on the inner side it was much lighter. The contrast of these two shades was very marked at the bow.

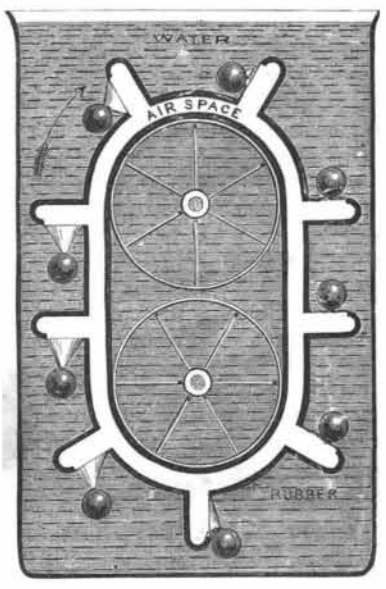
The beautiful rainbow continued thus for, perhaps, fifteen minutes, when, a cloud drifting before the moon from the south, the southern portion was obscured, but the northern continued for some minutes. C. E. E.

Petersburg, Ill., July 11, 1887.

A PERPETUAL MOTION MACHINE.

A correspondent describes the following "perpetual motion machine:"

"It is an endless rubber tube, with projections, on which are fastened thin rubber bags, and a small



weight is attached to each bag. The bags are filled with air when the weight hangs down, and when it comes on top it presses the air out and through the hollow projection and tube into the next bag that comes in position. When placed over two wheels in water, the bags filled with air should be lighter and rise, while the other side with the air forced out should sink."

Each bag, as it comes into position at the bottom of the left tube, will be filled with air expelled from a bag at the top. The weights will descend a certain amount, one in expanding and the other in contracting the bag. The lower bag has to be expanded against a heavy water pressure. Thus each weight will suffer "lost motion," and a constant loss of power in this inoperative falling of the weights, both at the upper and lower portions of their course, will take place. Hence the machine will not move.

Our Slow and Weak New Navy.

Captain Bunce, of the Atlanta, has officially reported the result of firing a couple of rounds from the guns of the new ship on July 15, at Gardiner's Island. He says:

"The result of this firing has been to completely disable both eight-inch B. L. gun carriages and to throw doubt upon the efficiency of the six-inch B. L. gun carriages and the three-pounder rapid-fire gun mounts.

"The arrangement of the battery has proved to be bad, as some of the guns have to be abandoned by their crews that the other guns may be fired at the target."

The report inclosed shows in detail the extent of the damage, which consists mainly in breakage of electric light plant, driving in of panels, disarrangement of joiner work, breakage of cabin windows, and a slight splintering of the deck.

THE ironclad Sinope, 10,000 tons, was launched on June 1 from the Russian Company's dockyard at Sebastopol.

Disinfection and Disinfectants.

Last December the State Board of Health of Connecticut, in its ninth report to the Governor of the State, made the following report on disinfectants, which the committee, after due examination, adopted as the result of a recommendation by the Public Health Association of St. Louis, which was composed of some of the most distinguished hygienic professors and physicians in the country.*

The object of *disinfection* is to prevent the extension of infectious diseases by destroying the specific infectious material which gives rise to them. This is accomplished by the use of *disinfectants.*

There can be no partial disinfection of such material; either its infecting power is destroyed or it is not. In the latter case there is a failure to disinfect. Nor can there be any disinfection in the absence of infectious material.

It has been proved for several kinds of infectious material that its specific infecting power is due to the presence of living micro-organisms, known in a general way as "disease germs;" and practical sanitation is now based upon the belief that the infecting agents in all kinds of infectious material are of this nature. Disinfection, therefore, consists essentially in the destruction of disease germs.

Popularly, the term disinfection is used in a much broader sense. Any chemical agent which destroys or masks bad odors, or which arrests putrefactive decomposition, is spoken of as a disinfectant. And in the absence of any infectious disease, it is common to speak of disinfecting a foul cesspool, or bad smelling stable, or privy vault.

This popular use of the term has led to much misapprehension, and the agents which have been found to destroy bad odors—*deodorizers*—or to arrest putrefactive decomposition—*antiseptics*—have been confidently recommended and extensively used for the destruction of disease germs in the excreta of patients with cholera, typhoid fever, etc.

The injurious consequences which are likely to result from such misapprehension and misuse of the word disinfectant will be appreciated when it is known that: *Recent researches have demonstrated that many of the agents which have been found useful as deodorizers, or as antiseptics, are entirely without value for the destruction of disease germs.*

This is true, for example, as regards the sulphate of iron, or copperas—a salt which has been extensively used with the idea that it is a valuable disinfectant. As a matter of fact, sulphate of iron in saturated solution does not destroy the vitality of disease germs or the infecting power of material containing them. This salt is, nevertheless, a very valuable antiseptic, and its low price makes it one of the most available agents for the arrest of putrefactive decomposition in privy vaults, etc.

Antiseptic agents, however, exercise a restraining influence upon the development of disease germs, and their use during epidemics is to be recommended, when masses of organic material in the vicinity of human habitations cannot be completely destroyed, or removed, or disinfected.

While an antiseptic agent is not necessarily a disinfectant, all disinfectants are antiseptics; for putrefactive decomposition is due to the development of "germs" of the same class as that to which disease germs belong, and the agent which destroy the latter also destroy the bacteria of putrefaction, when brought in contact with them in sufficient quantity, or restrain their development when present in smaller amounts.

A large number of the proprietary "disinfectants," so called, which are in the market, are simply deodorizers or antiseptics, of greater or less value, and are entirely untrustworthy for disinfecting purposes.

Antiseptics are to be used at all times when it is impracticable to remove filth from the vicinity of human habitations, but they are a poor substitute for cleanliness.

