## INDOOR CURLING.

The illustrations of this subject are taken from the Thistle Association club house, Hoboken, N. J. Indoor curling is a new idea in this country. Formerly the curling clubs played their games at the different parks around New York and vicinity. The accommodations being so poor at these places, the different clubs formed themselves into an organization known as the Thistle Association and built a large club house where they could have their games day and night all winter long. The floor of the curling hall is 100 feet in width and 150 feet in length, and is the largest floor for that purpose in the United States. The floor is raised from the ground about 4 feet and is made of narrow strips of yellow pine about 1 inch in thickness. The floor is sprayed to facilitate coating it with ice. The attendant in charge of the building on every freezing night starts in one corner and sprays the whole surface, the process taking about one hour. This practice is continued all through the winter. The spray falling on the ice freezes instantly. Under each window, on a level with the floor, are 4 feet by 2 feet swinging traps, which are opened on freezing nights to let in the cold air. The ice during the latter part of the winter, after repeated sprayings, becomes about 2 to 3 inches thick.

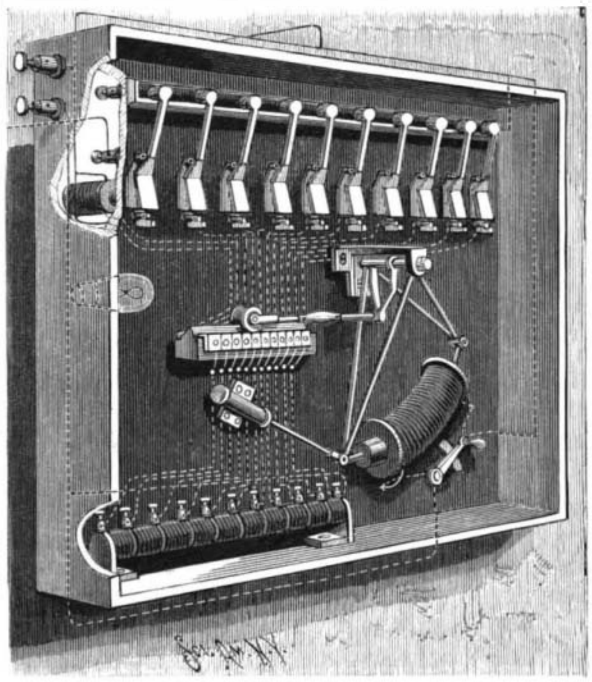
The circles at each end are painted in black on the bare floor, and can be seen through the ice. The rink from tee to tee is 38 yards in length. The circles around the tees are 2, 8 and 14 feet in diameter. Seven yards from each tee is a "hog line," every stone not clearing this line being called a "hog." There is also a line running at right angles to the rink half way between the tees, called the middle line.

The game is simple at first. The leader first tries to get as near the tee as possible, and his opponent has a similar object. During the game, if two or more stones have been well planted, the supporters of those who placed them are directed by their skips or captain to guard the winning stones rather then venture too near them, which may injure their position. The opposite players then try to knock off the guards and drive the well-planted stones away, so that they can get their own in a good position. Sometimes the stone nearest the tee is so well protected that it cannot be touched directly, and will take a master stroke to remove it. To do this, inringing is resorted to, which drives the stone in an oblique direction after striking the well-placed stone and becoming the winner instead. When the ice is blocked up so the tee caunot be seen, rebutting is resorted to. The player is told by his skip to put plenty of muscle into his arm, and the stone is sent with tremendous force, and goes crashing through the guards, sometimes changing the complexion of the game. Brooms are used by the players to sweep the ice dust which is scratched up by moving stones. By sweeping in front of a moving stone it gives it more power to move forward.

The curling stones weigh about 40 pounds each and are 12 inches in diameter across and about 5 inches in thickness. The best stones are made of Ailsa Craig granite. The best and hardest stone is taken from under the water. They are now being made by machinery, and cost $15 per pair. They are very highly polished. Formerly they were made by hand, at a cost of from $20 to $30 each, according to finish. The club house is built on piling, and cost about $18,000.

