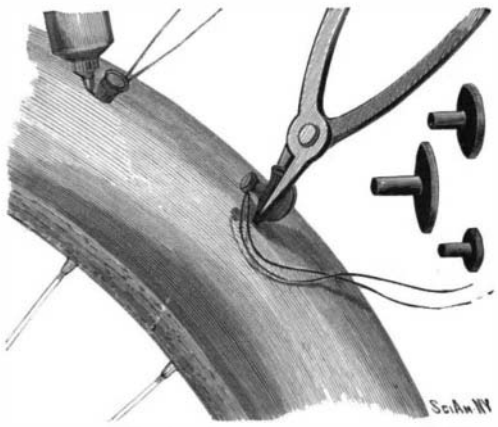
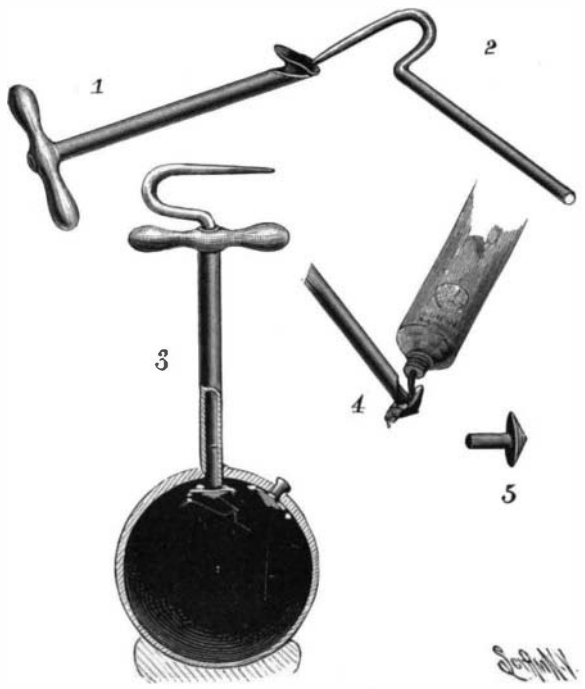
THE REPAIR OF SINGLE TUBE BICYCLE TIRES.

Single tube bicycle tires have become deservedly popular among American riders. Although it is sometimes more difficult to effect in them a positive and permanent repair than in the inner tube tire, a temporary repair, good for a thousand miles or more of riding, may often be made in a few minutes. We illustrate several methods of repairing such tires, which methods are divisible into three classes, plug repairing, patch repairing and band repairing.

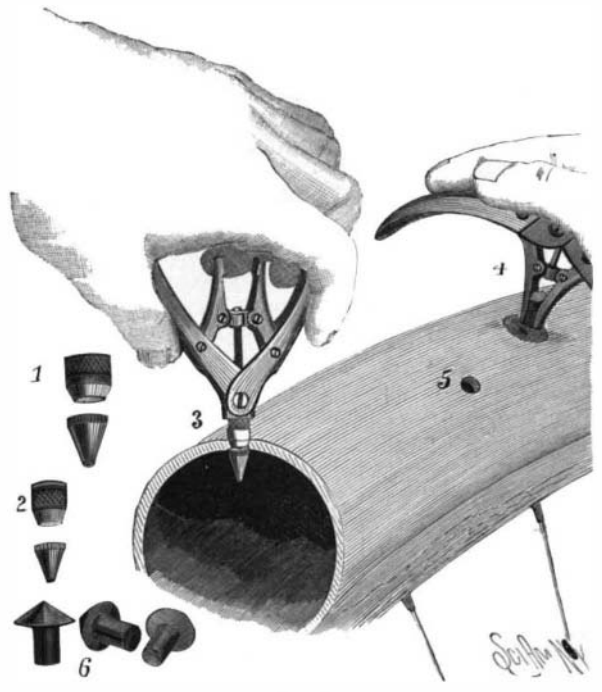
No. 1.



No. 2.—INSERTING PATCH WITH PLIERS.



No. 3.—TIRE PLUGGER.



