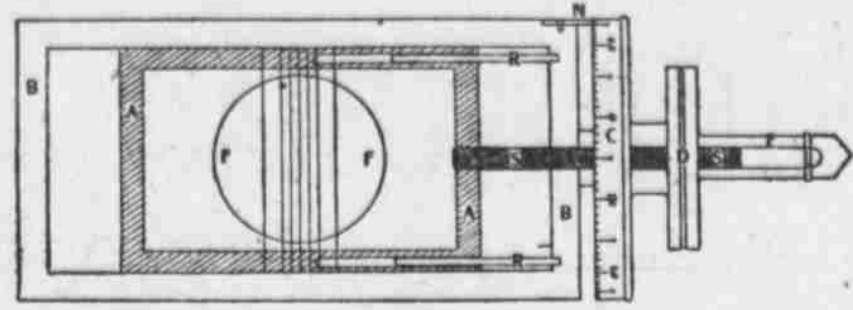


# Value of the Filmy Cobweb to the Science of Astronomy

**W**E HAVE often been told of the value of what are generally called trifles. We know that very great things often depend upon very small ones, that, for example, the lives of many people and the safety of tons of precious merchandise may be endangered by the neglect of a bolt on a bridge, and that a spark may cause the conflagration of a city or of miles of forest lands.

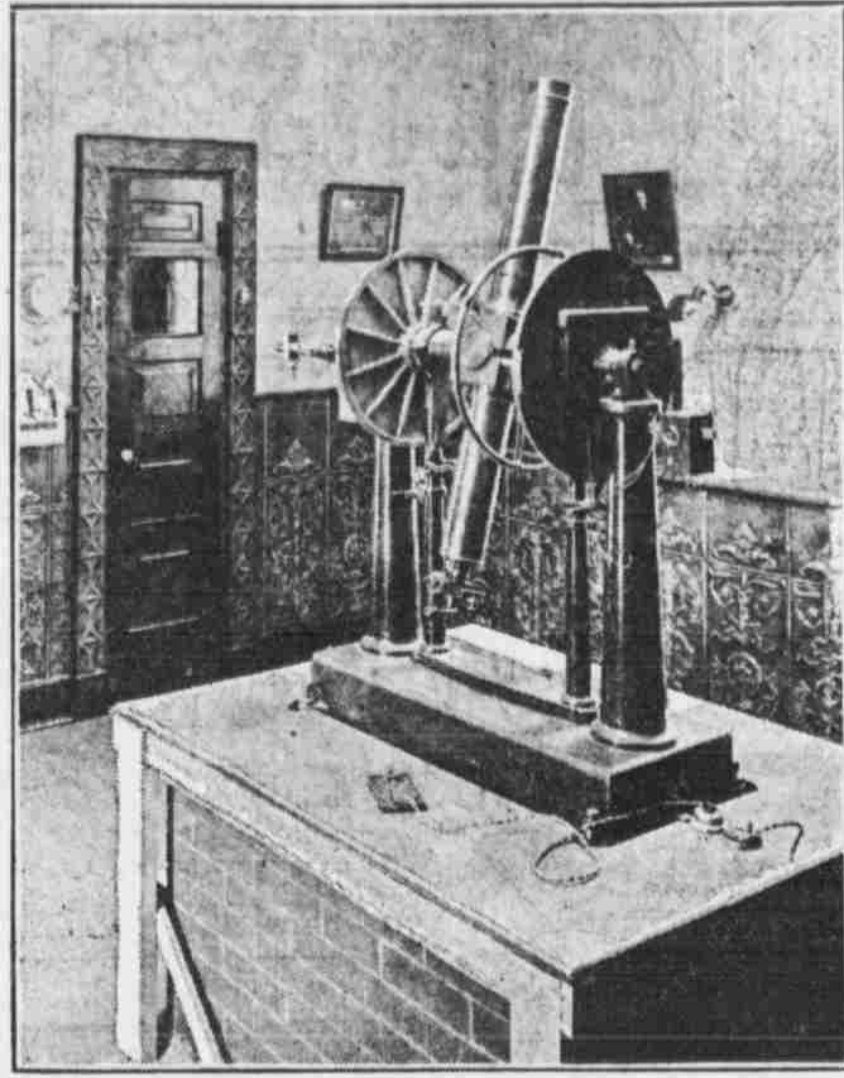
While we know these things and willingly admit them, and can give illustrative examples of our own, I think most of my readers would imagine I was drawing the long bow when I told them that a sixteen-hundred-dollar instrument was thrown completely out of use for the want of a cobweb! Yet, it was a sober fact, and was painfully in evidence to me no less than to some students of mine, one of whom has come 50 miles principally in order to use this instrument. It was about as serviceable to us as its picture would have been; and all that on account of an accident to the cobwebs it contained. Let me explain the cobwebs.