## NEW ELECTRICAL GOVERNOR.

We give an engraving of an electrical governor for controlling the current on a circuit, by introducing resistance into the circuit or removing it therefrom, or by



O'BRIAN'S ELECTRICAL GOVERNOR.

changing the exciting current in the field magnet of the electrical generator.

This instrument, as will be seen by reference to the drawing, is operated by a curved solenoid, in which is suspended a curved armature, so that it may swing freely in the solenoid. The armature is made tapering, to secure regular action, and its movement is damped by means of a dash pot. The arms which support the curved solenoid are attached to a rock shaft, which carries a shorter arm, connected with a double roller by an adjustable rod. The double roller rolls on two series of electric contacts, one set of which is connected with wires leading to resistance coils and the other set to a switch mechanism, which sends the current into storage batteries or other translating devices, when it is not required on the main line; that is to say, whenever the current in the main circuit is above the normal, the armature is drawn into the solenoid, moving forward the contact roller upon the contacts, cutting out one or more of the resistance coils and cutting in one or more of the switch magnets, thus shifting the circuit so as to allow the surplus current to go through storage batteries or other translating devices when it is not needed in the main circuit. When the current in the main circuit diminishes, the roller is returned by the armature, and in so doing cuts out one or more of the switch magnets, thus cutting out one or more storage batteries or other translating devices, and at the same time cuts in one or more of the resistance coils seen in the lower part of the apparatus, thus keeping the resistance of the governor constant.

This invention has recently been patented by Mr. John T. O'Brian, of Kearney, Nebraska.

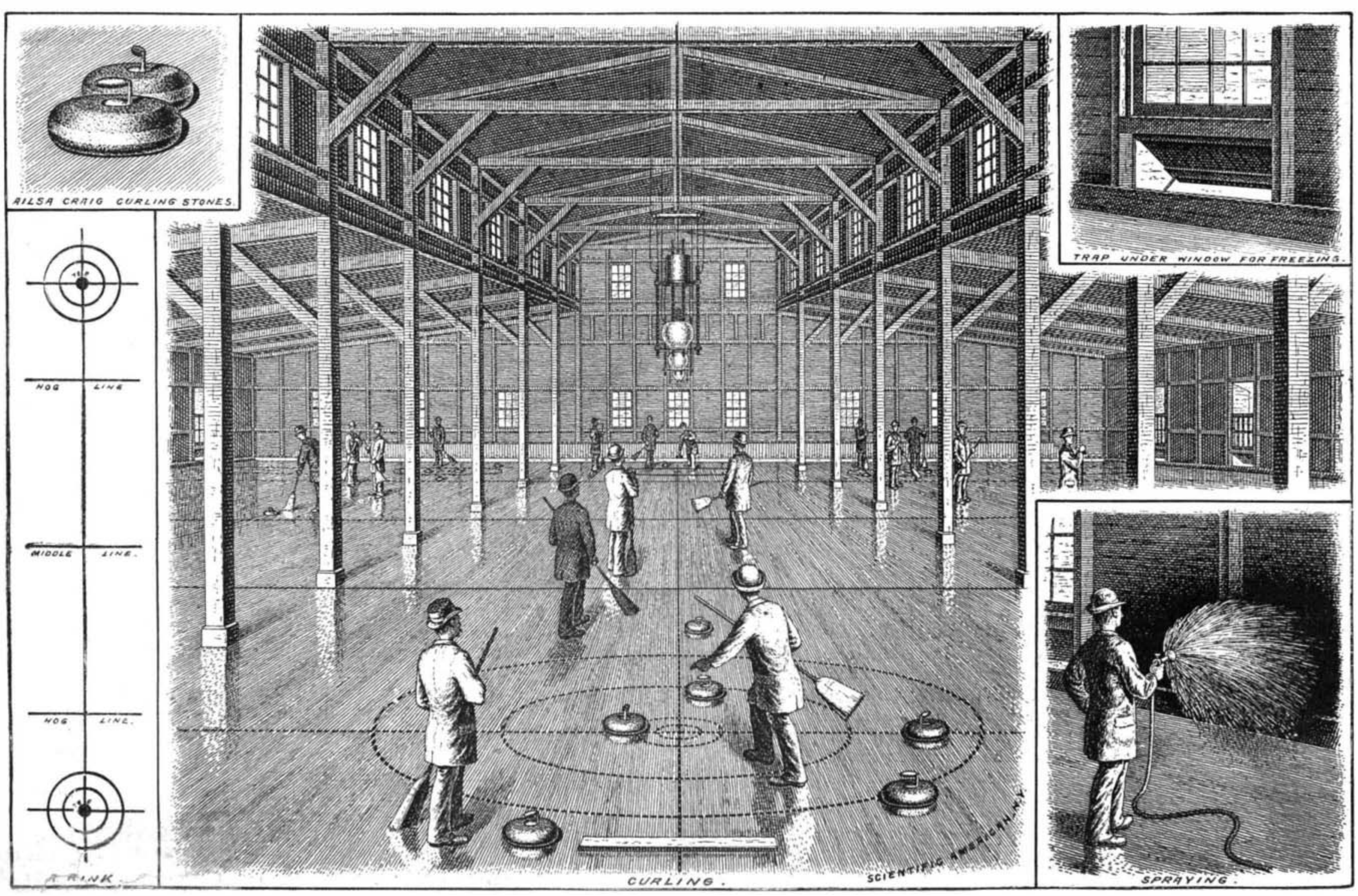
### Purification of Water by Metallic Iron.