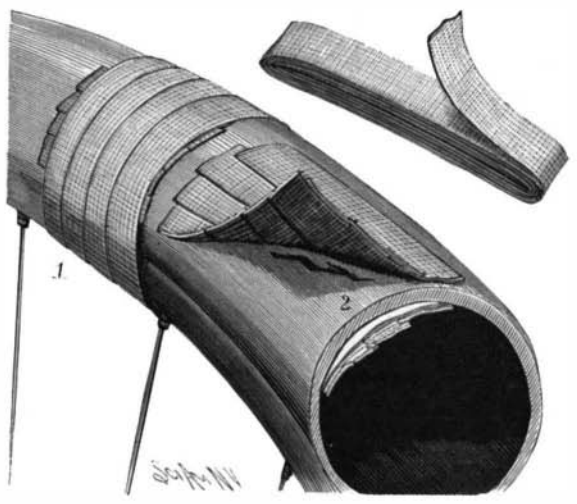
No. 4.

Our first cut illustrates typical forms of plugs, one with a cylindrical stem, two double-headers shaped somewhat like cuff buttons and another with a conical stem. They are made of various sizes and proportions.

One of the simplest and most popular means of inserting a plug is shown in the cut No. 2, where pliers specially made for the purpose are employed. The approved method of operating is to tie a string or strong thread tightly around the stem of the plug, which plug is then grasped by the pliers in the manner shown, is well lubricated with solution and is forced into the aperture with the head innermost; the solution is then squeezed out of the flexible tube, which is supplied with a special nozzle for the purpose, through the puncture, so as to fall upon the head of the plug within the tire. The tube of solution is withdrawn, the plug is drawn into place by the thread and part of the protuberance is cut off. The double header plug, such as shown in Fig. 3 of cut No. 1, is inserted by this instrument with the small head innermost. The large head is cemented to the outside of the tire by covering its inner surface and part of the tire adjacent to the puncture with rubber solution, allowing the surfaces to dry as perfectly as possible out of contact with each other, and by then pressing them together, when they instantly adhere.

Cut No. 3 shows a method of introducing a plug by a very simple apparatus. Fig. 1 is a metal tube with cross handle. The tube is cut off obliquely at its lower end. With it is provided a bent piece of metal, Fig. 2, by means of which a plug previously moistened with a solution as a lubricant only, Fig. 4, is forced into its oblique end, Figs. 1 and 2. The tubular tool is then driven into the puncture and the pricker is forced down through it after its introduction, Fig. 3, so as to expel fromit the head of the plug. On withdrawal of the two tools the plug is left in the aperture, and its head may be pulled up by means of its projecting stem against the interior of the tire. Fig. 5 shows the plug, and in the section of the tube one plug is shown in position.

In the next cut, No. 4, a more complicated apparatus is shown, used for introducing the plug shown in Fig. 6 of such cut. A pair of pliers of peculiar construction are arranged to support a cylindrical cutting edge, Figs. 1 and 2, of varying size. For each cutter a conical bed piece is provided, also shown in Figs. 1 and 2. The bed piece is secured to the pliers below its cutter, and the bed piece, which, as held by the pliers when open, will be in advance of the cutting edge, is forced through the puncture. By closing the pliers, the bed piece is drawn up against the cutting edge, so that a small round disk is cut out of the rubber. The cutting operation, as shown in Figs. 3 and 5, shows the result. By reversing the pliers and opening them, the plug is held in the other jaws, as shown in Fig. 4, and after a thorough lubrication with the solution is forced through the aperture into place.

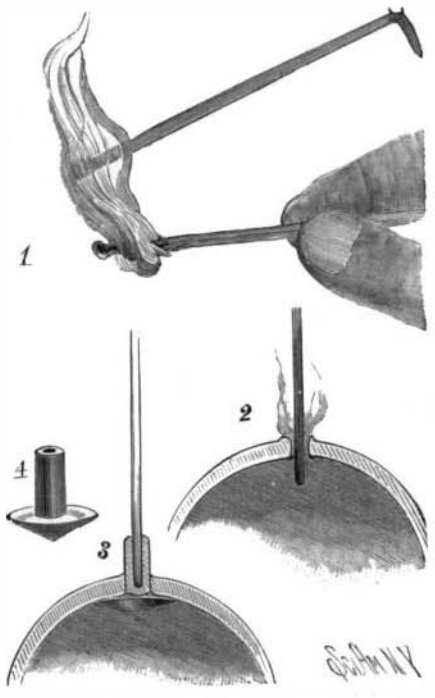


No. 8.—PUNCTURE PATCH MADE OF TAPE.