**Plan of Transit Micrometer.** The framework A, which carries the reticle, is moved in the box B by means of the screw S, which has a hundred threads or turns to the inch. The nut, head or drum C of this screw is divided into a hundred parts, tenths of which are indicated by the pointer N. In this way one-tenth of one-hundredth of an inch can be measured. The reticle is moved slowly by turning the milled head D, which forms one piece with the drum C and the shank E. Turning the shank E moves the reticle rapidly across the field. R R are two rods supporting long spiral springs, which push

the frame-work A away in the opposite direction, when the screw is turned backward. These springs are strong enough to hold the reticle firmly in any position. F is the field of view. The number of whose turns is indicated by a cogwheel gearing into a short spiral screw on the lateral face of the drum. It is not represented on the diagram. There is a second and similar micrometer at right angles to the one shown. It moves two parallel horizontal threads, which are supported by two short rods or studs, and brought as close to as possible without touching the seven vertical threads, so as to be in the same focus with them.

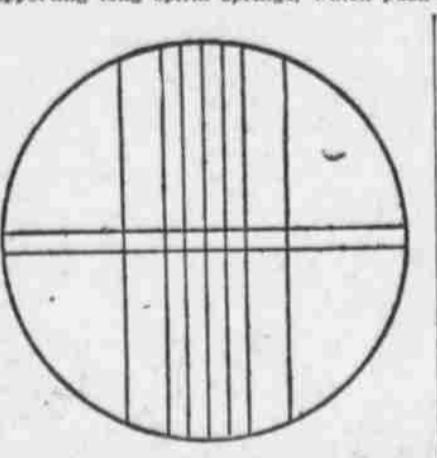
**Difficulties.** Yes, when everything is satisfactory—the reader ever tried it? We think not, for it takes a long time and infinite patience before everything is satisfactory. Cobweb is extremely delicate. The least false movement will tear the thread. Removing the loose ends may ruin two or three neighboring threads. Patience, try again. Sometimes the final drop of shellac may be too wet with alcohol and may so affect the threads as they curl up and stick together. Unraveling then is almost sure disaster. Files must not witness the work, for they may spoil the threads directly as well as indirectly by annoying the operator. A breeze is almost an objectionable. Altogether it is as trying a piece of work as one could well imagine, trying to hands and eyes and much more so to patience. The material is not worth much, but the



The sixteen-hundred-dollar transit instrument, which together with the chronograph hidden behind it in the photograph,

and the clocks in the vault, was rendered perfectly useless for the want of a few cobwebs.

**The Wires or Threads in a Telescope.** If the reader has ever looked through a telescope that was on a measuring instrument such as a surveyor's transit or level, he will surely have seen in it at least two fine black lines crossing each other at right angles, one being vertical and the other horizontal. The object of these lines is to enable the observer to direct his telescope very accurately upon a given object, or, conversely, to find the object his telescope is directed to when it is adjusted by means of its levels or circles. The whole round picture seen in a telescope is called its field of view. As this is of some considerable size and shows quite a number of objects, it would be impossible to know which of these objects the telescope was directed to, unless we had these fine lines to point it out to us.



**Reticle of transit,** consisting of seven vertical and two horizontal threads or wires, each system being moved by a micrometer screw.

A telescope, as we probably know, consists essentially of at least two lenses, one at each end of a tube, each lens being itself a compound of two or more simple or elementary ones. The lens nearest the object looked at is called the objective, and is always the larger of the two. This lens forms near the other end of the tube an image of the object, in exactly the same manner that a photographic camera does. In fact, as far as the objective is concerned, there is no difference between a telescope and a camera, both have the same kind of an objective mounted at one end of a tube or box, the first having generally a cylindrical or converging tube

in a visual telescope the image is looked at through an eyepiece, which is the second of the two lenses we mentioned before, and derives its name from the fact of its being nearest the eye of the observer. This eyepiece is a magnifying glass in principle, and makes the image look larger. It is often easily removable and replaceable by another, which has a different magnifying power, so that one may examine the object he is looking at under various degrees of magnification. The higher the power, the fainter is the image, because the eyepiece receives only a definite amount of light from the objective, and the more the image is magnified, the more the light is spread, so that the highest powers of a telescope can seldom be used to advantage, except on a bright object and in a clear sky.