Metallic iron, in the form of either cast iron borings or steel punchings, is placed in a cylinder so arranged that by a slow rotation the iron may be continuously showered through the water, which is being passed at a moderate speed through the same cylinder. The chemical action consists in great partin the conversion of the iron into ferrous carbonate, through the agency of the carbonic acid, which partly dissolves in the water and partly remains suspended in the form of dark green turbidity. On exposure to air the iron is converted into ferric hydroxide, which, settling rapidly, carries down with it and oxidizes the organic matter. The flocculent sediment permits of rapid and perfect filtration through a simple sand filter. For evidence of its success and efficiency it is only necessary to point to the continued successful use of the process at Antwerp, Dordrecht, Paris, Nancy, and other places.

### Mounting Paste for Lantern Slides.

For attaching lantern slide bindings to the glass nothing is better than bichromated paste, which is used for attaching paper to glass in the manufacture of electric machines, and which is a most useful paste for many purposes in damp climates. It is made as follows: Flour, 2 teaspoonfuls; water, 4 ounces; bichromate of potash, 5 grains. The flour must be rubbed to a smooth batter with the water, then placed in a saucepan over a fire, and kept stirred till it boils. Add the bichromate slowly, stirring all the time. Then stand to cool. *This paste must be kept in the dark;* and used as soon as possible.

*Soak* the paper in it, attach to the glass, and then place in direct sunlight for a day. This sets up a chemical change in the bichromate and renders the paste insoluble.—*M. V. Portman, Jour. Photo. Society of India.*




THE THISTLE CLUB CURLING FLOOR, HOBOKEN, N. J.

