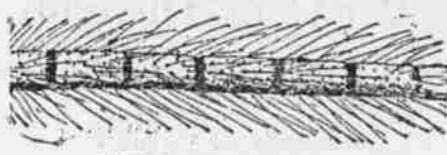


SEEN UNDER A GLASS

A MICROSCOPE REVEALS BEAUTIES OF ANIMAL LIFE.

Marvelous Arrangement of a Spider's Eyes—Daddy Longlegs Can See in Any Direction—Revelations About Mosquitoes, Flies and Other Things.

Dr. B. L. Riese is a Chicago scientist who devotes his leisure time to bug-hunting. His forte is microscopy and the use of this delicate instrument in connection with insect anatomy has resulted in some extremely interesting discoveries of late. He disposes of one or two theories which have been held for years, notably the one which provides insects with cup-shaped feet, the suction of which enables them to walk on polished surfaces in seeming defiance of all the laws of gravity. His microscope shows that the insects always have hooks of great relative pow-



FEELER OF A MAY FLY.

er on the ends of their legs, which are used to grasp inequalities invisible to human eyes.

Under the microscope the polished surface of plate glass is shown to be really a mass of inequalities. The naked eye, the touch, will not reveal them to man. Under this same instrument the feet of the common house fly is shown to be re-enforced by hooks small enough to find lodgment in the inequalities of the glass surface. The foot of the mosquito has a wonderful double hook which gives it the power of holding to almost any smooth surface. In fact, the foot is frequently entangled in some meshes which to the

been attracted to its existence by the microscope. The eyes are on each side of the tower, very near the top. "That insect can see as well over its shoulder as it can in almost a direct line in front," said Dr. Riese. "Possibly that is the reason—in fact, it may be said to be certainly the reason—that a spider can run backward as well as forward. The only spot where it does not seem to see well is right in front. You can capture one from that side much easier than from any other. This spider is not fitted with the additional eyes which other insects have. Usually the compound eyes are supplemented by simple eyes set in front and low down on or near the proboscis which enable it to see at short range in front. But the spider lacks these supplemental eyes.

"Here is the head of a grasshopper which shows the more ordinary style of eye with which insects are fitted," continued the doctor, placing another slide under the glass. "You will see that this insect has a huge eye on each side of the head. They resemble the eyes of a horse in a measure, but are immensely larger in proportion. Now they are fixed in the head immovably so that the bug can not turn them in the slightest degree. They have none of the delicate appliances of the human eye to reduce focus or change direction, so nature has compensated.

"You will see that the eye is enclosed in a transparent sack and that it has the appearance of hundreds of glassy fish eggs. These enable the insect to catch pictures in all directions. But just in front the lines are rather obscure, so nature has bestowed some extra eyes on the grasshopper. Look closely to the base of the antennae and you will see one of these extras. Some insects have them in the tips of their noses, as it were. These are for short range seeing and give the insect an advantage not possessed by spiders. This is an excellent type of the compound eye."

The slide was moved slightly that the

the greedy mouth. The net is a marvelous exemplification of nature's artistic power. The web is traced with beautiful lace work, the cords are twined in regular strands, as if they really are ropes, and the tackle is as intricate, yet simple in use, as anything used on a ship.

Seen under the most powerful glass—some 300 diameters were used—the tracery of the net is very clearly worth the study of engineers, for Dame Nature exceeds in skill any of her imitators. The study of this peculiar proboscis, with the beady eyes lying near to throw a brilliant light over the object assailed, is a work of art unsurpassed. In its mechanical purposes it is another evidence of the skill of the Creator in fashioning appliances to fit all needs.

One thing noticed in all the specimens displayed was that insects are usually covered with feathery hairs all over their parts. A glistening fly which to the human vision seems to be superlatively smooth is shown to be covered with a full suit of hairy feathers. The mosquito is literally engulfed in feathers, with here and there spirals entwined among them. The wing of the mosquito shows the same courses of feathers running along with each strand of the structure, while the web or sails are covered with delicate hairs.