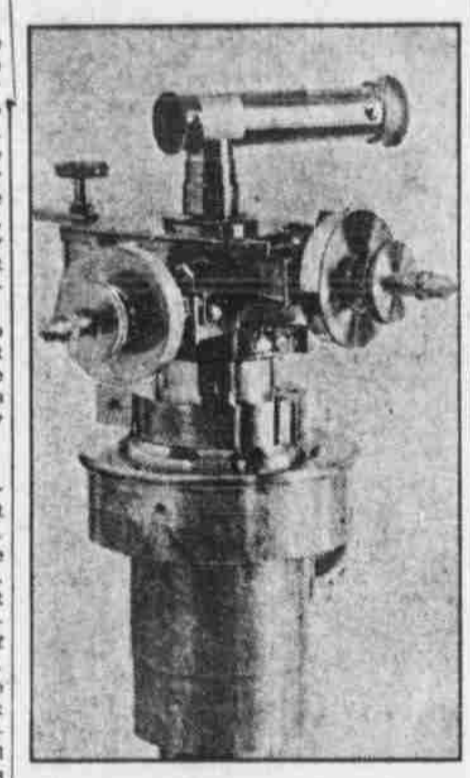
**Character of the Lines.** The fine black lines we have mentioned before are at the same place in the tube where the objective forms the image, so that both image and lines are viewed together through the eyepiece. For very accurate work it is evident that these lines should be very fine and smooth, so that they may be looked at through eyepieces of the highest magnifying power. They ought also to be perfectly straight and taut, and sufficiently elastic to remain straight and taut, no matter how much the tube of the telescope and the frame on which they are fixed, expands and contracts with the temperature, or in any other way. And lastly, they should not be hygroscopic, that is, should not be affected by wet weather.

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**Cobwebs.** Very few substances possess all these qualifications in a higher degree than the commonest kind of cobweb, simple ordinary spider's web, which tidy people abhor so much in the corners of their rooms. A spider line is perfectly smooth under the highest magnifying power. It is perfectly black in a bright field, and may be made bright in a dark field. It is also elastic, and may therefore be stretched perfectly straight, its weight being so insignificant that in short lengths there can be no danger whatever of sagging.

**How Spider Lines Are Put In.** The first thing to do is to get the cobweb. This is not as easy as it looks. Not every spider gives a web that can be used. Some lines are altogether too fine to be readily seen even with a magnifying glass, and too trying on the eyes. Some consist of loose strands not sufficiently knit together, they are not one line but many of them and absolutely unfit for the purpose. Some have heads strung upon them, or are otherwise of varying thickness. It took us actually a whole week to find the cobweb we wanted. This may be a powerful proof of the cleanliness of our buildings and premises, but it was a fact notwithstanding, and was responsible for 90 per cent of the inactivity of our telescope.

When the right spider has been found, his thread is caught as he spins it and before it touches anything, and wrapped on a branching twig or stiff wire shaped like the letter Y. Having then made ready the frame work on which the threads are to be



Photograph of whole eyepiece of transit taken out of the telescope. It shows the micrometer box with its two screws. The eyepiece proper is diagonal, that is, turned at right angles to the telescope, so that stars high up in the sky may be conveniently observed. It is also parabolic, that is, may be moved some distance laterally in any direction, so that any wire of the reticle may be brought into the middle of the field of view, no matter how far it may be moved by its screw.



The Creighton University, a "Field of Advantage and necessity of cross wires in a field of view."

stars or objects anywhere in the field of view. In the Creighton university transit the whole reticle is moved by means of a screw which has a hundred threads on turns to the inch. The head of the screw is divided into a hundred parts, and these parts are read by estimation to tenths, so that we may measure down to one-tenth of one-hundredth of one-hundredth, that is, to one hundred-thousandth of an inch. There are two such micrometer screws in the eyepiece, one moving the seven vertical threads, and the other the two horizontal ones. Their accuracy is such that one could measure inches on a stake eighty miles away.

The finely divided circle on this instrument is read by two micrometer microscopes, which also use spider lines. These came with the instrument twenty-five years ago, and are so well protected that there is no likelihood of their ever being damaged.

**Importance of the Spider Lines.** All the refinements of this sixteen-hundred-dollar instrument were lost on account of the want of the few cobwebs which constituted its reticle. Stars could not be timed, the micrometers had no employment, and the circle could not be used. Nor is this all. Several connected instruments were rendered idle. The chronograph, upon which star transits are recorded, and the sidereal and solar clocks as well were all out of commission on account of that apparently most insignificant accident to a few cobwebs. Even our great equatorial telescope was only a scenic instrument, and had lost a great part of its power of measurement, because the error of our time-pieces could not be ascertained. In a word, it was an actual fact, and, as I said, painfully in evidence, that all the measuring power of our observatory was ruined on account of the want of a few cobwebs. It was a great object lesson, which the reader may turn to his profit in his own way, and thus form a much higher estimate than he has ever done before of the value of "trifles," and especially of the value of a cobweb.