During the prevalence of epidemic diseases, such as yellow fever, typhoid fever, and cholera, it is better to use in privy vaults, cesspools, etc., those antiseptics which are also disinfectants—*i. e.*, germicides; and when the contents of such receptacles are known to be infected, this becomes imperative.

Still more important is the destruction at our seaport quarantine stations of infectious material which has its origin outside of the boundaries of the United States, and the destruction, within our boundaries, of infectious material given off from the persons of those attacked with any infectious disease, whether imported or of indigenous origin.

In the sick room we have disease germs at an advantage, for we know where to find them, as well as how to kill them. Having this knowledge, not to apply it would be criminal negligence, for our efforts to restrict the extension of infectious diseases must depend largely upon the proper use of disinfectants in the sick room.

The infectious character of the dejections of patients suffering from cholera and from typhoid fever is well established; and this is true of mild cases and of the earliest stages of these diseases as well as of severe and fatal cases. It is probable that epidemic dysentery, tuberculosis, and perhaps diphtheria, yellow fever, scarlet fever, and typhoid fever, may also be transmitted by means of the alvine discharges of the sick. It is, therefore, of the first importance that these should be disinfected. In cholera, diphtheria, yellow fever, and scarlet fever all vomited material should also be looked upon as infectious. And in tuberculosis, diphtheria, scarlet fever, and infectious pneumonia the sputa of the sick should be disinfected or destroyed by fire. It seems advisable also to treat the urine of patients sick with an infectious disease with one of the disinfecting solutions below recommended.

Chloride of lime, or bleaching powder, is perhaps entitled to the first place of disinfecting excreta, on account of the rapidity of its action. The following standard solution is recommended:

Dissolve chloride of lime of the best quality in pure water, in the proportion of four ounces to the gallon.*

Use one quart of this solution for the disinfection of each discharge in cholera, typhoid fever, etc.† Mix well and leave in vessel for at least one hour before throwing into privy vault or water closet. The same directions apply for the disinfection of vomited matters. Infected sputum should be discharged directly into a cup half full of the solution.

Standard solution No. 2 consists in dissolving corrosive sublimate and permanganate of potash in pure water, in the proportion of two drachms of each salt to the gallon.

This is to be used for the same purposes and in the same way as *standard solution No.* 1. It is equally effective, but it is necessary to leave it for a longer time in contact with the material to be disinfected—at least four hours. The only advantage which this solution has over the chloride of lime solution consists in the fact that it is odorless, while the odor of chlorine in the sick room is considered by some persons objectionable. The cost is a little more.‡ It must be remembered that this solution is highly poisonous. It is proper, also, to call attention to the fact that *it will injure lead pipes if passed through them in considerable quantities.*

It will be best to empty the vessel containing excreta and disinfectant into an earthen jar or wooden vessel, and to leave it for twenty-four hours, at the end of which time it may be thrown into a privy vault, or into a hole in the ground excavated for this special purpose.

Disinfection of the Person.—The surface of the body of a sick person, or of his attendants, when soiled with infectious discharges, should be at once cleansed with a suitable disinfecting agent. For this purpose, solution of chlorinated soda (*liquor sodæ chlorinatæ*) diluted with nine parts of water, or *standard solution No.* 1 diluted with three parts of water, may be used. A two per cent solution of carbolic acid is also suitable for this purpose, and under proper supervision the use of a solution of corrosive sublimate—1 : 1,000—is to be recommended.

In diseases like smallpox and scarlet fever, in which the infectious agent is given off from the entire surface of the body, occasional ablutions with solution of chlorinated soda diluted with twenty parts of water will be more suitable than the stronger solution above recommended.

In all infectious diseases, the body of THE DEAD should be enveloped in a sheet saturated with *standard solution No.* 1, or with a 5 per cent solution of carbolic acid, or a 1 : 500 solution of corrosive sublimate.

(*To be continued.*)

Alloy-Resisting Acids.

Mr. Rettz has invented an alloy which offers great resistance to the action of acids and alkalies. It has the following composition:

Copper	15 parts.
Tin	2·34
Lead	1·82
Antimony	1

It is said to be a useful substitute, in laboratories, for ebonite and porcelain.

* The following gentlemen composed the committee: Dr. George M. Sternberg, Surgeon U. S. Army, Fellow by Courtesy in the Johns Hopkins University, Baltimore; Dr. Joseph H. Raymond, Professor of Physiology and Sanitary Science in Long Island College Hospital, and Health Commissioner of the city of Brooklyn; Dr. Victor C. Vaughan, Professor of Physiological Chemistry in the University of Michigan, and member of the Michigan State Board of Health; Major Charles Smart, Surgeon U. S. Army, and member of the National Board of Health; Dr. W. H. Watkins, Medical Director of the Auxiliary Sanitary Association of New Orleans; Dr. Albert R. Leeds, Professor of Chemistry in Stevens Institute of Technology, and member of the New Jersey State Board of Health; and Dr. George H. Rohe, Professor of Hygiene in the College of Physicians and Surgeons, Baltimore.

* Good chloride of lime should contain at least 25 per cent of available chlorine. It may be purchased by the quantity at 3½ cents per pound. The cost of the standard solution recommended is, therefore, less than one cent a gallon. A clear solution may be obtained by filtration or by decantation, but the insoluble sediment does no harm, and this is an unnecessary refinement.

† For a very copious discharge use a larger quantity. For the disinfection of solid or semi-solid fæces use a solution of twice this strength—8 ounces to a gallon of water—in the proportion of one quart for every 4 ounces of material to be disinfected.

‡ Corrosive sublimate costs about 70 cents a pound, and permanganate of potash 65 cents a pound, by a single pound. This makes the cost of *standard solution No.* 2 a little more than 2 cents a gallon.