One of the most interesting wings seen was taken from a May fly, the mothlike insect which lives but one day, flutters about an electric or gas light and falls dead by the million. The lace work of this wing would furnish a pattern for the most delicate and filmy laces produced in Belgium, France or Austria. Under a powerful glass its intricacies are so clearly revealed that an accurate copy could be easily made.

Consumption.

Nearly one-fourth of the deaths among the animals at the British Zoological Gardens last winter were due to tuberculosis. This is nearly double the human average, and confirms the rapidly growing belief that the disease is emphatically one of confinement and overcrowding, far this society's superb menagerie is very much cramped for room. The difference in the distribution of the disease between the various classes of animals at the Zoo is marked. Reptiles of all sorts are almost exempt, probably because the tubercle bacillus cannot live at the low temperature of their bodies, although two or three suspicious cases were found in tortoises and pythons. Animals suffer nearly 50 per cent. more severely than birds. But the most striking difference is that between the meat-eaters and vegetable feeders. Among vegetarians (monkeys, antelopes, deer and kangaroos) it causes 26 per cent of all deaths; among meat eaters (lions, wolves, small cats, civets) barely 3 per cent. Among grain-eating birds (pheasants, pea-fowl, grouse, ostriches) tubercle is responsible for 30 per cent. of all deaths. Among flesh eaters (eagles, vultures, owls, crows) 11 per cent. Comment is superfluous. An open-air life and a meat diet are clearly the best protection against consumption.

Costly Fruit in England.

At a farmers' club in Devonshire, England, not long since, an experienced gardener in the employ of one of the nobility made the statement that the income from ten acres covered with glass beneath which early vegetables and fruits were grown would exceed that from 10,000 acres of the best farm land as ordinarily tilled. No doubt that assertion was extravagant, but it can be said within the lines of conservatism that the Britisher wasn't off in his figures more than 50 per cent. One man, to our knowledge, a German gardener, sold early cucumbers, melons, and celery, from one acre under glass—cold frames—to Leadville and Aspen (Colo.) miners to the amount of from \$3,000 to \$4,000 a season.

In England, where, on account of the damp, chilly climate, even peach trees must be trained flat against a brick or stone wall like vines in order to insure fruit, and where corn cannot be grown, extremely fancy prices are paid for extra early fresh fruits and vegetables. A dollar a pound for strawberries and 75 cents a piece for cucumbers are only ordinary prices for these products, when put upon the markets early. Early fruits and vegetables bring handsome returns in large cities in any country.—California Vineyardist.

Tall Men Scarce in England.

The directors of the Great Northern railway of England have issued a circular letter to the station agents stating that in future the standard height for porters in the passenger department shall be 5 feet 6 inches and in the goods department 5 feet 4 inches. This is a considerable reduction, forced by a scarcity of taller men.

Electric Street Sweepers.

Electric automobile street-sweeping machines are being prepared to clean the streets of Paris. The old clumsy dirt machines now in use are to be done away with.

After a man has been sick six weeks people quit worrying about him, and begin to wonder why he hangs on so long.

THE FILIPINO GIRL.

Her Habit of Smoking Is One Which Shocks Americans.

A Filipino girl whose parents make any pretensions to wealth or social ambition will not walk a half dozen blocks unless escorted by some relative, even in broad daylight, but she will sit on a balcony in full view of the street and puff contentedly at a long cheroot, perfectly conscious that she is within the bounds of strict propriety according to native standards.

This habit of smoking by girls and women is one which Americans in Manila find very hard to become accustomed to. We have heard that some women of our own race, members of a class of society more noted for its money than for its good morals, sometimes smoke a cigarette or a small cigar, and, if the exhibition of their daring, and it is generally believed that their numbers are few. The Filipino woman who does not smoke, however, is a rare exception. A writer in the Outlook says of them: "They are always glad to accept a cigarette or a small cigar, and, if you are not prompt in offering one, in all probability will produce one from their own supply and ask your permission to light it. This habit quickly ceases to attract your notice except under unusual circumstances."

EMPHASIZED HIS LAST WILL.

How an Old Steamboat Captain Tried to Prevent a Contest.

