THE MICROMOTOSCOPE.

BY D. F. ST. CLAIR.

The principles of the kinetoscope or mutoscope have been applied to the microscope, with some interesting results, by Dr. Robert L. Watkins, of this city. The instrument, though simple, was made a success only after many experiments and failures in adjusting the objective of the microscope in a line with the right sort of light and a rapidly moving film.

The principal difficulties in making a mutoscope out of so delicate an instrument as the microscope are the light and the lens. Every electric lamp in the market, when its light has been concentrated sufficiently for photography, will after a short time, with its heat, kill, dry up, or impair almost any kind of life in the microscopic field. The greater the magnification, the more intense the light must be and the nearer the microscope. This difficulty was often enhanced by the length of time it took to get a focus on the sensitive film, but most of the pictures taken were good and show well the various characteristics of the action taking place in cell life, so far as it can be observed with the microscope.

Whatever is to be photographed, once it is put in the field of the lens, is adjusted to a horizontal plane. Near one end of the microscope is placed an electric lantern containing a small arc light concentrated on the object. Near the other end is the box that covers the apparatus for moving the long, sensitive gelatine film. The film runs like a belt on wheels and passes in front of a tiny window in the box and on a direct line with the lens and light. This machinery is turned by a crank and its ordinary capacity is about 1,600 pictures per minute. It is possible to increase it to 2,000 or 2,500, but for most purposes 1,000 or even less per minute will record every motion taking place in most cell life. Dr. Watkins found, however, after a number of trials, that he could not turn the machine fast enough to photograph the motion of the blood circulating in the web of a frog's foot. He simply needed a larger wheel.

The advantages of mutoscopic photography to microscopy are quite evident, especially as regards the action of bacteria and blood cells. Nearly all the numerous families of bacteria have motion, often motion that the eye cannot always follow clearly. It has already been discovered that the same kind of bacteria will act very differently under different circumstances. For instance, a flash of bright light will suddenly drive some kinds to cover. Some kinds will readily seek the negative pole of the battery. They will also seek food with avidity and reject poison with true instinct. All such phenomena can, of course, be followed with the eye, but not with the same detail in the microscopic field as in a series of clear photographs. The fact is that, on account of the motion of some bacteria, it has been well nigh impossible to photograph them. The books have had to depend upon the eye and hand of the draughtsman and vague description. This may not be of much importance either way, but as yet comparatively little is known about bacteria. It is not yet known whether they are the cause of disease or its results, or neither. Photography, under the proper circumstances, is most needed for the investigator, and it can be only moving photography.

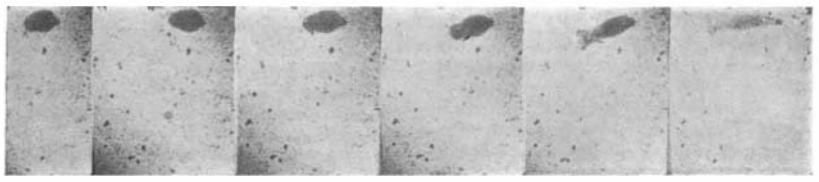
The capillary or circulatory motion of the blood cells, after the blood has been drawn, are comparatively slow at best. But the amœboid movement of the white cells and the changes taking place in the nuclei are complicated, and often hard to intelligently watch in the field. Many of these changes occurring in the white cell are certain to escape attention, but all of them will be clearly recorded on the rapidly moving sensitive film. These motions in the white cells, though they are as yet imperfectly understood, are full of meaning to the physiologist and pathologist. The offices that the blood performs in the body are believed to be due mainly to the action of the white cells. Certainly, the character of their amœboid action is one of the surest indications of health or disease.

But with the micromotoscope it need no longer be impossible to photograph the blood in actual circulation. With a better light the cells may be seen in the thin tissue of the ear or the web of the fingers. They have often been examined in the peritoneum during an operation, and Dr. Watkins himself has made a close study of them in the web feet of some birds and the tails of fishes.