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**Tesla's Wonderful Electrical Experiments.**

Mr. Nicolas Tesla, of New York, has lately repeated in London, at the Royal Institution, the remarkable electrical experiments first shown in this city. The lecturer was received with great enthusiasm in London. The proceedings are described by *Engineering* as follows: Wednesday, Feb. 3, saw another of those successful meetings for which the Royal Institution is famed. This time, however, the audience were not able to congratulate themselves that they were the first to view in public the striking experiments which were performed before them, as it is the custom of Royal Institution audiences to do, for on one occasion before, in America, Mr. Tesla, the lecturer of the evening, had been over the same ground. This was probably no disadvantage either to him or to the numerous members and associates of the Institution of Electrical Engineers who crowded to hear him, for the fame of his researches had had time to spread, and their significance to become more or less appreciated. Not that Mr. Tesla needed this to render him welcome in this country, for the man who shares with Professor Ferraris the honor of having invented the self-starting alternate current motor requires no introduction in England, nor, indeed, in any country where scientific ability is appreciated.

Our account of the previous lecture will have rendered our readers familiar with the line of Mr. Tesla's researches. We may, however, briefly state that he has devoted himself for the last year or two to the investigation of the effects attending the use of alternate currents of very high frequency and of high potential. This matter of the frequency of alternation seems to have been neglected by former experimenters with vacuum tubes. They took great pains to get immense potentials, but paid little attention to the rate at which the current vibrated to and fro. It now appears, however, that the rate of alternation is as important as potential in evolving certain phenomena, and by increasing it to a very great extent perfectly new and unexpected results can be obtained. This can be done in various ways, of which Mr. Tesla employs two. He has an alternate current dynamo, the armature of which consists of a steel disk, having arrayed on its rim 380 poles. This runs within a ring of magnets of corresponding number, and with the machine rotating at 2,000 revolutions, gives 13,000 complete alternations per second. The current thus produced is sent through the primary wire of an induction coil, and its potential raised from 50,000 volts to more than a million, although, of course, the exact amount is a matter of conjecture. In another method of obtaining currents of high frequency there was employed an alternator lent by Messrs. Siemens Brothers. The current was sent through the primary of a large induction coil, in the circuit of which a special break was interposed. This consisted of two balls, between which the current sparked, and two powerful magnet poles, which blew out the spark as fast as it was formed, and thus greatly multiplied the effect. The current from the secondary coil was then sent through the primary coil of one of Mr. Tesla's oil-insulated induction coils; in the circuit of the secondary coil there was interposed a battery of Leyden jars, which was constantly charged and discharged, the discharge being of an alternating character, with a frequency of immense rapidity.

Mr. Tesla's coils are of peculiar form. The primary coil is on the outside, and is separated from the secondary by some little space. The whole is immersed in oil, and the inventor insists most strongly that a solid dielectric can never be used successfully in this position. If this be damaged, it is spoiled irretrievably, while the oil may be struck through time after time, and instantly repairs itself. Any bubbles of air that the oil may contain are soon warmed and rise, and thus the defects are rapidly expelled—an event which cannot occur in a solid substance, in which defects tend to aggravate and not to eliminate themselves.

Mr. Tesla began his lecture with a tribute to the work of Professor Crookes, which, he said, had fired his imagination when at college, and had given a bent to his studies. He then turned to his own researches, and in a second revealed to his audience the immense distance which separates himself from his predecessors, by taking in one hand an exhausted tube, 4 ft. long, while the other hand was connected to one terminal of a coil. Instantly the tube glowed with a brilliant lambent flame from end to end, and recalled to every one the idea of the magician's enchanted wand. When the gas was turned out, the light was sufficient to reveal the lecturer and his assistants, and would have been enough to enable him to read newspaper print. It was a most striking experiment; the old ideas of electric circuits, metallic electrodes, and all the rest of time-honored notions, seemed to be flatly contradicted. From a single terminal of the coil the electro-magnetic radiations were conducted through the body of the lecturer to the tube, and entering through the glass, they put the few molecules of air that it contained into such active oscillation that they glowed in their mutual bombardment.

It was a breach of the dramatic canons to begin with an experiment of such brilliancy, and then to descend to others of less importance, but it was an indication of the power of the lecturer, and evoked rounds of applause. Indeed, the reception accorded to Mr. Tesla was one that must have raised feelings of pride in any breast. Both seats and standing room were filled, and on the front benches were to be seen most of our leading electricians and electrical engineers. All through the evening there was rapt attention, which never flagged, even during the less striking experiments.