"I am free to admit this story sounds a trifle fishy," said a New Orleans lawyer, chatting over an after-dinner cigar, "but I happen to know it is absolutely true. Last summer a local business man, whom it isn't necessary to name, made a new will of rather an elaborate and peculiar character. 'I am bound to say to you,' remarked his attorney, when the document was completed, 'that I think it more than likely your children will make a contest if this will is ever probated.' 'I'm going to have a talk with them on that very subject,' retorted his client. 'Yes,' replied the attorney, 'but when your voice is still forever they may think differently about it.'

"That remark set the old man to pondering, and he finally hit on a very picturesque expedient. He had a phonograph at his office, and, putting on a fresh cylinder, he roared his last injunctions into the receiver, in his most impressive style. Then he carefully removed the record, swathed it in cotton wool, and filed it away with the will. Next day he sent for the lawyer and gave him specific directions what to do after the demise. 'I want you to call the family together,' he said, 'and read the will carefully from beginning to end. As soon as you get through and before they have time to talk about it, start the phonograph going and let 'em hear my last message. Be sure to have a good, big horn on the machine and see that everything is in first-class working order. You had better keep the thing in your office,' he continued, 'and any time a contest is mentioned just turn it loose.'

"The old gentleman was a steamboat captain in his early days and he has a way of giving an order that makes one jump to here it. I am inclined to believe that his scheme is a good one, and that his parting adjuration, coming as it were from the grave, will have a highly discouraging effect on litigation."—New Orleans Times-Democrat.

Worse than a Sea Lawyer.

Sea time as most people know, instead of being reckoned by hours, is divided into "watches" of four hours each. From 4 o'clock to 6, and 6 o'clock to 8, there are half divisions, nautically termed "dog watches."

In a recent admiralty case the counsel asked an old sailor at what time of day a certain collision occurred, and received the reply, "About the middle of the first dog watch."

In summing up the case, the newly admitted admiralty proctor enlarged upon the information thus imparted as follows: "You can imagine, gentleman of the jury, the care which existed on this occasion, when, as appears from one of the plaintiff's own witnesses, this valuable ship and her cargo, and the lives of passengers and crew, were intrusted to what, gentleman?—why, to the mere watch of a dog?"—Collier's Weekly.

Big Royal Family.

The Bourbon Duke of Parma, who was obliged to quit his duchy in 1859 has a larger family than any other royal personage in Europe. By his first wife, a Princess of Bourbon-Sicily, he had nine children, all of whom survive except the eldest, the late Princess of Bulgaria. By his second wife, who was a Princess of Braganza and a sister of the hereditary Grand Duchess of Luxembourg, he has nine more children.

Every fall the women put up "plenty of preserves," and have none after Christmas.

NEW WAY OF STOPPING TRAINS!

Their Steam Is Cut Off When Danger of Disaster Is Ahead.

Judge Albion W. Tourgeon, who is now consul at Bordeaux, France, writes to the state department of a recent improvement upon the "block system" on railroads designed by a French inventor, which, it is claimed, will greatly lessen the danger of collisions on railways. "The fact that the United States is the most profitable field for the exploitation of useful inventions," writes the judge, "has taken a firm hold upon the inventive minds of other countries, and the first thing a man does who has a novel idea of any sort is to seek to have it patented in the United States. That this is especially true of inventions pertaining to railway appliances is only natural when one contemplates the fact that the United States, with its 183,000 miles of railway track, has six times the mileage of any other country in the world.

"French inventions are usually defective in the mechanical character of the means by which the end sought to be effected is attained. This is, no doubt, due to the fact that so small a proportion of the population have any practical mechanical knowledge. Almost every man in the United States knows the use of tools. Very many who have no manual occupation are fairly skilled workers, and those who have inventive tendencies are not ashamed to devote their leisure time to the acquirement of technical skill necessary to prepare their working models and perfect their inventions. In France, on the contrary, such knowledge is considered derogatory to anyone in the higher walks of life. A clerk will not close a shutter nor dust off the top of the desk at which he works, since that is the business of an 'ouvrier,' nor will a man who moves in good society permit himself to be seen carrying a package of any sort along the street.