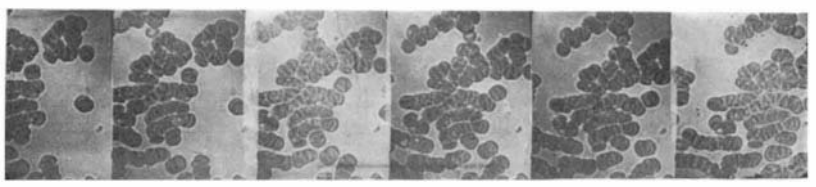
The illustration of blood here reproduced, unfortunately, does not show the white cells. They stuck to the glass; while the red cells, it will be perceived, retain something of their motion, continuing to flow across the field for half an hour after the blood was drawn.

The photograph of the rotifer in a drop of stagnant Croton water is the most interesting form of cell motion yet reproduced. This rotifer is moving with about the speed of a fly on the wing, and every action is photographed at the rate of about 2,500 pictures per minute.

Numerous photographs of bacteria were taken, but the motion happened to be an up and down one and showed no change of position in the field.



A ROTIFER AS SEEN IN THE MICROMOTOSCOPE.



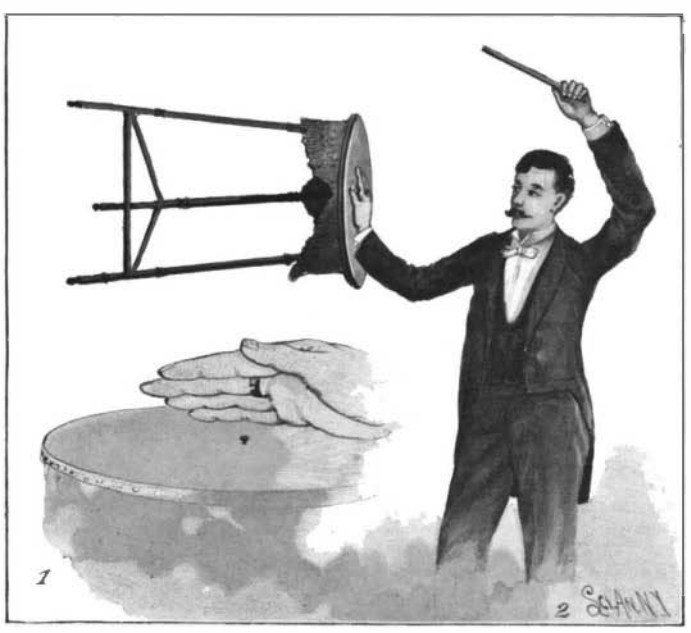
MOVEMENT OF BLOOD CORPUSCLES SHOWN BY THE MICROMOTOSCOPE.

Heart Burials.

The body of Louis IX, after his death at Carthage in 1270, is related to have been boiled in wine and water in order to preserve it for transportation, and it was then shipped by Charles of Anjou (I) to Sicily. Here the flesh and viscera were deposited in the Benedictine Abbey of Monreale, near Palermo. The heart and bones remained, by desire of the soldiers, in the camp. Later, his son Philip (le Hardi) having carried them and those of his brother Tristan into Italy, they were taken to Paris in 1271. On March 21 of that year, the bones, reduced to ashes, were deposited temporarily in Notre Dame, whence they were presently borne in state to the Benedictine Abbey of St. Denis, and at each spot by the way where the bearers paused, seven in number, Philip subsequently caused a cross to be raised. Charles of Anjou, dying at Foggia, 1285, his heart was sent to Angers, while his body was entombed in San Gennaro, at Naples. His viscera remained in the Duomo at Foggia. Philip II (le Hardi) died of pestilence at Perpignan, October 5, 1285. His flesh was buried at Narbonne. His bones were transferred to St. Denis. His heart was given by Philip IV (le Bel) to the Dominicans of Paris.—Notes and Queries.