Putting down the tube, Mr. Tesla attached an exhausted bulb to one terminal of a coil, and showed that phosphorescence was immediately set up in it. When he placed his hand near to it this phosphorescence was immensely increased, and the lamp filled with a vivid glow. This was repeated in other ways with different bulbs, and then two plates were attached to the terminals of a coil, with a sheet of vulcanite between them. The current then endeavored to spark across, and beat itself in purple rays on the sheet, branching out in streaming brushes to make its way round the edges of the plate. Turning to his audience, Mr. Tesla exclaimed: "Is there anything more fascinating than the study of alternating currents?" It was evident to all in the room that use had not rendered the lecturer insusceptible to the beauties of the experiments that he showed, and that his mind was as completely filled with wonder and enthusiasm as that of the merest novice present, and probably far more so, as he saw further into the inner nature of the phenomena which he displayed, and grasped more of their significance.

The next experiment was the passage of sparks between two balls, to simulate the discharge from a Wimshurst machine. This was done most successfully, and it was difficult to believe that the well known disks were not being turned in the ante-room. At first a 2 inch spark was shown, and then one of 6 inches, the balls being changed, for the size of the balls appears to have a distinct effect on the appearance of the arc set up between them. Next came another of those brilliant sights which are always so effective with an audience, especially when it is in a cordial mood. Two wires were stretched across the wall of the theater, about a foot apart, and were connected to the poles of a coil. When the current was turned on they glowed for their entire length with a blue light, which streamed from one to the other, and was of sufficient intensity to reveal the faces of the audience. Here there was no case of exhausted globes; the light was given off in the open air, and if not enough for the ordinary domestic purposes, was at any rate of very appreciable intensity. In this case the alternations were obtained by aid of the Leyden jars. The same idea was developed in another way in the next experiment. A wire ring, 3 feet in diameter, was connected to one terminal of a coil, and a second ring, 6 inches in diameter, was connected to the other, the two being concentric. The light streamed radially from one to the other, making a palpitating purple disk of great beauty.

Speaking on this subject of phosphorescence, Mr. Tesla stated his belief that it could be excited in all substances, if currents of sufficient frequency and potential were employed. He was also of opinion that exhaustion of the air was not necessary. Hitherto it has not been possible to drive the molecules on to the substance unless a fairly clear road were prepared for them, by removing all but an infinitesimal number. They could not get through the *melee*. But with sufficient initial velocity they will be able to proceed in straight lines, just as a cannon shot will pierce a crowd that would stop or deflect a cricket ball. All that is wanted is that the atoms shall fly fast enough and often enough to raise the surface, even of metal, to the phosphorescing or at least to the glowing stage. With extremely rapid alternation, also, the molecules never get far away from the substance they bombard, and so their heat is not diffused. Crookes' phosphorescent tubes give a magnificent glow if only held in the hand, while the other hand is applied to a coil working with sufficient frequency and potential.

Visible light and heat are not necessary to prove the existence of the electric radiation, and Crookes' radiometer placed near a ball connected to one pole of a coil rotates very briskly—curiously, however, in the opposite direction to that which it follows under the influence of light. This is explained as being due to the streams from the glass. In a second instance an unexhausted radiometer was made to rotate; the fans were covered on one side with mica, and the spindle was connected to the coil. The effect of the mica was to prevent the molecules heating one side of the vanes. As the current was increased, the speed diminished on account of the electrostatic action between the mica and the glass.