WILLIAM F. RIGGE, S. J.  
Creighton University Observatory,  
Omaha, Neb.

## WHAT WOMEN ARE DOING.

Mary Hoover, aged 12 years, of Valley, Pa., is the champion snake-killer of that section. She has the skins of twenty-five reptiles a dispatch already this season, but none of them so large as the black snake she killed after a battle 6 feet 7 inches.

Miss Rose Moriarty of Elyria, Ohio, is deputy city treasurer, deputy city auditor, deputy clerk of the town council, clerk of the board of control, clerk to the director of public service and clerk to the director of public safety.

Among the newest strange gifts Mrs. Taft has received are several sacred tea plants from the garden of the Buddhist priests in Ceylon. The plants were sent to the secretary of agriculture, who will have them cared for in the tea farms of the Carolinas, which are under the supervision of the department.

Lady Minto distributed the diplomas and prizes at the recent commencement exercises of the London School of Medicine for Women. In her address she said that she had been much impressed by the graduates of the school in Canada and India, as well as in Great Britain. As president of the National Society for Providing Medical Aid for Women in India she had come into close touch with women physicians, many of them graduates of the London school, who were treating native women in India and struggling to teach modern scientific methods in the homes and hospitals of India.

# Where many Omaha women get splendid ideas on the furnishing and beautifying of their own homes

When a retail store determines not to be a mere shop for the sale of wares, but has an ambition to excel—to make itself a source of information and a place of interest to all callers—it merits the praise of the general public.

There is always something fascinating about beautiful articles for the home, and when beautiful articles are so displayed as to give the visitor new ideas on how to make her home more attractive, it becomes a store of special interest to the lover of the home beautiful, whether this person is in need of any articles for her home or not.

**THE RUBEL FURNITURE CO.**

**WHERE ARTISTIC THINGS FOR THE HOME ARE SHOWN**

**VERY ATTRACTIVE DISPLAY OF THINGS FOR THE PARLOR AND THE LIVING ROOM.**

**A GLIMPSE OF THE BEAUTIFUL SECOND FLOOR.**

**A MAGNIFICENT SHOWING OF FLOOR COVERINGS.**

**THE MART OF PRETTY THINGS.**

**ART DISPLAYED EVEN IN SUCH FRAGILE ARTICLES AS STOVES.**

The store that presents, perhaps, the most unique appearance of all the home-furnishing establishments of Omaha and the one that furnishes the greatest number of suggestions to housewives on the furnishings and beautifying of their own homes is that of the Rubel Furniture Co., located at 1212 1/2 Howard St. They are demonstrating what charming ideas can be made with modern-furnished homes. The store is so arranged that every woman is enabled to produce the

most artistic and pleasing effects without any lavish outlay. The Rubel store has enjoyed a marked success in the past year, and since it became an institution in this city. Success has attended the endeavors of the firm on every hand. In a very short time after the store was established here, the firm outgrew its quarters and was forced to move to a new location on Howard street, where it has continued to prosper.

The Rubel Furniture Company is distinctively a new kind of store for Omaha. It does business in a different way from most furniture houses. One of its popular plans is to allow its customers to examine all purchases. If any article proves unsatisfactory for any reason whatever, it may be returned or returned for credit. No charges are made. This firm makes its motto "Satisfaction or money back" necessary in order to please a customer. This method forms a striking contrast to the unwilling manner in which some stores consent to exchange goods.

At the Rubel store an effort is made to show the most beautiful pieces of all times. From the nature of this company's stock one can readily see that the firm is in close touch with the best manufacturers in the country. The Rubels present a particularly handsome showing of living room furniture in new fumed oak and other novel finishes. They are distributing agents for Lambert's Arts and Crafts furniture.

The Rubels mark all their articles in plain figures so that a prospective buyer may walk through the store and see just what each piece is worth. The Rubel Company has a big store in Minneapolis. This establishment does a large business. The trade at the Omaha and Minneapolis houses is so great that the company is enabled to buy in sufficient quantities to secure the very lowest prices from all sources. The firm is living in its claim on low prices and livelier comparisons with figures at other stores.

Credit is extended by the Rubels to customers and the terms of payment may be made by the buyers. The Rubel company never takes a salary assignment, for this is regarded as unworthy the dignity of a reputable house. The utmost leniency is exercised with all customers.

Those who have not visited the establishment of the Rubel Furniture Co. on Howard street, can hardly realize, even from the pictures produced here, how very artistic and attractive this store really is. The management of the Rubel store extends a cordial invitation to everybody to call and see the pretty store and its many charming articles. No one is asked to buy. All may come and visit and see the management will be pleased to do all it can to show the fitness and explain points about them.