"One result of this exclusive use of tools by laborers is that French invention usually has, to an American, a certain sense of awkwardness in its mechanical application. The idea may be a good one, but there is very seldom any of the handiness which one finds in an American invention. In the many cases of application for American patents which come before me, I am almost always struck by this lack of directness of application, which leaves them open to competition, thus destroying the value of the invention by improvement of application of a principle.

"This does not apply to an invention by Pierre Paul Gilbert of Millau, department of Aveyron, France, intended to prevent railway collisions. It is, in effect, a simple and natural application of the 'block system'; but, instead of merely displaying a signal at each end of a section of track showing that the same is occupied, Mr. Gilbert's system acts also on the engines of the approaching locomotives, and, by cutting off steam automatically, brings the train to a standstill.

"As a preventive of head-on collisions this invention would seem a positive improvement on the block system, through it is quite possible that the increased cost of installation may prevent its general adoption. I send inclosed a set of drawings and a copy of the specifications for his patent, which Mr. Gilbert was kind enough to send me. Whether his system is of practical importance or not, it serves to show how the United States is regarded by the inventors of Europe, who make haste to secure protection under our law, so as to take advantage of the wonderful market it opens to really meritorious devices."

God Needs the Help of Mothers.

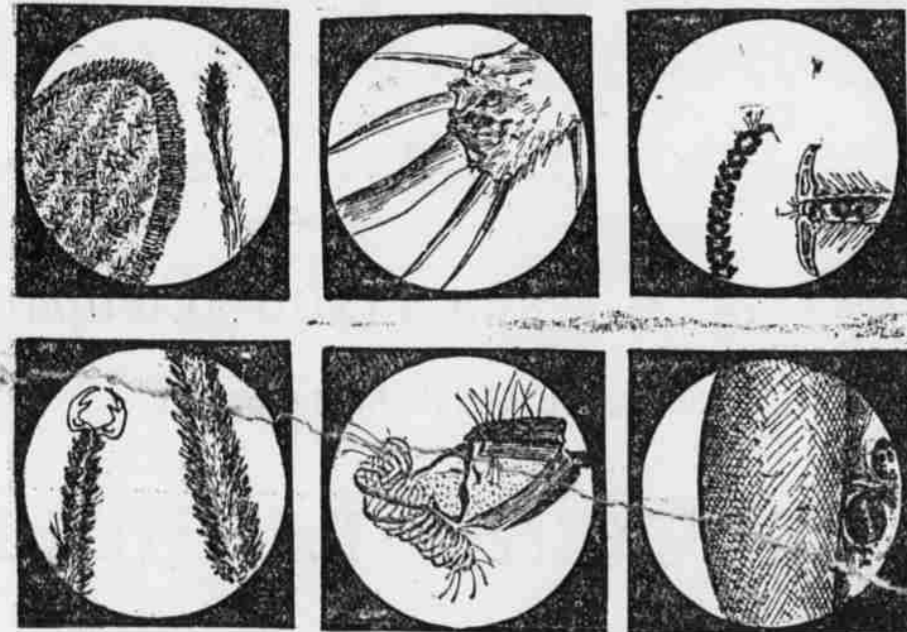
"The grave mistake of repressing children," writes Barbeta Brown in the Ladies' Home Journal, "is caused by the mother's failure to be keen enough to see where she may touch a child's life and where she may not; where it is for her to guide, to help, to encourage, and where the child-life is sacred to itself alone. That the child is another individual never occurs to some mothers, nor that he has his own possibilities for growth, not to be tampered with; his own privacies, not to be invaded; his own 'holy of holies,' to be held holy. The Power that is working in the vast life of this universe is working in your son or daughter as part of it; and it has its own purpose in regard to each child life as surely as for each planet in its orbit. God needs much help from mothers, but God does not intend to be effaced by mothers. Cooperate, then, with the Power working through your children, mothers. Do not make the great mistake of attempting to compete with it."

The Oldest Steam Engine.

The oldest steam engine in the world has recently gone off duty after working more than 120 years. It was built in 1777. It is a beam engine, the beam being of wood; the cylinder 32 inches in diameter, with an 8 ft. stroke. This veteran engine has been in the service of the Birmingham Canal Navigation Company.

