the bar at A, to move it in the direction of the arrow, will close both circuits by bringing together the contact points, *d d* and I I, and that a discoloration of the chemical paper under the recording points, C C, will take place at the instant of such contact. Therefore, if the force applied at A be instantaneously transmitted through the bar, the points of chemical discoloration will be side by side on the paper E, moving in the direction of the arrow; whereas they really stand with relation to each other as shown at *i i*, the first mark made being that caused by the closing of the circuit at I I, where the blow is struck, and the second being that caused by the closing of the circuit at *d d*, which closing of circuit will not take place until the force applied at A shall have been transmitted to the other end of the bar by the action of the atomic particles of the bar.

In my experiment, the length of chemical paper carried beneath the recording points was 90 inches per second, any greater speed occasioning a break, and the dots caused by the contacts were $\frac{1}{40}$ of an inch apart; that is $\frac{1}{40}$ of an inch from the line they would have observed had the contacts been simultaneous. Therefore the time required for the transmission of the force applied from one end of the bar to the other was the $\frac{1}{3600}$ part of a second, or at the rate of 2,045 miles per minute. These results, however, were probably far from accurate. The speed of transmission may not only be much greater than attained in my experiments, but the process of determining it by chemical decomposition is faulty in many particulars. I do not claim that it does more than show a remarkable speed of transmission of ordinary force, and that not only this transmission could not have taken place without the molecular action of the metal, but that the molecular action of the metal alone accounts for the difference in time between the imparting of the force at one end of the bar and its manifestation at the other end. And I doubt whether any one, witnessing this phenomenon would attempt to account for this transmission of force by urging the passing through the bar of a subtle fluid, generated by the bone, flesh, and blood of the person applying the force: yet we have in electricity the selfsame principle in the molecular action in which the electric force exists and by which it is transmitted.

The sun emits light. Now we know that this light has sufficient force, falling upon a surface properly placed, to impart motion to that surface. Therefore a ray of light must either consist of a solid projected from the sun, traveling through space and falling upon that surface, or it must be a certain condition of the molecular or atomic structure pervading everything, which condition is propagated, with inconceivable rapidity, from one atom to another, until, finally, the atomic light condition of the sun, though in less intensity, is reproduced at the earth. Now it is not only beyond all reason and hopelessly absurd to suppose that an atom of matter is projected from a burning body through a resisting medium at the rate of 192,000 miles a second, as, for instance, a ray from a feeble candle frame traveling through atmosphere and glass; but such a supposition is controverted by all the phenomena of forces. All forces—light, heat, sound, expansion, gravity, electricity—are transmitted in a similar manner to the transmission of force through a tube of water or air, as related; and as this is the fact, so all forces must reside in a certain condition of the atomic or molecular structure of matter. Primarily, there must be a normal condition of the molecules of matter as to shape and state of motion or quiescence. What that normal condition is, whether in shape the atomic particles are round, square, or otherwise, whether their motion is vibratory or circular, whether a certain motion attracts and another repels, we can of course never accurately determine, although we may theoretically approximate some of the conditions, as, for instance, the conditions necessary to the expansion of a metal by heat.

Washington, D. C. W. E. SAWYER.

Salycilic Acid for the Preservation of Infusions, etc.

"The wonderful reports of the conservative properties of salycilic acid led me some time ago to commence a series of experiments to determine the proportions of acid necessary to add to infusions, etc., in order to keep them a reasonable length of time without change. The results I have obtained are not quite as satisfactory as I had anticipated, but probably they will not on that account be less interesting to pharmacists in general.

Before experimenting with the infusions, I sought a suitable solvent for the acid, and several weeks ago found that solution of borax was its best solvent; but this does not take up a sufficient quantity to allow of its being added to medicinal preparations for the purpose of preservation. Boiling water dissolves the acid in proportions sufficiently large for the purpose, and does not deposit it again on cooling; therefore I made the infusions, etc., upon which I experimented, with water in which I had previously dissolved the requisite proportion of the salycilic acid. The following are the results of the investigation:

Infusion of cascarilla, without acid, kept two days; with acid (five grains to pint), kept five days. Another infusion made of double strength, with water containing ten grains of acid to the pint, has now kept over a fortnight and is perfectly fresh.

Infusion of quassia.—A quart of concentrated infusion (one to seven) was prepared, having forty grains of the acid dissolved in it: this has kept now over a month, and is as nice as when first made. One part of it was diluted with seven of water and kept for comparison with a simple infusion; the latter was unfit for use on the fourth day, whereas the former kept for six days.

Infusion of orange, made with water containing five grains of the acid to the pint, kept perfectly bright and fresh for eleven days, but then gradually became turbid.