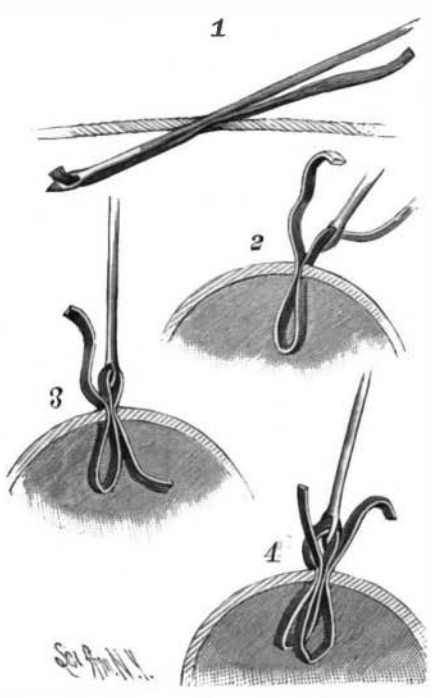
A peculiar system of introducing the plugs is shown in Fig. 5, where a plug with a hole in the stem is used. A piece of wire is heated, Fig. 1, in the flame of a match, and while hot is forced through the puncture, burning off the ends of the threads and leaving it ready for plugging, Fig. 2. The wire, still hot, or slightly reheated if necessary, is now inserted in one of the apertures of the plugs, 4, to which it adheres. The plug, after lubrication, is forced into the puncture by the wire, which is then drawn back, pulling the head of the plug up against the interior of the tube.

We here encounter for the first time the burning out of the hole with hot wire, and for all phases of tire mending where a plug is to be used it is an excellent plan to burn out the hole rather than to cut it out by any means. The burning out removes the projecting ends of the threads and does away with the fertile source of so-called porousness.

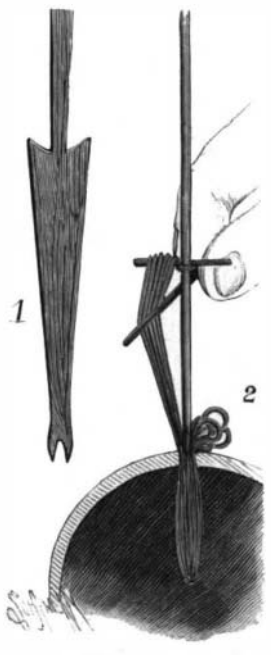
Band plugging is shown in the next cut, No. 6. A needle about eight inches long, with an end not too sharply pointed and containing a large perforation, is used. The other end should be bent into a ring-shaped handle. The needle is threaded with one or more bands of India rubber. It is shown as used with a single band. If it be desired to introduce a single thickness into the puncture, on account of its smallness of size, the manipulation shown in Fig. 1 is adopted. The needle is threaded, a small portion of the band projecting from the eye; after lubrication with solution, the needle is introduced, and being directed very obliquely, is pushed far in, the band being held back on the outside until it snaps out of the eye of the needle. On withdrawing the needle, a single thickness of the band is left in the puncture. If two thicknesses are required, the needle is thrust well into the tire through the puncture and withdrawn, as shown in Fig. 2, carrying with it the end of the band. In executing the manipulation of Fig. 2, the condition shown in Fig. 3 is always reached; when, if the ends are long enough, the bands may be cut at the bend where it passes through the eye of the needle, leaving three thicknesses in the hole. In Fig. 4 the double band is forced well into the hole, and then the band is withdrawn to be cut off close to the eye of the needle, leaving four thicknesses in the hole. By carrying out this system almost any number of thicknesses of bands



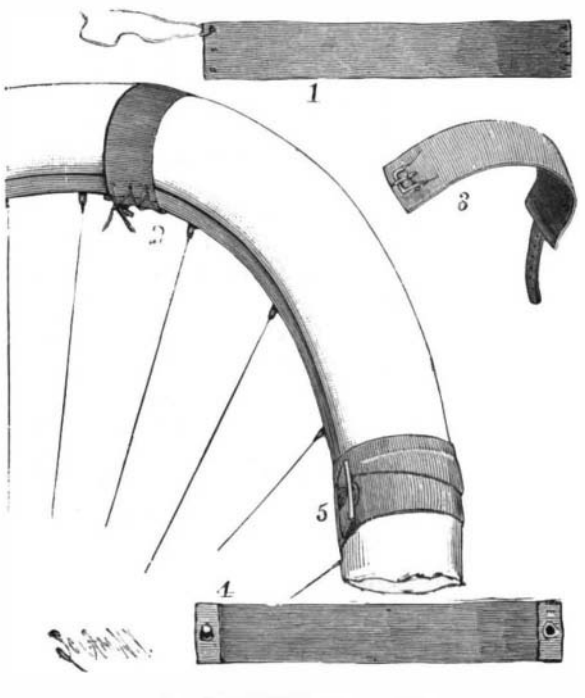
No. 5.—WIRE PLUGGER FOR SINGLE TUBE TIRES.