Western girls like to read of yachting and automobile costumes; they hope to own yachts and automobiles after they have married princes.

A credulous woman is one who believes a dentist when he promises not to hurt her.



REVELATIONS OF INSECT ANATOMY AS SHOWN UNDER THE MICROSCOPE.
Wing and bill of a Mosquito. Ankle of a Cockroach. Foot of Spider. Foot of Cockroach.
Foot and leg of the Mosquito. Proboscis of a House Fly. Eye of a Grasshopper.

eye appear to present no inequality. When the mosquito struggles—as can frequently be noticed—these hooks have clasped something which is clasped the tighter as the insect tries vainly to fly away.

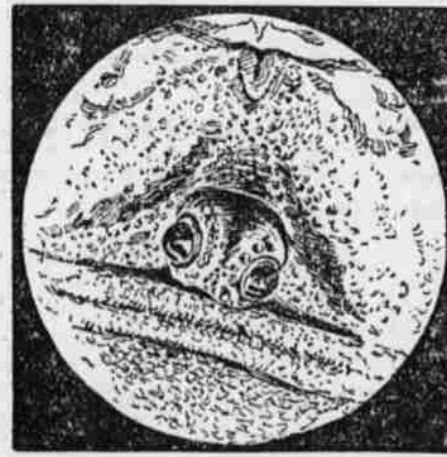
But it is in the visual apparatus that nature shows the most marvelous adaptability to the lives of the bugs. Some of the eyes Dr. Riese has placed on microscopic slides are marvels of intricacy. The fact that they are stationary, without lateral or vertical power—they can not alter the focus or direction of gaze—makes it necessary

leg of the insect might be examined under the powerful lens. The joint work of the limb is like a ruby rush, the delicate blood vessels imparting a brilliant hue thereto. The structure is extremely powerful, the joints fitting into each other so as to impart the greatest elasticity and power. On the end of the leg are strong hooks which can close on any object with great force. They also give the insect the power to grasp any inequality forcibly, to use the enormous muscular power which results in a leap of hundreds of times the length of the insect.

"The theory," said Dr. Riese, "that insects have cup-shaped terminations to their legs, which enable them to travel up a wall or up a glass is not correct. They have nothing of the kind—at least none I examined has. Suction, the supposed force which keeps them in the r seemingly unscientific position, is not used at all. Those hooks are used as a monkey uses the long fingers and as a bird uses its claws, to grasp any roughness on the surface. If the smoothest piece of glass known were examined under a powerful microscope it would be seen to be a mass of inequalities. Now, the hook or hooks—some have several on one leg—are so small that they can be inserted in these inequalities. Thus what seems to be a violation of natural laws is seen to be merely an accommodation thereto.

"Look at this set of hooks on the end of the leg of the mosquito. A close glance will reveal the fact that this insect has powerful double hooks working from opposite sides of the leg. These can close up on anything too small to be seen and hold on with great power. The spider you will also see has a set of hooks which he uses with legs several times as long as the diameter of his body. He must have tremendous muscular power to use those legs at all, yet he handles each in succession at will."

One of the wonders of nature was shown on another slide. It was the head, and particularly the proboscis, of the common house fly. Projecting out from between the feelers is a broad net hooked up to the head by extension ropes. This net or web can be thrown out to a distance several times as far as the diameter of the head. It is used to suck up fluids and convey them to



WATCHTOWER OF A SPIDER.

for the insect to be provided with lenses so cut up with facets that they will capture and retain pictures in almost every degree of the lateral and vertical planes. Insects can see as well between what in man would be called the shoulder blades as they can directly in front. In many cases they see to much better advantage behind than before.

Dr. Riese adjusted his microscope at this time and placed a slide in position whereon was pasted the body of a "daddy long legs," or common garden spider. This specimen is an exceptionally fine one and is so mounted as to bring the eyes directly under the searching power of the instrument. The eyes are wonders in themselves, but their position is even more wonderful. They are perched on top of a watch tower in the middle of the back. They project into the air to what seems a full inch under the glass; seen by the naked eye this tower is indistinguishable until the mind has