Infusion of calumba went bad in three days, and a sample with three grains of acid to the pint only kept four days. A stronger infusion, with ten grains to the pint, was put into an uncovered beaker, and was clear and good at the end of the week; but spots of mold then began to form upon its surface though it still remained bright.

Infusion of senna with eight grains of acid to the pint kept seven days, being four days longer than one without acid.

Infusion of malt (two ounces to pint).—A simple infusion was quite sour in three days; but with eight grains of the acid to the pint, a portion of the same infusion retained its odor upwards of fourteen days, and even now, at the expiration of twenty-one days, the odor might be distinguished.

Tragacanth mucilage.—The addition of acid, in the proportion of eight grains to the twenty ounces, causes this to keep for a length of time, a sample prepared nearly a month ago being quite fresh, while a mucilage without this addition had acquired a repulsive odor in about eleven days.

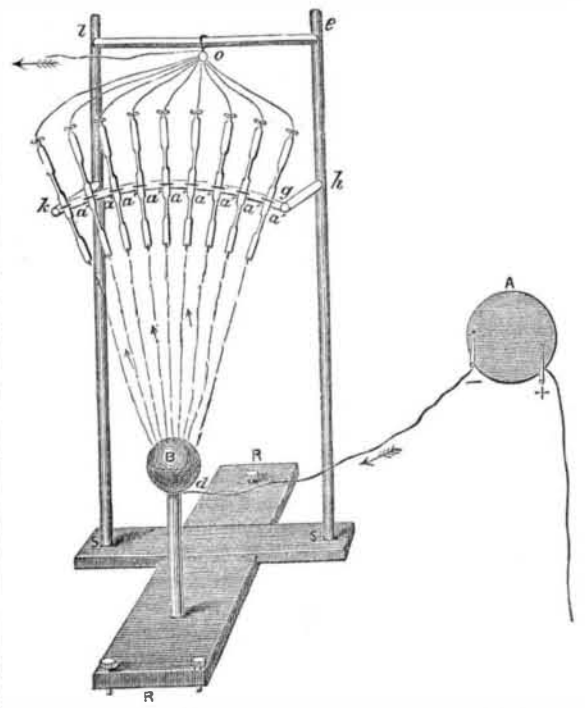
Mucilage of acacia also appears to keep well with this addition.

Lemon juice will retain its odor for weeks, and will not turn moldy, even if kept in an uncovered vessel, if five grains of salycilic acid are added to each pint.

Having read that this acid would keep leeches healthy and prevent the water in which they were kept becoming foul, I added ten ounces of acid solution (eight grains to pint) to half a gallon of water into which fifty leeches were put. Previous to this addition, we had found two or three dead leeches every week when the water was changed; but since, we have not lost a single leech, and the water keeps fresh for weeks. I forgot to note that, by adding ten grains of acid to each pint of sirups of red and white poppies, violets, etc., fermentation is effectually prevented. The addition of a little yeast to several of the samples produced no effect."—*J. C. Thresh, in Pharmaceutical Journal.*

AN EXPERIMENTAL AURORA.

M. Lynström, of the University of Helsingfors, has sent to the Geographical Exhibition, Paris, an interesting instrument invented by him to demonstrate that auroræ are produced by electrical currents passing through the atmosphere in the polar regions. Our illustration will give an idea of the apparatus.



A is an electrical machine, the negative pole being connected with a copper sphere and the positive with the earth. S S' are of ebonite, as well as R R *d d*, so that B is quite isolated as the earth in the space. B is surrounded by the atmosphere. *a' a' a' a' a' a'* are a series of Geissler tubes with copper ends above and below. All the upper ends are connected with a wire which goes to the earth, consequently a current runs in the direction of the arrows through the air, and the Geissler tubes become luminous when the electrical machine is set in operation. These Geissler tubes represent the upper part of the atmosphere, which becomes luminous when the aurora borealis is observed in the northern hemisphere. The phenomena produced by the Lynström apparatus are quite consistent with the theory, advocated by Swedish observers, that electrical currents emanating from the earth and penetrating into the upper regions produce auroræ in both hemispheres. The experiment, says *Nature*, differs from the apparatus of M De la Rive, who placed his current *in vacuo*, and did not show the property of ordinary atmospheric air of allowing to pass unobserved, at the pressure of 2 feet 6½ inches, a stream of electricity which illuminates a rarified atmosphere. The experiment was most attractive, and hundreds of persons witnessed it every day.

A board of engineers is now in session in this city, examining Captain Eads' plan for the improvement of the mouth of the Mississippi river. The recommendations thus far carry the total length of the east jetty to 12,700 feet, or 300 feet beyond the west jetty, and fix upon 1,000 feet as the space to be left for the current between the two artificial walls.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE BARNACLES ON THE GREAT EASTERN.