In a certain sense the most interesting part of the lecture was that dealing with lamps, because here we seem to get nearer to some practical result. Mr. Tesla's lamps mostly consist of a bulb inclosing a button of carbon resting on the end of a wire or a filament. This wire is screened by being surrounded by a tube of aluminum, which forces the radiation to follow it to the button, and not stream off sideways. When the single conductor, which this lamp contains, is connected to one terminal of a coil, the carbon glows with a light the intensity of which varies with the character of the current. On Wednesday the light seemed to be about equal to 5 candle power. When a metal screen was put over the lamp, and the radiations that fell on it were deflected back on to the sphere, the light was doubled, and reached a perfectly useful limit. Wonderful as this was, a greater marvel appeared when two zinc plates, one at a height of 10 feet and one on the floor, were connected respectively to the poles of the coil. Then it only needed that a lamp of this construction should be brought into the intervening space to glow brilliantly without any electrical connection whatever. The radiation between plate and plate was so active that, in passing through the attenuated atmosphere in the globe, it evolved the molecular bombardment which made the carbon glow.

The practical man asked as the lecturer finished, "What is the use of it all?" Nearly fifty years ago he was present when Faraday explained the laws of electro-magnetic induction, and then he also asked the same question. It was not till the Paris Exhibition of 1878 that he got his answer, but we shall be much mistaken if he has to wait so long this time. Wait he must, and in the mean time he cannot do better than join in honoring such men as Mr. Tesla, who engage in researches which promise no immediate pecuniary benefit. He must, however, be dull if he cannot discern in the few experiments we have described, out of the many shown to the audience, a clew tending toward a great discovery that would entirely revolutionize our methods of artificial illumination. If a space measuring several feet in each direction can be brought into such a condition that an attenuated atmosphere introduced into it instantly becomes self-luminous, it does not call for any great stretch of imagination to see the whole of the atmosphere of our rooms in the same condition, and filled with the same clear light which bathes our planetary system. Just as the sun puts the ether into vibration of the kind revealed to our senses as light, so does electric energy also put it into vibration of the same kind, but of a different degree. Wednesday's lecture marks one step in the progress toward luminous electric radiations; possibly some of us may live to see the remaining stages covered.

**Experiments on the Solubility of Metals.**

The insolubility of pure metals in acids has been investigated by Dr. Weeren, a German chemist, who states that chemically pure zinc, as well as many other metals in a state of purity, are insoluble or only very slightly soluble in acids, because at the moment of their introduction into the acid they become surrounded by an atmosphere of condensed hydrogen, which, under normal circumstances, effectually protects the metal from further attacks on the part of the acid. In the experiments which established this conclusion, the amount of chemically pure zinc dissolved by the acid was first determined; it was next sought to ascertain what difference would follow by performing the experiment in vacuo, when, of course, the escape of hydrogen would be greatly facilitated; and under these circumstances the solubility was found to be increased sevenfold. In the final experiment, namely, to learn the effect of introducing into the acid a small quantity of an oxidizing agent capable of converting the hydrogen film to water, it was found that when a little chromic acid was thus introduced, the solubility was increased one hundred and seventy-five times, and when hydrogen peroxide was employed, the solubility was increased three hundredfold.

**How to Take Silver Stains Out of a Gelatine Negative.**

BY J. V. DRAKE.

Soak the plate for five minutes in clean water; meanwhile, make a solution of iodide of potassium, 20 grains to an ounce of water; now put the plate in this solution, and let it stay for ten minutes. If the stain is very old, keep it in for half an hour. Now dissolve half drachm of cyanide of potassium in one ounce of water. Take the plate and put it into this, and gently rub the stains with a tuft of cotton wool, free from grit, until they are quite gone. If the stains are very old, make the solutions stronger, and soak for a longer time.

ACCORDING to Herren Lubbert and Roscher, aluminum cannot be used for articles which have to withstand the action of water at its boiling point, and consequently is not suitable for vessels intended to hold preserved foods, as these have commonly to be heated in order to sterilize their contents. The same experimenters also find that such mildly corrosive liquids as claret, tea, coffee, and herring brine act on it appreciably. As it is also attacked by phenol salicylic acid, and boric acid, it is unavailable for many surgical purposes.

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