No. 6.—PLUGGING TIRE WITH RUBBER BANDS.



No. 7.—TIRE PLUGGED WITH RUBBER BAND.



No. 9.—PUNCTURE BANDS.

may be introduced. The process seems exceedingly well adapted for irregular punctures.

Our next cut, No. 7, shows a tool for introducing small rubber bands in quantities. Fig. 2 shows a needle with a small cross piece and notched end. A quantity of small endless bands are strung upon it, their center portions passing over the notched end and their ends being looped over the two extremities of the cross piece. The needle and cross piece are so proportioned as to stretch the bands considerably. After lubrication they are forced into the tire as shown and the looped ends are pushed off the crossed piece. The needle is then withdrawn, leaving the bands in the hole, to be trimmed off as desired. Fig. 1 of the same cut shows a needle cut out of a piece of hard wood to be used in an emergency in perfecting this kind of a repair.

A patch repair executed with the well-known tire tape is shown in cut No. 8, designed for use especially for bad cases. A patch is built up of tire tape, by cutting short pieces and placing them transversely to each other, batten fashion. If a cut is large enough, such a patch is placed in the interior of the tube and pressed up firmly against the cut by forcing the sides of the tube together. Another such patch is placed outside and the whole is secured by winding the tire tape. Solution may be used to secure the tape in place if the tape is too dry to adhere without it.

Cut No. 9 shows a puncture band, which may be of heavy pure gum rubber or of leather, Figs. 1, 3 and 4. Fig. 1 is arranged to be secured by strings around the tire. Fig. 3 has a buckle and a strap, and Fig. 4 has the well-known eylet and stud catch used on gloves. To apply these, if made of leather, an India rubber patch is first cemented by solution over the puncture on the outside of the tire and over it the band is secured.

The band shown in Fig. 4 is of somewhat thick and elastic India rubber, long enough to be wound twice around the tire before being secured, thus producing a very perfect tension. This or other bands can be directly cemented over the puncture, the rubber patch being dispensed with. This is not recommended. As a substitute for the bands a leather shoestring, which is wound tightly over the rubber patch, is excellent. In all these cases the tire should be incompletely inflated, so that when finally inflated the tension is increased.

There are two points relating to the subject to be considered. One is the alleged porousness of tires. Single tube tires in general consist of an inner lining of India rubber, surrounded by a fabric, the latter bedded in and coated with India rubber. The tightness of such a tire depends almost entirely on the maintenance of the integrity of its inner lining. If this is punctured or injured from the inside, air will get into the fabric and following the threads escape in a quantity of minute streamlets, so that when sponged with water, minute bubbles will be seen escaping from an indefinite number of places. The tire may be punctured by a nail and the puncture may be mended so as to be perfectly tight, yet the nail may have punctured the inner coating on the opposite side too without cutting through, and this puncture may be enough to start leaks, producing so-called porousness. There is no way of finding the location of such an inner lining puncture.

Another point relates to the putting on of a patch by means of rubber solution. The adherence of these patches does not depend on cement-like action of the India rubber, but on cohesion. The best way of doing it is as follows: The surfaces to be fastened together are coated with the solution, which is allowed an hour or more to dry. If possible it is well to give ten to twelve hours. Or, after drying two or three hours, a second, and after a similar interval, a third coating of the rubber may be given to the surfaces, the final drying being as long as possible. When perfectly dry, the surfaces are placed in contact. The instant they touch they cohere and the operation is complete. In mending on the road, where time is an object, the surfaces coated with solution may be dried more rapidly by exposing to the sun and by blowing upon them.

A puncture in a single tube tire may be readily found by immersing the tire in water, and still more simply by wetting the surface with water, using a sponge or even the hand and watching for the escape of the bubbles from the wet surface. It is assumed, of course, that the tire is kept inflated all the time. For burning out a puncture in an emergency a hairpin may be employed, heated by a match.

As a desperate remedy a porous tire may have a longitudinal slit, about six inches long, cut through its inner periphery. At one end a hole half an inch in diameter is made. A weight, such as a nut from a bolt, is tied to a string and it is worked around the tire. An inner tube is drawn by it into the tire. The slit is then laced up, and the tire becomes an inner tube tire. This is not practicable except with tires having a good fabric to hold the lacing.