Mr. Henry Lee describes in *Land and Water* a recent examination of the bottom of the Great Eastern, made by him in search of new barnacles and other marine animals. His labors were unrewarded with much of novelty; but among other interesting facts remarked, he notes that the portion of the hull usually submerged was clad with an enormous multitude of mussels, extending over a surface of 52,000 square feet of iron plates, and in some parts six inches thick. The average weight of the mussels was from 12 to 13 pounds per square foot, so that the vessel was cumbered with fully 300 tuns of living marine animals, enough to load, with full cargoes, two ordinary collier brigs.

ANOTHER NEW ANTISEPTIC.

Among the benzol group, all of which are derived from coaltar, are (besides the phenol or carbolic acid ($C_6 H_6 O$) and its many compounds) the cresol ($C_7 H_8 O$), the phlorol ($C_9 H_{10} O_3$), and the phynol. The latter, of which the composition is $C_{10} H_{14} O$, is also found in the volatile oil of thyme, together with thymene, $C_{10} H_{16}$, and cymene, $C_{10} H_{14}$; but the cheapest source of its production is coal tar. Several compounds of the phynol were studied by chemis s long ago; but it was reserved for Lewin, of Berlin, to discover that it is a powerful antiseptic. When pure, it consists of transparent crystals of a very agreeable and strongly aromatic odor: while it is so powerful that a single grain in thirteen ounces of hot water is a sufficiently strong mixture for all purposes. Comparative experiments have shown that it possesses a much greater power to arrest fermentation and putrefaction than either carbolic or salicylic acid. Added to a solution of sugar, with yeast, it arrested fermentation; added to milk, it arrested coagulation till 20 days later than is usual, and after 40 days there was no vegetation visible. Albumen of eggs did not show putrefaction at the end of 11 weeks, and the peculiar aromatic smell was still prevalent at that time. Even in bony substances, otherwise so ready to start decomposition and putrefaction, it was able to arrest all putrefactive change for not less than 35 days.

It appears thus that the benzol series contains the best disinfectants, and that carbolic acid, which has hitherto enjoyed the highest reputation, is by no means the best in the series; and that it will be superseded by the fragrant thymol, until perhaps some better antiseptic is discovered.

A NEW OLEAGINOUS SEED.

The commission of the permanent Exposition of the French Colonies has lately called the attention of Marseilles soap makers to a new source of oil, found in the seed of the carapa, which is a tree abounding in immense forests in French Guiana. Twice a year the tree produces an abundant harvest of seeds, which at certain times cover the earth to a depth of four or five inches. These, immediately subjected to pressure, give 35 per cent of their weight in an excellent soap-making or illuminating oil.

NATIONAL TREE PROTECTION.

By a United States statute of March 3, 1875, a penalty of $200 or six months' imprisonment is attached to permitting cattle to run on national lands, and to break down trees and hedges. The unlawful cutting or wanton destruction or injury of "any timber tree or any shade or ornamental tree, or any other kind of tree" on the lands of the United States is punishable by $500 fine or a year's imprisonment.

A Shower of Hay.

Dr. Hawtrey Benson, of Dublin, writing in the Dublin *Daily Express* under date July 27, describes a remarkable shower of small pieces of hay which he witnessed at Monkstown that morning. It appeared in the form of "a number of dark flocculent bodies floating slowly down through the air from a great hight, appearing as if falling from a very heavy dark cloud, which hung over the house." The pieces of hay picked up were wet, "as if a very heavy dew had been deposited on it. The average weight of the larger flocks was probably not more than one or two ounces, and, from that, all sizes were perceptible down to a simple blade. The air was very calm, with a gentle under current from S.E.; the clouds were moving in an upper current from S.S.W." The air was tolerably warm and dry, and the phenomenon is thus accounted for by Dr. J. W. Moore: "The coincidence of a hot sun and two air currents probably caused the development of a whirlwind some distance to the south of Monkstown. By it the hay was raised into the air, to fall, as already described, over Monkstown and the adjoining districts."

A similar shower of hay fell near Wrexham, England, July 25.

Collodion.

Few bodies are more easily electrified than collodion. With the least friction by the hand, the membrane adheres to the fingers. If a collodion sheet be fixed, like a flag, to a glass tube, and waved in dry and hot air, it is electrified. Other uses of collodion sheets, here mentioned, are in experiments on polarization of light, on colors of thin films, on diathermancy, on vibrations in acoustics. M. Gripon prepares these sheets by dissolving 1·5 to 1·7 grains gun cotton in a mixture of 50 grains alcohol and 50 grains ether. The collodion is poured on a glass plate after the latter has been breathed upon so as to receive a coating of moisture. When —after some hours—the collodion is dry, the plate is put in water; and a sheet of paper having been applied and attached to the collodion by the edges, the film is drawn off with the paper