

ART. XXXI.—*On a Mechanical Finger for the Microscope*; by
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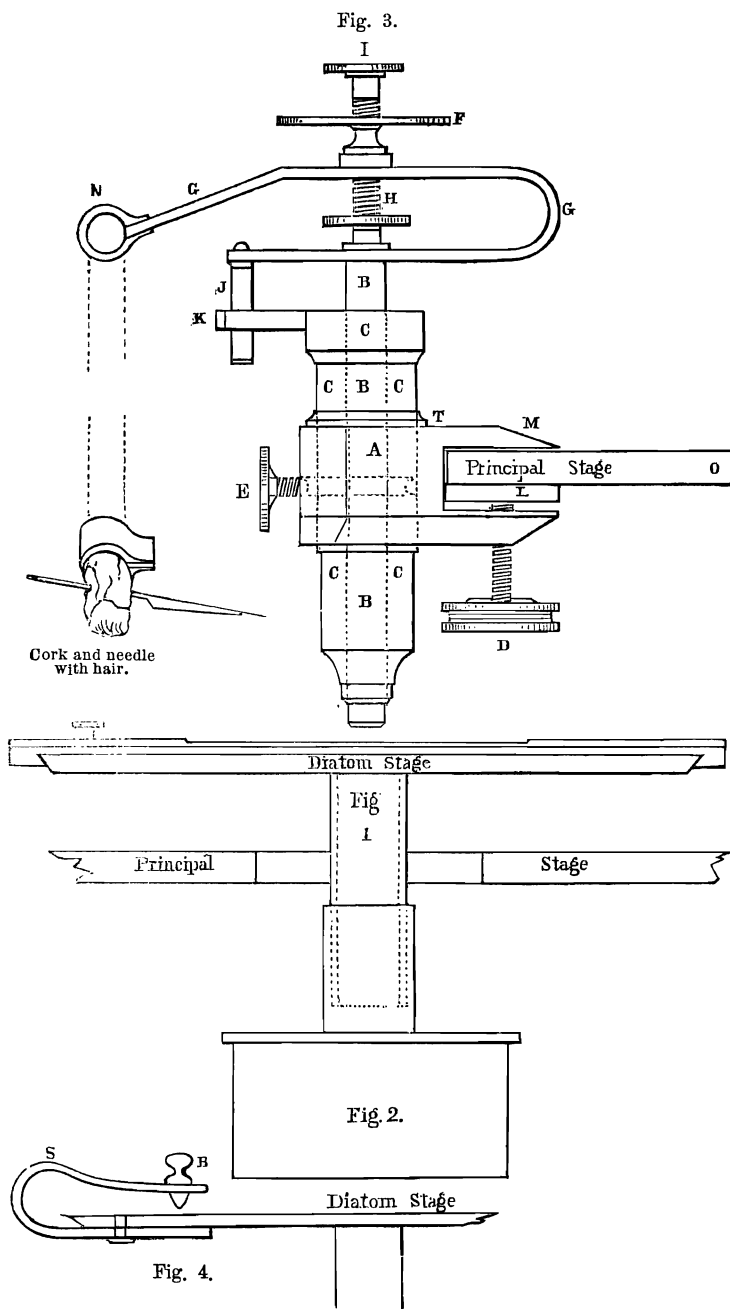
IN the Journal of May, 1866, there is a description and woodcut of a mechanical finger, by Mr. H. L. Smith.

There are few naked eyes, or ordinary hands, that can select, from a mass, one of the smaller diatoms; and the engraving in the Journal was seized upon, at once, by the writer, as affording a promise of relief in the patient labor that had so often tested both his eye and hand. It was his good fortune to be within reach of one of the instruments. It was a great help, no doubt; and, after acquiring "the knack," it was possible to use it. But it wanted solidity, and the writer ventured to think that it might be made firmer, if constructed with fewer parts and joints. It was a capital idea, however, usefully illustrated; but not beyond improvement: so an improvement, as it was thought, was put on paper, and sent to Mr. Joseph Zentmayer, the well known optician of Philadelphia.

Putting aside both the improvement and the original, Mr. Zentmayer went to work upon an entirely new system, and produced what seems to be very near perfection.