Percentage of Loss of Current in Electric Railways.

In St. Louis the electric railway officials are very much concerned over the ever-increasing loss of current. The rail return has proved, under present practice, inadequate, with the result of loss of power to the company and the partial destruction of lead and water pipes near the power houses. The ends of each rail are bonded with a small copper wire, and the running of supplementary wires between the rails, so that the current, after passing through the motors, can find an unbroken passage back to the generators at the power house. The bonds and wires used in the past were small, and many of them are now broken, so that the current, seeking the path of least resistance, leaves the wires and rails in hundreds of places, passes through the moist clay, and starts off along a water or gas pipe for some distance; then again wends its way through the moist earth back to the wires and rails. This is called by the electricians leakage of the current, and the action it produces on the pipes is termed electrolysis. Up to the present time but little has been done to remedy the evil. The trouble is becoming so marked that steps must soon be taken to suppress it.

The rail has a large current-carrying capacity and would prove an excellent return conductor were it a continuous one. But no matter how close the ends are to each other or how tightly clasped with fish plates and bolts, the connection for the conveying of current is a poor one. To obviate this, holes are bored near the ends of each rail and a copper wire the thickness of a lead pencil soldered and riveted to the two rails. This is called bonding. Every few feet copper wires were, up to a year or so ago, soldered to these and crossing over to the opposite rail, and also connected to a wire running alongside the track. Later on these wires were found too thin, and on new work thicker copper wires were used. The latest is a copper rod, each end of which is riveted to a rail. Even the copper rod bond, riveted to the web of the rail, has not proved satisfactory. Electric welding was tried on the Baden and St. Louis line, and the rail made a continuous one. The cost is prohibitive, however; the price per joint being about $6, and there are 352 joints in a mile. Cast welding costs $3 to $3.50 per joint.

Three of the St. Louis roads have an almost perfect rail return, namely, the Baden and St. Louis, the Southwestern and Citizens' line. On the first named the rails are electrically welded, and on the other two they are cast welded. The later process has been found by experience to be as good as the electric weld, while its cost is only half as much. A short time ago workmen started cast welding the rails of the Forest Park, Laclede Avenue, and Fourth Street line. Mr. P. C. Maffitt, president of the Missouri Railroad Company, had a great deal of trouble with leakage of current. It was a case of buying additional generators or attending to the return conductors. Mr. Maffitt decided to cast weld the joints, and this is being done without preventing traffic or even hindering it in the least. The joints are prepared during the day, and after midnight the perambulating foundries come along with molten iron, and 100 pounds or more of liquid iron is applied to each joint. This kind of a joint does away with fish plates, bolts, copper bonds, supplementary wires, and the like. When the work is finished the consumption of energy, it is estimated, will be from 15 to 20 per cent less than at present.—St. Louis Globe-Democrat.

Recent Archæological News.

Among the fragments of Egyptian papyri at Dublin, eighty lines or parts of lines of Homer's "Iliad" have been identified out of a manuscript of the third century before Christ. In the eighty lines are thirteen which do not exist in the "Iliad," but Prof. Mahaffy asserts that the Alexandrian critics took great liberties with the text.

Dr. Richardson, of the American School of Archæology, and his party, who have been making excavations in Corinth, have discovered the ruins of a large theater and a key to the topography of the ancient city of Corinth.

Over four hundred diamonds are known to have been recovered from the ruins of Babylon. Many are uncut, but most of them are polished on one or two sides.

A Druidical dolmen has been transported from Brittany and erected again in its original form over the grave of an archæologist named Piketty, at Meudon, outside of Paris. It is called the dolmen of Kerhan, comes from the neighborhood of Lochmariaquer, and consists of fourteen blocks of granite.

Santorini, the ancient Thera, the chief island of the Sporodes, in the Ægean Sea, has prehistoric remains which will be systematically explored by the German school of Athens.

Herr Dorpfeld, President of the German Archæological Institute, Athens, has resumed the work of excavation at the southwest of the Acropolis, and has discovered two statuettes of Hecate and Demeter, in brass.

At Delphi, a beautiful bronze statue of Apollo, eight inches high, has been discovered. It is thought that more valuable votive offerings may be found in the same place.