THE MAGIC TABLE.*

This was a trick of the late Alexander Herrmann. In the center of the stage is placed a light table with three legs and a plush top. The prestidigitator moves his hand over the table; suddenly it rises in the air and follows his hands wherever he moves them. The secret of the trick will be easily understood by reference to our engraving. A small nail is driven in the center of the table. This nail is not noticed by the audience and the plush top tends to hide it. The magician wears a ring which is flattened on the inner surface and a small notch is filed in it. The ring is placed on the middle finger of the right hand; the hand is spread over the table until the notch fits under the head of the nail. The table can then be lifted with great ease and it appears to follow the hand of the conjuror in obedience to the magic wand.



THE MAGIC TABLE.

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Peary Off for Greenland.

The steam sealing bark Hope, with Lieut. R. E. Peary and party on board, bound for North Greenland, left Boston on July 19. The object of the voyage is to establish a settlement at a remote northern point of Greenland which will be used as a base of supplies for an expedition under Lieut. Peary in a search for the North Pole in 1898. To this end a party of Esquimaux will be left at the new settlement and will be engaged during the next summer in making preparations for Lieut. Peary's expedition. The Hope will make directly for Sydney, C. B., where she will take in coal for the remainder of the voyage. She will skirt the coast of Greenland, dropping scientific parties at various places and taking Lieut. Peary to Whale Sound, where he will establish a settlement. The return voyage will be begun, it is expected, in five weeks after the Hope arrives, and the parties will be picked up on the way back.

In the party which left Boston are forty-three persons, including, besides Lieut. and Mrs. Peary and their daughter, their servants and the crew, Mr. and Mrs. H. J. Lee, of Meriden, Conn.; Robert Stein, of the United States Geological Survey; Albert Operti, the Arctic scenic artist; J. D. Figgings, of Falls Church, Va., taxidermist; Dr. Frederick Sohon, surgeon, of Washington; and several investigating parties, one under the direction of Prof. C. H. Hitchcock, of Dartmouth, who will study glaciers and the relics of the Norse colonists from Iceland, and another from the Massachusetts Institute of Technology, under R. W. Porter, who will remain in the north through the next winter to hunt the big game of the country and bring back zoological specimens. There are also on board two representatives of the National Museum. who are expected to bring home several tons of fossil flora for various museums.

Decadence of the Mediæval Trades Unions.

The moral havoc wrought by these monopolies was greater even than the industrial havoc. It crushed all feelings of justice and humanity, making its victims more grasping and cruel than Shylock; it led them to the practice of every trick and deception of a Newgate sharper to evade the laws; it stirred up a contention that rivaled the quarrels of the Guelphs and Ghibellines. Apprentices became no better than serfs and slaves. They were not merely pitilessly fined and brutally punished; they were often left in ignorance of the craft that they had purchased the right to learn. In that frightful social and moral revulsion following the long and devastating wars of the sixteenth and seventeenth centuries the corporations became more determined than ever to maintain their industrial aristocracy and monopoly. They refused to admit any trade less ancient and honorable than their own to the rights and privileges of the law; they soiled themselves by contact with no person of illegitimate birth; and in their savage and relentless pursuit of persons engaged in unauthorized traffic they invaded the homes of contraband workmen, confiscating both their tools and the hidden products of their toil, leaving them and their families destitute and starving. To such absurd lengths was the creation of corporations carried for the production of new taxes and new places for court favorites that occupations like the teaching of dancing, the selling of flowers, and the catching of birds were organized, and homogeneous occupations like the hatmakers' and carpenters' were divided and subdivided beyond the comprehension of the modern mind. —Appletons' Popular Science Monthly.

149 Miles in 143 Minutes.

On July 16, the Empire State Express of the New York Central Railroad ran 149 miles in 143 minutes. The train was twenty-three minutes late when it left Syracuse, and when the express reached Rochester ten minutes had been made up and eleven minutes more were saved between Rochester and Buffalo, which was reached at 4:47, the express being two minutes late.

THE American manufacturer, says an exchange, sells the Japanese one-twelfth dozen of machines, which the Japs use as a pattern. They build factories and make all they want in future. That is no doubt so, yet any new invention may be patented in Japan, and it behooves our manufacturers to take advantage of the privilege and thus prevent the manufacture of their inventions in Japan without their permission.