The microscope, in the writer's possession, is one of Mr. Zentmayer's large first class ones, though the finger can be adapted to any other. There are three pieces: one, an independent stage, that we will call the diatom stage, (fig. 1) supported, above the principal stage, upon a tube that fits into a sleeve attached to a cylinder, (fig. 2), that fits into the sub-stage. The tube of the diatom stage is passed through the opening of the principal stage into the sleeve, as shown in the drawing, when its only movement, up and down, is regulated by the rack and pinion of the sub-stage. Light from the reflector is thrown upon the object through the tube of the diatom stage. A spring, S, with an ivory button, B, is attached to the diatom stage, as shown in fig. 4, which steadies the slide as it is moved by hand to bring different parts of it into the field.

Fig. 3 shows the third piece of the apparatus, or, really, the only piece, so far as the finger is concerned; the other three pieces being necessary to hold the slide containing the diatoms, but having, otherwise, nothing to do with the finger proper. The drawing is of full size. A is a clamp secured to the principal stage by the jaws M and the movable plate L, which is tightened by the set screw D. The cylinder C passes through the clamp resting on the shoulder T. It turns horizontally when not fixed by the set screw F, whose point presses in the groove shown in the drawing. The steel rod B, surrounded by a spiral spring, which is not shown, but which can be readily



understood, passes through the cylinder C, the spiral holding it up when not pressed down. Upon this rod is the steel spring, G, bent as shown, carrying at its upper and longer extremity, at N, a cork-holder, through which is thrust the needle that carries the hair; and, at its lower extremity, the guide J, passing through a slot on the arm K, projecting from the cylinder C. The object of this is to counteract the rotary movement that would otherwise be caused by the spiral spring on the rod B when pressed downward in operating the apparatus. F is a large milled head lowering or raising the end of the spring N, in focussing the point of the hair. The down pressure is applied at I compressing the spiral spring around the bar B within the cylinder C, and bringing the point of the hair on the particular diatom.

A most excellent, if not an original, mode of attaching the hair to the needle, which is thrust, eye foremost, through the cork projecting from N, is the suggestion of a friend of the writer. Cut a piece of thin paper into the shape of the letter V about half an inch high and crease it lengthwise so as to bring the sides together. Having gummed the paper well, lay the needle on the crease, keeping its point within the paper, and place the hair along side of it. Then closing the sides of the V, the needle and the hair will be compressed together at the bottom of the crease; and when the paper is perfectly dry the hair can be cut with scissors to the proper length, if necessary, and so much of the paper trimmed off as may not be wanted to retain the needle and hair in their places. The needle may then be forced, with a pair of fine pliers, eye foremost, through the projecting end of the cork at an angle inclining somewhat downward; and, when this is done, the finger is ready for use. The angle of the needle to the stage may be changed by turning the cork, which is screwed into the opening at N, which has a thread for the purpose.

The slide containing the diatoms is now placed on the diatom stage; the part to be examined being over the opening of the tube, through which the light is reflected, focussed as usual, and the particular diatom selected. The hair is then brought, by hand, within the field of view. This is done by turning the cylinder C, and adjusting with the pliers, if need be, the length of needle and hair projecting through the cork. The set screw E is then tightened, and the observer has, in the field, the diatom in focus, and the end of the hair seen dimly, and not in focus. The screws of the principal or mechanical stage now enable him to bring the point of the hair with mathematical precision just above the diatom; when, pressing at I gently downward, the hair touches the diatom; the latter, if all goes well, adheres to it; the diatom stage is lowered; the slide removed; the clean slide, to which the diatom is to be transferred

is put in its place; the diatom stage raised until the hair, with the diatom on it, is in contact, when the diatom is taken off by the moisture that has been previously breathed upon the slide.

The superiority of the contrivance here described is its simplicity and absolute steadiness.

In the drawing, the position of the spring G with the cork-holder N is reversed. They turn, as already described, in any direction, horizontally.

The facility with which a diatom may "be handled," to use the term in this connection, is one of the great advantages of Mr. Zentmayer's contrivance. The point of the hair may be brought into focus along side of the diatom, which may then, by using the screws of the mechanical stage, be pushed in any direction by the finger, and separated from the mass, or, when transferred to a clean slide, may be placed wherever required thereon. With such an instrument may be understood the *modus operandi* by which the 392 diatoms of "Möller's Diatomaceen platte" were arranged.

Nothing more has been attempted here, than to describe the particular instrument. But no one can understand the whole subject, without reading the most admirable article of Mr. H. L. Smith already referred to, and which set the writer to work to improve, if possible, the mechanism there described. L.