Ruins of an important temple have been discovered at Conea, between Velletri and Porto d'Ansio. It is believed to be the famous shrine of the Mater Matuta spoken of by Livy, and to mark the site of the ancient Satricum. The temple had been added to. The earliest building belongs to the sixth century before Christ. The pediment of the primitive temple was adorned with splendid painted terra cotta statues of the Greek archaic type, the most important yet found in Italy. Traces of two other temples, bits of the walls of the city, and the site of the necropolis have also been found, and further important discoveries are expected.

At Chassenon, in the Department of the Charente, France, a statue of a Gallic god has been found in an old well believed to have been filled up in the time of the invasions of the barbarians. It is two feet high, squatting like a Hindoo Buddha, and has the collar of the Gauls around its neck.

The excavation of the so-called "Temple of Vesta," at Rome, has brought to light the foundations of surrounding walls. These are built in what is called opus reticulatum; there have also been discovered old black glazed Etruscan vases and several lamps, which have names in the Etruscan language scratched on them.

Recent archæological discoveries along the valley of the Tennessee River, in northern Alabama, have led to the belief that the region was once inhabited by cliff dwellers, and an expedition from the University of Pennsylvania is soon to explore the caves in that region. Prof. Mercer will head the expedition, and it is believed that valuable discoveries will be made. Many specimens of ancient pottery believed to have belonged to the cliff dwellers have recently been found in the caves along the Tennessee.

M. Maspero has found that the scarabs and other Egyptian ornaments discovered at Eleusis all belong to the time of the Ptolemies, and, consequently, their discovery does not help the theory that the Eleusinian mysteries originated in Egypt.

Excavations have been begun on the site of the ancient Roman city of Verulamium, near St. Albans, England. It is hoped that traces of the adjacent city of Cassivelaunus, who was defeated by Cæsar, may also be found.

From the discovery of the remaining fragments of the Hymn to Apollo at Delphi, imploring the protection of the Roman government for Delphi and Athens, the date is fixed as being not earlier than the taking of Corinth by Memmius, in the year 146 B. C.

Dr. Robert Fletcher, in his "Anatomy of Art," and Dr. Luigi Sambon having shown conclusively that Greeks and Romans must have had a good acquaintance with surgery, it seems strange that in the mediæval European period there was dense ignorance and no skill in amputation. Sword and lance wounds were necessarily of constant occurrence then, and the treatment was merciless. We have shown before how there was among primitive people a fair acquaintance with surgery, and even a knowledge of the refinements of it, as in plastic operations. The discovery of a manuscript of the eleventh century shows us conclusively that among the Arabs and in Syria at the time of the first crusades there was a fair knowledge of surgery, and that the Syrians held in poor estimation the Frank doctor. Osama tells how a knight was suffering from an abscess of the thigh and a woman from consumption. The Frank physician had the knight's leg put in a block, and it was hacked off with a sword. The woman was treated by having her hair cut and a cross cut into her skull. The knight died at once and so did the woman. Then the chronicler says the Syrian doctor who had been called in left disgusted, having learned "more about Frankish medicine than he had ever known before."

Instinct Not Always Faultless.

Many persons still believe that the instinct of animals preserves them from certain accidents, and that they never eat anything that is injurious to them. Well-instructed persons have long known that in this regard animals are no better off than men. A chicken does not hesitate to drink paint; a cow partakes of water in which bags containing nitrate of soda have been washed; ducks strangle and choke in swallowing snails. M. Giraud, a veterinary at Barnewitz, now notes a fact that merits the attention of poultry farmers. He has observed numerous cases of poisoning in ducks following their feeding on caterpillars, especially those of the cabbage moth; these caterpillars have been given to the fowls in mass or are found on the cabbage leaves furnished them for food. After from six to twenty hours, according to the number of caterpillars eaten, poisoning manifests itself by loss of appetite, great weakness, tottering steps, accompanied sometimes by symptomatic movements, finally by difficulty of breathing and often death, after an agony of variable duration, during which the beak and claws grow pale. The lesions disclosed by an autopsy consist chiefly in an inflammation of the digestive passages. The disease is not always fatal.—Cosmos.

Astronomical.

A dispatch from Geneva, New York, dated July 22, says:

"Prof. William R. Brooks, director of Smith Observatory, while observing the moon last night with the large telescope, made a most interesting and unique discovery. A dark round object was seen to pass rather slowly across the moon in a horizontal direction. Prof. Brooks believes that it was the passage of a dark meteor between the earth and the moon, far beyond the earth's atmosphere, so that it remained non-luminous. The observation is new in astronomical records."